INVESTIGATING NETWORKED LEARNING IN CORPORATE LEARNING CONTEXT: AN EMBEDDED DESIGN MIXED METHOD STUDY EXAMINING ONLINE KNOWLEDGE SHARING AND COLLABORATION VIA SOCIAL NETWORK ANALYSIS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

DİDEM TUFAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN
COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY

JUNE 2016

Approval of the thesis:

INVESTIGATING NETWORKED LEARNING IN CORPORATE LEARNING CONTEXT: AN EMBEDDED DESIGN MIXED METHOD STUDY EXAMINING ONLINE KNOWLEDGE SHARING AND COLLABORATION VIA SOCIAL NETWORK ANALYSIS

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ABSTRACT

INVESTIGATING NETWORKED LEARNING IN CORPORATE CONTEXT: AN EMBEDDED DESIGN MIXED METHOD STUDY EXAMINING ONLINE KNOWLEDGE SHARING AND COLLABORATION VIA SOCIAL NETWORK ANALYSIS

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June 2016, 221 pages

This study, implementing an Embedded Mixed Method Design incorporating Social Network Analysis (SNA), aimed to explore how employees participated and communicated in a networked learning environment within corporate context by investigating employees' discussions on an online wall platform. For this aim, Learning Management System logs of an e-learning company is used. They included self-organizing social groups, in an informal learning environment. The wall platform data from two social groups, including 50 employees, were examined by implementing Content Analysis (CA), SNA and statistical analysis.

CA is conducted by using cognitive presence and social presence constructs of Communities of Inquiry framework. Also, a novel network structure, Multiple Layered Presences Network (MLPN), was introduced to integrate CA results into network structure. The networks were examined by implementing community

detection, triadic analysis, symmetric acyclic decomposition and blockmodelling analysis of SNA. Also, the relationship between cognitive presence and social presence of the participants was analyzed with chi-square statistics depending on the interaction similarity of the participants.

As a result, self-organizing social groups were found to have unity without any subgroups. Also social groups were found to function according to their establishment aim but mostly in the exploration level of social presence. The study reflected that, information flow in the social group took place among all participants indicating no rigid informal ranking but a mild form of hierarchy. Also, cognitive presence and social presence were found to be related except for the highest level of cognitive presence which is resolution.

Keywords: Networked Learning, Social Network Analysis, Content Analysis, Mixed Method, Workplace Learning.

ÖZ

KURUMSAL ÖĞRENME BAĞLAMINDA ÇEVRİM İÇİ ÖĞRENMENİN İNCELENMESİ: SOSYAL AĞ ANALİZİ İLE ONLİNE BİLGİ PAYLAŞIMI VE İŞBİRLİĞİNİ İNCELEYEN BİR GÖMÜLÜ TASARIM KARMA YÖNTEM ÇALIŞMASI

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Sosyal Ağ Analizi (SAA) içeren Gömülü Tasarım Karma Yöntem uygulayan bu çalışma ile kurumsal bağlamda çalışanların ağ tabanlı bir öğrenme ortamına nasıl katıldıklarının ve bu ortamda nasıl iletişim kurduklarının, çevrim içi duvar yazıları uygulamasında yapmış oldukları tartışmaların incelenmesi ile araştırılması amaçlanmıştır. Bu amaçla, çalışmada bir e-öğrenme şirketinin kullandığı öğrenme yönetim sisteminin (ÖYS) kayıtları kullanılmıştır. Bu kayıtlar informal öğrenme ortamında kendi kendini örgütleyen sosyal grup kayıtlarını içermektedir. İki sosyal grubu, 50 çalışanı içeren, çevrim içi duvar yazıları verileri İçerik analizi (İA), SAA ve istatiksel analiz teknikleri kullanarak incelenmiştir.

İçerik analizi, Araştırmaya Dayalı Öğrenme Topluluğu Yapısı'nın (Community of Inquiry Framework- CoI) bilişsel bulunuşluk ve sosyal bulunuşluk bileşenleri kullanılarak yapılmıştır. Aynı zamanda, İA sonuçlarının ağ yapısına entegre

edilmesinde, yeni bir yöntem olan Çok Katmanlı Bulunuşluk Ağı (ÇKBA) ortaya konmuştur. Oluşturulan ağ yapısı, SAA'nın topluluk algılama, üçlü analiz, simetrik ve çevrimsiz ayrıştırma analizi ve blockmodelleme analizi yöntemleri uygulanarak incelenmiştir. Ayrıca katılımcıların bilişsel ve sosyal bulunuşlukları arasındaki ilişki, katılımcıların iletişim ağlarındaki etkileşim benzerliğine dayanarak Ki-Kare istatistik tekniği ile analiz edilmiştir.

Sonuç olarak, kendi içinde alt gruplaşma göstermeyen, bir bütün oluşturan, kendi kendine organize olan sosyal gruplar bulunmuştur. Ayrıca sosyal gruplar kuruluş amaçlarıyla uyumlu bir işlevsellik sergilemişlerdir. Çalışma aynı zamanda sosyal gruplar içerisindeki bilgi akışının katı bir hiyerarşik yapı göstermediğini, katılımcılar arasında grup içi daha ılımlı bir hiyerarşi bulunduğunu da göstermiştir. Ayrıca bilişsel ve sosyal bulunuşluğun, en yüksek bilişsel bulunuşluk seviyesi olan çözümleme seviyesi hariç olmak üzere, birbiri ile ilişkili olduğu bulunmuştur.

Anahtar Kelimeler: Ağ Tabanlı Öğrenme, Sosyal Ağ Analizi, İçerik Analizi, Karma Yöntem, İşyerinde Öğrenme.

To my love, to my family and to my miracle

ACKNOWLEDGMENTS

First and foremost, I would like to express my immense gratitude to my advisor, Prof. Dr. Soner Yıldırım. This thesis would not have been possible without his academic guidance, insight, patience and his life guarding encouragement and support throughout the study.

It gives me great pleasure to acknowledge the support and help of my co-supervisor Assoc. Prof. Dr. Banu Günel Kılıç. Her continuous support in addition to tolerant and genius attitude enabled me to learn and implement a new analysis method in this study.

I owe my deepest gratitude to Dr. Göknur Kaplan Akıllı for her for her invaluable contributions in content analysis. Also, her support and motivation has become visible several times throughout my long story of dissertation.

I would like to express my sincerest gratitude to my distinguished thesis committee; Assoc. Prof. Dr. Ayfer Alper, Assoc. Prof. Dr. Halil Yurdugül, Assist Prof. Dr. Gülfidan Can, Assist. Prof. Dr. Yeşim Çapa Aydın for their encouragement in addition to their valuable suggestions and comments.

This thesis would have remained a dream if Enocta hadn't agreed to supply the data from their unique learning environment, Sosyal 2.0. I would like to thank Burak Yücelyiğit, Ahmet Hançer, Kemal Taşkın, Kenan Gürhan Çelik and other colleagues at Enocta for their priceless support.

I really cannot thank enough my dear friends in Türksat and AFAD and also my friends Ayten Kaya Karaca, Hatice Kıvanc, Güngör Kıvanç and whole family for all kinds of assistance they provided and for making it possible for me to have enough time to work on my dissertation.

I wish to thank, Aslı Karabulut Aşçı for her efforts in translations of the messages. I am also thankful to my friends in the METU-CEIT department who provided me with their endless support and encouragement throughout this process.

I really cannot thank enough my mother Nihal Avdan, my father Erol Avdan and my brother Emre Avdan, for the love and support they always provided me. Especially, my mother's endavour with my son, made it possible for me to survive as a full-time working mum with a doctoral study.

I am indebted to my loving husband Dr. Emrah Tufan, who knew how it is like to be a PhD student, who tolerated me when I feel exhausted and who has always been a great father. He had warned me before starting this study. Nonetheless, I am glad we share life as well as we shared this dissertation writing experience.

And lastly, I want to thank my son Arın Tufan, who have provided me enough space to finish this dissertation. If he hadn't been such a great child, I would have fallen by the wayside…

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LIST OF ABBREVIATIONS

AF: Affective Responses level of Social Presence

ALN: Asynchronous Learning Network

BFV SG: "Bir Fikrim Var" Social Group

BPL: Blog post-like

CA: Content Analysis

CAI: Computer Aided Instruction

COI: Community of Inquiry

CP: Cognitive Presence

CSCL: Computer Supported Collaborative Learning

EX: Exploration level of Cognitive Presence

GC: Group Cohesion level of Social Presence

ICT: Information and Communications Technologies

IN: Integration level of Cognitive Presence

KD SG: "Kampus Destek Hattı" Social Group

LMS: Learning Management System

METU: Middle East Technical University

MLPN: Multiple Layered Presences Network

NL: Networked Learning

OC: Open Communication level of Social Presence

OC: Question-comment

QA: Question-answer

QL: Question-like

RE: Resolution level of Cognitive Presence

SA: Statistical Analysis

SAD: Symmetric Acyclic Decomposition

SG: Social Group

SNA: Social Network Analysis

SP: Social Presence

TE: Triggering Event level of Cognitive Presence

WPC: Wall post-comment

WPL: Wall post-like

CHAPTER 1

INTRODUCTION

1.1 Introduction

The current chapter presents the background of the study mentioning changes in the internet and communication technologies in the corporate learning environments. Then the problem is stated and the purpose of the study is explained. Afterwards, the significance of the study is presented based on the literature. In addition, the purpose of the study is explained and the research problem and research questions are stated in detail. At last, the significant terms covered in the thesis are defined.

We have witnessed the rise of web 2.0 technologies facilitating social interaction and communication in the last two decades. These technologies both affected individuals and organizations in addition to changing the way they evolve. In this rapidly changing context, organizations took measures in order to keep up with the revolution of technologies, while struggling with the problem of managing and creating knowledge. Although various knowledge management strategies, including learning management systems are being employed within companies, the question of how these technologies which increase the communication between people, influences the learning is still not fully explored. Therefore, the primary purpose of this study is to explore the utilization of a corporate networked learning environment assembled by using a learning management system (LMS) with social interaction abilities, allowing knowledge sharing and collaboration.

1.2 Background of the Study

The changes in technology provides us different ways of communication, which has changed our way of communication and interaction. The abilities that technology has resulted in changes communication inevitably. The mentioned changes in the internet and communication technologies are reflected as a cleavage in the knowledge management. According to Buono and Poulfelt (2005), when moving from first to second generation knowledge management; the understanding of knowledge has changed from being perceived as asset to be captured and disseminated towards an understanding of knowing-in-action in which knowledge is perceived as a socially embedded phenomenon. Similarly, De Laat and Broer (2004) points out that, the contemporary view knowledge emphasizing that the role of knowledge management in corporate context is not only to discover methods to gather and disseminate knowledge but also to offer new methods to share, communicate and generate knowledge.

The second generation knowledge management, mentioned by Buono and Poulfelt (2005) had also reflections on the workplace. Workers have started encounter with new ways of interaction and communication at the workplace. In their book Goggins Jahnke and Wulf (2013) define this innovative workplace as "*CSCL (Computer Supported Collaborative Learning) at work*" as a new space for investigation and state that: ".CSCL at Work frames a new area of inquiry, focused on making collaborative learning in the workplace explicit through social media and other collaborative technologies integrated into workplaces" (p.1). In a similar way, Dirckinck-Holmfeld, Hodgson and McConnell (2011), define networked learning as "learning and teaching carried out largely via the Internet/Web which emphasizes dialogical learning, collaborative and cooperative learning, group work, interaction with on-line materials and knowledge production" (Dirckinck-Holmfeld et al., 2011, p.11-12). In fact, as De Laat, (2005) underlines, the terms of CSCL and networked learning synonyms with geographically different origins.

In line with the highlighting on the networked learning environments in the workplace, Haythornthwaite and De Laat (2010) define Networked Learning (NL) with an emphasis on social perspective of the learning: "an emerging perspective on learning that aims to understand the network processes and properties of ties, relations, roles and network formations by asking how people develop and maintain a 'web' of social relations for their own and others' learning" (p.186). This focus on the social perspective of learning disclosed a comparatively novel analysis method for the networked environments. The investigation of the literature revealed that, Social Network Analysis (SNA), which enables investigating socially connected structures appeared as a complementary method for studying networked learning in addition to qualitative and quantitative methods.

As a result, the study primarily aims at examining the use of learning management system (LMS) with social interaction abilities allowing knowledge sharing and collaboration, in the corporate context, by using Community Of Inquiry (COI) framework's Social Presence (SP) and Cognitive Presence (CP) as a construct and by revealing the network structures by embedding SNA.

1.3 Statement of the Problem

Organizations search for new ways to improve organizational knowledge and knowledge sharing opportunities. Social media and social learning opportunities are gaining more attention. Organizations have started to implement revolutionized methods to foster communication among workers. For instance, Yammer, an enterprise social networking tool has reached to 8 million users at the end of 2013, after being bought by Microsoft (Lunden, 2013). On the other hand, as Saldanha and Krishnan (2012) explains although there is a potential for advantages and the developing utilization of Web 2.0 in workplace environment, the value of these implications is not proved adequately. Although the studies conducted about CSCL form an excessive literature, the literature examining adult learning at the workplace context is restricted. This situation points out that there is a noteworthy need for the exploration of networked learning in corporate training context to comprehend the

learning processes that occur in a networked learning environment. Therefore, the current study, which aims at exploring networked learning in corporate learning context in Turkey carries a significant mission in order to shed light on networked learnming processes in the workplace context.

1.4 Purpose of the Study

The current study aims to explore the use of LMS with social interaction abilities (sosyal 2.0), allowing knowledge sharing and collaboration, in the corporate context by examining workers' discussions on an online wall platform. In other words, exploring the asynchronous online discussions between the workers on the wall platform of a corporate LMS, the current study aims at finding out how employees participated and communicated in a networked learning environment within a corporate context and to what extend they show CP and SP.

1.5 Significance of the Study

Networked learning, CSCL, is a research area which is being studied for many scholars. On the other hand, the review of literature reveals more studies in relation to NL in higher education context in comparison to corporate learning or workplace context. This situation points out that there is a need for the exploration of networked learning in corporate training context to comprehend the learning processes that occur in a networked learning environment. Therefore, the current study, which aims at exploring networked learning in corporate learning context in Turkey carries a significant mission in order to shed light on networked learning processes in the workplace context.

In the past decades, many improvements have occurred regarding knowledge sharing, with the implementation of internet technologies such as blogs, wikis, microblogs and other idea sharing opportunities. By mentioning the names of some of the famous communication tools like Facebook, Twitter, LinkedIn and etc. Muyia (2015) points out that workers in the learning end development area had to keep up with the

mentioned facilities of social media in the workplace. On the other hand, as Riemer, Scifleet, and Reddig, (2012) notes, what is the role and the effect of social technologies on enterprises and their organizational knowledge are not fully examined although some valuable research are coming out. As Hara (2009) noted it is challenging to examine Communities of Practice (COP), especially in workplace because they cannot be easily recognized and separated from the organization. This study, will contribute to the related literature by providing evidence regarding how the use of online wall platform within a corporate LMS influence the form of networked learning in corporate learning settings by examining the social groups in the environment.

Another expected contribution of this research is regarding the use of SNA in e-learning research. Although there are many studies implementing SNA in networked-learning in the international literature such as Borgatti and Foster, (2003); Aviv, Erlich, Ravid and Geva (2003); Cho, Gay, Davidson and Ingraffea (2007); De Laat, Lally, Lipponen, and Simons (2007b); Erlin, Yusof and Rahman (2008); Ullrich, Borau, and Stepanyan (2010); Zhu, Rodríguez-Hidalgo, Questier, and Torres-Alfonso (2015), the review of literature from Turkey resulted in two studies, one doctoral dissertation conducted by Ergün (2014) an a master thesis conducted by Doğan (2010) implementing SNA in networked learning research in Turkey. From this perspective the current study will, hopefully, introduce a road map for the other researchers to conduct studies implementing SNA in networked learning research.

The current study explores the networked learning in corporate training context by implementing an embedded design mixed method study in combination with Social Network Analysis (SNA). The review of literature reveals that implementation of SNA in learning research does not provide a unified view in terms of how to implement SNA methodologically. The, methodological debate will continue as the field of research continues to evolve and mature. Therefore, the current research, providing an application of SNA in combination with embedded design mixed method study will contribute to this evolution process by standing as a different methodological case.

The networked learning environments are complex in nature and their investigation requires the utilization of different types of data in order to comprehend both group and individual learning (Gunawardena, Carabajal & Lowe 2001, p.12). The current study, while employing SNA to examine the networked learning environment in corporate context, puts forward a new method to code relations into networks in learning context. By preserving the sub-levels of CP and SP, the current study employs Multiple Relations Network (MRN) in coding procedures in SNA. This coding perspective is named as *Multiple Layered Presences Network* (MLPN) by the researcher. This coding perspective stands as a contribution to the literature of networked learning, implementing SNA.

In addition, this study is conducted in coordination with an e-learning corporation implementing LMS with social interaction capabilities and the results gained from this study will be provided to the related corporation. Therefore, the current study will form an example of university and industry cooperation. Because of time and scope limitations, this research is not designed iteratively. Nonetheless, the results of the current study will serve as guide for the design decisions for developing LMS's with social interaction capabilities, as the result will reveal exploration of real data.

1.6 Research Questions

The main aim of this study is to analyze and describe how employees participated and communicated in a networked learning environment within a corporate context by investigating employees' discussions on an online wall platform.

Research Question 1: What are the levels and motives of Cognitive Presence that emerge in the networked learning environment in online corporate training context?

Research Question 2: What are the levels and motives of Social Presence that emerge in the networked learning environment in online corporate training context?

Research Question 3: What are the characteristics of the communication network constructed within the networked learning environment in online corporate training context?

- What are the density and degree centralization values?
- Do the networks have any sub-communities?
- Is the interaction in the social groups centralized or is it distributed among many participants?
- Do networks show any informal ranking?

Research Question 4: Is there any relationship between the CP and SP of the participants, when the relationship is examined depending on the interaction similarity of the participants in the communication network in online corporate training context?

1.7 Definition of Terms

Networked Learning/ CSCL: Networked learning has been defined by (Dirckinck-Holmfeld et al., 2011) as "learning and teaching carried out largely via the Internet/Web which emphasizes dialogical learning, collaborative and cooperative learning, group work, interaction with on-line materials, and knowledge production" (p.11-12). Networked learning is used as an umbrella term to define CSCL, online learning environments etc.

Social Group (SG): A Social Group is a self-organizing group structure having an online workspace with informal learning capabilities such as wall, blog, question-answer etc. and gathering people around a specific area of interest in learning management system.

MRN (Multiple Relations Network): According to Hanneman and Riddle (2005), multiple relations network "describe multiple relations among the same set of actors". The writers also explain that "MRN data are usually stored in a data structure of node-by-node matrices that are "stacked" as "slices" in a single file."

Social Presence (SP): Social presence has been defined by Garrison (2009) as "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities" (p.352)

Cognitive Presence (CP): Cognitive Presence is defined as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (Garrison, Anderson & Archer, 2001, p.5).

Social Network Analysis (SNA): Nooy, Mrvar and Batagelj (2011) explain SNA analysis method for "detecting and interpreting patterns of social ties among actors" (p.5).

Density: Density indicates the intensity of interactions in a network. Density is a measurement of connections among the network nodes which is calculated by number of the ties between nodes divided by the maximum possible number of ties in a network of equal size (Scott, 2012, p.70).

Interaction similarity: Interaction similarity is the similarity of "vertices with respect to the profile of their rows and columns in the adjacency matrix." (Nooy et al., 2011, p.266). Two vertices are defined as "structural equivalent if they have identical ties with themselves, each other, and all other vertices" (Nooy et al., 2011, p.266). The interaction similarity of vertices, in terms of their dissimilarity scores, is reflected as dendrograms in Pajek ®.

Sociogram: According to Nooy et al., (2011), "a sociogram is among the most important instruments originated in sociometry, and it is the basis for the visualization

of social networks" (p.4). It reflects the structure of the ties in a network. The type and value of relationships, clusters and other network properties can also be reflected via a sociogram.

Dendrogram: is defined as a "chart visualizing the results of hierarchical clustering" (Nooy et al., 2011. p.319). It is a tree like visualization to reflect the hierarchical structure of the network in terms of the nodes' dissimilarity scores.

MLPN (Multiple Layered Presences Network): MLPN is the network structure reflects the relations in terms of SP and CP and their sub categories in the multiple relations network form. Each relation in sub dimensions of CP and SP were reflected as a separate layer of network.

CHAPTER 2

LITERATURE REVIEW

This chapter provides literature review on the Networked Learning (NL), Community of Inquiry (COI) and Social Network Analysis (SNA) and related literature bounded by the research problem, research methodology and the research questions.

2.1 Introduction

The current study aimed at finding out how employees participated and communicated in a networked learning environment within a corporate context. Guided by this aim of the study, as the current study took place in an online social environment, first of all, social aspects of learning and communities of practice research are introduced. Then, literature related to informal learning, CSCL/Networked Learning and the related theoretical assumptions are discussed. Afterwards, Social Network Analysis is presented in relations to its use in Networked Learning research. And lastly the COI, which is used as a lens for content analysis is presented.

2.2 Social Aspects of Learning and Communities of Practice

With the developments in technology, the communication and cooperation among people have gained more importance, especially in the online environment. In fact, this situation put more emphasis on learning as a social phenomenon. The social aspects of learning, have been examined by many works of researchers such as Lave & Wenger (1991); Hara (2009); Haythornthwaite (1999), Kreijns, Kirschner, Jochems and Van Buuren (2004) with an emphasis on both online and other learning

environments. All these studies are primarily based on the works of early researchers: Bandura, (1971) and Vygotsky (1978).

Learning, incorporating social traits was put forward by the work of Bandura (1971) which is called "Social Learning Theory". Bandura (1971) underlined the significance of the reciprocal relationships between the learner and the society while criticizing the behavioral views on learning. Another leading work emphasizing the social aspect of learning is the work of Vygotsky (1978) named as socio-cultural theory. Vygotsky (1978) claimed that "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)"(p.57). Emphasizing individuals' connection to the social environment in learning, Boekaerts (1997) underlined that learners engage their prior knowledge to the learning activities both cognitively and motivationally in social environments.

Based on the various roots from the domains of psychology, sociology or anthropology social aspects of learning are examined form various social formations in which learning occurs in communities (De Laat & Simons, 2002). One of those contexts, in which social learning takes place is the workplace. Goggins et al. (2013) noted the complexity of work by underlining the requirement of various actions in relation to many different areas of expertise to examine social learning within the context of workplace.

Wenger (1998) introduced a conceptual perspective integrating theory and practice, Communities of Practice (COP), which is originated from the social learning theory. According to Wenger, COP is composed of (1) meaning, (2) practice, (3) community and (4) Identity elements (p.5). The work of Lave and Wenger (1991) re-considering and extending the concept of COP's, named as "Situated Learning: Legitimate Peripheral Participation", propose COP as a framework to examine social learning in the context of workplace. Lave and Wenger (1991) define COP as "…a set of relations among persons, activity and world over time and in relation with other tangential and overlapping communities of practice" (p.98).

In his book titled "Communities of Practice Fostering Peer-to-Peer Learning and Informal Knowledge Sharing in the Work Place" Hara (2009) discussed the utilizations of COP in the workplace environment. The writer emphasized COP's relation to other research areas such as: situated cognition, organizational learning, knowledge management and information technologies (p.7). According to Hara (2009) COP's are challenging to examine and research as they cannot be easily recognized and separated from the organization. Also COP's are not revealed in the formal organizational hierarchy of the organizations. Schwen and Hara, (2003) perceived COP's as informal mechanisms which progress naturally over time.

2.3 Informal Learning

When workplace environments is considered as the context of learning it both takes place formally and informally. As Prilla, Degeling, and Herrmann (2012) explains, formal learning takes place at events which are arranged planned beforehand and inside deliberately designed settings that are expressly devoted to learning (p.139). It is usually named as training. On the other hand, learning does not always take place in formal settings at the workplace. It usually occurs informally. Eraut (2004) explains this situation by stating "Learning at workplace when done informally, means learning from experiences rather than learning from cases prevented by a teacher or a facilitator" (p.247). Eraut (2004), perceives informal learning as an interpersonal harmonizing companion to learning from experience, which is more intrapersonal (p.247).

Livingstone (2001) define informal learning as:

> Informal learning is any activity involving the pursuit of understanding, knowledge or skill which occurs without the presence of externally imposed curricular criteria. Informal learning may occur in any context outside the pre-established curricula of educative institutions. The basic terms of informal learning (e.g. objectives, content, means and processes of acquisition, duration,

> evaluation of outcomes, applications) are determined by the individuals and groups that choose to engage in it (p.4).

Ardichvili, Page, & Wentling (2002) underlines the informal structure of the COP's at the workplace. According to the researchers, COP's are in the cognizance of the members of COP who come together in a network around "specific shared problems or areas of interest" (p.96). As Johnson (2001) notes COP's can exist both in face to face and online contexts.

2.4 Learning as a Constructed, Cognitive and Social Phenomenon

The review of literature reflected that the field of education has been governed by different paradigms of learning. One of those paradigms in education is constructivism which has caught more attention in line with the developments in knowledge management. Jonassen (1999) explained that, in constructivist perspective of learning, it is anticipated that the knowledge is constructed by learners both "individually and socially" depending on their own "interpretations of experiences in the world" (p.217).

Constructivism is an umbrella term with many discussions from different viewpoints. Continuing this discussion about constructivism is beyond the scope of the current thesis. However, we mention constructivism as a theoretical background of our understanding in learning in the thesis presented. The current study integrated two perspectives of constructivism: social constructivism and cognitive constructivism as mentioned in the explanation by Jonassen (1999), the constructivist perspective gives importance to both "individual" and related "social" environments.

In social constructivism, As Cole and Engeström (1993) had extensively discussed in their book titled "Situated Cognition: Social, Semiotic, and Psychological Perspectives", the learning processes are hypothesized as a shared and participatory activities taking place in social practices and in which a series of multiple social interactions facilitate the knowledge exchange. Also, Koschmann, (1996) characterized the field of computer supported collaborative learning (CSCL) with its

social aspects and placed the terms under socially oriented theories of learning (p.16). Nonetheless, the writers underline the interdependency and emphasize the accumulative nature of the theories in learning field. That is, constructivist perspectives are also formed by the previous cognitive ancestors of theories.

The current study, mentions Cognitive Constructivism as a phenomenon because the studied environment not only focuses on the interpersonal or social aspects of learning but also individuals as the carriers of knowledge. As De Wever, Schellens, Valcke and Van Keer (2006) notes “Cognitive constructivists claim that the input in the CSCL-environment fosters learning due to the explication of individual knowledge elements (retrieval from memory) and the consecutive reorganization of knowledge elements in the course of the social transaction” (p.7).

2.5 Networked Learning

The literature about online learning is constituted by a set of different terms guided by the main theoretical assumptions and the related technologies of that time period, such as: distance learning, computer aided instruction (CAI), e-learning, online learning, CSCL. Computer Supported Collaborative Learning (CSCL). As explained by Haythornthwaite (1999). CSCL unifies two movements: diffusion of computer technologies all over society and the collaborative learning approach. Furthermore, in mid-90’s another term covering technologies affecting teaching and learning is announced: networked learning (NL) (Haythornthwaite & De Laat, 2010, p.185). From the theoretical perspective, NL builds upon the studies conducted by early constructivists like Dewey, Piaget and Vygotsky (Dirckinck-Holmfeld et al., 2011, p.142).

A very first definition of NL is "learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources" (Dirckinck-Holmfeld et al., 2011, p.6). According to Haythornthwaite and De Laat (2010) NL is "an emerging perspective on learning that aims to understand

the network processes and properties of ties, relations, roles and network formations by asking how people develop and maintain a ‘web’ of social relations for their own and others’ learning" (p.186).

As De Laat et al. (2007a) notes Networked Learning (NL) and computer supported collaborative learning (CSCL) are synonyms from different geographical origins (p.88). For the current research we selected to use NL as the main term.

2.6 Social Network Analysis and Networked Learning

2.6.1 Social Network Analysis

Social network analysis (SNA) is an analysis method which focuses on “relationships among social entities and on the patterns and implications of those relationships” (Wasserman & Faust, 1994, p.3). SNA takes its roots from the field of sociology and has many applications in diverse research areas. According to Carrington, Scott, and Wasserman (2005), the first applications of SNA dates back to 1930’s however, since 1990’s both the interest in the SNA as a methodology as well as the collection of social network practice has shown a rapid proliferation.

SNA examines the relations between the social units. These social units and the relations vary depending on the formalization of the network. Wasserman and Faust, (1994) underlined the need for concepts, definitions and processes while linking the social units to form various relations (p.5). With different assumptions and decisions in defining concepts, definitions and processes, many scholars conducted SNA in various fields of research such as: management (Borgatti & Foster, 2003); computer science (Reffay & Chanier, 2003) and networked learning (De Laat & Broer, 2004). Otte and Rousseau (2002) examined SNA in relation to its use in the field of information sciences by providing evidence from the literature in terms of publications, citations and citation networks. The writers underline the multidisciplinary nature of the SNA and state that “Social network analysis is a typical example of an idea that can be applied in many fields” (p.450).

Wasserman and Faust, (1994) emphasized the relational nature of SNA as a discriminative characteristic from the other analysis methods. They also deliberate on the following properties of SNA as significant:

- The social units and their activities are perceived as dependent on each other.
- The connections between the social units act as a bridge for the transmission of possessions.
- Network models perceive the social network organization, (it can be social, economic, political etc.) as permanent arrangements of relations among social units.

The writers mentioned that: "network models focusing on individuals view the network structural environment as providing opportunities for constraints on individual action" (p.4). In fact, these characteristics underlined by the researchers form the basis for SNA in NL research.

2.6.2 Ties Actors and Coding Procedures in SNA

Networks are made up of a set of nodes and set of connections between the nodes in addition to supplementary information on the nodes and relations (Nooy et al., 2011, p.7). Wasserman and Faust (1994) explain nodes and relations by naming them as the "structural variable". The writers explain that "structural variables measure ties of a specific kind between pairs of actors" (p.29). On the other hand, the properties of nodes are called as "composition variables" or "actor attribute variables" (Wasserman & Faust, 1994, p.29).

Additionally, there is one more term essential to define the network data: *mode*. If the structural variables are measured on one set of actors than the resultant networks are called "one-mode" (Wasserman & Faust, 1994, p.29). On the other hand, if the relationships are defined between two set of nodes in which one can only be related to the node in the other set, it is called "two-mode". Two mode-networks are also called

"bipartite network" or "affiliation networks" (Nooy et al., 2011, p.103). Figure 1 shows examples of one mode and two-mode networks.

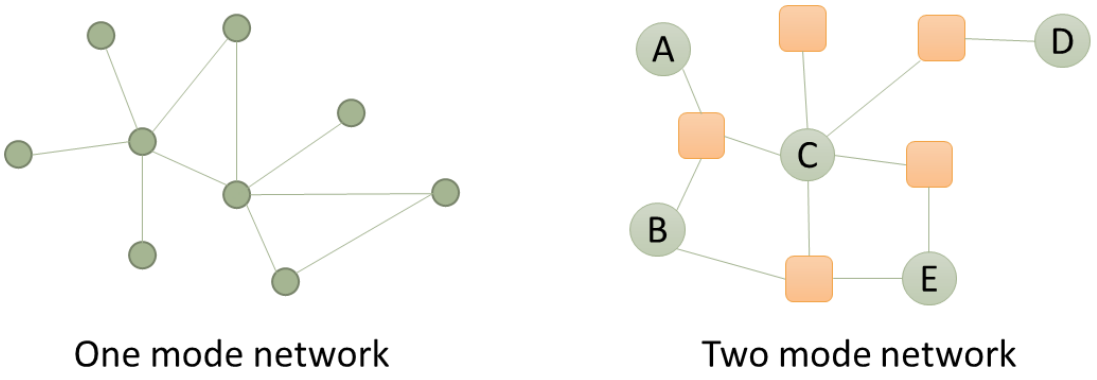


Figure 1 One-mode and two-mode network examples

What differentiates social networks from each other is the decisions about these "structural" and "attribute" variables and the set of actors "modes" while forming the networks. For instance networks can explain trade relations between the countries in one mode network as in the world-trade example provided by (Nooy et al., 2011, p.49). Alternatively, they can explain the relations between people as in the example provided by Wasserman and Faust, (1994) named Galaskiewicz's Ceo's and Clubs data. The mentioned data represents the two-mode network of CEO's, their boards and clubs they're attending.

Various studies implemented SNA in relation to collaborative learning. (Aviv et al., 2003; Reffay & Chanier, 2003; Cho at al., 2007; Russo & Koesten, 2005; Toikkanen & Lipponen, 2011; Haythornthwaite & De Laat, 2010). The networks in those studies differ in terms of decisions regarding the properties and the data sources of the networks. Cho et al., (2007) utilized internet access data; Stepanyan, Borau, and Ullrich, (2010) used microblogging logs; Rosen, Miagkikh, & Suthers, (2011) utilized chat logs to form their network data and etc. As Cela, Sicilia, and Sánchez (2014) underlined most of the studies conducted in networked learning used one-mode networks despite the variety of data sources used in the studies.

As Wasserman and Faust, (1994) explained there are various mathematical representations of social networks one of which is sociomatrices. They are used to represent relational data in two-way matrices. They can either be an adjacency matrix or a sociogram measuring and reflecting the relations between nodes (p. 77). Figure 2 shows an adjacency matrix of a one-mode network and its sociogram representation.

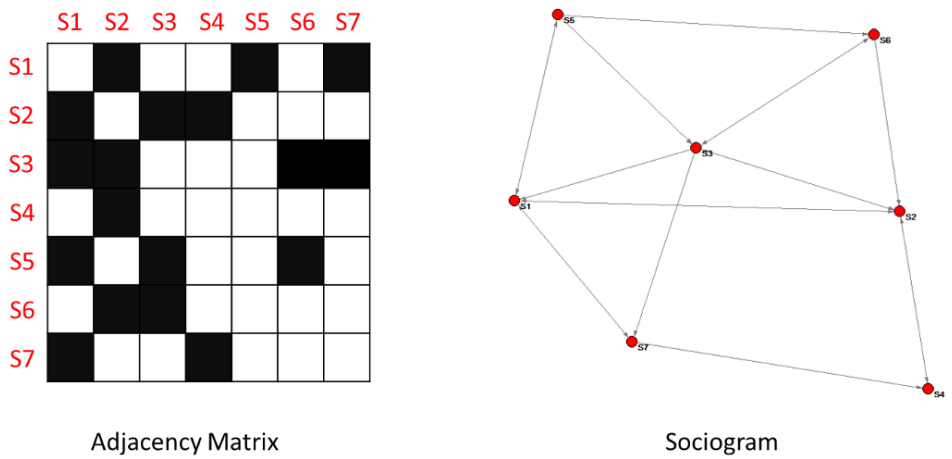


Figure 2 Adjacency matrix of a network and its sociogram

In addition to the interest in SNA as a research tool in learning research, various views and approaches about the implementation of SNA are suggested. One significant issue to consider is network coding procedures. For instance, Enriquez (2008) questions the response-message matrices used in online learning environment studies and claim that when networks are constructed based on the relational ties that are recorded automatically from thread-response data, it is not sufficient to provide information exchange (p.118). Suthers and Rosen (2011) propose *associograms* instead of using sociograms as to include digital artefacts rather than only interpersonal relationships when examining socio-technical capital in a networked environment. Similarly, Manca, Delfino and Mazzoni (2009) proposed adding semantic coding procedures to typical structural coding procedures in order to identify communication patterns (p.197). Manca, et al. (2009) discusses the coding procedures and groups coding procedures under two main groups: traditional structural coding and structural/semantic coding.

The review of literature also revealed that, in line with the coding procedures, the relations coded into the networks by studies implementing SNA had varied. Cela, et al. (2014) examined the relationships by categorizing the SNA related studies by the scale provided by Everett and Borgatti, (1999). The scale included similarities, social relations, interactions and flows (Cela et al., 2014, p.228). The writers said that among the 37 networks examined for the review, 33 studies reported interaction data whereas 4 of them conveyed no information. This situation clearly indicates that, relations between the individuals are the main focus in networked learning research implementing SNA.

Additionally, we should note that, as the context and the decisions for formation of the networks changes in each study, the question of "how the social network formed?" should clearly be stated. Moreover the decisions regarding the properties of the network should be clearly noted. This is required both for the replicability of the study and for the researchers to evaluate and place the results. Therefore, for the current study the definition of the network is explained in detail under section 3.8.3.

2.6.3 SNA Metrices

With the definition of underlying assumptions and a series of coding procedures the network is established and after that the analysis of social network is started. There are several SNA metrics and analysis methods in SNA literature. However, for the current research, the metrics will be limited to the most common metrics and analysis methods in the literature.

2.6.3.1 Density

One of the most widely used metrics of SNA is density. As Nooy et al. (2011) explains: "density, refers to the number of links between vertices" (p.77). Density values vary between 0 and 1 and if all the nodes in a network are connected to each other, then the density of a network is at the highest level (Lipponen, Rahikainen, Lallimo & Hakkarainen, 2003, p.493). Density is measured and reported in many studies in

networked learning literature (Sing & Khine, 2006; Stepanyan et al., 2010; Haythornthwaite, 1999; Lipponen et al., 2003 and etc.)

2.6.3.2 Centrality

Centrality is another main term that is examined with SNA in networked learning. As Wasserman and Faust (1994) mentioned, centrality measures such as degree, closeness, betweenness and information centrality are the terms which are related to ranking in networks. According to the writers, "these definitions yield actor indices which attempt to quantify prominence of an individual actor embedded in a network" (p.169). Centrality is discussed or used by many scholars in networked learning research (Aviv et al., 2003; Russo & Koesten, 2005; Cho et al., 2007; Dawson, 2010; Eberle, Stegmann, and Fischer, 2015). Freeman (1979) explained the idea of using centrality in examining communication networks by underlining the importance of central actors, who have direct communication with several other nodes in the information flow, stating a central actor is "a focal point of communication, at least with respect to the others with whom he is in contact, and he is likely to develop a sense of being in the mainstream of information flow in the network" (p.219-220).

2.6.3.3 Triadic Analysis

Another analysis method used in SNA is triadic analysis, or triad census as it is called in Pajek ®. In triadic analysis, balance theoretic models are used to analyze the occurrence of different types of triads in order to get an idea about the general organization of a network (Nooy et al., 2011, p.207).

Although, triadic analysis is extensively discussed under the terms of transitivity clustrability, ranked clusters or hierarchical clusters by many scholars in the literature (Cartwright & Harary, 1956; Davis, 1967; Davis, 1977; Holland & Leinhardt, 1970; Aldenderfer & Blashfield, 1984), the analysis did not find much reflection on the networked learning literature. The paper conducted by Stepanyan, Mather, and Dalrymple, (2014) report using triad census in their study. The writers asserted that

the analysis of the dynamics of the networked learning environment "can reveal tendencies towards cohesiveness as a result of course activities and structure" (p. 683). As a result, the writers reported an increasing cohesiveness over time in terms of both triadic and dyadic level.

2.6.3.4 Blockmodelling and Symmetric Acyclic Decomposition

Blockmodelling is another analysis method in SNA which asserts a model or a hypothesis about a network with multiple interactions (Wasserman & Faust, 1994, p.395). According to Wasserman and Faust (1994), blockmodelling "refer to the position of actors" and the results of the blockmodelling can be used to validate the property data or to describe the positions of individuals in the network or to describe the complete structure of the block model (p.408).

The literature review revealed that blockmodelling is not a commonly used method in in e-learning research. Rodríguez, Sicilia, Sánchez-Alonso, Lezcano and García-Barriocanal (2011) employed blockmodelling on two-mode networks to help tutors and learners in decision making about learning activities and resources. The writers state the aim of using blockmodelling as to identify "classes of units (called clusters) sharing structural characteristics" (p.322).

Symmetric acyclic decomposition (SAD) is a complementary SNA method to blockmodelling (Doreian, Batagelj & Ferligoj, 2000, p.3). By implementing SAD, the clusters and the related ranks can be identified. Unfortunately, the review of literature did not reveal any studies implementing SAD in networked learning research.

2.6.4 SNA and Networked Learning

SNA, examining the relationships between the actors, has been implemented by many studies in networked learning literature (Aviv et al., 2003; Reffay & Chanier, 2003; Cho at al., 2007; Russo & Koesten, 2005; De Laat at al., 2007b; Haythornthwaite & De Laat, 2010; Toikkanen & Lipponen, 2011; Tirado, Hernando, & Aguaded, 2012;

De Laat & Schreurs, 2013; Kellogg, Booth, & Oliver, 2014; Biddix, Chung, & Park, 2015). Cela et al. (2014) has conducted literature review examining the use of SNA in e-learning environments. Depending on the 37 final articles selected for the systematic review, the writers reported an expansion in studies using SNA in e-learning research (p.223).

Networked learning studies implementing SNA usually mention about the terms such as knowledge construction (Aviv et al., 2003), knowledge building (Oshima, Oshima, & Matsuzawa, 2012), participatory aspects of learning (Martinez, Dimitriadis, Rubia, Gómez & De La Fuente, 2003), community-based activities (Cho et al., 2007), share and construct knowledge (Tirado et al., 2012), knowledge-building community (Sing & Khine, 2006), information exchange (Haythornthwaite, 1999). Although, the terms differ, they all take their roots from the constructivist paradigm. This situation reflects that, social network analysis carries meaning and importance in examining the online learning environments with a constructivist theoretical basis with an emphasis on the social aspects of learning.

Although in some of the previous studies SNA has been handled as a standalone analysis method for networked learning research, this view has evolved in time and it is mostly perceived as a useful tool for analyzing networked learning research. However, there is no unified approach to explain how to integrate or implement SNA in combination with other research methods. In this part of the literature review, studies which used SNA in combination with other analysis methods will be reviewed.

2.6.4.1 SNA in Combination with Content Analysis

SNA is used in combination with other analysis methods in the literature. In this part of the literature review, studies that have used SNA in combination with content analysis will be examined.

One of the most cited studies was conducted by Aviv et al. (2003) titled “Network Analysis of Knowledge Construction in Asynchronous Learning Networks”. The

study used the concept of SNA while examining the asynchronous learning networks (ALNs). Bases on the constructivist paradigm of learning, the study examined two differently designed (a formal, structured university course ALN and an open forum) ALNs in terms of the differences of their knowledge construction processes and differences in terms of three social network constructs (cohesion, role and power). In order to evaluate the quality of knowledge construction process Aviv et al. (2003) employed Gunawardena, et al.'s (1997) interaction analysis model for content analysis in their study. The study proved that, structurally designed ALN showed higher degree of cohesion and it incorporated more set of cliques. Both the results of SNA and the content analysis proved that the knowledge construction process reached a higher position in the structural ALN.

Shea et al., (2010) conducted a study combining the content analysis and SNA methods to examine the different social, cognitive and teaching presences offered by COI framework. The writers examined the social presence in relation to the density values found by SNA. As a result, the writers assert that "measures of network density derived from social network analysis may be a useful proxy for understanding the development of social presence in online environments" p.16.

Kellogg, Booth and Oliver (2014) examined the patterns of peer interaction and the structure of peer networks in a course of a MOOC-Ed. They examined peer support mechanisms on the network structures by taking the homophily, reciprocity and transitivity measures of SNA. Also the writers examined the knowledge construction by applying interaction analysis model of Gunawerdena (1997).

2.6.4.2 SNA in Combination with Content Analysis and Statistical Analysis

Another method which incorporated SNA in learning environments integrates, SNA, CA and statistical analysis together. In this part of the literature review, studies that have used SNA in combination with both content analysis and statistical analysis will be examined.

Wang (2010) conducted a study incorporating SNA, content analysis and statistical analysis to examine social network position in relation to knowledge building in online learning communities in the university context. The researcher analyzed the network positions of the actors and the positions of structural holes, as well as examining the content of the two study forums by applying five level model of interactive knowledge building of Gunawardena et al. (1997). As a result, the researcher reported that, the courses represented typical core-periphery structure. Also the social networks of the two online courses contain structural holes. The actors are occurred to be significantly different in terms of knowledge building. According to the writer, "actors in the core and structural hole positions have very different characteristics in terms of knowledge building" (p.4).

Tirado et al (2012) implemented a study by integrating content analysis, SNA and statistical analysis techniques in order to investigate the network structures and social knowledge building in online discussions. The researchers employed structural equation modelling to test the influence of centralization and cohesion values in the social knowledge construction. As a result of the study, they reported that there is a positive effect of both cohesion and centralization measures on both social presence and cognitive presence.

2.6.5 Social Network Analysis Integrated Studies in Turkey

Although there is a considerable amount of literature implementing SNA in networked learning literature, the literature review of the studies conducted in Turkey resulted in very limited results. The searches done in Higher Education Council of Turkey thesis center resulted in only two studies which implemented social network analysis in networked learning environments.

The first study was a doctoral dissertation conducted by Ergün (2014) titled "The effects of social network structure and sociability on students' engagements in networked learning environment". The researcher examined the networks constructed from the discussion postings of university students in addition to the data gathered via

The Student Engagement scale and Percepted Ability to be Social scale adapted to the Turkish. Students' density and centrality metrics are used to analyze how they are correlated with the other variables measured by the adapted scales. The researcher reported no relationship between the students' engagement measured by the scale and the social network position measured by centrality.

The second study was a master thesis conducted by Doğan (2010) examining an online information technology teacher forum by social network analysis. As a result of the study, the researcher discussed individual level degree centrality, betweenness centrality and closeness centrality metrics. The writer also mentioned about the opinion leader in relation to the centrality. As a result, the researcher suggested SNA as a useful tool to study online learning environments.

The review of literature revealed that, the studies conducted in Turkey using SNA to examine networked learning are limited in number. Also the network measures, analysis techniques are also limited to degree and centrality measures. As Cela et al. (2014) note in their literature review, most of the studies in e-learning use the measures of centrality and density (p.236). The writers underline that, despite the significance of density and centrality metrics, they are not sufficient to grasp other constructs affecting learners in networked learning environments, such as subgroup characteristics and structural equivalence (p.236).

2.7 Content Analysis in Networked Learning Research

The investigation of CSCL is done using various methods such as content analysis, interviews, observations and surveys. The communication logs in CSCL environments provide valuable data for the researchers for several reasons. Macdonald (2003) explain that with online communication logs the collaboration process becomes more obvious which can be used to evaluate group communication practices and individuals' involvement in the processes (Macdonald, 2003, p.378).

According to De Wever et al., (2006) generally, content analysis is done in order to disclose the information that is hidden inside the online discussion transcripts. The writer states that: “To be able to provide convincing evidence about the learning and the knowledge construction that is taking place, in-depth understanding of the online discussions is needed” (p.7).

There are several content analysis instruments used in the literature. For the current study, existing coding schemas were examined: Henri’s model (1992); model of Gunawardena, Lowe and Anderson (1997); Veerman and Veldhuis-Diermanse (2001) and the instrument of Veldhuis-Diermanse (2002). After examination of all the mentioned coding schemas, COI and related presences are decided to be used for the study.

2.7.1 Communities of Inquiry (COI)

Communities of Inquiry (COI), which was first introduced by Garrison, Anderson, and Archer (1999) is a well-known framework examining creating collaborative communities of inquiry in online learning environments which is based on the three constructs: social presence, cognitive presence and teaching presence. COI is regarded as a theoretical framework that is used to examine the collaborative and constructivist learning environments. For the current study as teaching was not present on the context examined, social presence (SP) and cognitive presence (CP) constructs are employed.

2.7.1.1 Cognitive Presence

Cognitive presence, one of the three main constructs of COI, is defined as the degree to which learners have the capacity to build and affirm meaning through continuous discourse in setting of a community of inquiry (Garrison, Anderson, & Archer, 1999). In 2007, Garrison and Arbaugh (2007) revised the definition of the CP as “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse” (p. 161).

CP takes its roots from critical thinking research, and it is identified with the higher-order knowledge acquisition and application (Garrison et al., 2001). According to Garrison et al. (2001) the significance of a tool to assess cognitive presence relies on upon the utilization of the model of critical thinking and its capacity to reflect educational practice. For this aim, Garrison et al. (2001) utilize the practical inquiry model for critical thinking, which is grounded in experience and practice terms explained in the work of Dewey (1933).

Garrison et al. (2001) explained the Practical Inquiry Model in detail. The model incorporates joint and individual worlds of learners in order to understand the cognitive presence in educational context. The model describes the critical thinking processes in two dimensions reflected by two axes. The x axis of the model reflects the continuum of conception and perception, whereas the y axis of reflects continuum of action and deliberation. The two axes together symbolize the process between thought and action and represents the shared and personal worlds. These two axes produce for quadrants which form the "four phases essential to describe and understand cognitive presence in an educational context" (Garrison et al., 2001, p.2).

The practical inquiry model has been discussed by many scholars in the literature such as McKlin, Harmon, Evans and Jone (2002), Garrison et al. (2001), (Kanuka, Rourke, and. Laflamme (2007). Garrison and Arbaugh (2007) underlined that CP is the most challenging to study and develop in online courses in terms of the three COI presences.

Akyol and Garrison (2011) conducted a study to investigate the deep and meaningful learning approaches and outcomes in online and blended collaborative communities of inquiry. The results of the study assert that CP in a COI is related to perceived and actual learning outcomes. Lee (2014) conducted a study to investigate the correlation between CP density and higher order thinking and also examined the relationship between CP and SP. The researcher implemented quantitative content analysis by using data obtained from two different groups CSCL setting of a university. The results of the study revealed that high CP density does not assure the advancement in

higher order thinking skills. As many other researchers report in the literature, Lee (2104) also reported that most of the messages remained in the exploration phase in terms of CP. On the other hand, the writer reports that, SP is positively correlated to the quality of CP.

2.7.1.2 Social Presence

The use of online learning environments has raised many questions about the subject itself. One question is how SP is reflected in online learning environments. As Remesal and Colomina (2013) underlined, there is a lack of consensus on the definition of the SP and there is a variety in terms of the methodology regarding SP research. Therefore, the current chapter will discuss the evolution of the social presence with its' altered definitions.

The SP construct is inherited from the field of psychology. The former definition of social presence was provided by Short, Williams, and Christie, (1976). They called the term technical social presence and gave the definition as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (p.65). This very first definition of SP represented interpersonal relations. Furthermore, Short et al. (1976) argued that SP is depending on the medium and its strength while conveying messages.

On the other hand, further studies challenged the view of SP as a matter of the medium. In these studies SP is perceived as a property of the individual. Consistent with this view, Rourke, Anderson, Garrison, and Archer (2001) define social presence as "the ability of learners to project their personal characteristics into the community of inquiry" (p.3).

Tu, (2000) examined SP underlining the need for defining social presence for the computer mediated communication. Furthermore he examined social presence in relation to social learning theory. Tu et al. (2000) underlined that social presence is a

dynamic variable and the level of social SP is determined by both the medium and its characteristics.

Following the view of SP as a property of the individual, the importance of the societal aspect of the social presence gained attention. Rogers and Lea (2005) conducted a study in order to investigate the SP in distributed group environments. The writers examined SP in relation to social identity. According to the writers, "Social presence was enabled through the emphasis on the shared social identity at the level of the collaborating group rather than the creation of interpersonal bonds between individual group members." (p.156).

After the study of Rogers and Lea (2005), Garrison (2009) offered a revised the definition of SP including the properties of the community: "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities" (p.352).

Social presence in online learning environments is examined my many researchers. Garrison, Anderson, and Archer (2010) explained that, the social presence concept has been transformed over time reflecting the link of social presence with the formal education. The writers proposed a gradual model to explain the social presence. In the first level of the model, the community is identified, then members of the community connect within a trusting environment and in the last level, social relationships are developed. Furthermore, Garrison et al. (2010) underlined the need of more studies examining the association between social presence and other presences (p.7).

Another view of SP is put forward by Remesal and Colomina, (2013). The writers attempted to reconceptualize the SP and claimed that SP is multi-dimensional. The writers defined SP as "the result of constructive and evolutionary discursive group interaction which promotes the creation of a community feeling, the maintenance of positive relational dynamics, and the enhancement of self and collective efficacy in front of the learning task, in such a way that the learning process is supported" (p.358).

According Remesal and Colamina (2013), SP is no more considered as a post-hoc singular observation and assessment of the learning background, but more of an intelligent development among the members who plan to fulfill imparted, community oriented learning objectives (p.364). Furthermore, they underlined the need for research regarding the relationship between SP and learning.

Social presence is examined in many studies dealing with online learning, As Tu (2000) noted "social presence is required to enhance and foster on-line social interaction, which is the major vehicle of social learning" (p.27). On the other hand, Annand (2011) claimed that the impact of social presence in the online learning in higher education gives off an impression of being exaggerated.

Paralel to this viewpoint Rourke, Anderson, Garrison, and Archer (2001) conducted a study titled "Assessing Social Presence In Asynchronous Text-based Computer Conferencing". The writers implemented SNA and utilized density to measure interaction in online learning environments. The writers claimed that:

> The social presence density calculation provides an important quantitative description of computer conferencing environments. Social presence density calculation allows for the formulation and testing of hypotheses in which social presence is used as a dependent or independent variable. (p.14).

At the same period when Rourke et al. (2001) studied social interaction in terms of density, Tu and McIsaac (2002) also conducted a study to find out whether there is a relationship between SP and online interaction.

2.8 Summary

Informal, social learning environments in the corporate training context are being investigated from various aspects by various fields of research from knowledge management to learning science. In addition, the literature reveal that, SNA research has added new insights to this field of investigation. Therefore, this chapter, reviewed

the related literature by including the social aspects of learning and communities of practice, informal learning, networked learning and social network analysis in relation to networked learning research. As the written communication of the wall platform is used as the data for the current study, COI framework is used as a lens for the content analysis. Therefore COI and the related cognitive and social presence constructs are discussed in detail. Furthermore, in order to provide baseline for the following studies, SNA metrices and network formation procedures are also discussed comprehensively.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The current chapter describes the selected methodology of the study. Firstly, the research problem and the research questions are presented. Then, the overall design of the study along with the rationale behind the selection of this design and the research context are introduced. The procedures utilized for both content analysis and the SNA are explained in detail, which is followed by the elaboration of coding procedures to form the social network from raw data and information regarding the ties and relations. Lastly, the ethical concerns and the issues of validity and reliability are discussed

3.2 Research Problem and Research Questions

The main aim of this study is to analyze and describe how employees participated and communicated in a networked learning environment within corporate context by investigating employees' discussions on an online wall platform.

Research Question 1: What are the levels and motives of cognitive presence that emerge in the networked learning environment in online corporate training context?

Research Question 2: What are the levels and motives of social presence that emerge in the networked learning environment in online corporate training context?

Research Question 3: What are the characteristics of the communication network constructed within the networked learning environment in online corporate training context?

- What are the density and degree centralization values?
- Do the networks have any sub-communities?
- Is the interaction in the social groups centralized or is it distributed among many participants?
- Do the networks show any informal ranking?

Research Question 4: Is there any relationship between the cognitive presence and social presence of the participants, when the relationship is examined depending on the interaction similarity of the participants in the communication network in online corporate training context?

3.3 Overall Design of the Study and Justification for the Design

The current study aims to explore, analyze and describe how employees participated and communicated in a networked learning environment within a corporate context. In order to accomplish this goal, a mixed method research design was utilized in combination with SNA.

According to Creswell and Clark (2007) mixed method design is a method for integrating qualitative and quantitative methods in order to understand a research problem, while providing a route for data collection and analysis. Furthermore, Creswell (2011) explained that the primary assumption to use mixed method in research is to "provide a better understanding of the research problem and question than either method by itself" (p.535). More precisely, current study employed an embedded mixed method design where different types of data sets that are gathered

either concurrently or consecutively are mixed, in which one type of data performs a supplementary role within the overall design (Creswell, 2011).

Moreover, as De Laat et al. (2007a) underlined, CSCL/NL is a complex phenomenon, where various variables cooperate and impact one another. Such complexity was also inherent for the current study since this study's aim was to investigate networked learning within a corporate context. In order to provide an in-depth understanding of CSCL processes at workplace, this study applied the Embedded Mixed Method Design in combination with SNA.

Furthermore, NL/CSCL literature revealed several studies implementing SNA. Cela et al. (2014) reported that, among reviewed 37 studies, 25 of them use SNA as a single method, on the other hand the remaining studies use SNA in combination with content analysis. As SNA is a relatively novel method, the literature does not provide a standard or a route for combining SNA with other methods. As for SNA, it basically studies relations. It is based on the graph theory in mathematics. It has many applications in different research areas ranging from management (Borgatti & Foster, 2003) to computer science (Reffay & Chanier, 2003) and to learning sciences (Aviv et al., 2003; Reffay & Chanier, 2003; Cho at al., 2007; Russo & Koesten, 2005; Toikkanen & Lipponen, 2011; Haythornthwaite & De Laat, 2010).

Edwards (2010) discussed mixed method approaches within SNA in his work and divided the views in SNA as quantitative and qualitative traditions like the main research designs in education. He further underlined the interdisciplinary nature of SNA and stated that "SNA represents a specific *opportunity* to mix methods because of its dual interest in both the 'structure' and 'form' of social relations" (p.4-5). Since this study aims to explore the participation and communication in the networked learning environments within a corporate context, SNA was utilized both qualitatively and quantitatively to be embedded within the qualitative and quantitative research designs. Therefore, an adapted version of the embedded mixed method design (Creswell, 2011) incorporating SNA is presented in Figure 3.

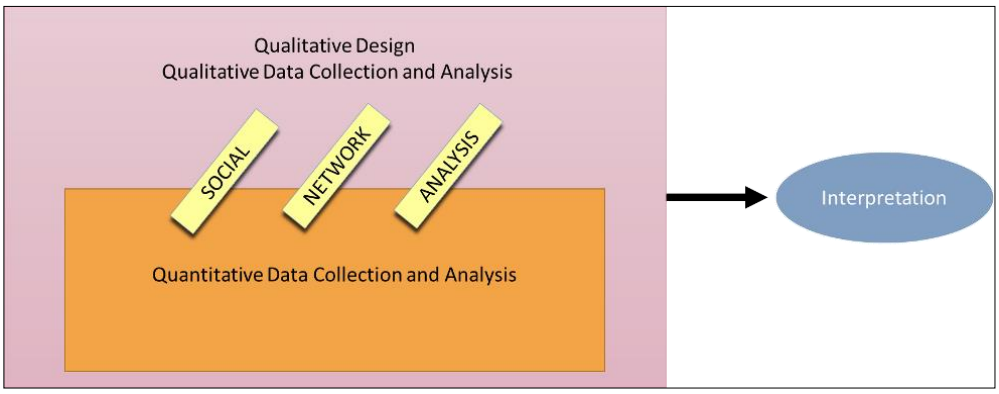


Figure 3. Embedded design (adapted from Creswell, 2011, p.541)

The flow of the research design includes the following steps

- Networked learning data is collected and qualitative content analysis is conducted.
- Qualitative content analysis results are used for interpretation both qualitatively and quantitatively.
- In order to conduct SNA, networks are constructed based on the qualitative content analysis results.
- SNA is conducted to examine the relations in the networked learning environment both qualitatively and quantitatively.
- Statistical analysis is conducted using the outputs from the previous steps.

The most significant justification for the selection of the methodology as the embedded mixed method design is that, networked learning environments are complex in nature so that, the exploration of these environments cannot be revealed by qualitative or quantitative methods solely. Correspondingly, the relations and the constructed networks are only visible with the use of SNA. Therefore, the current study incorporates content analysis, statistical analysis and SNA techniques under the main heading of embedded mixed method design.

Another significant concern about the mixed method design is that, the researcher should be aware of the characteristics and the limitations of the different techniques

used in the study. Wang (2010) summarizes the benefits and shortcomings of the different methods of content analysis, social network analysis and statistical analysis. According to Wang (2010) although content analysis enables researchers to analyze online discussions, it is hard to conduct and susceptible to errors. Also, although social network analysis enables researchers to visualize the system, it has limitations in describing the social context. And lastly, although it enables researchers to describe the system with scientific models to portray the main foundations, multifaceted factors can be ignored by statistical analysis. Current study is conducted being aware of the benefits and shortcomings mentioned by Wang (2010).

3.4 Research Context

The study is conducted in cooperation with an e-learning company working on corporate learning projects for several corporations from different industries in Turkey. Enocta LMS, Enocta Eğitim Platformu (EEP), is a learning management system (LMS) designed to handle corporate learning needs of the companies by assigning pre-designed courses to a group of employees and tracking and reporting employees progress in the system. EEP initially provides standard training functions to manage training in organizations. With EEP companies can collect their training requests and prepare their training activities accordingly. In addition, they can form their own training programs while enabling their employees to reach the intended e-learning modules. In this way, companies can monitor their training plans. Also, EEP is compliant with the two well-known e-learning standards: Aviation Industry Computer-Based Training Committee (AICC) and Sharable Content Object Reference Model (SCORM). In EEP the flow of training is generally top-to bottom.

Sosyal 2.0 on the other hand is an informal social interaction and communication platform developed and integrated to the LMS. Sosyal 2.0 provides users a shared, web-based platform, which enables collaborative and informal learning. In this platform, users can share documents, blogs, links, and ideas around the “Social Group”.

A Social Group (SG) can be defined as a self-organizing group, gathering people around a specific area of interest. SGs can be created, searched and viewed by any member in the community. The user interface of a Social Group is provided in Figure 4. The social interaction and communication facilities of Sosyal 2.0 included, self-regulated social groups, badging system, wall platform, wall post-like, blog posting, blog post-like, question-answer, question-like, resource (image, link, file etc.) sharing, personal page and tagging.

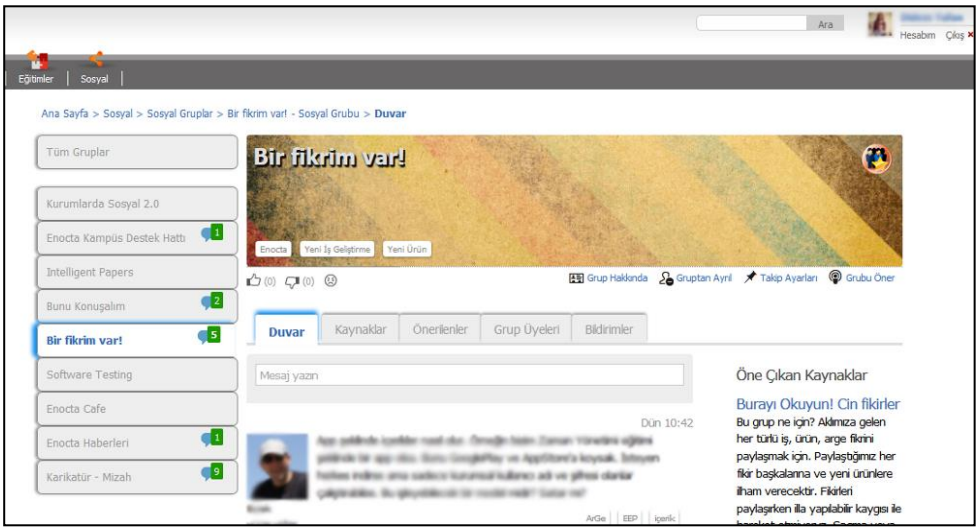


Figure 4 The interface of Sosyal 2.0

EEP was widely used by the corporations from different industries such as: banking, finance, retail sectors and etc. It is offered as a cloud solution or installed within the company. The number of users range from ten to hundred thousands of employees for each company or organization. In total, EEP reaches over one million users. On the other hand, for the current study, the e-learning company's own LMS logs were used. Enocta had about 120 employees working in the selling, content development, support and software development departments. The company was located in two cities, Ankara and İstanbul. It also employed young (mostly 25-35 years old) employees. The employees were from different domains such as, computer engineers for software development, instructional technologists for e-content development and visual designers for training material design. Each employee in Enocta was given an LMS

account once they entered to the company, they are also assigned to some pre-defined courses. Additionally, they have access to the Sosyal 2.0 and free to enroll in any social groups or courses they prefer.

When the data were gathered, the learning management system had 119 defined users within the company. Some of those users were managers and administrative board members who did not use the system actively. Among the 119 defined users, the queries had 67 active members who were using the communication and collaboration facilities in the system. And among those 67 employees, 50 of them took place in the current study as they are the members of the examined social groups.

Furthermore, although Sosyal 2.0 had various social interaction and collaboration tools, as a result of the pilot study (See Section 3.7), it is found out that wall platform provided the tightest interaction among the different social interaction and collaboration tools in Sosyal 2.0. Therefore, the current study mainly focused on the wall platform data within the SG structure. The wall-platform is a discussion-based threaded wall, in which messages are post as a reply message to a wall-post (See Figure 5 for an example wall post and comments).

Figure 5.An example wall post and comments

3.5 The Role of the Researcher

The current research employed mixed method design in combination with SNA. Therefore, research concerns regarding both qualitative and quantitate research methodologies are taken into consideration. Yıldırım and Şimşek, (2000) explained the role of the qualitative researcher and underlined that qualitative researcher carries an important role in qualitative researcher as a person being a part of the research him/herself and sometimes acting as a data gathering tool for the research (p.43). Therefore, as the role of the researcher carries importance for the qualitative research, the role of the researcher is presented as a part of the current dissertation. In addition, Punch, (2005) mentioned about the roles of the qualitative researcher in a continuum of the *observer* and *participant* and stated that the role of the researcher may represent a mixture of these roles during the research process.

The role of the researcher in this research has changed since the initiation of the current research. Although the researcher started the study as an insider, later on the researcher stood as an independent researcher. In the following paragraphs two main roles of the researcher depending on the time period and responsibilities and duties of that time period will be presented in detail:

The role as an insider: This role covers the time period of the development and the initial implementation of the LMS with social interaction capabilities (Sosyal 2.0). During that time period, the researcher was working as an instructional technologist/project manager and contributed to the design decisions regarding some aspects of Sosyal 2.0. Afterwards, she used the system being one of the initial users within corporation. Additionally, the researcher was also responsible for guiding the implementation processes of Sosyal 2.0 in other corporations. She replied many questions regarding the use of the system and its potential benefits for the corporations. With these duties and roles, the researcher stood as an insider who is caring about the valuable successful operation of Sosyal 2.0 within corporations to provide a networked learning environment. This emic role of the researcher was the major

motive to study networked learning in the corporate training context, as this problem was a real life problem for the researcher as a part of her job and responsibilities.

The role as a researcher: Throughout the thesis period, the role of the researcher has changed from an insider towards an outsider researcher, as the researcher has left her job. This time period coincided with the proposal period of the research. Since then the researcher acted as an outsider researcher. During content analysis, quantitative analysis and SNA periods, the researcher didn't contribute the context directly. Nonetheless, some design decisions made during this period was affected by the pervious role of the researcher. One specific example to this situation regarding the decisions about the network formation procedures is as follows. Inheriting from the role as an insider who took place in the Sosyal 2.0 both as a designer and a user, the researcher was aware that when coding interaction patterns in Sosyal 2.0, standard procedures of network formation, forming all relations from the sender to the receiver, would not reflect the communication in Sosyal 2.0. Consequently, the researcher investigated for a better network forming procedure and used the coding procedure offered by Manca et al. (2009).

3.6 Participants and Sampling

The participants of the current study were the employees of an e-learning company using the corporate LMS social interaction capabilities (Sosyal 2.0). As the context of the current study was the corporate learning, there was no existing term, course or another setting which limited the learning environment. The online learning environment, Sosyal 2.0, stood available to all employees of the corporation as long as the employee worked for the company.

Therefore, the current study employed purposeful sampling. The participants were limited by the borders of the social network constructed with the social interaction within the LMS. Another limitation applied was the period of time. The participants of the study included time period between February 2013 and August 2014. Also the

data was limited to two SGs which have most participants and interaction within the whole networked learning platform.

Employees who took place in this study were located in Enocta's two branch offices located in İstanbul and Ankara. A total of 112 users were registered in the whole system. However, only 76 of the users participated in information exchange in the Sosyal 2.0 either by writing a blog/question/answer/wall-post or commenting or liking. As a result of the limitations mentioned, the current study included 50 participants in two selected SG's.

3.7 Pilot Study

A pilot study was conducted in order to investigate the interaction and collaboration patterns in the system. The main aim of the pilot study was to determine the most stringent interaction among the various web 2.0 environments like question-answer, wall post and blog. The pilot study had a holistic approach and included all social groups' data. The social interactions between any pair of learners in the system, depending on the variety of web 2.0 facilities in Sosyal 2.0, were represented by square socio-matrices. These social matrices included the following:

- Wallpost-comment (WPC)
- Wallpost-like (WPL)
- Question-answer (QA)
- Question-comment (QC)
- Question-like (QL)
- Blog post-like (BPL)

To be able to examine the interactions among participants average degree, degree centralization, closeness centralization, betweenness centralization and cohesion analysis were carried out using Pajek ® software. The results revealed that the tightest interaction was constructed via wall platform (WPC) in Sosyal 2.0 in comparison to question-answer and blog post platforms (See Figure 6 for sociograms). The results of

cohesive sub-groups showed that, the users of Sosyal 2.0 form a comparatively big community by using wall platform. The results of the pilot study were used to determine the main source data to be used in the study. As a result, the wall-post data in which the tightest interaction among the users is identified were selected as the main type of data for the current study.

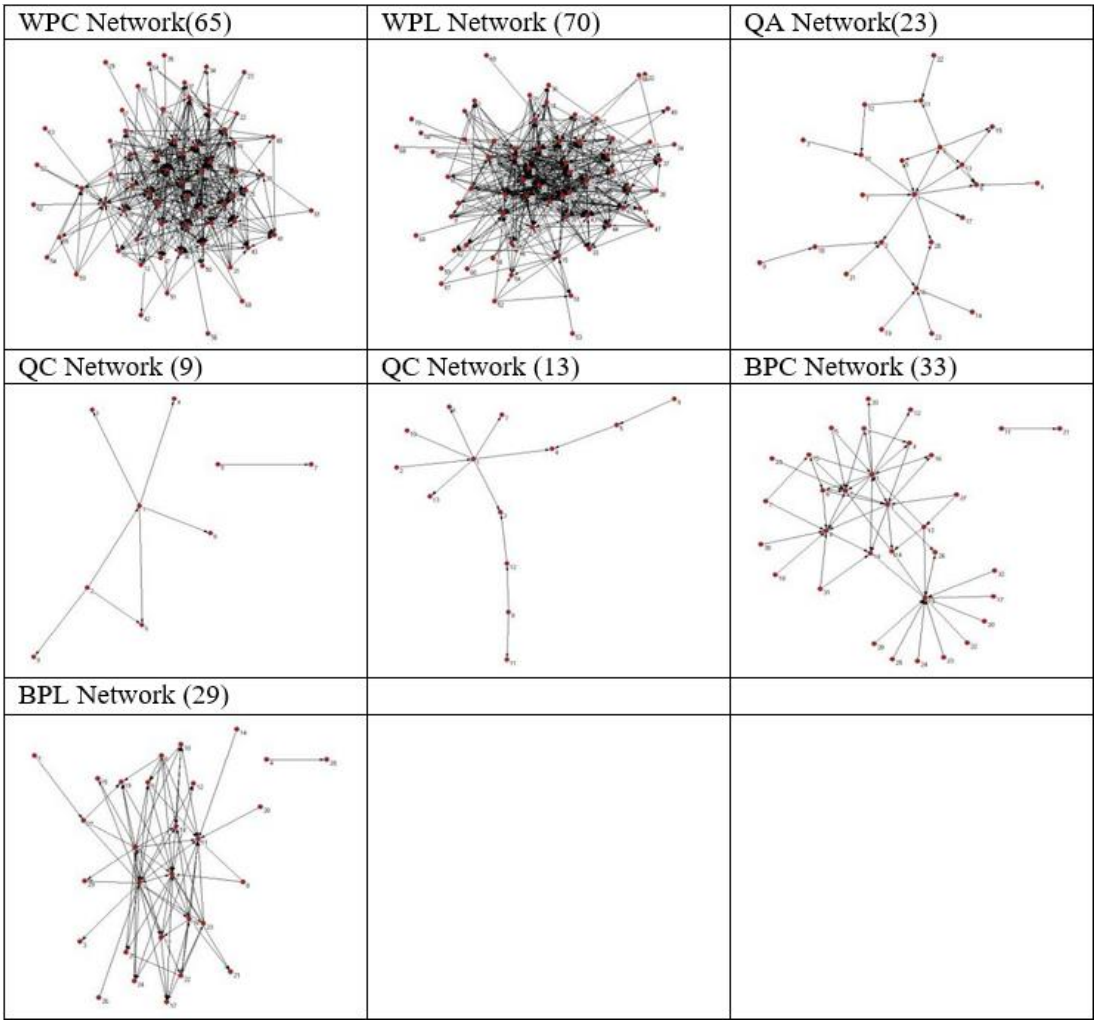


Figure 6.Sociograms of different sharing and interaction facilities in Sosyal 2.0

3.8 Data Collection and Analysis

This part of the study explains the data collection and analysis processes and the context of the study.

3.8.1 Data Collection Procedures

The data were collected via LMS logs. The system administrator prepared queries to gather the data from the database. The queries included the following search criteria:

- Social groups and their contributors.
- Who follows whom in the system
- Wall post data: posts, comment texts, contributors and dates.
- Question- answer data: posts, comment texts, contributors and dates
- Blog posts: contributors, commenters, likes and dates
- Contributors and their badges
- Contributors and their areas of interest.

As Sosyal 2.0 is actively used, the listed queries produced huge amount of data. Therefore the data was limited to a period of time in accordance with the research process. The data was limited to the time period between February 2013 (initiation of the sytem) and August 2014.

When the data was examined it was observed that, it included a total of 37 SG's with number of members ranging between 3 and 112. A total of 11 social groups had 30 or more group members. As the analysis of the all 11 social groups' wall discussion data was not possible due to the large volume of data, further elimination was required.

A pilot SNA study was conducted in order to find out in which platform of Sosyal 2.0 more information exchange has happened. As a result of the analysis conducted, wall-post comment network was found to have the tightest interaction among the users and the densest network in the system. Moreover, the wall post data contained both qualitative and quantitative value. Therefore, wall-post and comment data were selected deliberately to conduct further analysis.

In addition to the elimination procedure explained above, the number of social group members, the average number of wall posts in the SGs and the focus of the SGs were

also taken into consideration. As a result, the two social groups whose focus was more work-related and with highest group member numbers and with the highest average of wall posts were identified:

- SG 1: Kampus Destek Hattı (KD)
- SG 2: Bir Fikrim Var (BFV)

In August 2014 another query was run to gather the wall post-comment data by the system administrator at Enocta. The data was provided in the .xls format and edited in Microsoft Excel ®spreadsheet program for analysis. The data included the wall-post text, author of the text, post date and time. Also the data included the main post, and the related answers relation (wall post code, comment code and their relation). (See Figure 7 for the wall post example from the system.)

Figure 7. An example view of wall posts in the Sosyal 2.0.

In order to ensure the anonymity of the participants, the real names were replaced with nicknames. The nicknames were generated by using a free excel macro called *name generator.xslm* developed for generating names for fantasy plays.

3.8.2 Content Analysis

The review of literature revealed that, one of the frequently utilized methodology used to analyze networked learning environments was content analysis. Rourke and Anderson (2004) define content analysis as a "process that includes segmenting communication content into units, assigning each unit to a category, and providing tallies for each category" (p.5). There is a wide range of transcript analysis instruments available in the literature: Gunawardena et al., 1997; Henri, 1992; Veerman & Veldhuis-Diermanse, 2001; Anderson, Liam, Garrison and Archer, 2001, etc.

De Wever et al. (2006) reviewed various content analysis schemes which are used to analyze online discussions. The writers underlined the significance of "theoretical framework", "the unit of analysis" and the "inter-rater reliability" in analyzing online discussions. Keeping mentioned three significant concerns into consideration and examining other mentioned instruments, community of inquiry, abbreviated as COI, is defined as the content analysis framework for the current research. However, one of the three constructs of COI, teaching presence, was not implemented for the current research as the context of the study does not have any procedures related to teaching. Therefore, two main constructs of COI, social presence (SP) and cognitive presence (CP) were used to analyze the messages in the wall platform of Sosyal 2.0. The online messages were analyzed by coding three main categories of SP which are affective expression (AF), open communication (OC) and group cohesion (GC) (Rourke et al. 2001). In addition, the messages were analyzed for CP in terms of four categories which are triggering event (TE), exploration (Exp), integration (Int) and resolution (Res) (Garrison et al., 2001).

3.8.2.1 Inter-rater Reliability

Another important concern regarding content analysis is inter-rater reliability. The inter-rater reliability is referred as the test of objectivity in content analysis studies. Inter-rater reliability can be explained as the amount of agreement or correspondence among two or more coders (Neuendorf, 2002). Shea et al. (2010) emphasized that in

order to reach valid results in content analysis both that extensive care and high-level agreement between coders is crucial. They further criticized the previous work for supplying insufficient information about the inter-rater reliability procedures. In order to avoid mentioned criticism and to ensure sufficient levels of validity and reliability, negotiated coding procedures are applied. The researcher and full time instructor (professional in content analysis) analyzed the transcripts by applying a negotiated coding approach.

In order to analyze the content for SP and CP, each message was coded twice by the researchers according to the indicators SP and CP in two different iterations. Both researchers coded the messages independently. A total of 223 messages were taken into inter-rater reliability procedures which constituted the 30% of whole messages. Table 1 presented the number of messages and percentage values regarding coding and inter-rater reliability procedures according to SG's.

Initially, the messages were coded for SP. However, the researcher found that the code categories provided by the literature did not completely meet the needs for coding the messages in selected SG's. Therefore, two new sub-categories, SP-OC 45 and SP-OC46 were added and the code book was updated accordingly. (See Appendix B).

For coding SP, multiple possible codes were defined and afterwards, the most obvious code for each message was selected. On the other hand, for coding CP, the threads were examined in order to determine the main category and afterwards sub categories were defined. Moreover, the highest category for CP was decided for each message.

In order to provide a guaranteed transparent coding procedure between researchers, a code book (See Appendix B) and a detailed coding procedure document were prepared by the researcher. A face to face "how to code" session was conducted. In this session, the code book was examined and one message was coded as an example.

Table 1. Thread Numbers for Inter-Rater Reliability

	Total Number of Threads	Number of Threads Sent to Review	Percent %
KD SG	493	139	% 28.20
BFV SG	233	84	% 36.05
Total	726	223	% 30.71

The literature provided several inter rater reliability coefficients. For the current study, one of the widely known coefficients, Holsti's (1969) coefficient of reliability (C.R.) was selected as an inter-rater reliability measure. Holsti's coefficient of reliability (C.R.) measures the percentage of agreement. It reveals the number of agreements for each number of coding decisions done. As explained by the Rourke, Anderson, Garrison, Archer, and others, (2001), the Holsti's coefficient of reliability is calculated by dividing the total number of agreed codes of both researchers, by the total number of codes. The formula is: C. R. = 2m / n1 + n2 in which, m represents the total number of agreed codes by both researchers, n1 and n2 represent number of coding decisions made by first and second researchers alone respectively (Holsti, 1969, p.140).

After completion of the independent coding process, the two researchers met and conducted a negotiation session to discuss similarities and dissimilarities among codes. According to Garrison, Cleveland-Innes, Koole and Kappelman (2006) negotiation can increase reliability by providing "hands-on training, coding scheme refinement" (p.3). Therefore, negotiation sessions were conducted for each presence, for each set of indicators. As a result of conducting researcher agreement sessions, researchers arrived at a final decision regarding the codes. The inter-rater reliability was calculated before and after the negotiated coding sessions. The Table *2* and Table *3* summarized the coding agreement details and reliability coefficients for cognitive and social presence constructs.

Table 2 Social Presence Coding Agreement Table

	Total no of messages coded	Before Agreement			After Agreement		
		Agree	Disag	CR	Agree	Disag	CR
KD SG	139	88	51	0.63	136	3	0.98
BFV SG	84	34	50	0.40	83	1	0.98
Total	223	122	101	0.54	219	4	0.98

Table 3. Cognitive Presence Coding Agreement Table

	Total no of messages coded	Before Agreement			After Agreement		
		Agree	Disag	CR	Agree	Disag	CR
KD SG	139	66	73	0.47	137	2	0.98
BFV SG	84	35	49	0.41	83	1	0.98
Total	223	101	122	0.45	220	3	0.98

After finishing the independent coding processes, coding agreement sessions were conducted for each presence. If any systematic dissimilarity was identified regarding the codes, they were noted and the researcher re-checked the data in order to increase the reliability. For instance, in coding of SP for BFV SG, the researchers had identified a systematic coding difference and after the agreement session they came to an agreement regarding those codes. The percentages and CR values for both of the groups before and after the agreement sessions are presented Table 2 and Table 3.

3.8.2.2 Unit of Analysis

A significant step in content analysis is determining the unit of analysis. De Wever et al., (2006) explained that "unit of analysis determines how the overall discussion is to be broken down into manageable items for subsequent coding according to the analysis categories" (p.9).

The literature reveals that, there are several different ways of defining unit of analysis in content analysis. Strijbos, Martens, Prins, and Jochems (2006) listed five different units of analysis which are "message (email or forum contribution), paragraph (section), unit of meaning (or thematic unit), sentence (or syntactical unit) and illocution" (p.7). Deciding on the unit of analysis is very crucial for the quality of the content analysis. Therefore, Veldhuis-Diermanse, Biemans, Mulder and Mahdizadeh (2006) proposed that it is important to examine the substance of the notes for intending to focus unit limits. Similarly, De Wever et al. (2006) also underlined that, each coding decision has its own advantages and disadvantages. Therefore, researchers make a decision about the unit of analysis in their own research context.

For the current study, after exploring different avenues regarding the different units of analysis, the whole message, each wall-posts and related comments posted by members, was found suitable for the objectives of the study and defined as the unit of analysis. Wall post messages and the answer posts are clearly separated in the data. Therefore, different coders could dependably recognize when a coding choice is needed.

Another reason for deciding on the whole wall post message was the fact that the length and substance of the message is defined by its owner not the coders. Using sentence based unit of analysis or dividing messages according to some words like (and, etc.) were not found suitable for the current research as the unity of the message post cannot be reflected upon adding several analyzed sentences together. Besides, the flow of the data, wall post messages and answers given to that specific wall post or comments, carried importance for the current study as they reflect about the underlying cognitive processes. Dividing messages into smaller sub-units would have diminished the structure when the whole wall post thread structure is considered. Furthermore, the use of unit of meaning is also considered. However, using smaller units requires dividing the messages into smaller units depending on each researcher's own decisions. This division procedure makes the coding process problematic for the researchers which consecutively reduces the reliability and validity of the study.

The last reason for using message level unit of analysis is the use of SNA for analysis. The value of the relationships between two users of the system was examined in terms of CP and SP, and the relationship was reflected as a network. The relationship between two people is defined as an edge or an arc with a CP or SP value. The relationship is already represented with a multiple relationship network with more than one relationship and more than one value in the network. (See section 3.8.3). Dividing a message into smaller semantic or syntactic units would make the network analysis processes very difficult and would have ruined the network assumptions.

Rourke et al, (2001) underlined that the most studies define the unit of analysis by sticking to the reason for a defining a part that various coders can recognize consistently and instantaneously. Being aware of the side effects of coding long messages into one single code, as a result of the listed reasons, the whole message was deliberately selected as the unit of analysis for the current study.

3.8.3 Social Network Analysis

For the current study, SNA was conducted in addition to content analysis and statistical analysis methods. As Martinez et al. (2003) underlines "in order to perform social network analysis, we need to define the set of networks and relationships to which the study is to be applied" (p.8). Furthermore the writer notes that, the definition of network and the relationships relies on the specific settings of the study conducted. Therefore, in this part of the study, the definition of network and the relationships examined will be formulated.

3.8.3.1 Definition of Actors

SNA examines the relations, Wasserman and Faust, (1994) explain the *actor* as the social entity that we want to examine the relations between. In our case the individuals who actively take place in social interaction in social groups' wall in Sosyal 2.0 are our actors.

Defining the limits of network is another significant concern in SNA. There are two methods in defining the data collection boundaries: etic approach and emic approach (Creswell, 1998, p.60). Etic approach was implemented for the current study in which the limits of the network were defined by the researcher. Also, the following limitations are implemented to clarify the data boundaries:

- For the current study, in order to limit the data to analyzable amount, the data were deliberately limited to the wall post communication in the NL environment. The decision making processes and details are explained in the Pilot Study Section. (See Section 3.7).

- The current study implemented qualitative data analysis in conjunction with SNA. In order to conduct qualitative data analysis, we had to limit the data to a reasonable size. For this reason we deliberately selected two social groups for data analysis. We defined two most actively used social groups in the NL environment; one of them was directly related to the work named as "Kampus Destek Hattı", whereas the other was about new ideas "Bir Fikrim Var".

- As the data used in this study were derived from a living and actively used platform, the data, so as the communication network continues to grow in time. Therefore we had to limit the data to a specific time period. Data analyzed in this study is limited to the time interval: from February 2013 to August 2014.

As a result of these limitations, regarding etic approach for defining data boundaries, in total 50 actors, from two different social groups, took part in information exchange by using wall platform in Sosyal 2.0. The number of actors and the total actors are presented in Table 4.

Table 4. Number of Actors According to Social Groups

	Number of actors
Social Group 1 (KD)	38
Social Group 2 (BFV)	35
Total number of actors (unique)	50

3.8.3.2 Definition of Ties and Coding Procedures

In this section the definition of the ties and the coding procedures utilized in current study will be explained in detail. A tie represents the relations between actors in a network. Therefore the notion of a tie is important as it represents the relationship in that specific network. According to Cook and Whitmeyer (1992) a tie not only represents the relation but also represents the "exchange of valued items" (p.119).

The data derived from the LMS cannot be used in its original form to be used in SNA. So we converted it to the adjacency matrix format. This conversion process, coding procedures as named by Manca et al., (2009), is not a standard process. Furthermore, how raw data is coded into social network data and the coding procedures, seriously affect the structure of the network and the assumptions regarding the study of interactions.

For the current study the coding framework suggested by Manca et al. (2009) was adapted to define actors and ties in online social communication in Wall Platform in Sosyal 2.0 (See Table 5).

Table 5. Coding Framework for Social Interactions

Situation		Resultant interaction
Action	Response	
(A) Employee E posted a wall post	Employee D replied to the wall post	D→E
	Employee D made a wall post comment following E's wall-post but as a direct reply to Employee A's comment directed to E.	D→A
(B) Employee E received comments to his/her wall post and posted a reply	The reply was addressed to the receiver R explicitly or implicitly	E→R
	The reply was not addressed to a specific receiver. Bu the initial wall post had been replied by Employees X, Y, Z.	E→X E→Y E→Z

3.8.3.3 Form of the Multiple Relations Network (MRN)

The current study does not solely focused on the content of the messages or the individuals in the system. Rather the focus of the study was the relations in the system including both the content of messages and the senders or the receivers of the messages. Therefore, for the current study, a Multiple Relations Network (MRN) was constructed to reflect the communication network in the wall platform in Sosyal 2.0.

Wasserman and Faust (1994) explained MRN as a collection of social actors and a set of different social associations which explain how the social actors are connected to each other. We say that each of the social relations in R constitutes a univariate network on the actors in N.

We defined R_{CP} and R_{SP} for two types of presences detected in the network.

- R_{CP} included levels of CP = {Triggering Event, Exploration, Integration, Resolution}

- R_{SP} included levels of SP = {Affective Expression, Open Communication, Group Cohesion}

Each r defines a social relationship expressed by the dimensions of CP and SP. This means that, each r carries a unique value represented in a separate relation but not independent from each other. This structure of social and cognitive presence reflected in MRN is named as *Multiple Layered Presences Network* (MLPN) by the researcher.

According to the explained MRN mathematical notation, two separate MLPNs were constructed for each of two social groups. In total four directed networks were formed, explaining the social relations defined according to the dimensions of CP or SP. The constructed networks had loops, in case people replied to their own comments in networked learning environment.

In SNA, MRNs can be divided into their sub networks. For the current study we also divided the main networks into their sub networks according to the different social relations defined by the sub-levels of SP and CP. As a result, we have analyzed a matrix of networks in the study. The examined networks are explained in Figure 8.

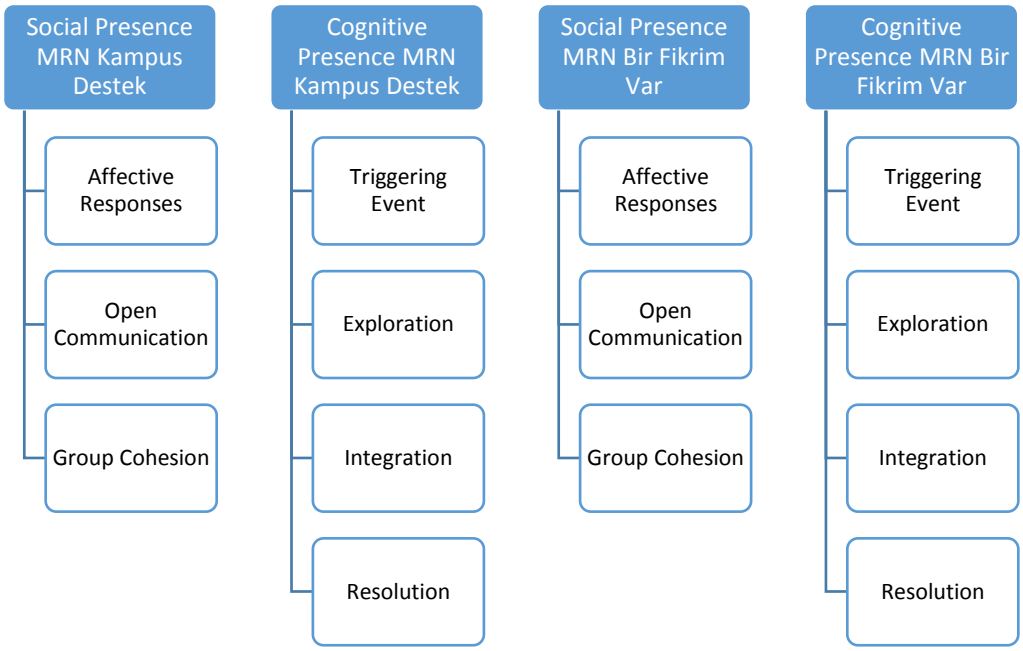


Figure 8 Multiple Layered Presences Network (MLPN) structure of social Groups

For each network, sub networks are derived from MRN by using "Network>Multiple Relations Network> Select Relation(s) into One Network" command in Pajek ®.

3.8.3.4 SNA Measures and Methods Used

For each sub network dissimilarity between the vertices were calculated and they were grouped according to their structural equivalence positions. This was done by using running dissimilarity command in Pajek ®.

Nooy et al., (2011) suggest using "Euclidean or Manhattan distance indices" to take line values into account while calculating dissimilarity scores. These indices are reflected as d5 and d6 options in dissimilarity command in Pajek ®. For the current study, after checking both indices, d5, Euclidean distance indices were used for calculating dissimilarity scores.

Pajek ® produces dendrograms as well as the dissimilarity matrix. Dendrogram is a type of diagram representing hierarchy relations in a tree like format. In our case the

dendrogram represents the hierarchy of the network actors depending on their interaction similarity. When the dendrograms drawn as a result of dissimilarity calculations are examined, it is observed that they generally reflect 3 main groups. Therefore, each network is divided into 3 groups depending on their structural equivalence positions and dissimilarity results. See Appendix C for dendrograms for the networks constructed.

The clusters/groups are stored and executed by using partitions in Pajek ®. In order to compare different clusters gained from the dissimilarity scores, a pairwise comparison between partitions are conducted by using "Partitions>Info>Cramer's V, Rajski" command in Pajek®.

3.8.3.4.1 Community Detection Analysis

Community detection analysis is used to detect and define if any natural community is present in the network. Newman (2006), pointed out modularity to be as one of the most viable methodology to discover the probable clusters of a network.

Newman (2004) proposed to examine the network by checking variety of network divisions to reach at the highest modularity result. In fact, what high modularity results reflect is the compact groups within the network, which are highly connected within group but loosely connected between groups.

For the current study, one of the two community detection methods provided by Pajek ®, Louvain method, was employed. *Louvain community detection algorithm* (Blondel, Guillaume, Lambiotte & Lefebvre, 2008) is a modularity optimization method in provided in Pajek ®.

3.8.3.4.2 Triadic Analysis

Triadic analysis is an SNA method, in which the possible ties of a network with three nodes are used to define the overall structure of a network. Nooy et al., (2011)

acknowledged that “It has been shown that the overall structure of a directed network (or a complete signed network) can be inferred from the types of triads that occur” (p. 207). In other words, triadic census is an inductive analysis technique which helps to identify the type of interactions in the entire network. With this analysis it is possible to define the characterizing network structure by looking at the relations at triad level.

Triadic analysis was conducted by running Triad Census command in Pajek ®. The triad census model reported frequencies of sixteen different types of different triads and their comparison with the distribution of triad types expected by chance (Nooy et al., 2011, p.210). The Triad Census analysis includes the following models:

- Balanced Model by Cartwright and Harary, (1956)
- Model of Clustrability by Davis (1967)
- Model of Ranked Clusters: by Davis, (1977)
- Transitivity Model by Holland and Leinhardt, (1970)
- Hierarchical Clusters Model by Aldenderfer and Blashfield, (1984)

Triad census analysis also listed the forbidden triads, the type of triads which doesn’t fit in any of the five models listed. Therefore it is expected that, forbidden triads should be found less if the network structure can be explained by models. (Nooy et al., 2011, p.210).

3.8.3.4.3 Symmetric Acyclic Decomposition Analysis

Symmetric acyclic decomposition analysis is a partitioning method used to test whether an acyclic structure exists in the network (Doreian et al., 2000, p.3). Nooy et al. (2011) explained the assumption of the analysis: nodes with reciprocal relations are assumed to be in the same rank, and they are assumed to be in the same group; however, one way interactions are in different levels and they constitute ranking (p.215). The symmetric-acyclic decomposition method enables us to uncover the informal ranking structure in the networks. They reveal the hierarchy of relations

within the network. Then it is possible to identify the ranking structure within the communication network if any.

For the current study, the symmetric acyclic decomposition analysis was conducted in addition to triadic analysis to identify, whether the communication networks constructed in Sosyal 2.0 have any kind of ranking structure and if so how that structure is shaped.

3.8.3.4.4 Blockmodelling Analysis

Blockmodelling analysis is an SNA technique dealing with the "social roles and role sets" residing on the "equivalence" and "position" concepts (Nooy et al., 2011, p.259). Blockmodelling changes the numbers of the nodes in the matrix structure of the network and in this way helps to recognize if any blocks, regarding the positions of the nodes in the network, exist within the data. In blockmodelling, actors are grouped into partitions and the associations between these partitions are examined (Nooy et al., 2011, p.259).

For instance, one of the most common block structure that is mentioned in the literature is the core-periphery structure. For the current study, there is no a priori knowledge whether there is a cluster structure like core-periphery or not. Furthermore, the current study aimed at examining if such a structure is hidden within the communication networks constructed for the current study. To accomplish this task blockmodelling technique was used which is provided in Pajek ®.

3.8.4 Summary of Data Collection and Analysis Procedures

In this part the data preparation and analysis process is summarized. The following steps were performed for data analysis throughout the study:

1. Raw data is examined and cleared.
2. Pilot study is conducted.

3. Data is limited according to the results of the pilot study.
4. Wall threads are organized so that they reflect the flow of the wall posts.
5. Data are examined and the names specifically referred in the threads are defined. (as explained in the coding procedures)
6. A defined set of the data, forming %30 of the total, are analyzed by both researchers in terms of CP for inter-rater reliability.
7. A defined set of the data, forming %30 of the total, are analyzed by both researchers in terms of SP for inter-rater reliability.
8. Researcher agreement meetings are conducted. Systematic mistakes or disagreements are defined and removed.
9. Remaining content analysis is done for both CP and SP.
10. Network coding procedures are applied to data.
11. Including the content analysis results for CP and SP data converted to adjacency matrix format.
12. SNA and statistical analysis are conducted.

3.9 Ethical Concerns

The current study was also reviewed by the Applied Ethics Research Center, Institutional Review Board (IRB) members at METU, and received an approval. Furthermore, an approval form, explaining the aim of the study and data analysis, was signed with Enocta. The IRB approval document and signed approval form from Enocta can be found in Appendix A.

Furthermore, the real names of the participants were replaced with pseudo names to ensure the anonymity and privacy of participants. Also, the content analysis procedures were conducted as blind review. The names of actors, company and product names and links were changed in the data in order to avoid researchers' biases.

3.10 Validity and Reliability of the Study

Validity refers to the accuracy of the scientific findings and reliability refers to the replicability of scientific findings (LeCompte and Goetz, 1982). According to Creswell and Clark (2007) although the meaning of validity varies for quantitative and qualitative research, it mainly serves for examination of the value of the data and the results.

The current study employed mixed method design, therefore handled both quantitative and qualitative data. Creswell and Clark (2007) suggested addressing validity and reliability concerns for both data types in mixed method studies. Consequently, for the current study, validity and reliability concerns for each type of data analysis handled accordingly.

The current study employed content analysis as a method to analyze the messages in networked learning environment. According to Yıldırım and Şimşek (2005) the main aim of the content analysis was to reach the constructs and reasons to be able to explain the qualitative data. Similarly Rourke et al., (2001) explained content analysis as a research strategy that expands on methods to make legitimate inductions from content.

Gunawardena et al. (2001) underlined the need for a solid theoretical basis for validity. The writer underlined the requirement for a descriptive model for the collaborative learning and he mentioned that without such a model "…we cannot even begin to identify empirical indicators or instances that will form the basis of a coding scheme as a standard against which to evaluate whether or not effective learning is occurring within the network" (p.7). As a result of the mentioned concerns, COI, a solid model for collaborative learning is selected for the current study.

Strauss and Corbin (1990) define three main methods in conducting content analysis one of which is using pre-existing coding schemes. Rather than forming a new category set, a known and structurally tested coding schema was selected for the current study. Social presence (Rourke et al., 2001) and cognitive presence (Garrison

et al., 2001) constructs from the COI framework has been used. These constructs have been previously used and tested in terms of their structural validity in many studies: Garrison, (2012); Garrison and Cleveland-Innes, (2005); Shea et al., (2010); Remesal and Colomina, (2013) and etc.

The first step in content analysis is determining the unit of analysis. For the current study, the whole message was determined as the unit of analysis. The whole message was selected as the unit of analysis, because the length and weight of the message is defined by the writer of the message. In addition, the length and weight of the unit of analysis is standardized in this way. These two concerns are found to be critical for the replicability of the study. The details and concerns related to defining the unit of analysis are presented in section 3.8.2.2.

Another concern in relation to the CA is reliability. In order to confirm the reliability of the CA, the messages were coded independently by two researchers. One of the researchers was the writer and the other was professional in the content analysis. To ensure reliability, negotiated coding approach was applied. 30% of whole content was put into interrater reliability processes. Holsti's coefficient of reliability was calculated for the interrater reliability and it was found to be suitable for the coded messages. The related processes are presented in detail in section 3.8.2.1.

The current study employed SNA in combination with CA. The data derived from CA were put into a process of network formations then these networks were analyzed by SNA. Throughout this process of network coding, several decisions were made. These decisions directly affected the structure of the network and the resultant inferences. Furthermore, the properties of networks, directed/undirected, multiple lines, loops, affect the network analysis results and procedures. Because of these motives, the replicability of the study is highly dependent on the network formation processes, the details regarding SNA are clearly presented under the section 3.8.3.

3.11 Limitations of the Study

The current study had some limitations, inherited from the field, at the same time affecting the reliability and validity of the study. The first limitation is inherited from the area of networked learning. The study of community related, networked activities are complex in nature. Moreover, networked activities are affected by many factors. For instance, within the context of current study, LMS events of a corporation is related to many variables, like the company culture, managerial support, workload, physical conditions and etc. However, for the current study, those variables cannot be manipulated or fixed. For that reason, the generalizability of the conclusions is limited to the related context and the related variables.

Additionally, for the current study, solely the data from the e-learning company was analyzed. Although, the LMS and the social sharing facilities mentioned in this study were used by many other instructions or companies in various industries, only e-learning company's data were available for the study. This situation implied that, generalizing conclusions from the current study should be made cautiously.

Lastly, the current study focused only on the data gathered via LMS logs. Gathering data via interviews or applying measurement instruments would have provided supportive data. On the other hand, reaching the sample for interview could not been possible due to the reachability limitations.

3.12 Delimitations of the Study

For the current study, throughout the research process several decisions are made by the researcher. In this part those decisions and the resultant delimitations will be discussed.

One delimitation about the study is regarding the sample. For the current study, the sample is deliberately limited to the purposeful sample, the employees of the e-learning company who are in reach of the researcher.

Another delimitation was related to the social groups examined. The system had 37 social groups. They had different numbers of group members. For the study, as the interaction data is needed for analysis, two of the most active social groups were selected and the study is delimited to the data from those social groups.

Furthermore, although there are other interaction and communication facilities, as a result of the pilot study the data to be analyzed is delimited to the online discussion data from wall platform.

Another delimitation for the current study was related to the selected constructs used in the content analysis. The constructs were deliberately limited to the social presence and cognitive presence as the teaching presence was not present in the system.

The study used data provided by an e-learning company, covering the time between February 2013 and August 2014. The data is deliberately limited to the mentioned time interval to be able to conduct data analysis within a fixed scope of data.

For the current study, the literature review was limited to the COI and SNA and the related studies incorporating SNA. Although there is a huge amount of literature related to management, Computer Supported Collaborative Work (CSCW), Communities of Practice (COP), knowledge management and etc. The detailed discussion of all these domains is beyond the scope of the current study.

3.13 Summary

The main aim of this study was to explore the knowledge sharing and collaboration when using an LMS with social interaction abilities, in the corporate context by examining employees' discussions on an online wall platform. For this aim, mixed method research design was utilized in combination with SNA and statistical analysis to answer the research questions. The context of the study was corporate training in Turkey. For the current study, an e-learning company's LMS logs were used. After conducting a pilot study, wall-post communication data from the two social groups of

the system were defined. There were 50 unique participants in the two social groups. The data were analyzed by implementing three data analysis methods consecutively: content analysis, social network analysis and statistical analysis. Table 6 represented relationships among research questions, data sources and data analysis.

Table 6 Relationships among Research Questions, Data Sources and Data Analysis

Research Questions	Data Sources	Data Analysis
What are the levels of cognitive presence that emerge in the networked learning environment in online corporate training context?	Sosyal 2.0 Wall-Post Discussion Postings	Content Analysis
What are the levels of social presence that emerge in the networked learning environment in online corporate training context?	Sosyal 2.0 Wall-Post Discussion Postings	Content Analysis
What are the characteristics of the communication network constructed within the networked learning environment in online corporate training context?	Network constructed with Sosyal 2.0 Wall-Post Discussion Postings	Content Analysis + Social Network Analysis
Is there any relationship between the cognitive presence and social presence of the participants, when the relationship is examined depending on the role/position of the participants in the communication network in online corporate training context?	Network constructed with Sosyal 2.0 Wall-Post Discussion Postings	Content Analysis + Social Network Analysis + Statistical Analysis

CHAPTER 4

FINDINGS OF THE STUDY

4.1 Introduction

The current chapter presents the findings in relation to the research questions presented in previous chapters. The results presented includes the findings from the content analysis of wall posts, social network analysis of the network originated from the discussions and statistical analysis conducted in combination with the social network analysis in order to examine the relationship of cognitive and social presences in relation to the network constructed in networked learning environment. On the whole, the results chapter presents findings describing how employees participated and communicated in a networked learning environment in corporate context.

4.2 Demographics of the Participants

The two social groups examined, BFV SG and KD SG had 35 and 38 members respectively. However, the total number of unique participants was 50 which means that 23 participants were member of both social groups. Table 7 presents gender, city and position in the firm distributions of the participants according to their social groups.

Table 7. Characteristics of the Participants According to the Social Groups

	Gender	City	Position in The Firm
KD SG	Male:27 Female:11	Ankara:15 İstanbul:23	High level manager: 4 Middle level manager: 6 Worker: 28
BFV SG	Male:23 Female:12	Ankara:13 İstanbul:22	High level manager: 4 Middle level manager: 6 Worker: 25

4.3 Content Analysis Results

For the current research, in order to analyze the wall post data of the two social groups qualitatively, content analysis was conducted. The wall post data included a total of 18 months long wall discussion data entered since the opening of the system between February 2013 and August 2014. Table 8 represents the summary of wall post activity by presenting number of participants, total number of wall posts, average thread length and max thread length according to the social group.

In Sosyal 2.0, multiple participants can reply to a wall post. Thread length is the total thread number including the initial wall post and replies related to that wall post. Longer thread length indicates longer discussion about that initial wall post.

Table 8. Summary of Wall Post Activity

	No of participants	Total no of wall posts	Total no of wall discussions	Max. thread length
KD SG	38	495	144	10
BFV SG	35	235	49	13

Table 9 presents the distribution of thread length according to social groups. The table indicates that maximum thread length was 13 and it was observed in BFV SG. On the other hand, in KD SG, the maximum thread length was 10.

Table 9. The Distribution of Thread Lengths According to Social Groups

Thread length	KD SG	BFV SG
1	1	0
2	55	10
3	36	7
4	23	15
5	14	3
6	5	4
7	4	2
8	3	3
9	0	0
10	3	2
11	0	1
12	0	1
13	0	1
Total no of wall discussions	144	49

Table 9 shows that, among the total 293 initiated wall discussions in two social groups, only one wall post in KD SG was remained uncommented. In other words, there was only one orphan post among the 293 initiated wall posts in the examined social groups. The table also indicates that, wall post discussions were usually comprised of two, three or four wall-posts. Also, longer wall discussions were present, in KD SG, 3 wall discussions were comprised of ten wall-post messages and in BFV SG, 3 all discussions were comprised of eleven, twelve and, thirteen messages, respectively (See Figure 9 and Figure 10).

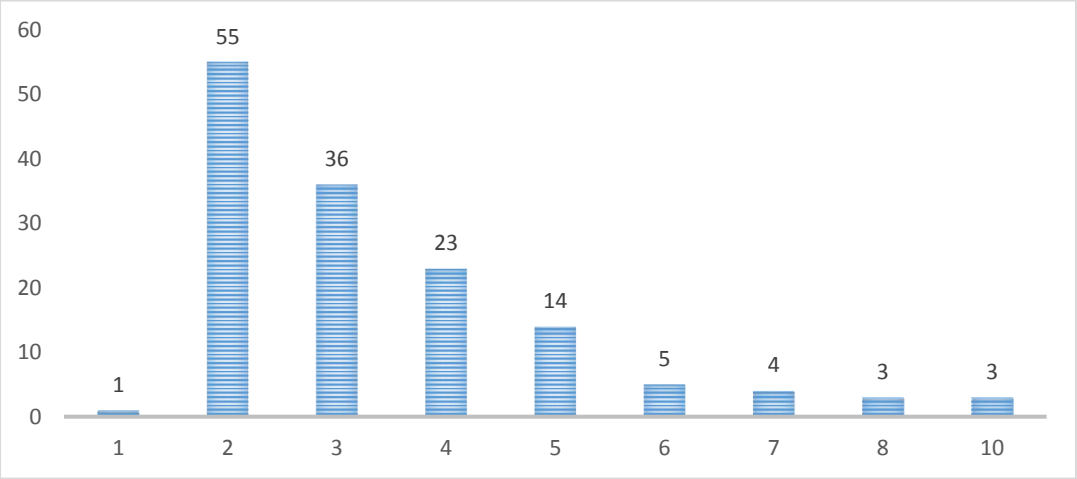


Figure 9 Thread length distribution of KD SG

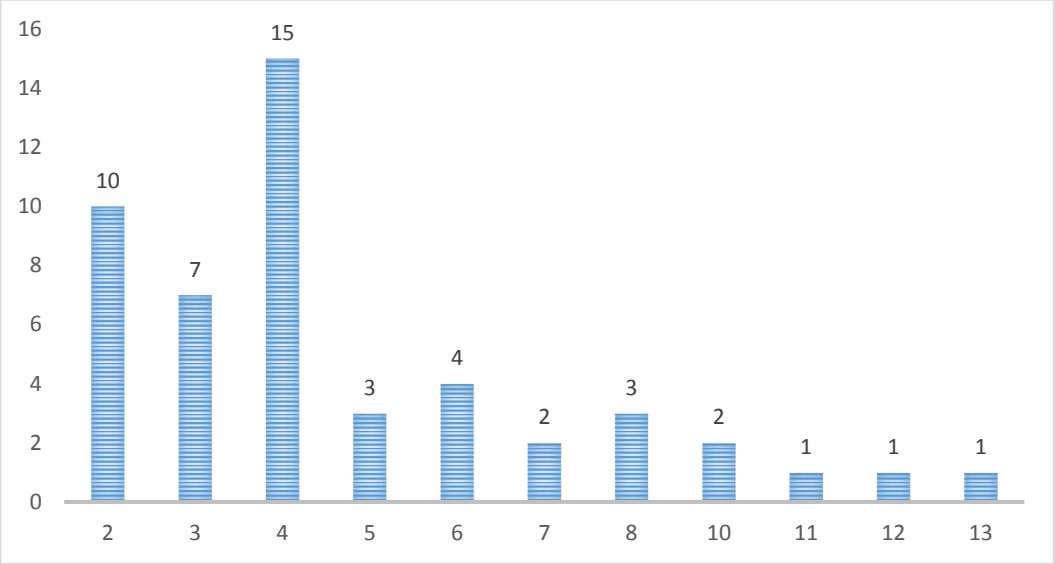


Figure 10 Thread length distribution of BFV SG

4.3.1 Levels and Motives of Cognitive Presence

The wall posts comments were analyzed depending on the cognitive presence coding indicators and examples provided in Appendix B. The analysis included 15 different coding categories under the four main dimensions of CP, which are triggering event (TE), exploration (EX) integration (IN), and resolution (RE). The coding indicators and categories were defined based on the work of Garrison et al., (2001). The links, product and person names in the examples provided in Appendix B are altered for ethical concerns.

4.3.1.1 KD Social Group Cognitive Presence Levels

When the distribution of CP codes of the KD SG is examined, the results revealed that the exploration category was most frequently coded (n=263) and it was followed by the triggering event category (n=133). On the other hand resolution was the least coded category (n=13). The remaining codes (n=84) were related to integration level of CP in KD SG. Figure 11 presents the distribution of CP codes of the KD SG.

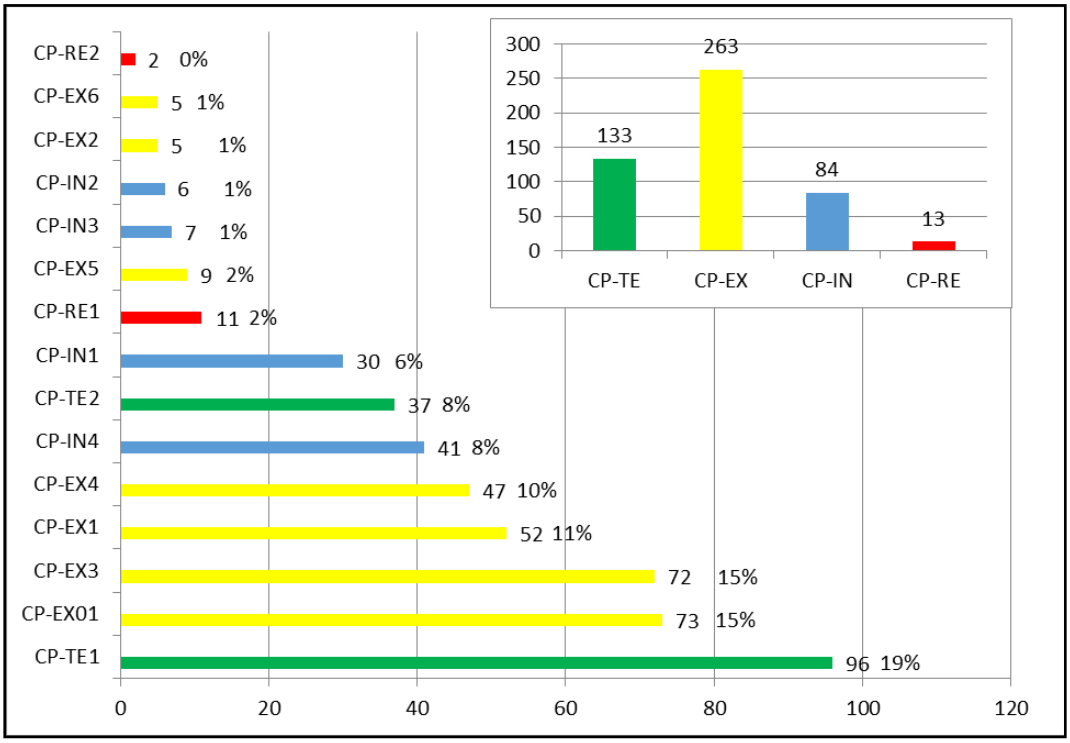


Figure 11 KD cognitive presence code frequencies

When the categories are examined in terms of their sub-levels, it is revealed that, CP-TE1 category which represents *recognizing a problem*, was most frequently found (n=96) in discussions in KD SG; whereas CP-RE2 category, representing *defending solutions about why a problem was solved in a specific manner*, was found in only two (n=2) messages.

The most frequent category was followed by four exploration sub-categories, CP-EX01 category, which signifies *messages that does not directly represents a standpoint* were found quite common (n=73). It was followed by CP-EX3 category, expressing *information exchange* (n=72). The fourth most commonly coded category was; CP-EX1 conveying *exploration within the online community* (n=52). CP-EX1 category was followed by CP-EX4 category representing *suggestions for considerations* (n=47).

For instance, the following wall post activities from the KD SG reflected the participants'' cognitive presence motives assembled around CP-TE1, CP-EX3, CP-EX4 and CP-EX01 in the SG. In these activities, Hunarc triggered an event by stating the situation that he faces, then Salovil provided some information regarding the situation. Afterwards, Dlumen made some suggestions about the subject. The starter of the conversation, Hunarc, added, "I guess I tried to like a blog. This subject is OK. Thanks.", but didn't provide any standpoint. And lastly, Blarin added further opinion that reflected sense of puzzlement by asking another question (CP-TE2). This last message took the discussion to a new direction but no other comment was provided. Then the thread was closed.

> *Hunarc:* When I try to like some comments in some of the group-walls, it says you are unauthorized? Is it related to the group creator's closing the authorization settings or is it related to me not having some of the rights? As an example, I couldn't like the blogs of Salvoil and Crapum.
>
> *Hunarc: Bazı grupların duvarlarına yazılan yazıları beğenmek istediğimde bu yetkiye sahip değilsiniz diyor? Bu konu grubu kuran kişinin yetkileri kapatması ile mi ilgili yoksa benim bazı yetkilere sahip olmamam ile mi ilgili? Örnek olarak; Salvoil ve Crapum'un bloglarında beğenme yapamadım.*
>
> Salovil: Hunarc, was it the wall post or the blog you could not like? Liking the post on the wall is not dependent on a badge, but liking the blog is. Maybe you did not get the related badge.
>
> *Salovil: Duvar yazısını mı yoksa blogu mu beğenemedin Hunarc? Duvar yazısı beğenme bir rozete bağlı değil ama blog beğenme işlemi bağlı. İlgili rozeti kazanmamaış olablirsin.*
>
> Dlumen: I think, this badge thing is the most significant function of Social 2.0. As far as I observed from Enocta experiences, it enables the use of the communication platform "without contamination," which I like. However, how the motivation is affected by the irrelevant appearance of some badges occasionaly should be evaluated.

Dlumen: Bu rozet konusu Sosyal 2.0'ın en önemli özelliği bence. Enocta içi deneyimlerden gördüğüm kadarıyla, iletişim ortamının "kirlenmeden" kullanımını mümkün kılıyor. bunu seviyorum. Ama bazı rozetlerin bazı anlarda cart diye kişinin karşısına çıkması motivasyonu nasıl etkiliyor, bir değerlendirmek gerek.

Hunarc: I guess I tried to like the blog. It is ok. Thanks.

Hunarc: Galiba blog beğenmeye çalıştım. Ok bu konu. Teşekkürler

Blarin: I cannot add comments on Crapum's Sailing group. I could not find out why.

Blarin: Ben de Crapum Bey''in Yelken grubunda yorum yapamıyorum. Neden olduğunu anlamadım?

KD cognitive presence code frequency distribution, see Figure 11, revealed that CP-IN4 was found in the middle of the code frequency distribution (n= 41). It reflected *the statements which are explicitly characterized as a solution*. In KD SG messages reflecting solutions to the problems faced in the Sosyal 2.0 system were coded under this category. The example below represented a typical example to this motive found in the KD SG. Szumen reported a problem and triggered an event by providing a link. Dlumen agreed and reflected to the problem in the exploration level. And lastly, Salovil responded to the reported problem in the integration level by creating a solution to the problem reported by the thread initiator.

Szumen: A box automatically appears when I want to share a link while I am writing on a wall. Sometimes, I want to remove the box and directly share the link since the title or the description of the page consists of meaningless texts. However, it gives error. Let's click on this as an example and see if it opens: [URL]

It doesn't open; I have been directed to the error page of campus. It says "You are unauthorized to access this page."

Szumen: Bir duvara yazarken link vermek istediğimde otomatik açılan bir kutu oluyor ya. Bazen açılan sayfanın title ve description gibi bilgilerinin anlamsız metinlerden oluşması nedeniyle o kutuyu kaldırmak ve linki doğrudan paylaşmak istiyorum. Ancak link hata veriyor, mesela tıklayalım şunu bakalım açılacak mı: [URL] bende açılmıyor, kampüsün hata sayfasına yönlendiriliyorum. "Bu sayfaya erişim izniniz bulunmamaktadır. " diyor.

Dlumen: I cannot open it neither. The same error.

Dlumen: Ben de açamadım. aynı hata

Salovil: The related case has been opened.

Salovil: Konuyla ilgili case açılmıştır

The wall-post thread samples provided in this section are selected to represent the characteristics of the KD SG in terms of the CP frequencies.

4.3.1.2 BFV Social Group Cognitive Presence Levels

As a result of the content analysis, examination of the distribution of categories of cognitive presence categories of BFV social group revealed that, the exploration level was most frequently coded (n=141) in BFV social group. It was followed by the integration (n=60) category responses, and then the Triggering Event (n=20) category responses.

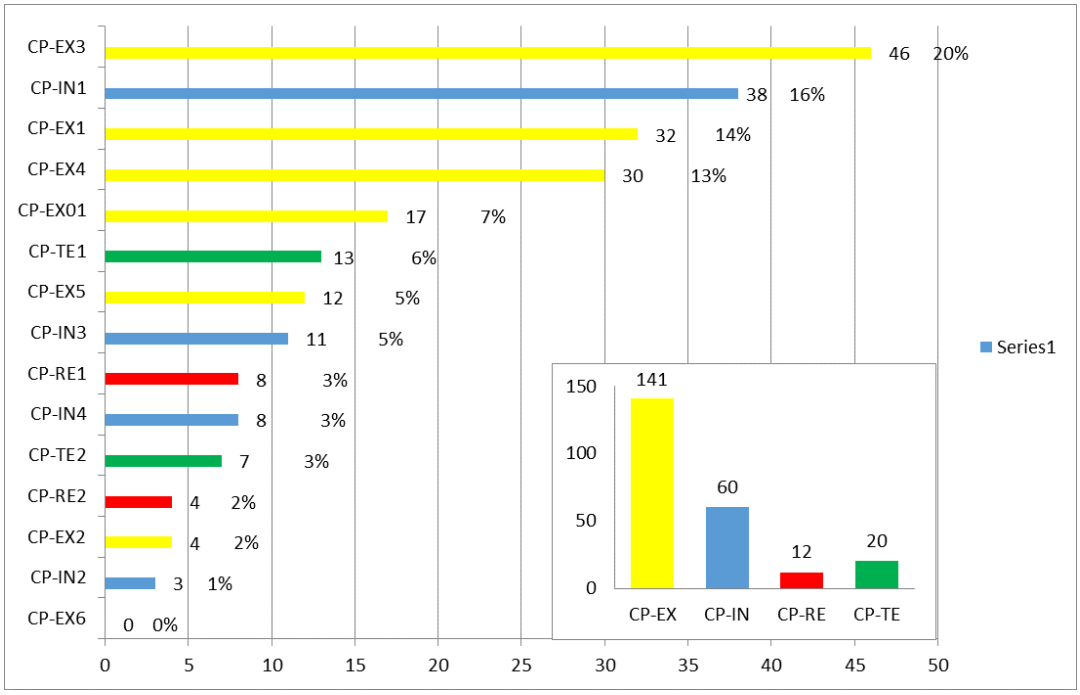


Figure 12 BFV Cognitive presence code frequencies

When the distribution CP code frequencies of BFV SG, was examined see Figure 12, it is observed that CP-EX3 respresenting *information exchange* was the most common coded sub category (n=46). Furthermore, CP-IN1, coded for *integration among group members* was the second most frequently coded category (n=38). This sub category reflected that building on, adding to others ideas by agreeing and disagreeing is frequently seen in BFV SG.

The following two most commonly coded sub-categories were also from the exploration category of CP: CP-EX1, *divergence within the online community reflecting the different perspectives* (n=32) and CP-EX4, expressing *suggestions for considerations* (n=30). They were followed by the CP-EX01 category which represented *engagement in the activity but not directly reflects any standpoint*.

The codes indicated that, CP-IN2 representing *justified, developed, defendable, yet tentative hypotheses* (n=3), CP-EX2 indicating *exploration within a single message* (n=4) and CP-RE2 expressing *defending why a problem was solved in a specific manner* (n=4) were the least found categories in BFV SG. Also, CP-EX6 which is reflecting messages related to *leaps to conclusions* was not found at all (n=0). Figure 12 presented the distribution of CP codes of the KD SG.

For example, the following wall post activity from the BFV SG reflected the participants' CP motives assembled around CP-EX3, CP-EX1, CP-IN1 and CP-EX4. Hyocih initiated a wall thread by asking an open ended question "Let's select the best custom content in Enocta?" which suggested an idea for consideration. Then, Elunor agreed the idea by simply stating an advantage to the stated suggestion: "that would be beneficial for everyone." A further agreement to the idea was presented by Efamen by opening a perspective to the suggested idea "If you consider filtering the trainings, listing the projects that you think is special that might be good". Adding to this conversation, Bererne provided some up to date information about the related topic. Fonalne just agreed to this idea. And lastly, Anatar agreed with this idea further exploring the needs for the suggestion.

> Hyocih: Shall we select the best feature of Enocta? Shall we vote for the trainings developed by the special content team quarterly and select the top 3 trainings? Thus, everyone will be informed about what kind of training is being developed by the special content. We can learn about our weaknesses and strengths from the feedback we receive. This would also be a source of motivation for the special content team. It can be inspiring for the catalogue team. It would also provide insight for the sales team about how to provide guidance to the customers that demand training on the same topics. I couldn't find a benefit for the R&D and Support teams. :) Perhaps, they would like to test the trainings.
>
> *Hyocih: En iyi Enocta özel içeriğini seçelim mi? 3 aylık periyotlarda, özel içerik ekibinin ürettiği eğitimleri oylayıp, ilk 3 eğitimi seçmeye ne*

dersiniz? Böylece herkes özel içerik tarafında nasıl eğitimler üretildiğinden haberdar olur. Aldığımız geri bildirimlerle zayıf ve güçlü yanlarımızı görebiliriz. Özel içerik üretim ekibi için motivasyon unsuru oluşturmuş oluruz. Katalog ekibi için ilham verici olabilir. Satış ekibi için aynı konularda eğitim isteyen müşterileri yönlendirmede fikir verir. Ar-Ge ve Destek ekibi için bir fayda bulamadım. :) Onlar da eğitimleri test etmek isterler belki.

Elunor: It would be useful for everyone :)

Elunor: Herkese faydası olur :)

Efamen: It would be good if you filter the trainings and list the projects you find special.

Efamen: Egitimleri filtreleyip ozel oldugunu dusundugunuz projeleri listelemeniz iyi olabilir.

Bererne We are thinking about creating a group on Social and share it there. We will see :)

Bererne: Sosyalde bir grup açıp, orada paylaşmak gibi bir niyetimiz var bakalım :)

Fonalne: Good idea.

Fonalne: Güzel fikir.

Anatar: Good idea. Do it right now. Tell if there is anything I can do or if we are supposed to do anything.

Anatar: Güzel fikir. Hemen hayata geçirin. Benim yapabileceğim, ya da yapmamız gereken bir şey olursa haber verin.

In another wall activity in BFV SG, Sfehet suggested the use of a new tool in the company. Anatar added further thoughts about Sfehet's suggestion and reflected his agreement. Hnamen engaged in the activity by stating "We are backed up by the CEO, I think we will manage it :)". Lastly Szumen, stated his objection to this suggestion by mentioning his personal experiences.

Sfehet: I suggest using LYNC to reduce the e-mail traffic within the company and to increase productivity.

Sfehet: Şirket içerisinde e-posta trafiğini azaltmak ve verimliliği arttırkmak için LYNC kullanmayı öneriyorum. [URL omitted]

Anatar: Sfehet, thank you so much for your suggestion. I think it is a good means of communication for a team working in two cities with tens of customers and involving lots of projects and field work. It would be very effective and enhance the communication and productivity. Best,

Anatar: Sfehet çok teşekkür ederim önerin için. İki şehirde, onlarca müşteride, çok sayıda projede ve sahada da olan bir ekip için iyi bir iletişim aracı olduğunu düşünüyorum. Çok faydalı olacak, iletişimi ve verimliliği güçlendirecektir. Sevgiler,

Hnamen: We are backed up by the CEO, I think we will manage it :)

Hnamen: CEO'muzu arkamıza aldık, bence bu iş olur :)

Szumen: A solution is definitely needed for the e-mail traffic. However, while the instant messaging speeds up the things for the sender and it is alright, isn't it a bit distracting for the receiver? The received e-mails are sorted and we respond to them by priority. I am of the opinion that we get rid of even the telephone if possible :)

Szumen: eposta trafiğine kesinlikle bir çözüm bulmak lazım. yalnız bu anlık mesajlaşma, gönderen için işleri epey hızlandırıyor, pek güzel oluyor da; mesaj alan için biraz dikkat dağıtıcı ve konsantrasyon bozucu olmuyor mu? Ggelen epostaları bir sıraya sokuyoruz ve önceliklendirerek yanıtlıyoruz. bunu seviyorum. ben mümkün olsa da telefonu bile çıkarsak hayatımızdan diyorum :)

Overall, these examples and the code frequencies revealed that, the information exchange in BFV SG carried discussions around the information suggestions, agreements/disagreements and elaborations on these ideas. Only very few of the

conversations resulted in developed, defendable, yet tentative hypotheses or defending solutions in the resolution level CP indicators.

4.3.2 Levels and Motives of Social Presence

The wall comments and answers were analyzed depending on the social presence coding indicators and examples provided in Appendix B. The analysis included 19 different codes under the three main categories of affective expression (AF), open communication (OC) and group cohesion (GC). The coding indicators and categories were defined based on the work of Rourke et al. (2001). In addition, during data analysis, two new categories aroused as a sub category for open communication. They were coded as OC-45 and OC-46. Details of those novel categories were explained in section 3.

4.3.2.1 KD Social Group Social Presence Levels

When the distribution of SP codes of the KD SG was examined, the results revealed that the open communication was the most frequently coded category (n=407), it was followed by the affective expression (n=65), and then the group cohesion category was followed (n=23). See Figure 13 for the distribution of the coding categories.

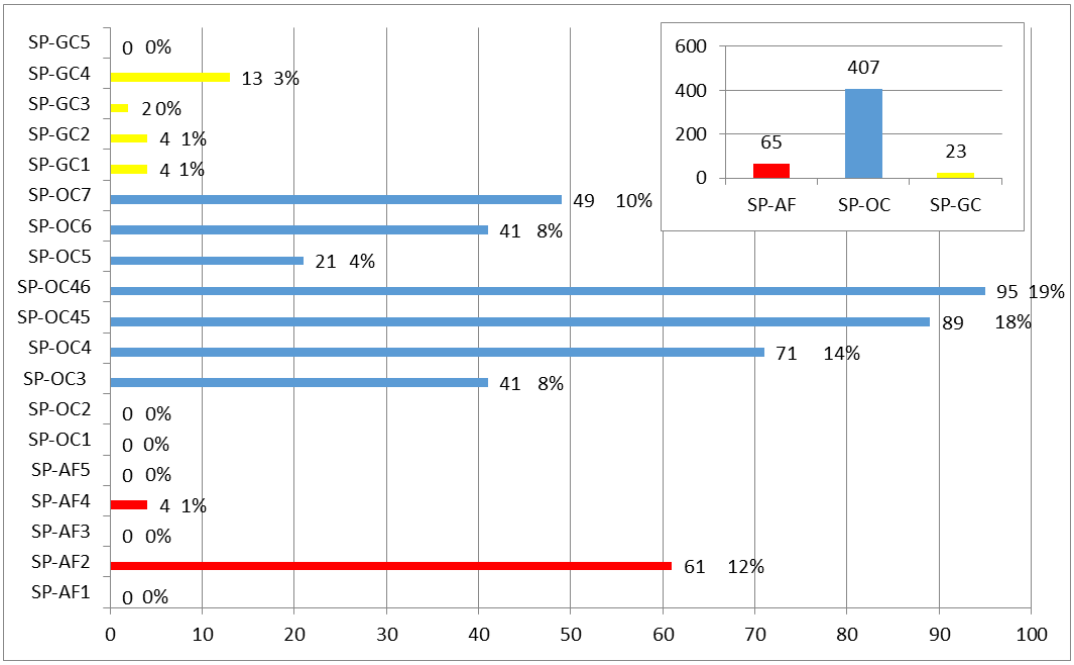


Figure 13 KD Social pesence code frequencies

When the categories were examined in terms of their sub-levels, it is revealed that, SP-OC46 category which represents *responding problems*, was most frequently found (n=95) in discussions in KD SG; whereas SP-GC3 category, representing *communication that serves a purely social function; greetings, closures*, was found in only two (n=2) messages.

The most frequent category was followed by two exploration sub-categories which are SP-OC45 and SP-OC4. SP-OC45 was representing *reporting problems* (n=89) category followed by SP-OC4 which represented *asking questions* (n=71). The fourth most commonly coded category was; SP-AF2 representing the *use of humor* in the wall platform (n=61).

For instance, the following wall post activities from the KD SG reflected the participants' social presence motives assembled around SP-OC46, SP-OC45 and SP-OC4 in the SG. Hunarc asked a question by mentioning a problem that he faced in the system and Kruper responded to the problem and explaining that it will be later examined:

Hunarc I will give another example from the Blog. When I open the editor to sing in to the blog on this screen, the domain box does not appear at the first stage. After I click send, the domain error occurs and then the related box comes up… wouldn't it be better if it comes open at the first stage and I fill in without receiving the default error?

Hunarc: Yine Blog alanından örnek vereceğim, bu ekranda blog girişi yapmak için editörü açtığımda ilk etapta ilgi alanı girebileceğim kutu gelmiyor, ilk gönder dedikten sonra zaten ilgili alanı hatası verip ilgili kutuyu da getiriyor... İlk etapta açık gelse de kafadan hata almadan doldursam iyi olmaz mı?

Kruper: There must be a checkbox on that screen. It must not be compulsory to add domain unless you click on the checkbox. We will check it out.

Kruper: Bir checkbox olması lazım o ekranda. Onu tıklamadığın sürece ilgi alanı girmen zorunlu olmaması lazım. Bunu inceleyelim.

In another wall post activity representing the common motives in KD SG, Hnamen asked a question about the system and then Kruper responded to the question by providing possible solution. Afterwards, Hunarc asked further about this solution. Lastly Kruper responded to this last question in a humorous manner.

Hnamen: Can a component be developed to add a one-item mini survey on the wall (like add file, add photo)? Can we create an entry for this?

Hnamen: Duvar'a tek soruluk mini anket ekleme (dosya ekle, resim ekle tadında) şeklinde bir özellik için component geliştirilebilir mi? Bununla ilgili çalışma kaydı açabilir miyiz?

Kruper*:* You can add it in ART, Hnamen. Thank you. This issue had been discussed before, there might be an entry. If you like, first search for the entry. If there is no entry, you can add it.

Kruper: Öneri olarak ART'a girebilirsin Hnamen. Teşekkürler. Bu konu daha önce de gündeme gelmişti, belki mevcut bir kayıt da olabilir. İstersen önce bir arat, yoksa eklersin.

Hunarc: We will be able to keep and show the results, won't we Kruper?

Hunarc: Sonuçlarını tutup gösterebileceğiz değil mi Kruper?

Kruper: Hunarc, we don't have that function yet :) I just said add it in ART. If we have entries, we also keep the results :)

Kruper: Hunarc, daha bu özellik yok :) Art'a girin dedim sadece. Yaparsak tutarız :)

In another representative example, Atueville reported a problem by attaching a print screen from the system and Salovil responded to that problem by mentioning they had already known that problem and handled it in a case.

Atueville: I faced with a situation as sen in the attachement. Play buttons have appeared on the left side, ain addition the images from imdb are not shown

Atueville: Ekteki gibi bir durumla karşılaştım. Sol tarafta play tuşları çıktı, ayrıca imdb'deki imajlar da sanırım gelemedi.

Salovil: We already have a case and we're handleing this problem.

Salovil: Bu konuyla ilgili bir caseimiz bulunmakta Atueville, durumla ilgileniyoruz :)

Overall, these examples and the code frequencies of social presence of KD SG revealed that, the information exchange in the wall platform of this SG were mostly reflecting open communication structure. The members of the platform openly communicated while reporting and responding problems and asking questions in the social groups. The analysis also revealed that the members also shared many information which were categorized under group cohesion. Lastly, it is revealed by

the results that, although affective expressions were found in the communication structure, they were not dominant in the discussions as a whole, but rather stood as a catalyst among many conversations.

4.3.2.2 BFV Social Group Social Presence Levels

Examination of the distribution of categories of social presence of BFV Social Group revealed that, the Open Communication was the most frequently coded category (n=173), followed by the Affective Expressions (n=33), which was then followed by the Group Cohesion category (n=20). See Figure 14 for BFV SG SP Code Frequencies.

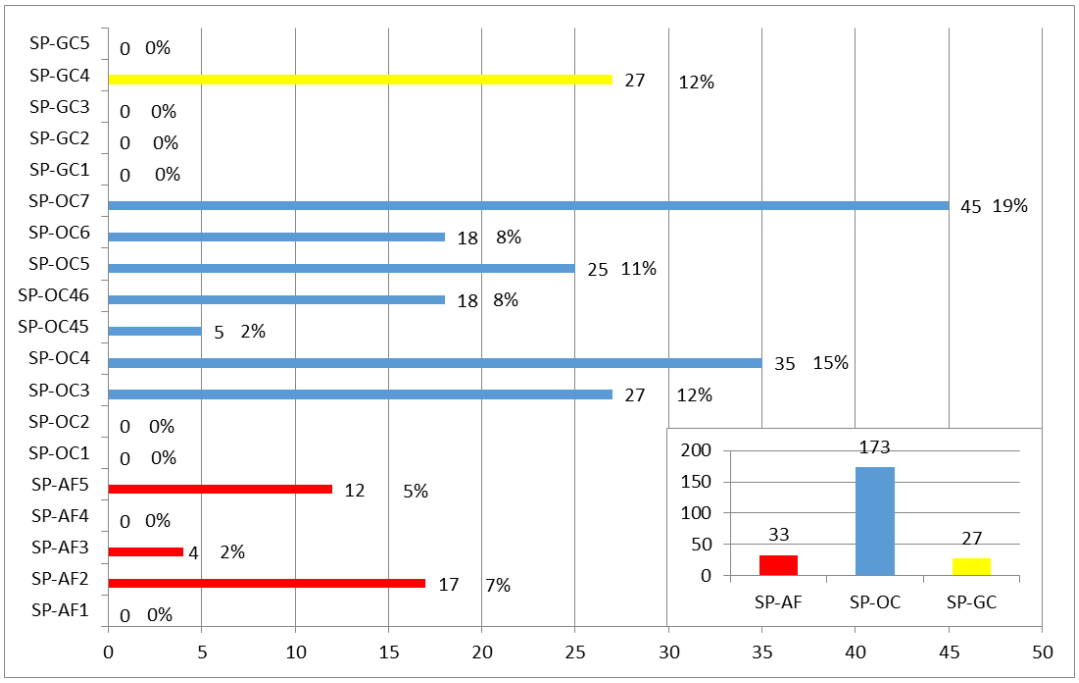


Figure 14 BFV Social presence code frequencies

BFV Social group was mainly aimed at gathering and discussing new ideas in Sosyal 2.0. The distribution of codes also revealed reflective results, SP-OC7 which includes personal advice was the most frequently coded category (n=45). It was followed by SP-OC4 which reflected asking questions (n=35). Afterwards, SP-OC3 which includes messages referring explicitly to other member's messages (n=27) and SP-GC4, representing social sharing (n=27) stood as the most frequently coded categories.

For example, the following wall post activities from the BFV SG reflected a small sample for the discussions structured around personal advice (SP-OC7) and asking questions (SP-OC4) themes of SP. Dlumen initiated a wall thread by providing an advice regarding a note taking tool for the meetings. Then, Blarin asked a question about that idea. This thread was closed with this question of Blarin with no other contribution.

> *Dlumen:* Holding long meetings and coming to a decision in the end is very difficult. It is even more difficult as the organization enlarges. They developed this tool as a solution to this problem. It worth examining to get new ideas.
>
> *Dlumen: Uzun toplantılar yapıp sonunda karar almak çok zor. Hele organizasyon büyüdükçe daha da zor. Bu soruna çözüm için böyle bir tool ortaya çıkarmışlar. Yeni fikirler için incelemeye değer.*
>
> Blarin: It is an interesting tool. It is exactly the tool that might be needed for Enocta. Can a similar structure work on Sosyal?
>
> *Blarin: Enteresan bir araç. Tam da şirketin ihtiyacı olabilecek bir araç. Sosyal üzerinde benzer bir yapı çalışabilir mi acaba*

In another discussion, Digorne asked a question about a common subject to her colleagues (SP-OC4). After some time, Digorne shared a link related to her previous post in the social group (SP-GC4). And lastly, Szumen mentioned his experiences related to the designated subject and expressed his feelings by complimenting, and appreciation (SP-OC5).

Digorne: Considering it as a social responsibility, we had posted a great part of the earthquake training on YouTube with but we did not share it too much so that it can be shared by anyone. Today an earthquake has occurred. Can we think about something about this while awareness has been built in people about the earthquake? Can it be reposted as a social responsibility project?

Digorne: Deprem eğitimimizin büyük bir bölümünü sosyal sorumluluk gibi düşünerek Youtube üstünden yayınlamıştık ancak bizlerin paylasimiyla çok fazla yayip herkesin paylaşacağı bir hale getirememistik. Bugün deprem olmuş, insanlar bu konudaki algılarını acmisken bununla ilgili bir formül düşünülebilir mı? Kucuk bir sosyal sorumluluk projesi olarak yeniden sunulabilir mı?

Digorne: The first part of the training, "things to do before the earthquake," has been shared with the customers, as you know from the e-mails. It was also shared as a video on the social networking sites of Enocta so more people can view it. You share it immediately as well so your beloved ones can view this valuable video :) [URL]

Digorne: Eğitimin ilk bölümü "deprem öncesi" hazırlıklar, sizin de maillerinizden gördüğünüz gibi müşterilerle paylaşıldı. Ayrıca daha fazla insanın yararlanabilmesi adına Enocta'nın sosyal paylaşım sitelerindeki hesaplarında da video olarak paylaşıldı. Sizler de sevdiklerinizin bu faydalı videoyu izlemesi için vakit kaybetmeden paylaşın :) [URL]

Szumen: We already completed the first application. The administrators of our customer Hantington's Machines had another LMS and we managed to install e.mobil for our videos in these devices in accordance with the above-mentioned method. I mean, you did it :) Well done.

Szumen: İlk uygulamamızı yaptık bile. Müşterilerimizden Fantington Makina'nın yöneticilerinde başka bir LMS vardı ve bizim videolar için bu cihazlara yukarıda açıklanan yöntemle e.mobil'i kurmayı başardık. Yani başardınız :) Elinize sağlık.

Overall, these examples and the code frequencies of social presence of BFV SG revealed that, the information exchange in the wall platform of this SG were mostly reflecting open communication structure. The members of the platform openly communicated while providing personal ideas and making suggestions in the social groups. These ideas and suggestions were discussed openly and they were appreciated by the members. Lastly, it was revealed by the results that, as it was the case for the KD SG, affective expressions found in the communication were not dominant in the discussions as a whole, but they, especially use of humor, rather stood as a catalyst among many conversations. In addition, expressing value of ideas as a form of affective expressions was found in the discussions.

4.3.3 Summary of Content Analysis Results

In this part, the results of the content analysis are presented by handling the two social groups in terms of both social presence and cognitive presence.

When the CP distribution of both social groups were examined it revealed that, the distribution of categories were different for two social groups. Although the participants were more engaged in the exploratory activities in both social groups, the two groups were differentiated especially in the CP-TE2, CP-IN4 and CP-EX01 dimensions of the CP. If we examine the findings in detail, CP-TE2 category, which implies sense of puzzlement taking discussions into a new direction comprised 7.47% of the messages in KD SG whereas it was only 2.98% for BFV SG. Similarly, 8.28% of the messages were coded into the CP-IN4 category in KD SG representing explicit solutions by participant. On the other hand it only constituted 3.40% of the messages in BFV SG for this sub category implying solutions. And lastly for the CP-EX01 sub category, which was added by the researcher to meet the needs for the current research

was distinctive for two social groups. Although, CP-EX01, the messages implying a cognitive engagement in discussion but not representing a clear position were more common in KD SG (14.95%) they were less common in BFV SG (7.23%).

In addition, except for CP-EX6, which includes messages that leaps to conclusions in BFV SG, all categories were coded in both social groups. The commonalities, differences and percentage of CP code frequencies can be examined in Table 10.

Table 10. CP Code Frequencies for Both Social Groups

Code	Description	KD SG frequency	KD SG percent	BFV SG frequency	BFV SG percent
CP-TE1	Recognize problem	96	%19.39	13	%5.53
CP-TE2	Sense of Puzzlement	37	%7.47	7	%2.98
Triggering Event Total		133	%26.87	20	%8.51
CP-EX01	Not directly represents a standpoint	74	%14.95	17	%7.23
CP-EX1	Exploration within the online community	52	%10.51	33	%14.04
CP-EX2	Explorationwithin a single message	5	%1.01	4	%1.70
CP-EX3	Information exchange	72	%14.55	47	%20.00
CP-EX4	Suggestions for considerations	48	%9.70	30	%12.77
CP-EX5	Brainstorming	9	%1.82	12	%5.11
CP-EX6	Leaps to conclusions	5	%1.01	0	%0

Table 10. CP Code Frequencies for Both Social Groups (continued)

Exploration Total		265	%53.84	143	%60.85
CP-IN1	Integration among group members	30	%6.06	38	%16.17
CP-IN2	Integration within a single message	6	%1.21	3	%1.28
CP-IN3	Connecting ideas, synthesis	7	%1.41	11	%4.68
CP-IN4	Creating Solutions	41	%8.28	8	%3.40
Integration Total		84	%16.97	60	%25.53
CP-RE1	Vicarious application to real world testing solutions	11	%2.22	8	%3.40
CP-RE2	Defending solutions	2	%0.40	4	%1.70
Resolution Total		13	%2.63	12	%5.11
TOTAL		495	%100	235	%100

In the same way, when the SP distribution of both social groups is examined, it is found that, some of the SP categories were not coded in both social groups. They are: SP-AF1, SP-OC2 and SP-GC5.

SP-AF1 category reflects *conventional expressions of emotion*. For the current study, each message is defined as the unit of analysis and it has been assigned to only one category. Although some of the messages carried meaning for the expressions of emotions, they were not defined solely as to reflect emotions. Therefore, at the end of the coding process, none of the messages were selected for SP-AF1 coding category.

Another category which was not found among the coded in SP category is SP-OC2 representing *using software features to quote others messages or cutting and pasting selections of others' messages*. This result is related to the capabilities and properties of the wall platform. The definition of the SP-OC2 category points to the preliminary discussion forum properties in which quoting is done in order to relate messages to each other. On the other hand, the platform used in this study was a wall platform in which messages were already related to the previous ones. This situation removed the need for quoting or cutting and pasting from the other's messages. As a result, none of the messages were selected under SP-OC2 category.

The last category which was not coded at all was SP-GC5. It included the reflection on the course. It was not applicable for the context of the current study. Therefore, it is noted as not applicable in the code book.

In addition to the explained categories, some of the categories were not evident in different social groups. For the KD social group SP-AF3 category, which was presenting the details of life outside the class, or express vulnerability was not coded by both researchers. On the other hand, in BFV social group, categories: SP-AF4 representing use of unconventional expressions to express emotions, SP-GC1 representing vocatives, SP-GC2 addressing the group using inclusive pronouns and SP-GC3 representing phatics, salutations and greetings were not coded.

Furthermore, the differences in SP distributions of both social groups clearly reflected the role and usage differences of the social groups. The examination of code category frequencies and percentages revealed that participants were openly communicating in both social groups. However, they were differentiated especially in the SP-OC45 messages that report problems, SP-OC46 messages that respond problems, SP-AF2 representing use of humor, SP-OC3 messages referring explicitly to others' messages, SP-OC5 messages representing compliments, expressing appreciation and SP-OC7 representing personal advice dimensions of the SP. For instance, SP-OC45 and SP-OC46 categories were more frequently coded in KD social group. SP-OC45, which implies reporting problems was comprised 17.78% of the messages in KD SG whereas

it was only 2.13% for BFV SG. Similarly, SP-OC46, which implies responding problems was comprised 19.19% of the messages in KD SG whereas it was only 7.66% for BFV SG. In a similar manner, SP-AF-2 category, the use of humor, comprised 13.32% of the messages in KD SG whereas it was only 7.23% for BFV SG.

Likewise, 10.64% of the messages were coded into the SP-OC5 category in BFV SG that stands for complimenting and expressing appreciation. On the other hand, it only constituted 4.24% of the messages in KD SG. There was a similar result for, SP-OC7, personal advice. It was 19.57% of the messages for BFV Social Group whereas only 9.90% for KD SG.

Table 11. Social Presence Code Frequencies

Code	Description	KD SG frequency	KD SG percent	BFV SG frequency	BFV SG percent
SP-AF1	Expressing emotions	0	%0	0	%0
SP-AF2	Use of humor	61	%13.32	17	%7.23
SP-AF3	Self-disclosure	0	%0	4	%1.70
SP-AF4	Use of unconventional expressions to express emotion	4	%0.81	0	%0
SP-AF5	Expressing value	1	%0.20	12	%5.11
Affective Expressions Total		66	%13.33	33	%14.04
SP-OC1	Continuing a thread	1	%0.20	0	%0
SP-OC2	Quoting from others' messages	0	%0	0	%0
SP-OC3	Referring explicitly to others' messages	41	%8.28	28	%11.91
SP-OC4	Asking questions	71	%14.34	35	%14.89
SP-OC45	Reporting problems	88	%17.78	5	%2.13

Table 11. Social Presence Code Frequencies (continued)

SP-OC46	Responding problems	95	%19.19	18	%7.66
SP-OC5	Complimenting, expressing appreciation	21	%4.24	25	%10.64
SP-OC6	Expressing agreement/disagreement	40	%8.08	18	%7.66
SP-OC7	Personal advice	49	%9.90	46	%19.57
Open Communication Total		406	%82.02	173	%73.62
SP-GC1	Vocatives	4	%0.81	0	%0
SP-GC2	Addresses or refers to the group using inclusive pronouns	4	%0.81	0	%0
SP-GC3	Phatics, salutations and greetings	2	%0.40	0	%0
SP-GC4	Social sharing	13	%2.63	27	%11.49
SP-GC5	Course reflection	0	%0	0	%0
Group Cohesion Total		23	%4.65	27	%11.49
TOTAL		495	%100	235	%100

4.4 Social Network Analysis Results

In this part of the study, the research findings related to the SNA are presented. The result presented are derived from the social networks constructed by using different SNA metrices and methods. Overall, SNA results included density and degree centralization values of the networks, community detection analysis findings, triadic analysis findings, symmetric acyclic decomposition anlaysis findings and blockmodelling analysis findings. Table 12 presents explanation of SNA Methods and Related Research Questions.

Table 12. Explanation of SNA Methods and Related Research Questions

SNA Methods Used	Related Research Question(s)	Explanation of the Analysis
Characteristics and Properties of the Communication Networks	What are the density and degree centralization values of the networks constructed?	Density and degree centralization values of the networks and sociograms of the sub-networks reflect the general structure of the networks.
Community Detection Analysis	Do the networks have any sub-communities?	Community detection analysis is used to detect and define if any natural community is present in the network. Newman, (2004) proposes to examine the network by checking variety of network divisions to reach at the highest modularity result. In fact, high modularity results compact groups within the network, which are highly connected within group but loosely connected between groups.
Triadic Analysis	Is the interaction in the Social Groups centralized or is it distributed among many participants? Do networks show any informal ranking?	Triadic analysis is an SNA method, in which the possible ties of a network with three nodes, used to define the overall structure of a network. Nooy et al., (2011) acknowledges that "It has been shown that the overall structure of a directed network (or a complete signed network) can be inferred from the types of triads that occur" p. (207).
Symmetric Acyclic Decomposition	Is the interaction in the Social Groups centralized or is it distributed among many participants? Do networks show any informal ranking?	Symmetric Acyclic Decomposition Analysis is a partitioning method used to test whether an acyclic structure exist in the network or not (Doreian et al., 2000, p.3). Nooy et al., (2011) explains the assumption of the analysis: nodes with reciprocal relations are assumed to be in the same rank, and they are assumed to be in the same group; however, one way interactions are in different levels and they constitute ranking (p.215). The symmetric-acyclic decomposition method enables us to uncover the informal ranking structure in the networks.

4.4.1 Characteristics and Properties of the Communication Networks

For the current study SP and CP multiple relations networks were constructed in order to reflect the relations in terms of SP and CP and their sub categories. Each relationship in sub dimensions of CP and SP were reflected as a separate layer of network. This structure is named as *Multiple Layered Presences Network* (MLPN). As a result, the networks were formed in a layered structure with MLPN. Figure 15 reflects layered structure of MRNs used in the current study. Also Figure 16 presents the names and explanations of the networks constructed and used in this study.

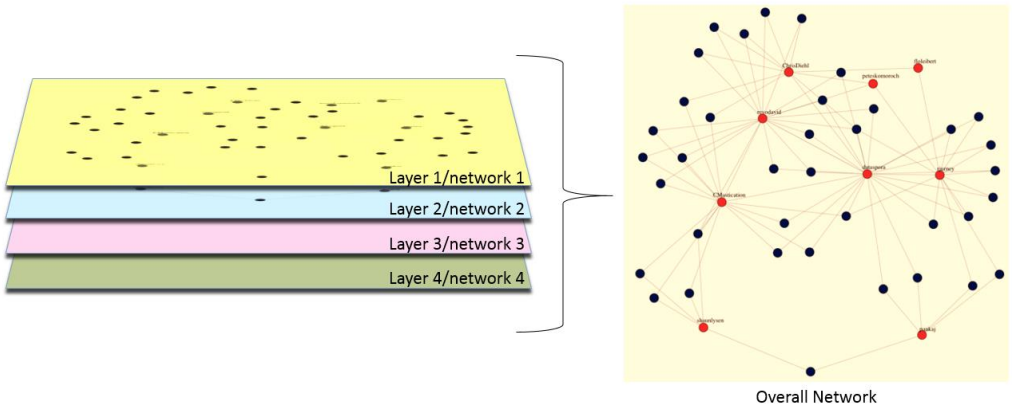


Figure 15 Multiple Layered Presences Network (MLPN) Structure

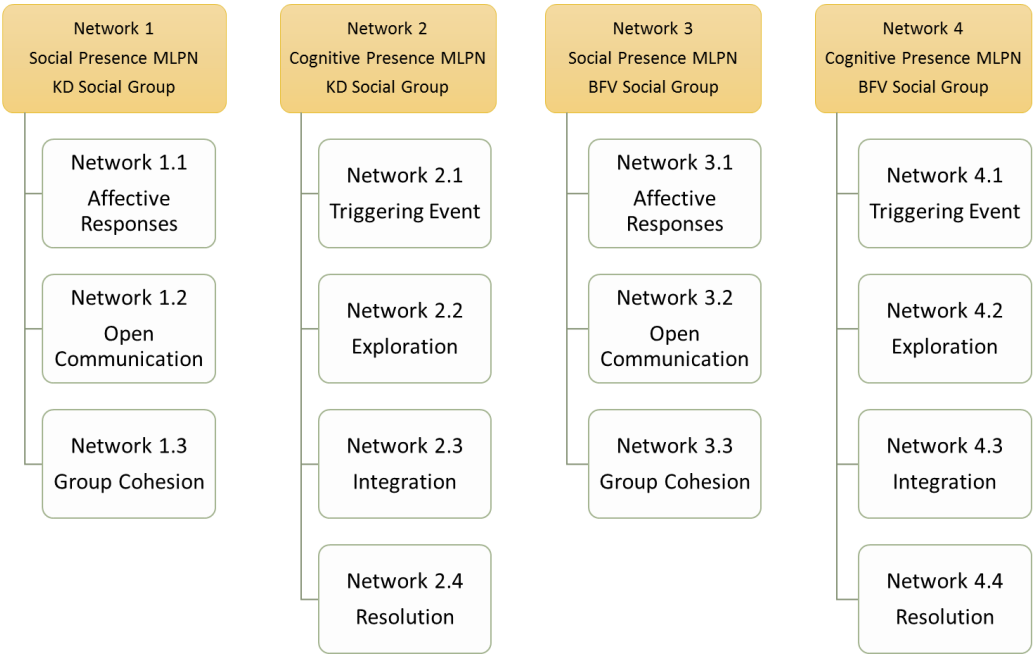


Figure 16 Names and explanations of the MLPNs and related sub-networks

The networks explained in Figure 16 had loops when first constructed. According to the coding procedure, this situation is a representation of a participant's comment to his/her own wall post. However, when calculating the network metrics loops are removed as the current study mainly focuses on the relations between the people in the networked learning environment.

Additionally, multiple lines in the constructed networks mean that two people have communicated more than once using wall platform in social groups. These multiple relations between two people were added and represented as line values in the networks. Therefore, line values reflected how many times two people interacted.

Furthermore, although the networks constructed for one social group included the same set of discussions, when the content analysis results of CP and SP were integrated into the network by MLPN structure, different interactions were kept under different SP or CP sub-categories. As a result, with MLPN structure, interactions between two actors, under different relations were preserved. Therefore, although network 1-2 and network 3-4 are very similar to each other, they are differentiated in terms of their multiple lines and multiple line values. The detailed information regarding the networks are provided under section 4.4.1.1.

The networks constructed were also visualized by drawing sociograms using Pajek ® program. Visualizing networks enabled us to visualize the relations constructed among the contributors in an asynchronous text based wall platform. As Nooy et al., (2011) underlined, visualizing networks is a unique way of visualization, which enables us to trace and present the patterns of ties (p.14). The sociograms of the networks and sub-networks listed in Figure 16 are presented in Appendix E.

4.4.1.1 Explanation of the Communication Networks

Network 1: Network 1 is a MLPN, including social presence codes of KD social group. It includes three sub-networks each representing the sub categories of SP. (Information related to network 1 and its sub-networks are presented in Table 13).

Network 1.1: Represents the communication network which includes affective expression sub category of SP in wall platform of KD social group.

Network 1.2: Represents the communication network which includes open communication sub category of SP in wall platform of KD social group.

Network 1.3: Represents the communication network which includes group cohesion sub category of SP in wall platform of KD social group.

Table 13. Information of the Network 1 and Sub-networks

	Network 1	Network 1.1	Network 1.2	Network 1.3
Number of vertices (n)	38	38	108	38
Number of lines with value=1	236	45	35	46
Number of lines with value#1	62	15	143	7
Total number of lines	298	60	143	53
Number of loops	0	0	0	0
Number of multiple lines	125	0	39	3
Density (loops allowed)	0.206	0.042	0.099	0.037
Density2 (no loops allowed)	0.211	0.043	0.102	0.038
Average Degree	15.68	3.158	7.526	2.789

Network 2: Network 2 is a MLPN, including cognitive presence codes of KD social group. It includes four sub-networks each representing the sub categories of CP. (Information related to network 2 and its sub-networks are presented in Table 14).

Network 2.1: Represents the communication network which includes triggering event sub category of CP in wall platform of KD social group.

Network 2.2: Represents the communication network which includes exploration sub category of CP in wall platform of KD social group.

Network 2.3: Represents the communication network which includes integration sub category of CP in wall platform of KD social group.

Network 2.4: Represents the communication network which includes resolution sub category of CP in wall platform of KD social group.

Table 14. Information of the Network 2 and Sub-networks

	Network 2	Network 2.1	Network 2.2	Network 2.3	Network 2.4
Number of vertices (n)	38	38	38	38	38
Number of lines with value=1	253	31	150	61	11
Number of lines with value#1	59	5	42	12	0
Total number of lines	312	36	192	73	11
Number of loops	0	0	0	0	0
Number of multiple lines	139	5	60	11	0
Density (loops allowed)	0.216	0.025	0.133	0.051	0.008
Density2 (no loops allowed)	0.221	0.026	0.137	0.052	0.008
Average Degree	16.421	1.895	10.105	3.842	0.579

Network 3: Network 3 is a MLPN, including social presence codes of BFV social group. It includes three sub-networks each representing the sub categories of SP. (Information related to network 3 and its sub-networks are presented in Table 15).

Network 3.1: Represents the communication network which includes affective expression sub category of SP in wall platform of BFV social group.

Network 3.2: Represents the communication network which includes open communication sub category of SP in wall platform of BFV social group.

Network 3.3: Represents the communication network which includes group cohesion sub category of SP in wall platform of BFV social group.

Table 15. Information of the Network 3 and Sub-networks

	Network 3	Network 3.1	Network 3.2	Network 3.3
Number of vertices (n)	35	35	35	35
Number of lines with value=1	167	24	120	23
Number of lines with value#1	32	4	24	4
Total number of lines	199	28	144	27
Number of loops	0	0	0	0
Number of multiple lines	73	1	38	0
Density (loops allowed)	0.162	0.023	0.118	0.022
Density2 (no loops allowed)	0.167	0.024	0.121	0.022
Average Degree	11.371	1.600	8.229	1.542

Network 4: Network 4 is a MLPN, including cognitive presence codes of BFV social group. It includes four sub-networks each representing the sub categories of CP. (Information related to network 3 and its sub-networks are presented in Table 16).

Network 4.1: Represents the communication network which includes triggering event sub category of CP in wall platform of BFV social group.

Network 4.2: Represents the communication network which includes exploration sub category of CP in wall platform of BFV social group.

Network 4.3: Represents the communication network which includes integration sub category of CP in wall platform of BFV social group.

Network 4.4: Represents the communication network which includes resolution sub category of CP in wall platform of BFV social group.

Table 16. Information of the Network 4 and Sub-networks

	Network 4	Network 4.1	Network 4.2	Network 4.3	Network 4.4
Number of vertices (n)	35	35	35	35	35
Number of lines with value=1	177	15	90	57	15
Number of lines with value#1	26	5	12	9	0
Total number of lines	203	20	102	66	15
Number of loops	0	0	0	0	0
Number of multiple lines	77	4	18	10	0

Table 16. Information of the Network 4 and Sub-networks (continued)

Density (loops allowed)	0.166	0.016	0.083	0.054	0.012
Density2 (no loops allowed)	0.170	0.017	0.086	0.055	0.012
Average Degree	11.600	1.143	5.829	3.771	0.858

Figure 17, Figure 18, Figure 19 and Figure 20 represent the sociograms of Network 1, Network 2, Network3 and Network 4. In addition, Appendix E includes the sociograms of the Network 1, Network 2, Network 3, Network 4 and their sub-networks.

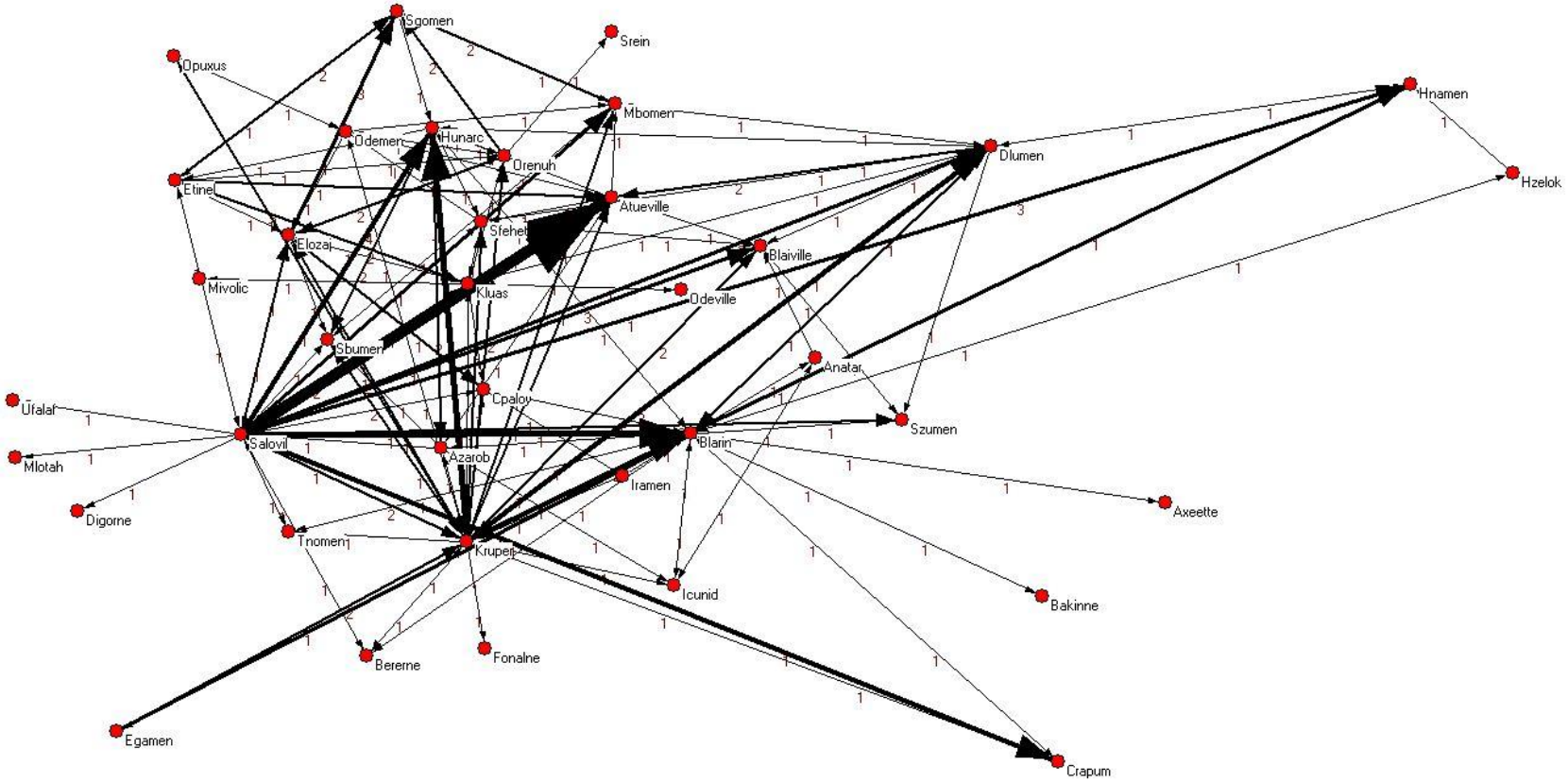


Figure 17 Sociogram of Network 1. One-mode directed multiple relations network of KD social group, representing SP relations. Drawn by using Kamara-Kawai algorithm (separate components) in Pajek ®. Line widths denote line values.

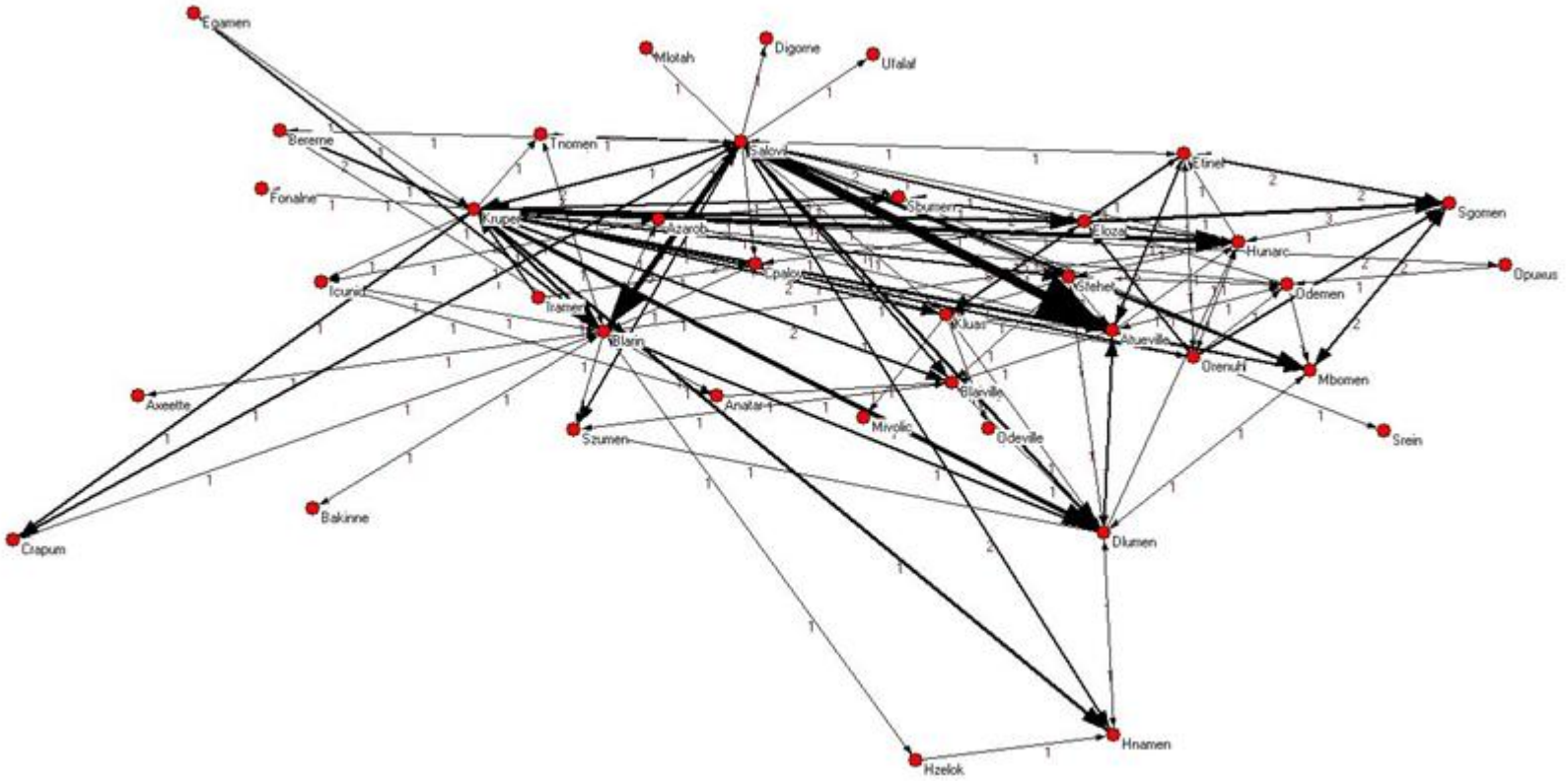


Figure 18 Sociogram of Network 2. One-mode directed Multiple relations network of KD social group, drawn by using Kamada- Kawai algorithm (separate components) in Pajek ®. Line widths denote line values.

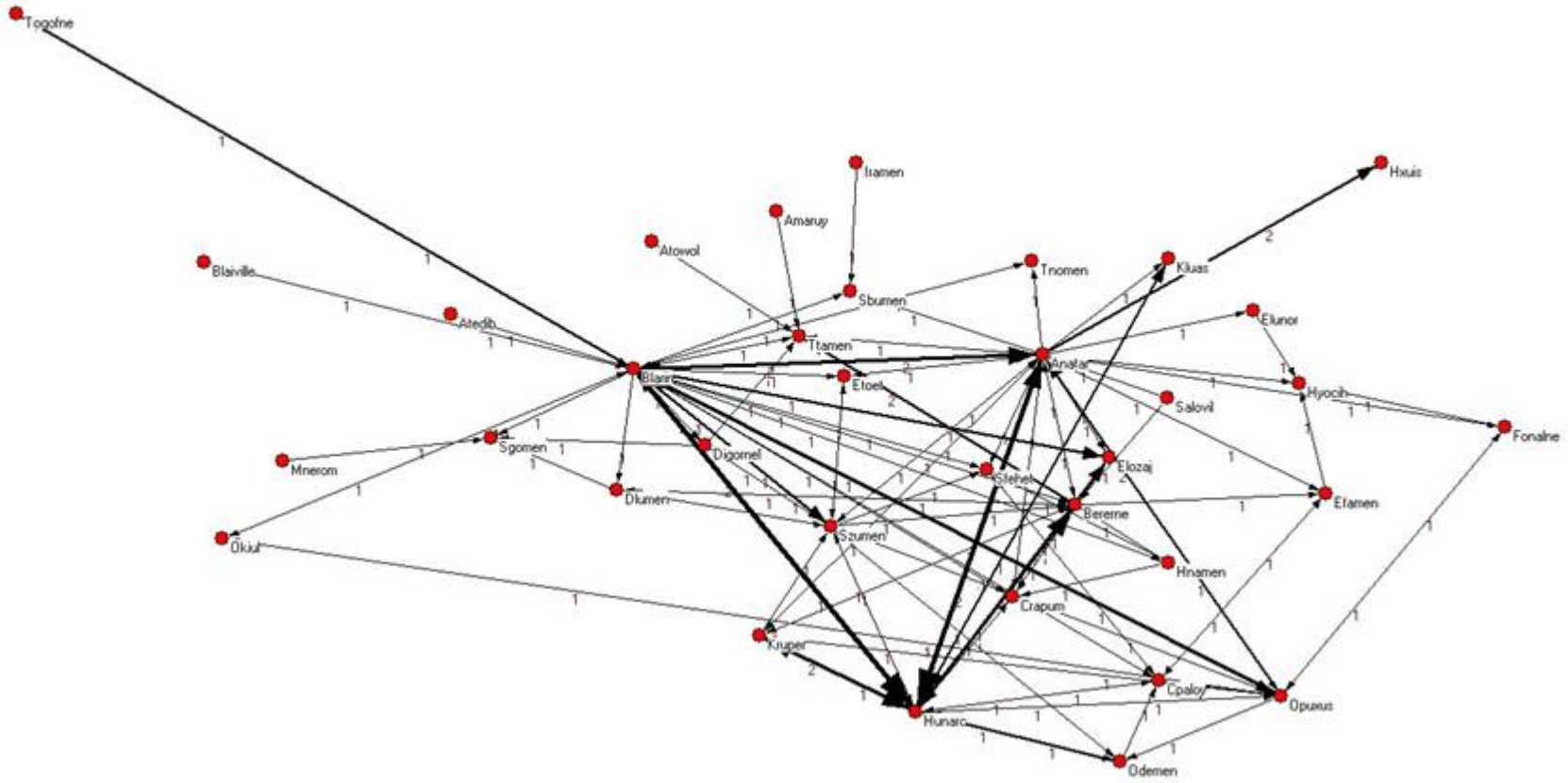


Figure 19 Sociogram of Networks 3. One-mode directed Multiple relations network of BFV social group, drawn by using Kamada- Kawai algorithm (separate components) in Pajek ®. Line widths denote line values

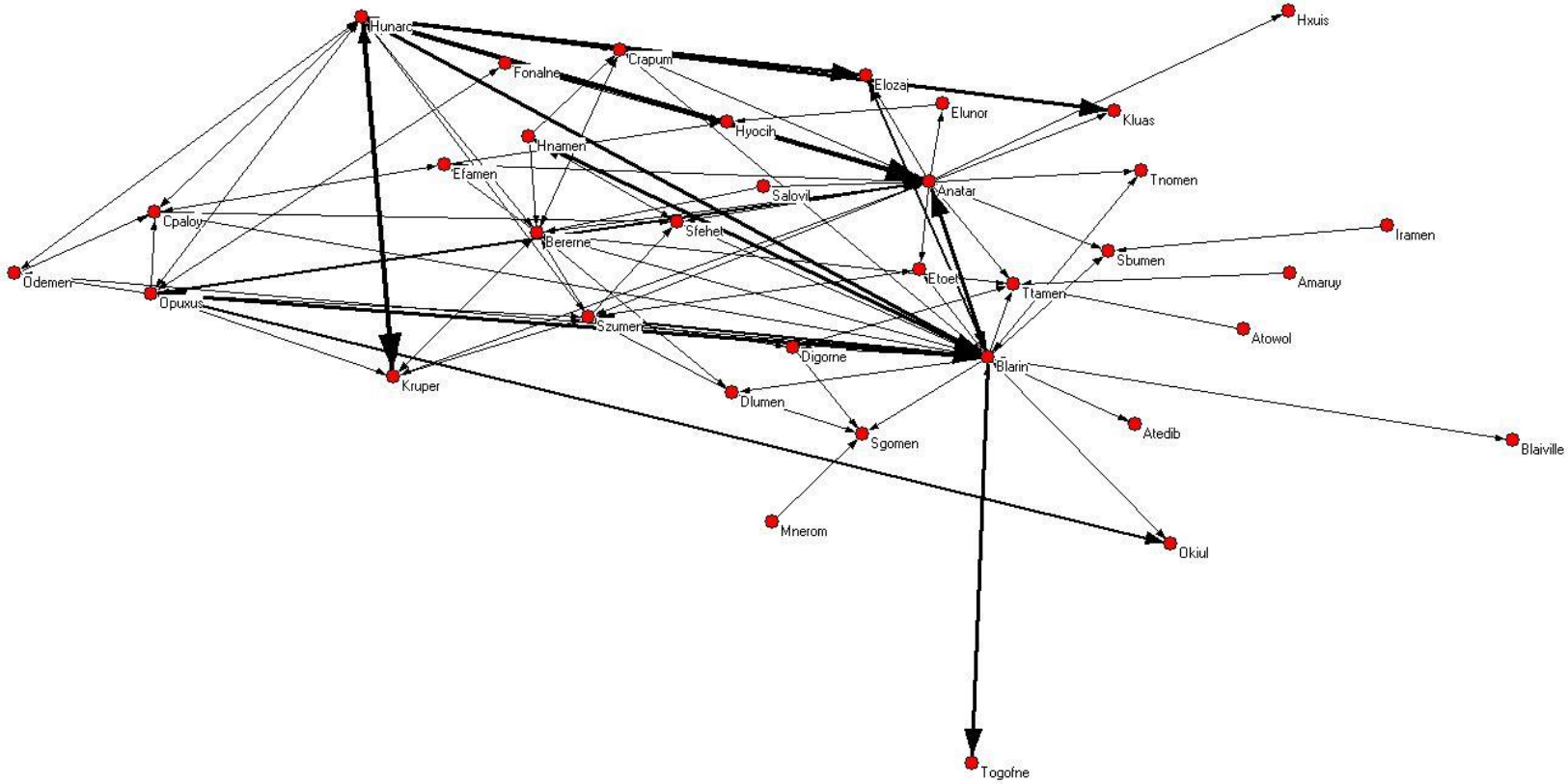


Figure 20 Sociogram of Network 4. One-mode directed multiple relations network of BFV social group, drawn by using Kamada- Kawai algorithm (separate components) in Pajek ®. Line widths denote line values.

4.4.2 Community Detection Analysis Findings

A community detection analysis was conducted to examine community characteristics of the communication networks in Sosyal 2.0. Louvain community detection algorithm (Blondel et al., 2008) is applied for the community detection which is a modularity optimization method in provided in Pajek ®. The details of the analysis are presented in section 3.8.3.4.1.

For the community detection, as the differences resulted from the multiple lines affected the results, MRN network were simplified and layers in the MLPN structure are merged. When the sub relations division was removed, Network 1 and Network 2, which represent KD SG, becomes identical. Similarly, Network 3 and Network 4, representing BFV SG also becomes identical. As a result, one network for each SG is formed. For each social group, the communication network is examined by using these networks, from a broad perspective, without the sub relations preserved in the MLPN structure. Community detection is conducted using these simplified versions of networks. The *Louvain method* modularity results for KD SG are provided in Table 17 and the modularity results for BFV SG is provided in Table 18.

Table 17 Modularity Results for KD SG

Resolution Parameter	Number of Clusters	Modularity
5	18	-0.37
1	4	0.18
0.8	3	0.25
0.7	2	0.33
0.2	1	0.80

Table 18 Modularity Results for BFV SG

Resolution Parameter	Number of Clusters	Modularity
5	21	-0.45
1	4	0.18
0.5	2	0.50
0.2	1	0.80
0.1	1	0.90

Both tables indicated that, both of the social groups provided the higher modularity results for only one cluster. These results showed that, the network structure of both social groups had no sub communities. Both SG's best fitted in only one cluster structure rather than being divided into multiple sub communities.

4.4.3 Triadic Analysis Findings

In order to explore the communication patterns of the social groups in Sosyal 2.0, triadic analysis was conducted using *Triad Census* command of Pajek ®. By the triadic census analysis we aimed at describing the overall structure of a network by inferring it from the types of triads that are found in the network. The details of the analysis are presented in section 3.8.3.4.2.

Triadic analysis is conducted with all MLPN networks constructed for the current study. The *Triad Census* command was used to find out the frequencies of triads and their comparison with the distribution of triad types expected by chance (Nooy et al., 2011, p.210). The results of the analysis provided clues about the model of the networks, whether the networks are balanced, hierarchical, transitive, ranked or clustrable. The details of the triadic analysis and related models are explained under section 3.8.3.4.2.

The models presented in triad census table are organized in a way that, the latter listed model included the triads of the previous models. Therefore, as Nooy et al., (2011) suggests, the latter, therefore the *least restrictive* model is selected for the represeantation of the overall structure of the network (p.209).

The triad census distribution of Network1 and Network 2 revealed that, KD SG (see results in Table 19) showed a tendency towards balanced structure (triad 102 and triad 300 were found more than expected), clustrability (triad 003 were found more than expected) and hierarchical clusters (triad 210 were found more than expected). As the hierarchical clustering is the least restrictive model, it can be inferred from the results that the hierarchical clusters, with chi-square statistics highly significant at .001 level ($p < 0.001$), affected the relations in the KD SG. However, forbidden triads 111U and 201 were also found more frequent than expected. The existence of the forbidden triads, which were found more than expected, implied that we cannot select the least restrictive model to completely represent the overall structure of the network but, decreases the trustworthiness of the hierarchical clusters model for KD SG.

Table 19. Triad census results for KD SG (Network 1 & Network 2)

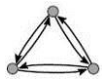
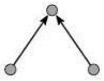
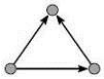
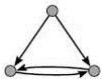
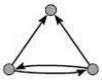
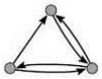
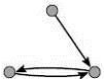
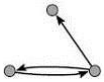
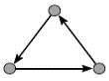
Triad	Type	Model	Number of Triad(ni)	Network 1		Network 2	
				Expected (ei)	(ni-ei)/ ei	Expected (ei)	(ni-ei)/ ei
	3-102	Balance	1094	438.47	1.50	456.80	1.39
	16-300	Balance	34	0.76	43.46	1.01	32.75
	1-003	Clustrability	5369	2020.52	1.66	1872.10	1.87
	4-021D	Ranked Clusters	69	438.47	-0.84	456.80	-0.85

Table 19. Triad census results for KD SG (Network 1 & Network 2) (continued)

	5-021U	Ranked Clusters	17	438.47	-0.96	456.80	-0.96
	9-030T	Ranked Clusters	4	235.85	-0.98	260.55	-0.98
	12-120D	Ranked Clusters	4	31.72	-0.87	37.15	-0.89
	13-120U	Ranked Clusters	19	31.72	-0.40	37.15	-0.49
	2-012	Transitivity	1107	3260.55	-0.66	3203.44	-0.65
	14-120C	Hierarchical Clusters	15	63.43	-0.76	74.31	-0.80
	15-210	Hierarchical Clusters	59	17.06	2.46	21.19	1.78
	6-021C	Forbidden	65	876.94	-0.93	913.60	-0.93
	7-111D	Forbidden	98	235.85	-0.58	260.55	-0.62
	8-111U	Forbidden	254	235.85	0.08	260.55	-0.03
	10-030C	Forbidden	0	78.62	-1.00	86.85	-1.00
	11-201	Forbidden	228	31.72	6.19	37.15	5.14

For network 1, Chi-Square: 12636.86, p < 0.001
For network 2, Chi-Square: 12988.84, p < 0.001

Network 3 and Network 4 were also examined via triad analysis (see results in Table 20). The results revealed that BFV SG showed a tendency towards balanced structure (triad 102 and triad 300 were found more than expected), clustrability (triad 003 were found more than expected), ranked cluster structure (triad 120U were found more than expected) and lastly hierarchical clusters (triad 210 were found more than expected). As the hierarchical clustering was the least restrictive model, it can be inferred from the results that hierarchical cluster guided the relations in BFV SG, with chi-square statistics highly significant at .001 level ($p < 0.001$). However, forbidden triads 111U and 201 were also found more frequently than expected. The existence of the forbidden triads, which are more than expected, decreases the trustworthiness of the hierarchical clusters model.

Table 20. Triad Census Results for BFV SG (Network 3 & Network 4)

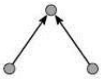
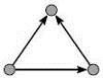
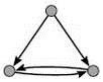
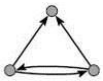
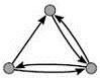
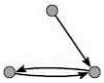
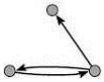
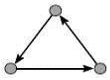
Triad	Type	Model	Number of Triad(ni)	Network 3		Network 4	
				Exp. (ei)	(ni-ei)/ ei	Exp. (ei)	(ni-ei)/ ei
	3-102	Balance	707	268.64	1.63	275.35	1.57
	16-300	Balance	26	0.11	233.63	0.12	207.22
	1-003	Clustrability	4912	2545.47	0.93	2488.43	0.97
	4-021D	Ranked Clusters	75	268.64	-0.72	275.35	-0.73
	5-021U	Ranked Clusters	28	268.64	-0.90	275.35	-0.90
	9-030T	Ranked Clusters	4	100.77	-0.96	105.76	-0.96
	12-120D	Ranked Clusters	2	9.45	-0.79	10.16	-0.80

Table 20. Triad Census Results for BFV SG (Network 3 & Network 4) (continued)

	13-120U	Ranked Clusters	10	9.45	0.06	10.16	-0.02
	2-012	Transitivity	936	2864.55	-0.67	2867.46	-0.67
	14-120C	Hierarchical Clusters	4	18.90	-0.79	20.31	-0.80
	15-210	Hierarchical Clusters	31	3.54	7.74	3.90	6.95
	6-021C	Forbidden	24	537.27	-0.96	550.70	-0.96
	7-111D	Forbidden	33	100.77	-0.67	105.76	-0.69
	8-111U	Forbidden	198	100.77	0.96	105.76	-0.87
	10-030C	Forbidden	0	33.59	-1.00	35.25	-1.00
	11-201	Forbidden	150	9.45	14.87	10.16	13.77

For network 3, Chi-Square: 13694.37, p < 0.001
For network 4, Chi-Square: 2968.75, p < 0.001

The results of triad census analysis of the networks revealed that, both social groups had a tendency towards hierarchical clustering. On the other hand, the existence of the forbidden triads prevented us to conclude certain model structures for both of the social groups.

4.4.4 Symmetric Acyclic Decomposition Analysis Findings

The results of the triadic analysis findings indicated a milder form of ranking, which is hierarchical clusters, for both of the social groups analyzed. Therefore, in order to analyze the ranking structure further, Symmetric Acyclic Decomposition (SAD) analysis is conducted for both of the networks. SAD analysis accepts that, nodes having reciprocal relations are in the same group and only the ties which are not reciprocal result in ranking (Nooy et al., 2011, p.215). Therefore in this way SAD analysis enables us to reveal the clusters and nodes forming ranked structure within the network.

For the current analysis, Create Hierarchy >Symmetric Acyclic command provided by Pajek ® is executed. The results of the SAD analysis revealed that, the two different social groups resulted in different ranking structures when shrinked. But also they had some commonalities.

For instance, KD SG, the results showed that, among the 38 nodes who took place in the communication network, 9 of them did not took place in reciprocal relations. The remaining 29 nodes had reciprocal relationships in the communication network in KD SG forming a strong component. The nodes of the strong component is represented in red and the other 9 nodes are represented by other colors in the sociogram in Figure 21.

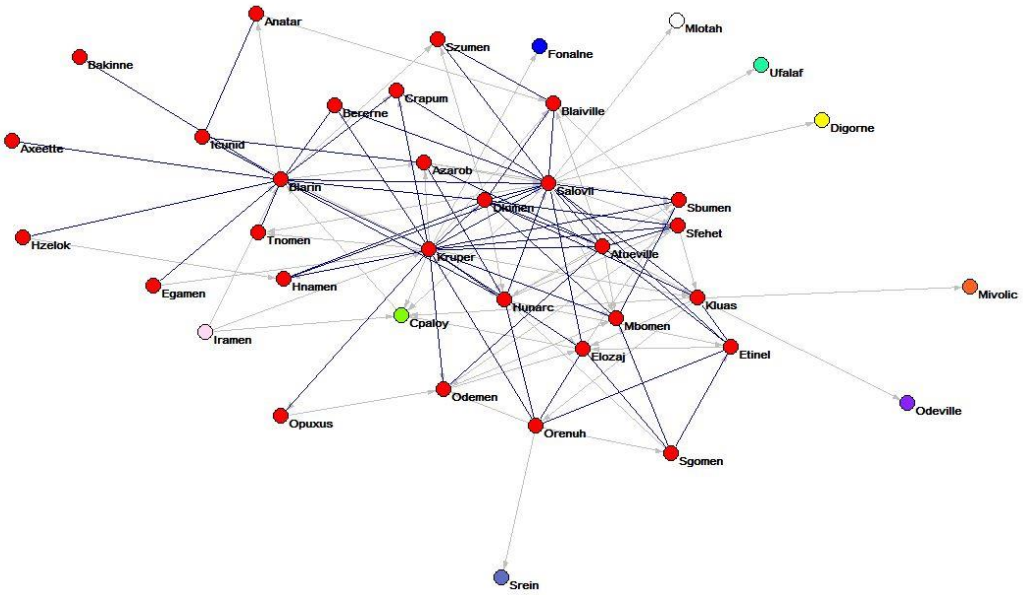


Figure 21 Sociogram of Networks 1&2. One-mode directed MLPN of KD social group. Bi-directed arcs are converted to edges, arcs drawn in grey, edges drawn in dark blue. Node colors represent symmetric acyclic analysis partition. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek ®

Symmetric acyclic decomposition command in Pajek ®, replicates the decomposition procedure until no reciprocal relationship is left in the network, which means that the resultant network is shrunk according to the clusters and it is acyclic. Therefore in the resultant network, Network>Acyclic Network>Create Partition>Depth partition command is executed to determine the rank order in the resultant network. Figure 22 shows Network1& Network2 Shrunk According to The Result of symmetric Acyclic Decomposition and drawn according to the symmetric Acyclic Depth partition according to layers (Layers> In y direction). and drawn according to the symmetric acyclic depth partition.

The results revealed that KD SG had a three layered ranking within the social group. Iramen forms the first rank, with a flow of information towards the strong component in the middle rank, represented by Anatar in red color in Figure 22. The yellow color, represented the third rank in which there are individuals taking information from the strong component in the middle rank. In fact, Iramen stood here as an exception having

one way interaction with the main (strong) component.

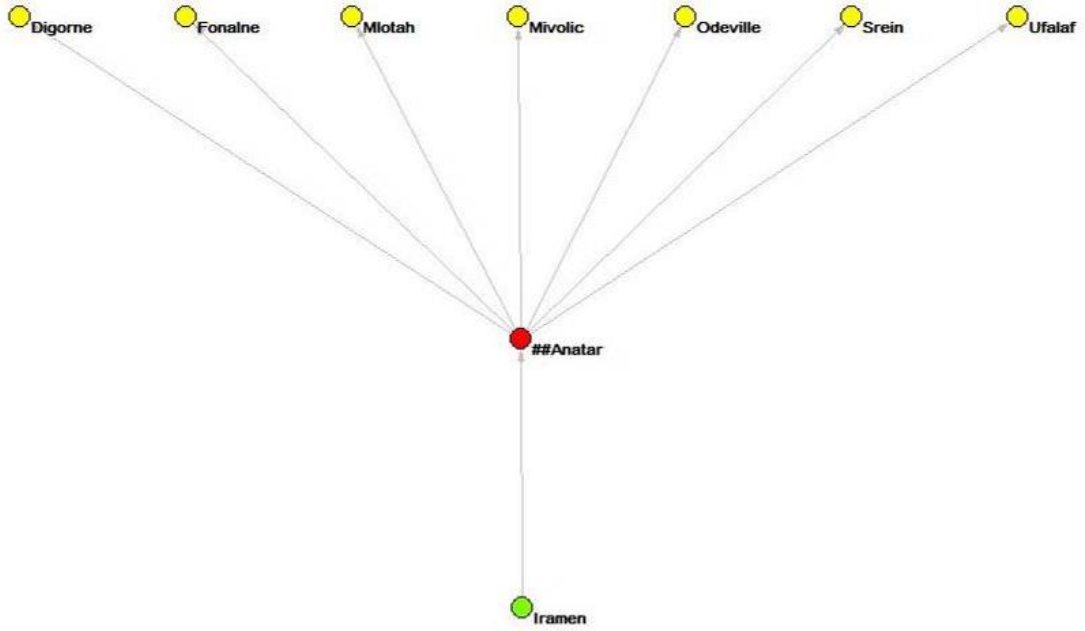


Figure 22 Network1& Network2 shrunk according to the result of symmetric acyclic decomposition and drawn according to the symmetric acyclic depth partition according to layers (Layers> In y direction).

For BFV SG, the results of the symmetric acyclic decomposition analysis revealed that, among the 35 nodes taking place in the communication network, 12 of them did not take place in the reciprocal relations. They are represented with various colors surrounded around the red colored strong component in Figure 23. The remaining 23 participants having reciprocal relationships formed a strong component.

BFV SG was also subjected to the same decomposition procedure until no reciprocal relationship had been left. Depth partition is found for the resultant acyclic network, Figure 24 shows Network 3 & Network 4 shrunk according to the result of symmetric acyclic decomposition and drawn according to the symmetric acyclic depth partition according to layers (Layers>In y direction).

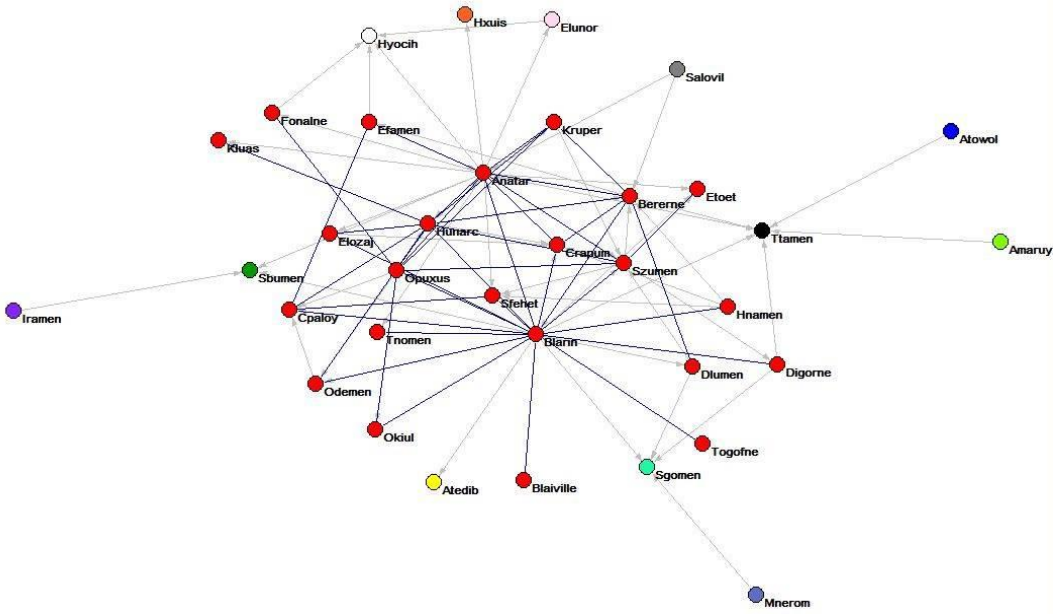


Figure 23 Sociogram of Networks 3&4. One-mode directed MLPN of BFV social group. Bi-directed arcs are converted to edges, arcs drawn in grey, edges drawn in dark blue. Node colors represent symmetric acyclic analysis partition. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek ®.

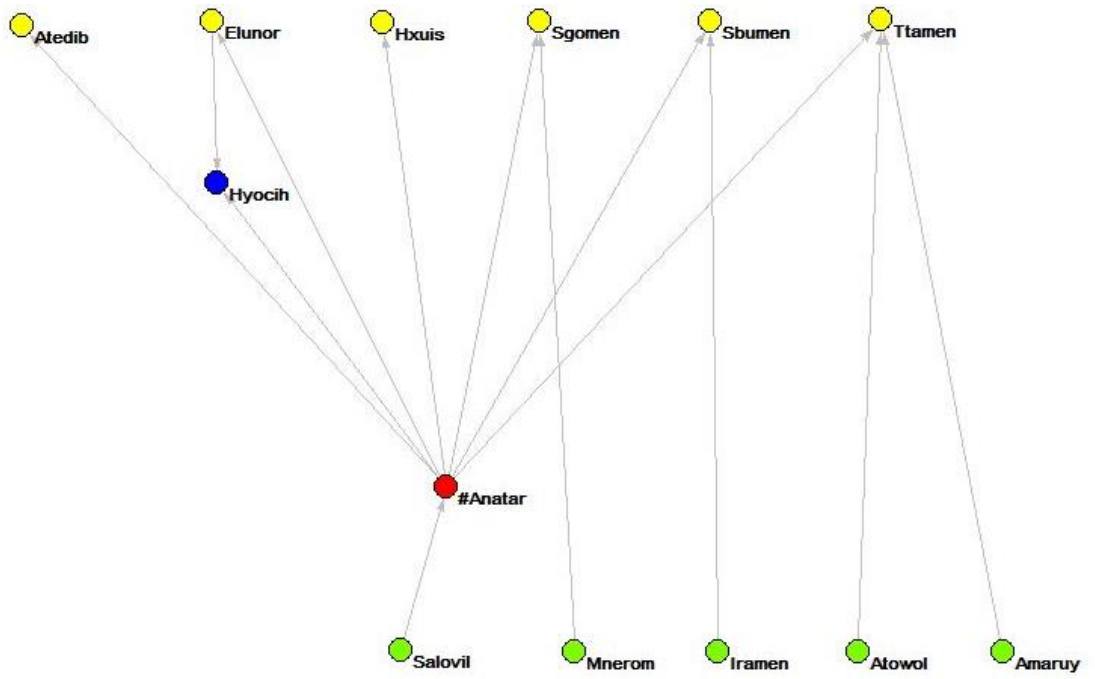


Figure 24 Network 3 & Network 4 shrunk according to the result of symmetric acyclic decomposition and drawn according to the symmetric acyclic depth partition according to layers (Layers>In y direction)

The results revealed that BFV SG had a four layered ranking within the social group. In fact, Hyocih and Salvoil represented an exceptional case. Similar to the KD SG there is a flow of information from the strong component, represented by Anatar in red color in Figure 22 towards the individuals. The yellow color represents the lower rank individuals taking information from the strong component in the middle rank. Also, the green nodes represent a higher rank in which the information from this nodes flow towards the strong component or the lowest rank.

In fact, the results of the triadic analysis does not point to a strict ranking structure, that's why ranking structure found as a result of the symmetric acyclic decomposition should be considered by referring the hierarchical clusters model found in the triadic analysis. This means that the ranks representing individuals in both groups are not in the same level. The current analysis is not capable of detecting the differences between the individuals' rankings in this network structure.

4.4.5 Blockmodelling Analysis Findings

The four MLPN constructed for the current study were examined in an exploratory manner to find out whether the communication network in the wall platform shows a significant distinction in terms of participants' social positions in the network by using blockmodelling analysis. Blockmodelling analysis is put forward as complementary analysis to the SAD analysis in literature. (Doreian et al., 2000). The details of the analysis are presented under section 3.8.3.4.4.

For this analysis, four MLPN's contructed were examined using blockmodelling analysis provided in Pajek ® under "Network>Create Partition >Blockmodeling" menu. The results of blockmodelling revealed that searching for structural equivalence (Nooy et al., 2011, p.266), in which every actor within a block in the network is assumed to be identically connected to every other actor and each other within the group, resulted in high error results. Therefore, networks were examined via searching for regular equivalence in Pajek ® (Nooy et al., 2011, p.281). Regular equivalence is a less strict form of equivalence. Nooy et al. (2011) are explaining regular equivalence by stating "Vertices that are regular equivalent do not have to be connected to the same vertices, but they have to be connected to vertices in the same classes" (p.280).

Therefore, for all of the networks, the following blockmodelling analysis procedure is followed. Firstly, Network>Create Partition >Blockmodeling>Random Start choice of blockmodelling is executed to test structural equivalence for 2 clusters. The following image matrix (see Table 21) is tested for each network.

Table 21. Structural Equivalence Image Matrix for 2 Clusters

	Cluster 1	Cluster 2
Cluster 1	Null /complete	Null /complete
Cluster 2	Null /complete	Null /complete

The error results for the structural equivalence were high; therefore, random start choice of blockmodelling command is executed to check regular equivalence for 2 clusters. The following image matrix (see Table 22), searching for a milder form of equivalence is applied for each network.

Table 22. Regular Equivalence Image Matrix for 2 Clusters

	Cluster 1	Cluster 2
Cluster 1	Null/complete/regular	Null/complete/regular
Cluster 2	Null/complete/regular	Null/complete/regular

Afterwards, in order to see whether a lower error score is possible with more clusters, random start choice of blockmodelling command is executed for regular equivalence for 3 clusters (See Table 23). The results of blockmodelling analysis revealed supportive results with the SAD Analysis.

Table 23. Regular Equivalence Image Matrix for 3 Clusters

	Cluster 1	Cluster 2	Cluster 3
Cluster 1	Null/complete/regular	Null/complete/regular	Null/complete/regular
Cluster 2	Null/complete/regular	Null/complete/regular	Null/complete/regular
Cluster 3	Null/complete/regular	Null/complete/regular	Null/complete/regular

In the following two sub-sections the result of the explained procedure are presented for each social group.

4.4.5.1 Blockmodelling Analysis KD Social Group.

In order to examine KD SG with blockmodelling analysis, the explained sequence of analysis were conducted for both Network 1 and Network 2. The examination of Network 1 and Network 2 revealed the same error results for the same analysis procedures. As both Network 1 and Network 2 were reflecting the same interaction data from the KD social group, this was an expected result. Therefore, the results were reflected in the same table (see Table 24).

The error results showed that, the structural equivalence model was too strict for KD SG, it resulted in a high error result (Error=147 with 4 possible solutions). Therefore, blockmodelling analysis was conducted with a less strict model, regular equivalence, with two clusters. The error result was 10 and only one solution was possible.

Further analysis is done with regular equivalence model with 3 clusters and ranked regular equivalence model with 3 clusters. These analysis also revealed the same error result (error=10) however with more than one solution.

Table 24. Error Results for Blockmodelling for Network 1 & Network 2

Type	No of clusters	Error
Structural Equivalence	2	147 (4 solutions)
Regular Equivalence	2	10
Regular Equivalence	3	10 (10 solutions)

In addition to the results presented in Table 24 the sociograms for these results are also examined. Figure 25 represents Sociogram of Network 1 & Network 2. One-mode directed multiple relations network of KD SG, drawn by using Kamada- Kawai algorithm (separate components) in Pajek®. Vertice colors represent regular equivalence clusters. These two clusters are shown with red and green colors in the sociogram. The results show that KD SG is composed of two clusters in terms of

participants' social position in the network. The first cluster, represented in red dots, had regular equivalent relationship with each other. However, among those 38 participants 8 of them were in the second cluster, represented in green dots, and had only negligible relationship with the first cluster and no relationship with each other. The error results are detailed in Table 25 and the network sociogram is presented in Figure 25.

Table 25. Regular Equivalence Error Results for KD SG

	Cluster 1	Cluster 2
Cluster 1	Regular (Error=0)	Null (Error=7)
Cluster 2	Null (Error=3)	Null (Error=0)

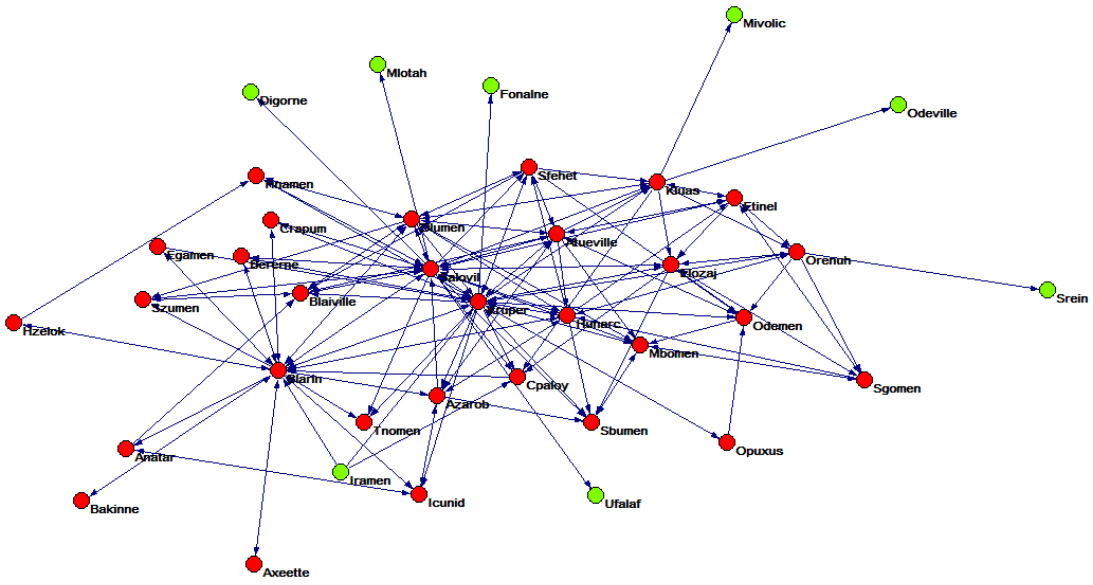


Figure 25 Sociogram of Network 1 & Network 2. One-mode directed multiple relations network of KD SG, drawn by using Kamada- Kawai algorithm (separate components) in Pajek®. Vertice colors represent regular equivalence clusters.

4.4.5.2 Blockmodelling Analysis for BFV Social Group

In order to analyze BFV SG with blockmodelling analysis, the explained sequence of analysis were conducted for both Network 3 and Network 4. The examination of Network 3 and Network 4 revealed the same error results for the same analysis procedures. As both networks were reflecting the same interaction data from the BFV SG, this was an expected situation. Therefore the results were reflected in the same table (See Table 26).

The error results show that, the structural equivalence model was too strict for BFV SG, it resulted in a high error result (Error=96 with 2 possible solutions). Therefore, blockmodelling analysis was conducted with a less strict model, regular equivalence, with two clusters. The error result was 22 and only one solution was possible.

Further analysis was done with regular equivalence model with 3 clusters. The results revealed the same error result (error=10) however with more than one solution (See Table 26)

Table 26. Error Results for Blockmodelling for Network 3 & Network 4

Type	No of clusters	Error
Structural Equivalence	2	96 (2 solutions)
Regular Equivalence	2	22
Regular Equivalence	3	22 (10 solutions)

In addition to the results presented in Table 26, the sociograms for these results were also examined. Figure 26 presents Sociogram of Network 3 & Network 4. One-mode directed multiple relations network of BFV SG, drawn by using Kamada- Kawai algorithm (separate components) in Pajek ®. Vertice colors represent regular equivalence clusters. The results showed that BFV SG was composed of two clusters in terms of participants' social position in the network. The first cluster, represented in red dots, had regular equivalent relationship with each other. However, among those 35 participants, 12 of them were in the second cluster, represented in green dots in Figure 26, had only negligible relationship with the first cluster and with each other. The error results are detailed in Table 27 and the sociogram is presented in Figure 26.

Table 27. Regular Equivalence Error Results for BFV SG

	Cluster 1	Cluster 2
Cluster 1	Regular (Error=0)	Null (Error=15)
Cluster 2	Null (Error=2)	Null (Error=5)

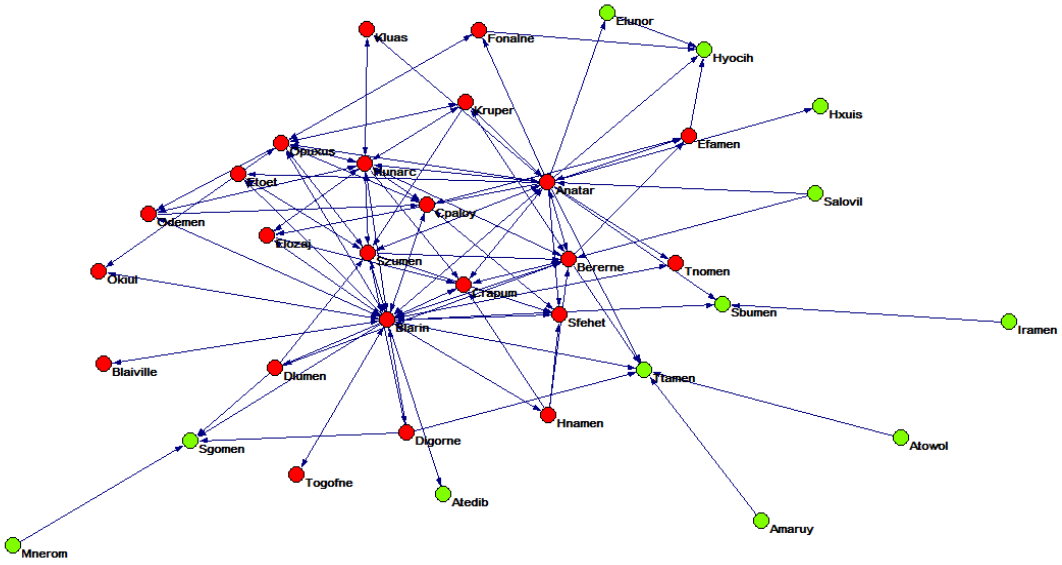


Figure 26 Sociogram of Network 3 & Network 4. One-mode directed multiple relations network of BFV SG, drawn by using Kamada- Kawai algorithm (separate components) in Pajek ®. Vertice colors represent regular equivalence clusters.

4.5 Statistical Analysis Results

4.5.1 Analysis of Cognitive Presence and Social Presence Depending on the Interaction Similarity of Participants

For the current study, the strength of association between the CP and SP depending on the interaction similarity of the participants is calculated by using the four MLPN's. To be able to conduct this analysis the following steps were accomplished in sequence:

- MLPN's were created for each SG, carrying information regarding the sub-categories of CP and SP in the sub-relations in MRN structure.

- The sub networks, representing each sub category for each presence were extracted from each MLPN using Pajek ®.

- Hierarchical clustering is implemented with all extracted sub-networks to determine the positions of the actors in these networks. (See Appendix C to examine the dendrograms created as a result of hierarchical clustering)

- The results of the hierarchical clustering, which are dendrograms grouping similar actors according to their structurally equivalent positions, were used to define categories for chi-square analysis. Dendrograms were cut into three groups to reflect, maximum, minimum and medium interaction levels in each sub-network.

- Chi-square and Cramer's V values are calculated by using the categories obtained as a result of hierarchical clustering for the dimensions of CP and SP in order to analyze the strength of association between the CP and SP

4.5.1.1 Analysis of Cognitive Presence and Social Presence Depending on the Interaction Similarity of Participants in BFV Social Group

For the current study hierarchical clustering is implemented for all four MLPN's representing the two SG's. Nooy et al. (2011) explains hierarchical clustering as a statistical technique to group vertices according to their structural equivalent positions with the data of dissimilarity of node pairs. As a result of hierarchical clustering Pajek ® produces dendrograms. The dendrograms reflect the people who are similar to each other in terms of their role/position in the network. See Appendix C to examine the dendrograms.

The dissimilarity results can be stored as partitions in Pajek ®. For each group of dimension of CP and SP, the position of individuals is stored as partitions in Pajek ®. In other words, each individual is categorized according to interaction similarity in each of the sub-network of CP and SP. For this study this interaction similarity categories were divided into three levels representing, high-level, medium-level and low-level interacting participants. Then, depending on these grouping, a chi-square

test of independence was performed to examine the relation between each dimension of CP and SP in terms of the interaction similarity of the participants.

Table 28 presents the pairwise analysis of chi-square and Cramer's V values for the dimensions of CP and SP for the KD SG. Cramer's V was calculated to analyze the strength of association between the CP and SP depending on the interaction similarity of the participants in the social group. The effect size for reporting the strength of association between the variables were reported according to Kotrlik, Williams, and Jabor (2011).

Table 28. Chi-square and Cramer's V Results for BFV SG

CP dimension	SP dimension	df	N	X^2	p	Cramer's V
Triggering Event	Affective Exp.	4	35	9.63	0.05	0.37
	Open Com.	4	35	26.00**	0.00	0.61
	Group Cohesion	4	35	24.93**	0.00	0.60
Exploration	Affective Exp.	4	35	17.07**	0.00	0.49
	Open Com.	4	35	37.82**	0.00	0.74
	Group Cohesion	4	35	31.82**	0.00	0.67
Integration	Affective Exp.	4	35	20.76**	0.00	0.55
	Open Com.	4	35	31.80**	0.00	0.67
	Group Cohesion	4	35	40.79**	0.00	0.76
Resolution	Affective Exp.	4	35	6.17	0.19	0.30
	Open Com.	4	35	8.95	0.06	0.36
	Group Cohesion	4	35	6.87	0.14	0.31

*p < 0.05, **p < 0.01

The chi-square results of the analysis of triggering event dimension of CP with affective expression dimension of SP revealed that these two dimensions were not related to each other at the .05 significance level, $X^2(4, N = 35) = 9.63, p = 0.05$. However, the analysis of Triggering Event dimension of CP revealed a strong association between the open communication dimension, $X2(4, N = 35) = 26.00, p < 0.01, V = 0.61$, and group cohesion dimension of SP, $X^2 (4, N = 35) = 24.93, p < 0.01, V = 0.60$.

Furthermore, the chi-square results revealed that the exploration dimension of CP had a relatively strong association with the affective expression dimension of SP, $X^2 (4, N = 35) =17.07, p < 0.01, V= 0.49$. Also, exploration dimension of CP, was found to be strongly associated with open communication, $X^2 (4, N = 35) =37.82, p < 0.01, V = 0.74$ and group cohesion dimension of SP $X^2 (4, N = 35) =31.82, p < 0.01, V = 0.67$, all at the .01 significance level.

Similarly, integration dimension of CP was found to have a relatively strong association with the affective expression dimension of SP, $X^2 (4, N = 35) =20.76, p < 0.01, V =0.55$. Also for the integration dimension of CP was found to be strongly associated with open communication $X^2 (4, N = 35) = 31.80, p < 0.01, V = 0.67$, and group cohesion dimension of $X^2 (4, N = 35) = 40.79, p < 0.01, V = 0.76$.

Lastly, the chi-square results showed no statistically significant relation in the resolution dimension of CP and the three sub categories of SP: affective expression, group cohesion and open communication. For the affective expression dimension of SP, the chi-square test found to be not significant, $X^2 (4, N = 35) = 6.17, p = 0.19$, for the open communication dimension of SP chi-square test found to be not significant, $X^2 (4, N = 35) =8.95, p = 0.06$, and also for the group cohesion dimension of SP was not significant $X^2 (4, N = 35) = 6.87, p = 0.14$.

4.5.1.2 Analysis of Cognitive Presence and Social Presence Depending on the Interaction Similarity of Participants in KD Social Group

Table 29 presents the chi-square and Cramer's V values for the dimensions of CP and SP for the KD SG. Cramer's V was calculated to analyze the strength of association between the CP and SP depending on the interaction similarity of the participants in the social group.

Table 29. Chi-square and Cramer's V Results KD SG

CP dimension	SP dimension	df	N	X^2	p	Cramer's V
Triggering Event	Affective Exp.	4	38	15.00	0.05	0.44
	Open Com.	4	38	56.51**	0.00	0.86
	Group Cohesion	4	38	31.75**	0.00	0.64
Exploration	Affective Exp.	4	38	29.56**	0.00	0.62
	Open Com.	4	38	41.78**	0.00	0.74
	Group Cohesion	4	38	41.99**	0.00	0.74
Integration	Affective Exp.	4	38	15.92*	0.03	0.46
	Open Com.	4	38	46.67**	0.00	0.78
	Group Cohesion	4	38	28.26**	0.00	0.61
Resolution	Affective Exp.	4	38	1.67	0.80	0.15
	Open Com.	4	38	6.39	0.17	0.29
	Group Cohesion	4	38	10.43	0.34	0.37

*p < 0.05, **p < 0.01

The chi-square results of the analysis of triggering event dimension of CP with affective expression dimension of SP revealed that these two dimensions were not found to be related to each other at the .05 significance level $X^2(4, N = 38) = 15.00$, p = 0.05. On the other hand, the analysis of triggering event dimension of CP revealed a very strong association between the open communication dimension, X2(4, N = 38)

= 26.00, $p < 0.01$, V = 0.86, and group cohesion dimension of SP, X^2 (4, N = 38) = 31.75, $p < 0.01$, V = 0.64.

Furthermore, the chi-square results showed that the exploration dimension of CP had a strong association with the affective expression dimension of SP, X^2 (4, N = 38) =29.56, $p < 0.01$, V= 0.62. Also, exploration responses dimension of CP, was found to be strongly associated with open communication, X^2 (4, N = 38) =41.78, $p < 0.01$, V = 0.74. Exploration dimension of CP, strongly associated with group cohesion dimension of SP X^2 (4, N = 38) =41.99, $p < 0.01$, V = 0.74.

Similarly, integration dimension of CP was found to have a relatively strong association with the affective expression dimension of SP, X^2 (4, N = 38) =15.92, $p < 0.05$, V =0.46. Also for the integration dimension of CP was found to be strongly associated with open communication X^2 (4, N = 38) =46.67, $p < 0.01$, V = 0.78, and group cohesion dimension of SP X^2 (4, N = 38) =28.26, $p < 0.01$, V = 0.61.

Lastly, the chi-square results showed no statistically significant relation in the resolution dimension and the three sub categories of social presence: affective expression, group cohesion and open communication. For the affective expression dimension of SP the chi-square test was found to be not significant, X^2 (4, N = 38) =1.67, p = 0.80, for the open communication dimension of SP chi-square test was found to be not significant, X^2 (4, N = 38) =3.39, p = 0.17, and also for the group cohesion dimension of SP was not significant X^2 (4, N = 38) =10.43, p = 0.34.

The results indicated that, CP was statistically associated with SP in exploration and integration sub-dimensions, when examined in terms of interaction similarity of participants in a networked learning environment. Also the first dimension of CP, which is triggering event was found to be associated with open communication and group cohesion dimensions. On the other hand, the highest level of CP, which is resolution, was found to have no association with the SP in both social groups. Table 30 summarizes the chi-square and Cramer's V results for both social groups.

Table 30. Chi-square and Cramer's V Results for BFV SG & KD SG

		BFV SG			KD SG		
CP dimension	SP dimension	X^2	p	Cramer 's V	X^2	p	Cramer 's V
Triggering Event	AF	9.63	0.05	0.37	15.00	0.05	0.44
	OC	26.00**	0.00	0.61	56.51**	0.00	0.86
	GC	24.93**	0.00	0.60	31.75**	0.00	0.64
Exploration	AF	17.07**	0.00	0.49	29.56**	0.00	0.62
	OC	37.82**	0.00	0.74	41.78**	0.00	0.74
	GC	31.82**	0.00	0.67	41.99**	0.00	0.74
Integration	AF	20.76**	0.00	0.55	15.92*	0.03	0.46
	OC	31.80**	0.00	0.67	46.67**	0.00	0.78
	GC	40.79**	0.00	0.76	28.26**	0.00	0.61
Resolution	AF	6.17	0,19	0.30	1.67	0.80	0.15
	OC	8.95	0.06	0.36	6.39	0.17	0.29
	GC	6.87	0.14	0.31	10.43	0.34	0.37

*$p < 0.05$, **$p < 0.01$

4.6 Summary

For the current study, an embedded mixed method design incorporating SNA was utilized and the results are presented. The findings were presented under four main sections. In the first part, demographics of the participants were explained. In the second part, content analysis results were presented. In the third part, under SNA results, the networks constructed for the study were explained and social network analysis results employed for the current study were discussed in detail. Finally, in the last part, the statistical analysis results were explicated.

The content analysis results revealed that the exploration sub dimension of CP was dominant in both social groups. Also the two groups were differentiated especially in

the CP-TE2, CP-IN4 and CP-EX01 dimensions of the CP, which stands for sense of puzzlement, creating solutions and messages not directly representing a standpoint, respectively. Also both groups were less engaged in resolution level CP activities. Two groups were also differentiated in terms of SP coding results. One of the most important findings was non-existence of the some of the categories in different sub dimensions of social presence: SP-AF1, SP-OC2 and SP-GC5, which stands for expressing emotions, quoting from others' messages and course reflection, respectively. Another important finding was reflection of the role and usage differences of the social groups in SP distributions of social groups.

The SNA results included the characteristics and the properties of the communication networks. As a novel approach to construct networks in networked learning environment, the SP and CP content analysis results were integrated into the network structure in multiple relations network form. This new structure is named as *Multiple Layered Presences Network*. As a result four MLPN were constructed, for both SP and CP and for both social groups. SNA was conducted using four MLPN's constructed for the study. For current research, community detection, triadic analysis, symmetric acyclic decomposition and blockmodelling were utilized to further explore the community characteristics of the network respectively.

SNA results revealed were congruent with each other. The results showed that, the communication network constructed in both networks had only one component which means that there were no sub-networks within the SG communications. Also the triadic analysis results revealed no strict form of ranking, rather a hierarchical clusters model was found in both networks indicating a milder form of ranking.

Supporting the community detection findings clustrability was low in both SG's. Further analysis conducted with symmetric acyclic decomposition and blockmodelling also supported previous results. Both analyses revealed a big cohesive cluster in the center of the networks with regular equivalence within the cluster in the center. The cluster in the center was found to be surrounded by individuals who were

in one way interaction with this cohesive group. All these results show that the wall discussions in social groups were unified around one big group.

And lastly, under the statistical results, the strength of association between the CP and SP were presented depending on the interaction similarity of the participants in the MLPN's. The chi-square analysis revealed strong association between exploration dimension of CP with open communication and group cohesion dimensions of SP. Also the integration dimension of CP was found to be strongly associated with open communication and group cohesion dimensions SP. However, no statistically significant relation was found between the resolution dimension of CP and the sub categories of SP which are affective expression, open communication and group cohesion.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

The main aim of this study was to analyze and describe how employees participated and communicated in a networked learning environment within a corporate context by exploring the asynchronous online discussions between the workers on the wall platform of a corporate LMS. Therefore, the current chapter highlighted the findings collected through content analysis of wall discussions, the SNA results examining the characteristics of the communication network and the statistical analysis examining the strength of association between CP and SP depending on the interaction similarity of the participants in the MLPN's. This chapter discussed the results in relation to the previous research from the literature. Methodological concerns, practical implications and suggestions for future research are also presented in this chapter.

5.2 Content Analysis Results

The results of the content analysis portrayed that, the discussions in the wall were highly interactive. Only one orphan post, a post that was remained uncommented, was found among the initiated 293 wall posts in both of the social groups (0.34% of the total posts). On the other hand, the orphan post rate reposted in the literature is comparatively higher. For instance, in their study investigating the networked learning environment constructed in the bulletin boards of distance learning class, Haythornthwaite and Gruzd (2012) reported 50% rate of orphan posts. Similarly,

Akıllı (2010) reported 3.71% of the total messages as orphan in an online fan community. The low orphan message rate illustrates the quality and seriousness of the communication in the analyzed context.

Furthermore, the initiated wall posts usually, took one-three comments in both social groups; however, longer wall discussions were less common. Although, the discussions were not long, the content analysis proved that, the messages were meaningful and related to the context.

The exploration level was the most coded phase of CP in the current study and the resolution phase, which is the highest level of CP was the least coded category. This result was supported by the findings of the previous studies from the literature (Gunawardena et al., 1997; Garrison et al., 2001; Pawan, Paulus, Yalcin & Chang, 2003; Kanuka, Rourke, & Laflamme, 2007; Rourke & Kanuka, 2009). These researcher were reporting higher code percentages in the exploration level and lower percentages in integration and resolution levels. This meant that employees in both social groups were mostly showed exploration level of cognitive activity, searching for solutions to the problem, but they were less able to integrate information and come up with solutions to the problems in the networked environment.

The content analysis of CP resulted in some differences in terms of the distribution of CP sub-levels for the two social groups analyzed. These results stood as a reflection of the different purposes of using those specific social groups. For instance, in KD SG, the integration level CP indicator, CP-IN4, which was implying explicit solutions put forward by the participants were found higher, where issues related to system are discussed; in comparison to BFV SG where new ideas were discussed. Similarly, in KD social group, triggering event category of CP was found more frequently than BFV social group. This is an expected result, as the KD SG was engaged in a collaborative activity that mainly depend on the reflections about the company's own professional work and responses to problems faced in the networked learning environment. For instance, codes representing explicit solutions by participants were more common in KD SG in comparison to BFV SG. These results revealed that KD

SG members were more engaged in solutions in comparison to members in BFV SG in which new ideas are discussed. These results clearly portrayed the use of two social groups with different functions.

When we examined the results of SP, it was seen that in both groups open communication was the most coded category of SP. This revealed that people in the network learning environment can interact openly without using unconventional messages in this networked learning environment context.

Another finding regarding the content analysis was about the coding indicators and the categories of the SP and CP. Although both presences are used by many studies in the literature (Akyol, 2009; Akyol, Vaughan, & Garrison, 2011; Garrison & Arbaugh, 2007; Shea et al., 2010) it is found out that, the categories of the presences didn't meet the needs for content analysis for the current research. Therefore, some supplementary codes had to be added such as CP-EX01 for messages not directly representing a standpoint, SP-OC45 for messages reporting problems and SP-OC46 for messages which respond to problems. Furthermore, some of the categories of SP were not coded at all for both of the social groups: expressing emotions (SP-AF1), quoting from others' messages (SP-OC2) and course reflection (SP-GC5).

This situation might be originated from two reasons: the first is related to the context of the study. The literature about COI is mostly conducted in formal education settings such as online and blended learning environments in higher education, graduate courses and etc. The context of the current study, which is an informal learning environment within a corporate training LMS, clearly differs from those contexts. This alteration of context might result in requirements for modifications in the SP and CP categories. Therefore, further research in similar contexts is required to validate SP and CP constructs.

The second reason for the need of modifications in SP and CP predictors for the current study might be the lack of teaching presence in the current study. The analyzed networked learning environment did not include any explicit teaching effort. On the

other hand, COI was formed of three constructs one of which is teaching presence. Although teaching presence was not used for analysis in this research, the assumptions related to teaching were found to be evident in other constructs. For instance, SP-GC5, code representing course reflection, was not coded at all in the current study. This code and the indicator clearly carried an assumption of a *course* context. Therefore, this study in which no course structure was present revealed that, SP and its codes and constructs are needed to be revised to be used in the corporate training settings. Otherwise, further content analysis frameworks are required to assess online learning in corporate online learning contexts.

5.3 Social Network Analysis

5.3.1 Characteristics and Properties of the Communication Networks

Networks are made up of two basic components which are ties and nodes (Wasserman & Faust, 1994). Therefore, the first step in conducting network analysis is to have data in the form of network nodes and ties. The definition of ties and nodes can vary significantly depending on the network coding procedures and the related assumptions. For the current study, the coding framework by Manca et al. (2009), which included semantic procedures enriching the communication flows, was employed to form the networks from the wall discussion data. In addition, each relation between the actors was designed to have a value in terms of both SP and CP. In order to define these relations into network structure, the current study used MLPN structure (the related networks are detailed under section 4.4.1). Robins and Pattison (2006) underlines, multiple relations network, implies that there may be multiple types of interactions and exchange present between people forming a network. In the current study, by using MLPN structure, the value of multiple relations arousing from sub levels of SP and CP were preserved under different relations within one network. This situation also enabled us to illustrate the network structures in sub dimensions preserving the value of content analysis in the relations not only the individuals.

Cela et al. (2014) conducted a systematic review and examined the networks used in learning sciences related studies. The writers reported that, among 37 studies reviewed 36 of them to one mode, explaining either student-student relationship or the student-teacher relationship. The writers also mention about only one two mode- network. However they did not provide any information about multiple relations networks (MRN). The review of the literature did not reveal any learning sciences related studies using MRN as network structure in networked learning environments. The current study used MRN, a different form of one-mode network, in order to integrate CP and SP content analysis results into network structure. That special form of structure is named as multiple layered presences network (MLPN).

The SNA processes has portrayed that, examining networks with MLPN structure had effects on SNA calculations. Therefore, the current study provided a rationale for further studies to implement MLPN in formation of networks in networked learning environments.

We examined the characteristics, the density and average degree results, for the constructed four MLPN's. The findings supported the findings from the content analysis. For instance, resolution sub-dimension network for CP, in both social groups (Network 2.4 and Network 4.4), had the lowest average degree and density values, presenting the weak resolution level communication network constructed in the networked learning environment. Correspondingly, open-communication sub-dimension network for CP, in both social groups (Network 1.2. and Network 3.2) had the highest average degree and density values, representing open-communication communication network constructed in the networked learning environment.

5.3.2 Community Detection Analysis Findings

For the current study, we examined community structures by employing modularity optimization on Pajek ®. Modularity optimization method, proposed by Blondel et al., (2008), was conducted to identify communities. As Blondel et al. (2008) noted,

searching for previously unknown community structures may reveal practical modules, such as digital groups in informal communities.

In the current study, however, the examined social groups resulted in high modularity results for one cluster only. In fact, this analysis was related to the homophily principle in SNA (McPherson, Smith-Lovin & Cook, 2001). As Borgatti and Foster (2003) underlines, homophily principle assumes that, individuals who have similar traits are more eager to interact with each other (p.999). The results of the study revealed that each social group formed a whole within the group, rather than being divided into small units of communities as anticipated with homophily principle. In fact, this result was a remarkable result as Sosyal 2.0 was an informal knowledge sharing environment aimed at arranging social groups among same interests. As the enrolment of a social group was voluntary, the social groups were self-organizing, that proved that, the wall platform, guided by informal learning within a corporate LMS was able to form rigid communities within the corporate learning context.

5.3.3 Discussion of Triadic Analysis Findings

The triadic analysis was conducted for both social groups including all the four MLPN's used in the study. The properties and the details of the analysis are detailed under section 3.8.3.4.2. Triadic analysis assesses whether a network shows dominance of any triadic relations, when it is examined in terms of micro-level patterns of triads and the related models.

The findings revealed that the 300 type of triads were found more than expected for in all MLPN's (For KD, 3.46 and 32.75; For BFV, 233.63 and 204.22). Especially the ratio is very high for BFV SG. This situation indicated a balanced relationship in between the members of the BFV SG in the communication network. BFV SG aimed at exchanging ideas between the group members in order to find new ideas. Therefore, we can assert that, the participants of the BFV SG exchanged ideas mutually in a balanced arrangement as presented in Figure 27. However, the balanced model did not

account for the whole network as triadic analysis findings indicated other less restrictive models.

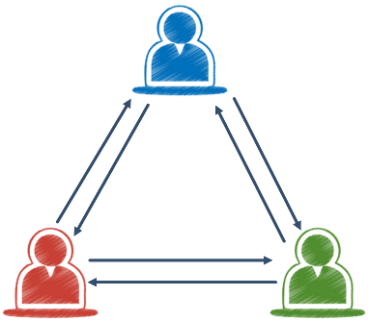


Figure 27 Type 300 triad (Balanced Model)

The triadic analysis results revealed that, both KD SG and BFV HG was conformed to the hierarchical clusters model, with chi-square statistics highly significant at .001 level ($p < 0.001$). 210 type of triads were found more than expected for in all MLPN's (For KD, 17.06 and 21.19; For BFV, 7.74 and 6.95). As, Nooy et al., (2011) notes, in Pajek ®, the triad census are listed in sequence that least restrictive model is listed as the latter. That is why, although balance and clustrability models have been found more than expected by chance as a result of the triadic analysis, we characterize both of the networks as hierarchical clusters model. The hierarchical clusters model, points out a hierarchical structure in the network with "a mild form of ranking within a group" (Nooy et al., 2011, p.209). Then we can talk about hierarchical structures in the wall discussions of the social groups in Sosyal 2.0. This finding should be emphasized, as the social groups in Sosyal 2.0 are not assigned any pre-leader or a teacher initially. Both groups are self-organizing. We can conclude that, in corporate networked learning environments, when wall discussion networks are examined, the online self-organizing social groups formed a unified one cluster, with hierarchical clustering structure within the groups, reflecting a mild form of ranking among participants.

Another prominent result was about the forbidden triads found in both social groups. The forbidden triads 111U and 201 were also found more frequently than expected in

both social groups. This situation tells us the communication networks in online discussion postings cannot completely be described with one or more models taking place in triadic analysis. Rather the mentioned models provided us clues about the structure of the communication network but did not give a strong result about the comprehensive dominance of any triadic relations.

Especially, the 201 type of forbidden triad was found more frequently than expected with high frequency values in both groups (For KD, 6.19 and 5.14; For BFV, 14.87 and 13.77). This situation showed that the communications in both social groups were characterized by the 201 type relations to some extent. The triadic analysis model accepts the 201 type triad as a forbidden triad. Triad 201 (see Figure 28) contains two reciprocal relations and a missing tie between the two vertices. The hierarchical clusters model accepts nodes with reciprocal relations to be in one cluster; whereas it accepts if there is a missing dyad, the nodes fit into different clusters. As these two assumptions of the hierarchical clusters model contradicts in 201 type of triads, the triad is accepted as forbidden in triadic analysis model (Nooy et al., 2011). On the other hand, it is meaningful to have such a triadic relation in networks representing communication. The triad, explains a mutual relation between two different pair of nodes and a hierarchical relation between the two other nodes. I think the dilemma with the 201 type of triads is that, it asserts a hierarchy to some extent, but it can't be explained with the assumptions of the models contained in the triadic analysis. Therefore, as a researcher, I assert that, the triadic analysis model should be further extended to examine the existence of 201 triads.

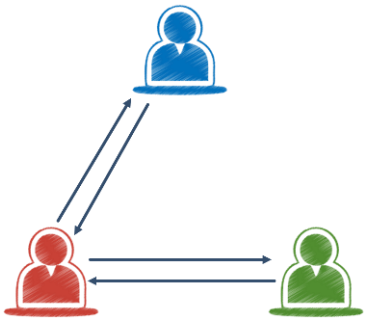


Figure 28 Type 201 triad

In social sciences, the existence of a formal and/or informal ranking is recognized. The formal ranking is exemplified with the hierarchy in army.

On the other hand, the informal ranking is not apparent, it is rather reflected "in the opinions and behavior of people toward each other" (Nooy et al., 2011, p.204). The results of the triadic analysis of our study indicated that, there is no stark ranking in both social groups in Sosyal 2.0. Being designed as a social learning environment in corporate context, social groups in Sosyal 2.0 do not have a pre-assigned leader or an instructor/teacher. Furthermore, the social groups are self-organizing. The results of the triadic analysis showed that, this formal situation is also reflected in informal ranking structure. No informal ranking is observed except for the mild form of ranking, hierarchical clusters, within the group. We can conclude that, the communication is taking place within one group and the flow of information is taking place within the groups with mild form of hierarchy.

5.3.4 Discussion of Symmetric Acyclic Decomposition and Blockmodelling Analysis Findings

Networks may have hidden structural hierarchy in which some actors are more connected to each other than the others. In order to further analyze the hierarchical structure indicated by hierarchical clusters model in triadic analysis findings, both symmetric acyclic decomposition and blockmodelling analysis were conducted on both of the social groups, which are both the self-organizing, to find out whether there is hidden structural hierarchy or not.

Symmetric acyclic decomposition is put forward as a complementary analysis to the blockmodelling analysis in literature. (Doreian et al., 2000). Analysis revealed similar nested group structures for both KD SG and BFV SG. Both groups resulted in one big strong component having reciprocal relationships among participants. Symmetric acyclic decomposition analysis showed that in KD SG, 29 nodes among 38 and in BFV SG, 23 nodes among 35 reflected an acyclic characteristic. This cluster represented attached individuals within the network. Blockmodelling analysis also supported this finding. These nested groups arouse as regular equivalent groups the remaining nodes occurred to be attached individuals to this connected structure.

Similarly, Beck, Fitzgerald and Pauksztat (2003) was concerned about the core-periphery structures of preservice teachers' self-organizing online discussion groups. Different from the results of the current analysis, the writers reported an ideal core-periphery structure: "Core members exchanged many messages with many different others, while periphery actors exchanged fewer messages with fewer others" (p.319). Likewise, Wang's (2010) study examined networked learning environments at university level and reported definitive core-periphery structures. With this respect, our findings are not supported by the literature regarding the core and periphery groups. In this study, we rather faced a core group surrounded by some individuals who have very limited interaction with each other and the core.

The groups in Sosyal 2.0 are self-organizing groups, which have no assigned leaders at the formation stage. Unlike the networked learning environments examined in higher education context, the social groups in Sosyal 2.0 do not have a pre-assigned hierarchical structure like student-teacher or moderator-member. However, as Beck et al (2003) underlines, "in unassigned, initially leaderless groups, a stable influence hierarchy and role system will emerge and persist after initial instability" (p.313). Although, no initial group leader was assigned to the social groups in Sosyal 2.0, the results denoted a tightly connected core group emergent in both social groups. But the periphery structure is not apparent yet. De Laat, et al. (2007a) asserts that the structure of the network can change over time and this provides chance for each actor in the network to have position in the core or in the periphery. Therefore, we might conclude

that, the periphery structure might occur in time but we don't have enough evidence regarding this finding provided by the current study.

Except for the similar nested group structures, two social groups reflected different depth structures as a result of the symmetric acyclic decomposition. In KD HG, only one of the users, Iramen, had an exceptional case; he had one way integration towards the nested group. Taking the coding procedures into account, he might have asked some questions but not got the answer. In fact, he seemed to get behind the information flow. The remaining individuals were receiving information from the nested group.

In BFV SG there was a more complex structure. Salvoil was in a similar structure with Iramen having a one way interaction with the nested group. Hyocih had a place in between Elunor and the group. Sgomen, Sbumen and Ttamen had information flow from both the groups and some other individuals. This communication network had a four layered structure but we don't know the exact position of the layers and individuals in terms of ranking, as this layered structure was reflecting the hierarchical clusters structure in the network was not purely ranked. We can conclude that except for the core group the individuals attached have different positions in terms of ranking.

5.4 Discussion of CP and SP Depending on the Interaction Similarity of Participants

We examined the strength of association between the cognitive presence and social presence depending on the interaction similarity of the participants calculated by using the four MLPN's constructed. The results revealed that, in both social groups, triggering event phase of CP was related to open communication and group cohesion categories of SP. Also, exploration and integration phase were related to all categories of SP. On the other hand, resolution phase did not reveal any relation with the categories of SP.

Interaction similarities of participants are defined by the positions of the participants in the network. As Nooy et al., (2011) explains, "in social network analysis, a position

is equated to a particular pattern of ties" (p.265). Therefore, with this finding we can assert that, the actors in the network were found to be related in terms of cognitive presence and social presence, except for the resolution level of cognitive presence, when the relationship is examined in terms of similarity of members' positions in the network.

Correspondingly, cognitive presence and social presence are reported to be connected to each other in many studies in the literature (Shea & Bidjerano, 2009). The current study conducted in corporate training context, where no teaching effort was present. The online learning environment was informal, social learning environment, where learners were acting freely depending on the rules and regulations of the system, but not the teacher in the environment. Therefore, no teaching presence was present. Similarly, Lee (2014) conducted a study in the graduate course context and he also did not include the teaching presence in the study. Supporting our findings, Lee (2014) also reported that social presence and cognitive presence are correlated to each other.

Lee (2014) also studied the relationship between CP and SP by examining the online discussion board messages of college students by using the community of inquiry (COI) model for analyzing qualitative data. He concluded that, social presence and cognitive presence are positively correlated. (p.49). On the other hand, the results of the current study suggested that, the CP and SP are related if CP is in the first three levels which are triggering event, exploration and integration but not the highest level which is resolution. The result of the current study conflicts with the findings of Lee (2014) from this respect.

Supporting the findings of the current research, Wang, (2010) also reported strong relationship between the position of the actors in the network, in terms of their coreness values, and their level of knowledge building in the network for the first three levels of knowledge construction which are information sharing, consolidating understanding and negotiation of meaning levels (p.20). Similarly, Wang's (2010) findings didn't reveal a relation for the highest two levels of knowledge construction, which are knowledge modification and constructed knowledge use.

Although the studies point to the existence of a correlation between SP and CP, we cannot conclude a direct positive correlation with these two constructs within the corporate training context. Especially, the highest level of CP, resolution, did not result in any association between the dimensions of SP, when it is examined depending on the actors' roles and positions in the network. Supporting our findings Garrison and Cleveland-Innes (2005) conjectures that, SP is a required but inadequate requirement to create a COI and to support higher levels of knowledge acquisition.

The results reflected that the first three sub dimensions of CP which are, triggering event, exploration, and integration are strongly correlated with open communication and group cohesion levels of SP. In fact, this finding is a reflection of the social environment, where members can communicate effectively with a unity and cohesion between the group members, and in that environment they can initiate discussions and openly explore ideas. The correlation results asserted that in such a social climate the SP of the participants were found to be related to the first three levels of CP but not the highest level which is resolution.

Therefore we can conclude that, although the networked learning environment provides a suitable network structure as discussed in social networked analysis findings for open communication and discussion and although the participants reflect SP in all levels in addition to CP in triggering event, exploration and integration levels; it is hard for employees to reach at the resolution stage in networked learning settings in corporate context.

5.5 Practical Implications

Implication 1: An LMS with social interaction abilities, allowing knowledge sharing and collaboration with informal learning principles, in the corporate context can provide opportunities for employees to show their social presence by openly communicating, discussing to integrate ideas.

The current study aimed to explore the use of LMS with social interaction abilities by examining employees' discussions on an online wall platform in the corporate context. The results of the study revealed that, employees participated and communicated in the wall platform and gone through quality discussions without orphan messages and very high response rate. In addition, the content analysis results clarified that, participants were mostly engaged in exploratory activities within the learning environment despite the low rate of resolution level messages in the environment. Goggins et al., (2013) mention that the information to comprehend, outline and unravel the problems in the workplace does not exists; however, these are created progress and in a shared environment in a process of outlining and answering the problem. The writers underlined that in a place where the answers of the problems are not acknowledged, the media should "provide the opportunity and resources for social debate" (p.31). The findings of the current study revealed that, in a workplace environment where social learning is implemented, online networked learning environments can provide an environment for employees where they can show their social presence by open communication and discuss and integrate ideas their cognitively. Also, the results of the content analysis also supported this implication. The results of the content analysis showed that, two social groups evolved in such a structure that, the code distribution of CP and SP clearly reflected that, they served for their establishment aim. This situation also implied that, companies can benefit from the informal online networked environments.

Implication 2: Learners can form social groups without any pre-assigned leader or moderator and they can reach up to integration level CP in an informal learning environment in corporate context.

Most of the studies conducted in literature examine the SP and CP in higher education context with a pre- assigned leader or a teacher. However, in the current thesis we examined an informal learning environment in corporate context, employees can get together around a shared interest and operate according to defined initial aim of the social group when reaching up to the integration level of cognitive presence.

Implication 3: In corporate training context, it is possible to have social groups operating according to their establishment aim without any informal ranking in communication in an informal, online, networked learning environment

In Sosyal 2.0 social group membership was based on a shared interest on a specific social group which is defined in the social groups' definition. Although there was an initiator of the SG, there were no pre-assigned leader or moderator in the social group. The examined social groups did not result in any strict form of informal ranking and did not show strict dominance of a group. Rather SNA resulted in large cooperating communities. Also content analysis results support that, they were operating around the defined initial aim.

Implication 4: The current study implies that, in an online networking environment, the actors' similarity in terms of their ties, each other, and the other actors in the networked environment can provide clues about the presences of people in the networked learning environment, in corporate context.

This implication puts forward that, tools con be incorporated in learning management systems which can follow and calculate the network metrics of t participants can be utilized by learning management systems or similar learning environments offering networked learning opportunities. However, further investigation of these relationships between the social network metrics and the related presence constructs is needed for the similar learning environments.

Implication 5: SNA, a useful tool analyzing networks can and should be used in the networked learning studies by implementing embedded mixed method design with SNA.

This study also put forward some methodological implications. The qualitative and quantitative methodologies offer various opportunities to understand and examine the networked learning environments, On the other hand, the nature of the networked environments naturally complex, so that some of the aspects of networked learning

environments can only be revealed via the opportunities offered by SNA as supported by other scholars in the literature (Aviv et al., 2003; De Laat et al., 2007a; Tirado et al. 2012; De Laat et al., 2006; Wang, 2010; Haythornthwaite and De Laat, 2010; Enriquez, 2008). By embedded mixed method design incorporating SNA, the current study claims that SNA is a useful tool and should be used in the networked learning studies.

Implication 6: Multiple layered presences network (MLPN) can be used to analyze networked learning environments with preserving data from multiple dimensions of presences in network formation and integrating content analysis with SNA.

When conducting research with SNA, how network is formed is an important concern. The decisions made while forming the network affects the assumptions, results and therefore implications of the analysis conducted. The literature implementing SNA in combination with CA does not provide any solid or agreed method explaining how to integrate CA results into the network in network formation process. Some studies do not even give a clue about how they integrated CA into their SNA analysis. In the current study we implemented a novel method to integrate content analysis results in terms of CP and SP into the network called: MLPN. In their network structure, we gathered the relations under the sub dimensions of SP and CP forming a multiple layered network structure. In this method the CP and SP values are presented in different layers of the communication network. This structure enabled us to see the sub-dimensions of the relations and work on them when needed. For instance, the last research question, in which social presence and cognitive presence relationship examined in terms of the interaction similarity of the participants, the values form the sub-layers are utilized.

This MLPN structure is completely novel and used in this study for the first time when integrating SNA with CA. As a result, the current study implies that, MLPN can be used in integrating SNA and CA in networked learning research.

5.6 Suggestions and Implications for Future Research

This study was conducted in a corporate setting. The difficulties in reaching the data in corporate learning settings make similar researches rare in the literature. The current study was also limited to data from only one company and from two social groups within that company. Studies examining broader context are required in order to get more insight and increase generalizability of the research conducted.

The current study was conducted in cooperation with an e-learning company. This was the only possible way that we could reach data from the corporate training field. Especially when the networked learning is conducted in corporate context, reaching data becomes a real problem. Further studies examining corporate learning at workplace can be possible by designing and conducting broader research projects in coordination with other companies from various industries and this research should be sponsored by governmental agencies so as to support national development. This is the only way to reach wider population to study networked learning environments in corporate training settings.

Furthermore, the current study investigated the resultant networks constructed in the corporate learning environment limited to a time period. However, De Laat et al. (2007a) argued the participation in the networked environments evolve in time (p.99). Therefore, the evolution of network in time in corporate learning environments stands as a research area to be investigated.

The content analysis results of the current study revealed that CP and SP coding categories did not completely answer the needs of the current study conducted in the informal learning settings corporate context. During research, we had to implement new coding categories and some of the categories of social presence were not coded at all. This situation might be originated as result of the difference of the context and the social learning perspective. Therefore, further research in similar contexts is

required to update SP and CP to be used in similar contexts. Otherwise new constructs should be developed to be able to examine learning in informal learning settings.

Another issue faced while conducting this study was, hardship of content analysis. Content analysis requires too much time and effort. This situation resulted in limitations in the scope and the data. Conducting content analysis by automated systems integrated in networked learning environments can be more powerful to examine to provide insight about the content.

Furthermore, the social network constructed within the current study was also constructed by hand and CA was integrated into the social network by employing MLPN structure put forward in the current study. However, there are some automated systems in the literature. If those automated systems can be integrated into learning management systems, the effort of network formation can reduce, and research can be conducted with wider population. If such an automated learning environment would be possible, the results would be more generalizable when analyzed. Also the human mistake can be reduced in this way.

The current study is limited to the online discussion data gained from the LMS. Gathering data via interview or conducting ethnographic research can add new insights to the phenomenon studied.

The research question handled in the current study is a part of a greater research area which is workplace learning. This research area is a cross section of many other research areas such as management, information systems, cultural studies, etc. In this study we only handled this question via educational technology research lens. Therefore, the study is open to study from other perspectives as well.

The current study puts forward a MPLN structure in which SP and CP content analysis results are imported into network structure with sub-categories of the constructs. MLPN structure enables us to layer the interaction among the actors of the communication network and also to preserve the line values between the same people

but with varying presence indicators. In addition, with this structure, the content analysis results were imported into the relations between the actors; but not the actors themselves. This MLPN structure can be used in upcoming studies and with further CA tools with several layers. Also other constructs from the literature can be examined with the MLPN perspective with SNA.

Learning sciences studies, employing SNA are very limited in Turkey. Therefore the current study, which is conducted in the corporate learning context can stand as a guide for the further studies while implementing SNA. Also, studies using two-mode networks should be conducted to gain insight about actor-object relationship in networked learning environments.

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APPENDIX A

FORMS

Tarih 12/ 8/ 2015

Şirket Bilgi Paylaşım Sözleşmesi

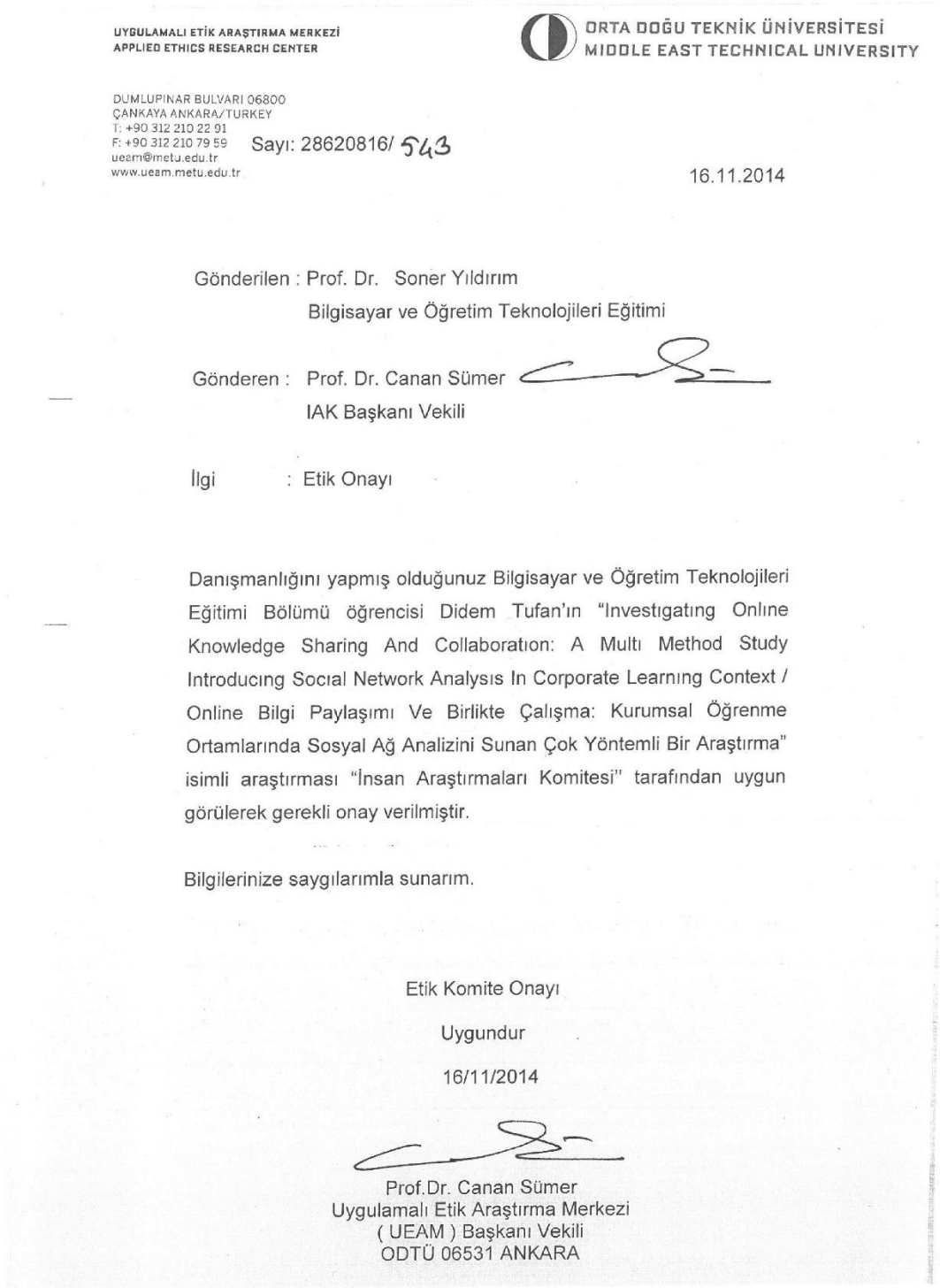
Didem TUFAN tarafından ODTÜ-Fen Bilimleri Enstitüsü-Bilgisayar ve Öğretim Teknolojileri Eğitimi alanında devam eden doktora tezi kapsamında Kurumsal e-öğrenme ortamlarında, online bilgi paylaşımının nasıl gerçekleştiğini anlamaya yönelik araştırması için, Enocta içinde kullanılan, Enocta Eğitim Platformu içinde bulunan Sosyal 2.0 online paylaşım verilerini (Öğrenme Yönetim Sistemi Loglarını) kullanmasında hiçbir sakınca yoktur.

Kişilerin gizliliği ilkesine sadık kalmak ve verileri araştırma kapsamında, sadece bilimsel amaçlar için kullanmak koşulu ile, sistem veritabanından excel olarak aldığımız verileri Didem TUFAN ile paylaşıyoruz.

Enocta (Avez elektronik A.Ş)adına
Burak Yücelyiğit
İmza

Didem TUFAN
İmza

Figure 29 Company information sharing form



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16.11.2014

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Bilgisayar ve Öğretim Teknolojileri Eğitimi

Gönderen : Prof. Dr. Canan Sümer
IAK Başkanı Vekili

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü öğrencisi Didem Tufan'ın "Investigating Online Knowledge Sharing And Collaboration: A Multi Method Study Introducing Social Network Analysis In Corporate Learning Context / Online Bilgi Paylaşımı Ve Birlikte Çalışma: Kurumsal Öğrenme Ortamlarında Sosyal Ağ Analizini Sunan Çok Yöntemli Bir Araştırma" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

16/11/2014

Prof.Dr. Canan Sümer
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkanı Vekili
ODTÜ 06531 ANKARA

Figure 30 METU Applied Ethics Research Center, Institutional Review Board (IRB) approval form

APPENDIX B

CODE BOOK FOR COGNITIVE PRESENCE CODING INDICATORS AND EXAMPLES

Table 31 Code Book for Cognitive Presence Coding Indicators and Examples

Code	Description	Example	
		CP Sub Category 1: Triggering Event	
CP-TE1	Recognize problem	*Duvar'a tek soruluk mini anket ekleme (dosya ekle, resim ekle tadında) şeklinde bir özellik için component geliştirilebilir mi? Bununla ilgili çalışma kaydı açabilir miyiz?*	Can a component be developed to add a one-item mini survey on the wall (just like the ones to add file file, add photo)? Can we create an entry for this?
CP-TE2	Sense of Puzzlement	*Ya arkadaşlar; 5 puanım var ama grup oluşturma yetkim yok ??? 4 puanı olan kişilerin oluşturdukları gruplar görüyorum... Grup olayı farklı bir yetkiye mi bağlı?*	Guys, I have 5 points but I am unauthorized to create a group??? I see that those with 4 points have created groups… Does the group-creating thing depend on a different sort of authorization?
		CP Sub Category 1: Exploration	
CP-EX01	Not directly represents a standpoint.	*Küllerinden doğacaklar demek :)*	So, they will rise from their ashes :)
CP-EX1	Divergence (exploration) within the online community	*Onu değiştirebiliriz. Şimdi böyle bakınca lms bize sürekli kızıyor gibi oluyor :)*	We can change that. From where we stand, it seems like lms is constantly angry with us :)

Table 31 Code Book for Cognitive Presence Coding Indicators and Examples (continued)

CP-EX2	Divergence (exploration) within a single message	*Benim aklıma en çok takılan konu Sosyal 2.0 'daki uzmanlık. Aşağıdaki sorularla ilgili görüşlerinizi ve aklınıza takılan diğer sorularınızı yazmanızı rica ediyorum.* *1- Bir kişinin bir konuda uzmanlık için sosyal 2.0'da geçirmesi gereken süre toplam ne kadardır?* *2- Doğal yollardan uzman olmak çok zor iken kurumun isteği ile uzmanlık verilen kişiler olması rozet sistemini nasıl etkiler?*	The question that preoccupies my mind the most is Social 2.0 expertise. I kindly ask you to state your opinions about the followings as well as the other questions you wonder. 1-What is the total time a person is to spend on Sosyal 2.0 for being awarded expertise in a field? 2- While it is very difficult to be an expert by normal means, how would the persons who are awarded expertise upon the request of the institution have an effect on the badge system?
CP-EX3	Information exchange	*Küçük bir örnek belki fikir verebilir: [URL]*	Perhaps a sample can give an insight: [URL]
CP-EX4	Suggestions for considerations	*"Bu yazı blog'umda yer alsın." check box'ı yerine kavramın biraz daha net olması açısından "Bu yazı beğenme ve yoruma açık" gibi bir check box olsa nasıl olurdu?*	In order to make the concept a bit clearer, what about having a check box like “Comments and Likes” rather than the check box “Include this post in my blog”?
CP-EX5	Brainstorming	*Kişisel sayfanızı dilerseniz internete açabiliyorsunuz. Hangi menülerin ve hangi yazılarınızın açık olacağını seçebiliyorsunuz. Kampüs'e kayıtlı olmayan kişiler girdiklerinde beğenme, yorum gibi işlemleri yapamıyorlar; site içindeki diğer fonksiyonlara da*	If you like, you can open your personal page to the Internet access. You can identify which menu and posts will be open to access. When the website is visited by the persons non-registered on the campus,

Table 31 Code Book for Cognitive Presence Coding Indicators and Examples (continued)

		ulaşamıyorlar. Belki bu konularda tartışıp fikir alış verişi yapabiliriz ayrıca.	they cannot like or comment on your posts; they cannot access to the other functions on the website neither. Maybe we can discuss this issue and exchange views later on.
		Kutuya bizim bildirimleri koyalım Kruper, tekrar liste yapmaya gerek var mi? Bildirimlerde neler varsa hepsi widget'ın içinde olabilir.	Let's add our notifications in the box. Kruper, do we need to make another list? All the notification content can be included in widgets.
CP-EX6	Leaps to conclusions	*Grupta bulunan bir kullancu için gruptan üyelik daveti yollanamıyor Blaiville. Büyük ihtimalle sen daha gruba üye olmadan ilgili gruptan sana davet gelmiş ve sen de o davetten bağımsız olarak o gruba sonrasında üye olmuşsundur.*	No membership invitation can be sent to a group user, Blaiville. Most probably, you received an invitation from the related group before you joined the group and you joined the group later independent from that invitation.
		CP Sub Category 3: Integration	
CP-IN1	Convergence (integration) among group members	*Bildiğim kadarıyla scorma göre daha esnek ama bu esnekliğin kaynağı ne bilmiyorum. Neye göre bu iddia ediliyor? LRS konusu da başka bir dünya. Bunun kime ne kazandıracağını ben gözümde canlandıramıyorum. Bununla ilgili başarı hikayeleri var mı?*	As far as I know, it is more flexible than scorm, but I do not know why. What is the basis of this claim? The LRS thing is another story. I cannot imagine what sort of benefit it will bring. Is there any success story about it?
CP-IN2	Convergence (integration) within	*Öncelik AppStore ve Google Play'de uygulama geliştirmek olmalı bence. Hazır kitleyi göz önünde*	I think the priority must be to develop applications on AppleStore and Google Play. When the current

Table 31 Code Book for Cognitive Presence Coding Indicators and Examples (continued)

		a single message (response to prompt)	*bulundurduğumuzda çok daha mantıklı gibi geliyor. win 8 daha sonra düşünmeliyiz. Samsung BT ve Mobil iletişim müdürü JK Shin; " Windows phone, Windows 8 ve RT satışlarından memnun olmadıklarını dile getirdi" android çok daha fazla tercih ediliyormuş Avrupa genelinde.*	audience is concerned, it sounds a lot more logical. We should think about win 8 later. Samsung IT and Mobile Communications Manager JK Shin stated that "…they are not satisfied with Windows phone, Windows 8 and RT sales." Android is preferred a lot more in Europe.
	CP-IN3	Connecting ideas, synthesis	*Bununla ilgili bir blog yazısı yazacağım. Uzun bir metin olduğu için duvar yerine blog daha iyi olur sanırım. Linkini de bir çok yerde paylaşırım. Bu konuda önemli ilerlemeler var. örneğin sosyal modül tümüyle ayrıldı. [URL] adresinden bakabilirsiniz. Buradan yola çıkan başka senaryolar da var. Yukarıdaki linkte özellikle sol taraftaki Katalog linki ile ilgili düşüncelerinizi ve sunduğu imkanları tartışalım. benim Aklıma bir sürü fikir geliyor. Örneğin, koleksiyonların bu şekilde sunulması gibi.*	I will write about it on the blog. Since it is a long text, I guess the blog would be better than the wall. I will share the link as well. There are significant developments about it. For example, the social module is totally isolated now. You can check it on [URL] There are other related scenarios as well. On the above-mentioned link, let's discuss your ideas about particularly the Catalogue link on the left as well as the opportunities it offers. There are many ideas that come to my mind like presenting the collections in this form.
	CP-IN4	Creating Solutions	*Sosyal yönetimi kısmında bu şekilde girilmiş ilgi alanları birlerştirilerek tek hale getirilebiliyor. Yani yukarıdaki 3 ilgi alanı İş Ortakları altında birleştirilebilir ve diğer 2 ilgi alanı için girilmiş nesnelerin ilgi alanalrı birleştirilen ilgi alanıyla değiştirilir.*	In social administration section, this sort of domains can be combined and unified. I mean, the above mentioned 3 domains can be combined under Business Partners and the domains of the objects entered for the 2 other domains are replaced by the combined domain.

Table 31 Code Book for Cognitive Presence Coding Indicators and Examples (continued)

		CP Sub Category 4: Resolution	
CP-RE1	Vicarious application to real world testing solutions	*Puan dışında Okuryazar, Paylaşımcı, Eğitim Yorumcusu rozetlerine de sahip olman gerekiyor. Kontrol ettim ilk ikisi sende var, sonuncusunu da alırsan grup kurabilirsin Hunarc:) Bu arada bu bilgiye Yeni Grup Oluştur düğmesine tıkladığında da ulaşabilirsin.*	In addition to the points, you need to have the Reader-Writer, Sharer, and Academic Commentator badges. I found out that you have the first two badges and if you have the last one as well, you can create a group Hunarc:) By the way, you can also find this information by clicking the New Group button.
CP-RE2	Defending solutions	*Müşterilerin talep süreçlerindeki katı tutumları konusunda Blarin Bey ile hem fikirim. Çoğu müşterimiz onaylarının olmasını istiyorlar Dolayısıyla, biz de mevcut durumda dediğin şekilde talep yapılabilmesi için etkinliği kayda açma ve etkinlik onayı olacak şekilde etkinliği düzenleme işlemini de önerebiliyoruz. Böylece, talep toplayıp, talep raporu çekerek süreci yürütmek yerine dediğimiz şekilde de yönetebiliyorlar.*	I agree with Blarin about the strict attitude of the customers concerning the process of demand. Most customers want to receive approvals. So, we suggest organizing the event by adding an entry and requesting approval for the event so the demand can be submitted like you said. Thus, they are able to manage the process the way we suggest instead of collecting the demands and submitting a demand report.

Table 32 Code Book for Social Presence Coding Indicators and Examples

Code	Description	Example	
		SP Sub Category 1: Affective Expression	
SP-AF1	Expressing emotions	*Herkese faydası olur :)*	It would be helpful for everyone :)
SP-AF2	Use of humor	*Cihazi değil, duvarı süslemeniz lazım :)*	We need to embellish the wall, not the device :)
SP-AF3	Self-disclosure	*Ben kendime bir mac siparişi verip yazılımı yapmaya başlıyorum. Desteklerinizi beklerim.*	I will order a mac for myself and begin to develop the software. I expect your support.
SP-AF4	Use of unconventional expressions to express emotion	*Haydaaaa*	Oh no!
SP-AF5	Expressing value	*Bu gerçekten iyi bir örnek. içerik ne kadar şık olursa o kadar iyi tabii..*	This is a really good example. The more polished the content is, the better, of course
		SP Sub Category 2: Open Communication	
SP-OC1	Continuing a thread	NOT APPLICABLE	NOT APPLICABLE
SP-OC2	Quoting from others' messages	*"Bu yazı blog'umda yer alsın." check box'ı yerine kavramın biraz daha net olması açısından "Bu yazı beğenme ve yoruma açık" gibi bir check box olsa nasıl olurdu?*	In order to make the concept a bit clearer, what about having a check box like “Comments and Likes” rather than the check box “Include this post in my blog”?

Table 32 Code Book for Social Presence Coding Indicators and Examples (continued)

SP-OC3	Referring explicitly to others' messages	*Evet. Konuda bir dizi mesaj çalışması yapılacak. Daha sonra da bu tür uygulamalar için elimizde bir video serisinin olması düşünülüyor. Siz olsanız ilk olarak neyi öğrenmek isterdiniz?*	Yes. A series of message work will be carried out about it. Then, we are thinking about having a series of video for this sort of applications. If it was you, what would you like to learn about first?
SP-OC4	Asking questions	*Yukarıdaki linkin çalışması için ne yapmam gerekiyor?*	What should I do to activate the link above?
SP-OC45	Reporting problems	*Bu arada "bütün haberleri al" dediğim halde yukardaki güncellemeler maille gelmedi bana. Buraya bakınca gördüm.*	Although I selected “inform me about each news” option, I did not receive the above-mentioned updates via e-mail. I saw them when I checked this page.
SP-OC46	Responding problems	*Fixlendi. Güncelleme ile normale dönecektir. :) Konuyla ilgili case açılmıştır.*	It has been fixed. It will return to normal once updated. :) The related use case has been created.
SP-OC5	Complimenting, expressing appreciation	*Arkadaşlar elinize sağlık. Şu yaptığınız iş, bazı kurumlar için o kadar inanılmaz bir nokta ki tarif edemem.*	Thank you everyone. The work you have done is so unbelievable for some institutions that I cannot define.
SP-OC6	Expressing agreement/disagreement	*Elozaj'ın dediği gibi kazanılanlar yeşil veya pasif'e düşse daha şık olur :)*	As Elozaj said, it would look more polished if the wins fall in green or passive.
SP-OC7	Personal advice	*EEP kullanıcı ana sayfasında Sosyal Haber Kaynağı'nın bir Widget'ını koysak nasıl olur. Sosyal menüsüne girmeden kullanıcılar anasayfalarından*	How about we insert a Widget of the Social News Source on the EEP user home page? Wouldn’t it be good if the users are able to follow what is going on

Table 32 Code Book for Social Presence Coding Indicators and Examples (continued)

		sosyal tarafta neler olduğunu takip edebilseler... Güzel olmaz mı?	on the social side on their home page without entering the social menu?
		SP Sub Category 3: Group Cohesion	
SP-GC1	Vocatives	*Edilmesi lazım İcunid. Bakalım sesini ne zaman duyacaklar? Kluas, Kluas, alo arkadaşlar…*	It should be followed Icunid. Let's see when they will hear you? Kluas, Kluas, hello friends..
SP-GC2	Addresses or refers to the group using inclusive pronouns	*Evet, bir link verildiğinde sanırım bizim sistem linki kısaltmayı deniyor arka planda, ancak orada bir sorun var gibi. Ben de denk geldim linklerde. common_link_shortener.aspx sayfasında l=0fcfa09b2c184cd0a86ec9dee62de4db benzeri bir parametre ile kalıyor.*	Yes, when a link is given, I think our system is attempting to shorten the link in the background, but there seems to be a problem. I came up with it in the links. On common_link_shortener.aspx page, it is limited with a parameter like l=0fcfa09b2c184cd0a86ec9dee62de4db.
SP-GC3	Phatics, salutations and greetings	*Merhabalar; Katalog özelliğindeki aşağıdaki hatanın düzeltilmesi yönünde bir planımız var mı? Teşekkürler, İyi çalışmalar.*	Hello; Do we have a plan about how to correct the error below in the catalogue properties? Thank you, Regards
SP-GC4	Social sharing	*SharepoinT ve Enocta Kampüs artık Entegre! Yeni özelliğimiz enocta kullanıcıları için aktif edilmiş durumdadır. Artık Kampüs üzerinden sharepoint aramalarını yapabilirsiniz. Yazıyı görünce aklıma [URL] geldi :)*	SharepoinT and Enocta Campus are now integrated! The new feature has been activated for enocta users. Now, you can conduct sharepoint search on Campus. When I saw the post, it reminded me of [URL]
SP-GC5	Course reflection	NOT APPLICABLE	NOT APPLICABLE

APPENDIX C

DENDROGRAMS

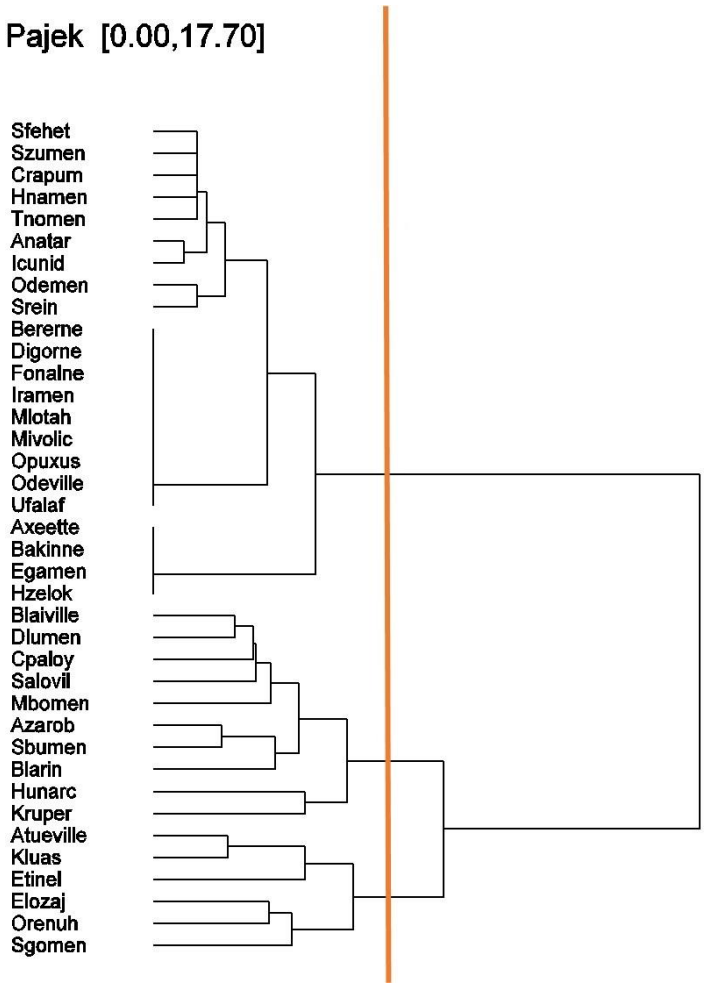

Figure 31 Dendrogram for Network 1.1 (KD SG social presence affective responses network)

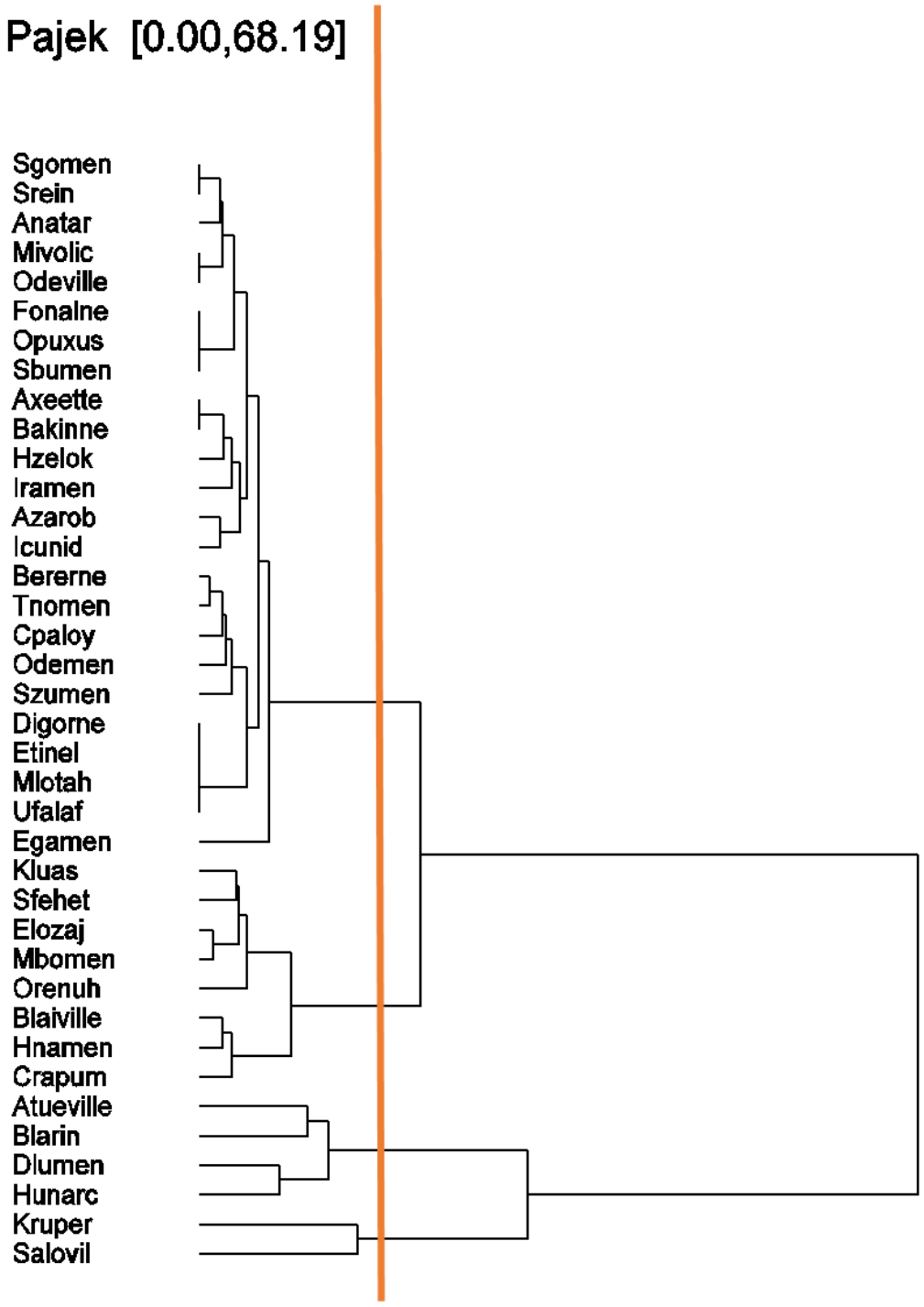

Figure 32 Dendrogram for Network 1.2 (KD SG social presence open communication network)

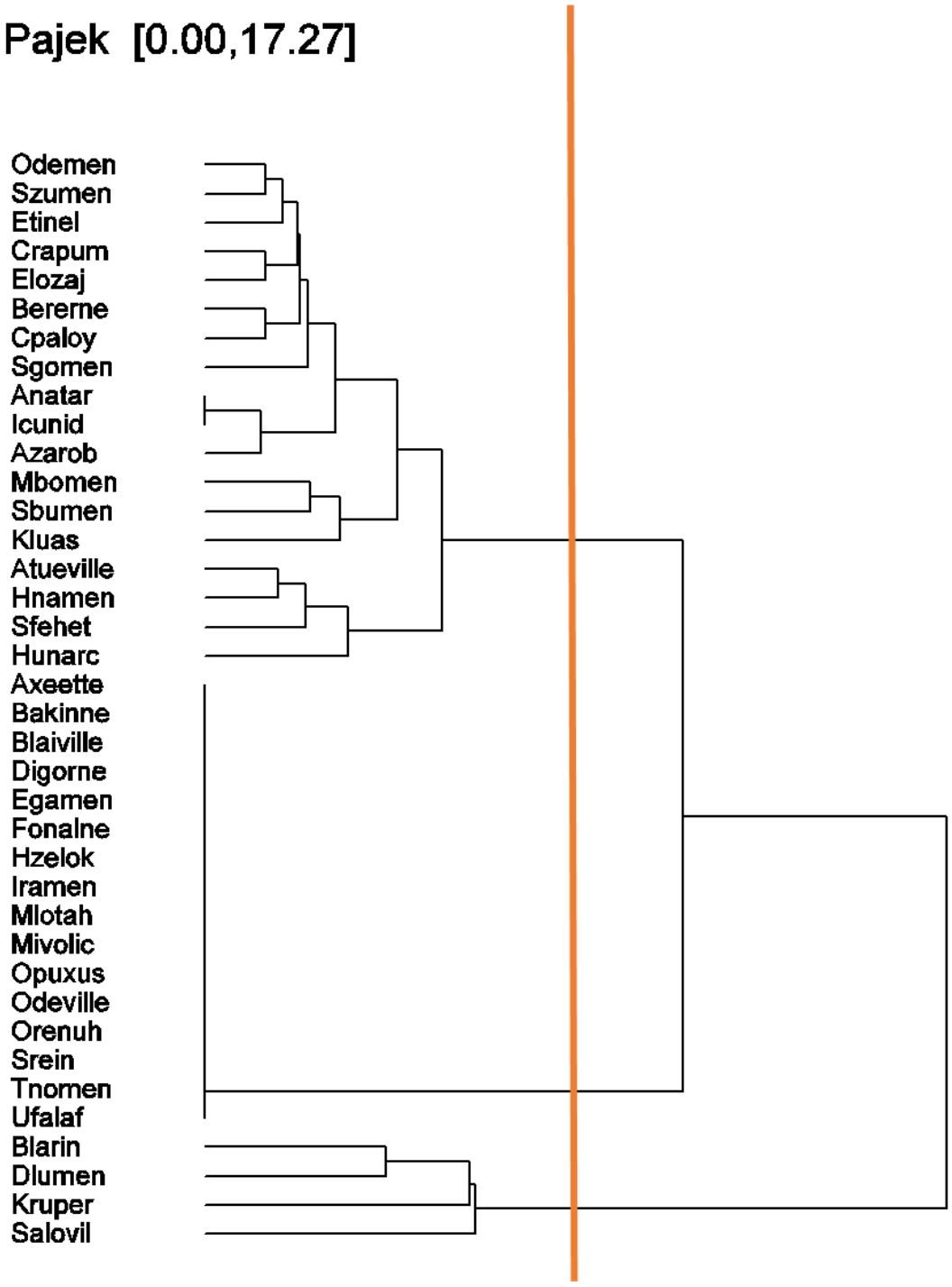

Figure 33 Dendrogram for Network 1.3 (KD SG social presence group cohesion network)

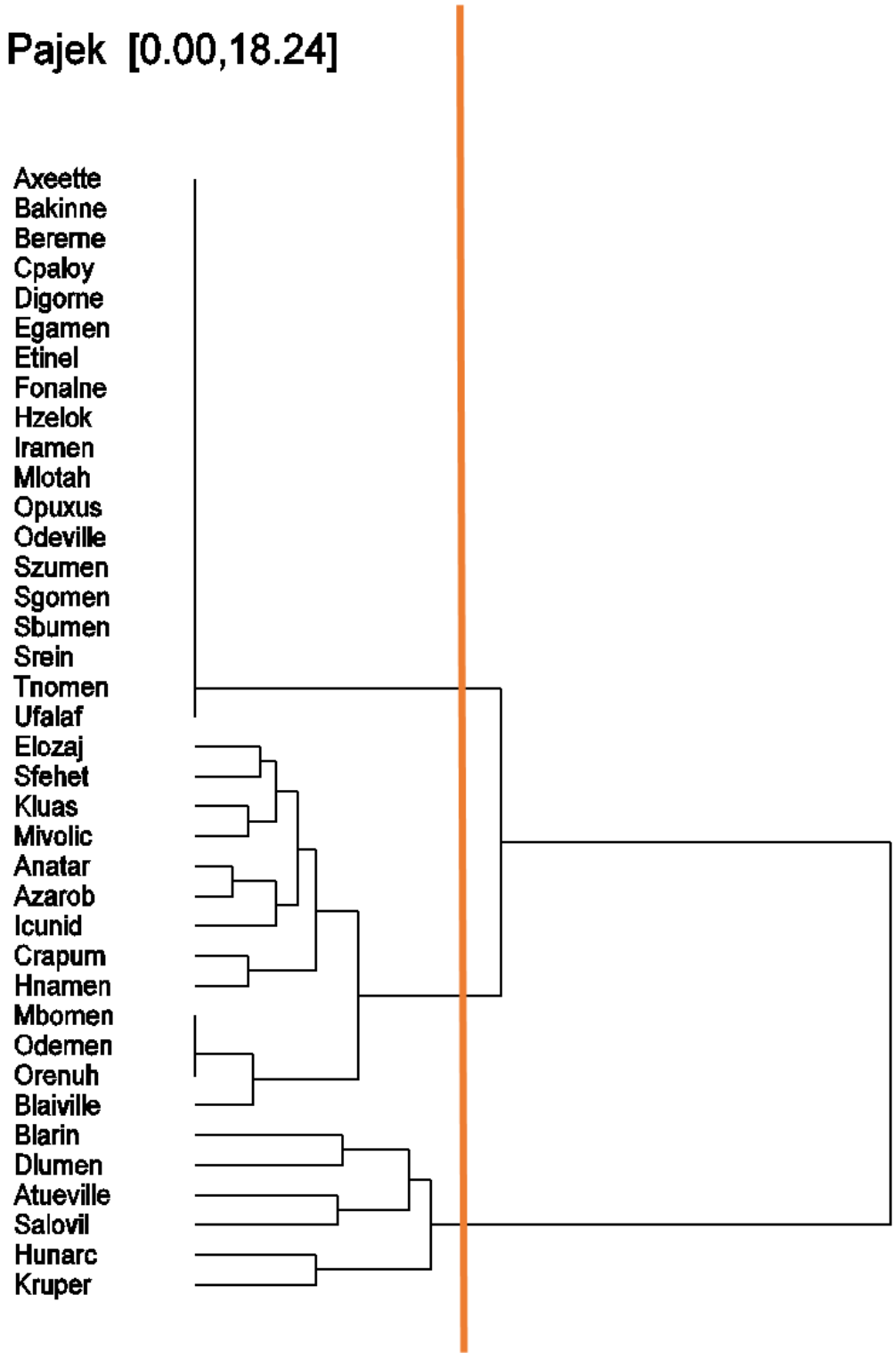

Figure 34 Dendrogram for Network 2.1 (KD SG cognitive presence triggering event network)

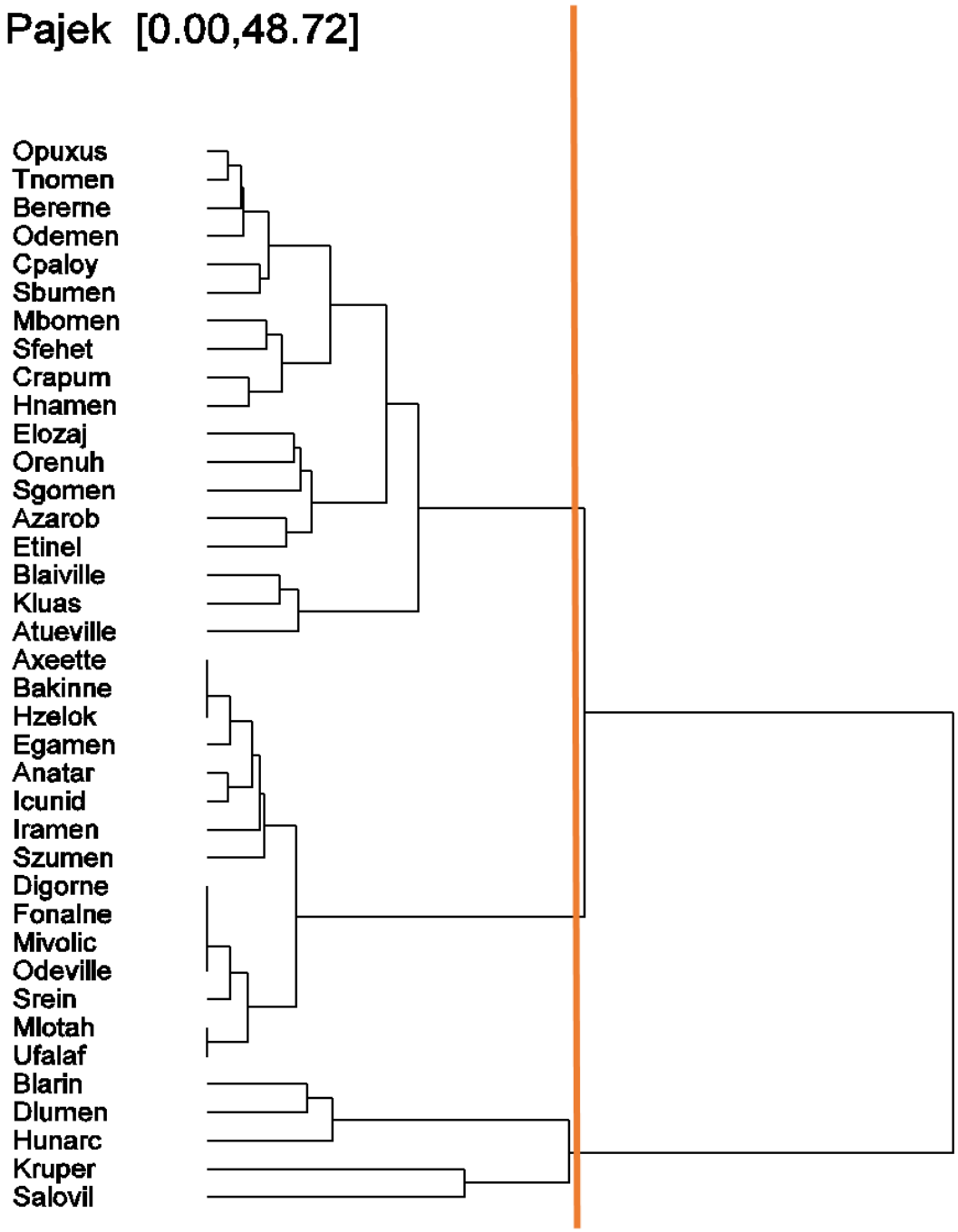

Figure 35 Dendrogram for Network 2.2 (KD SG cognitive presence exploration network)

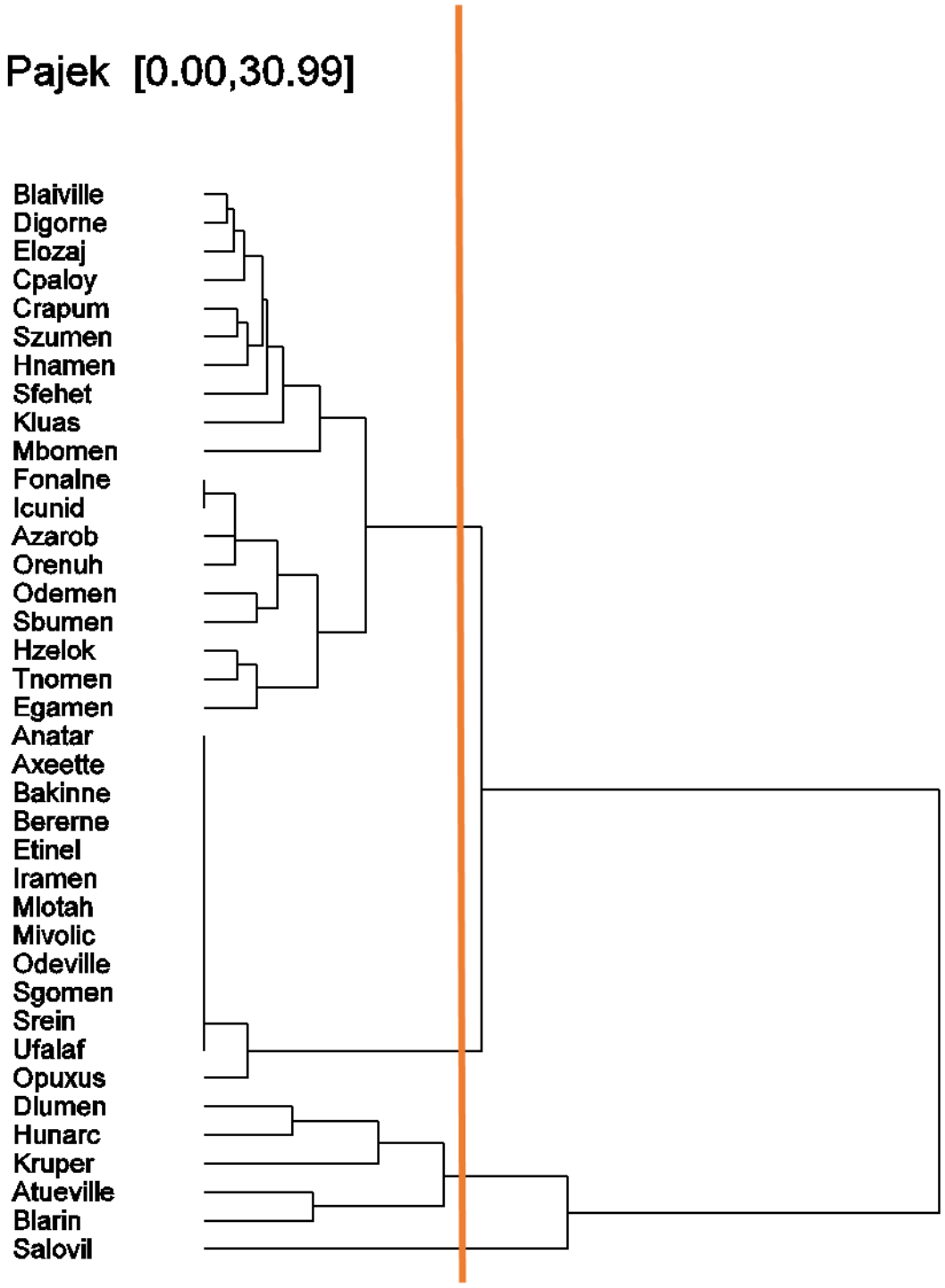

Figure 36 Dendrogram for Network 2.3 (KD SG cognitive presence integration network)

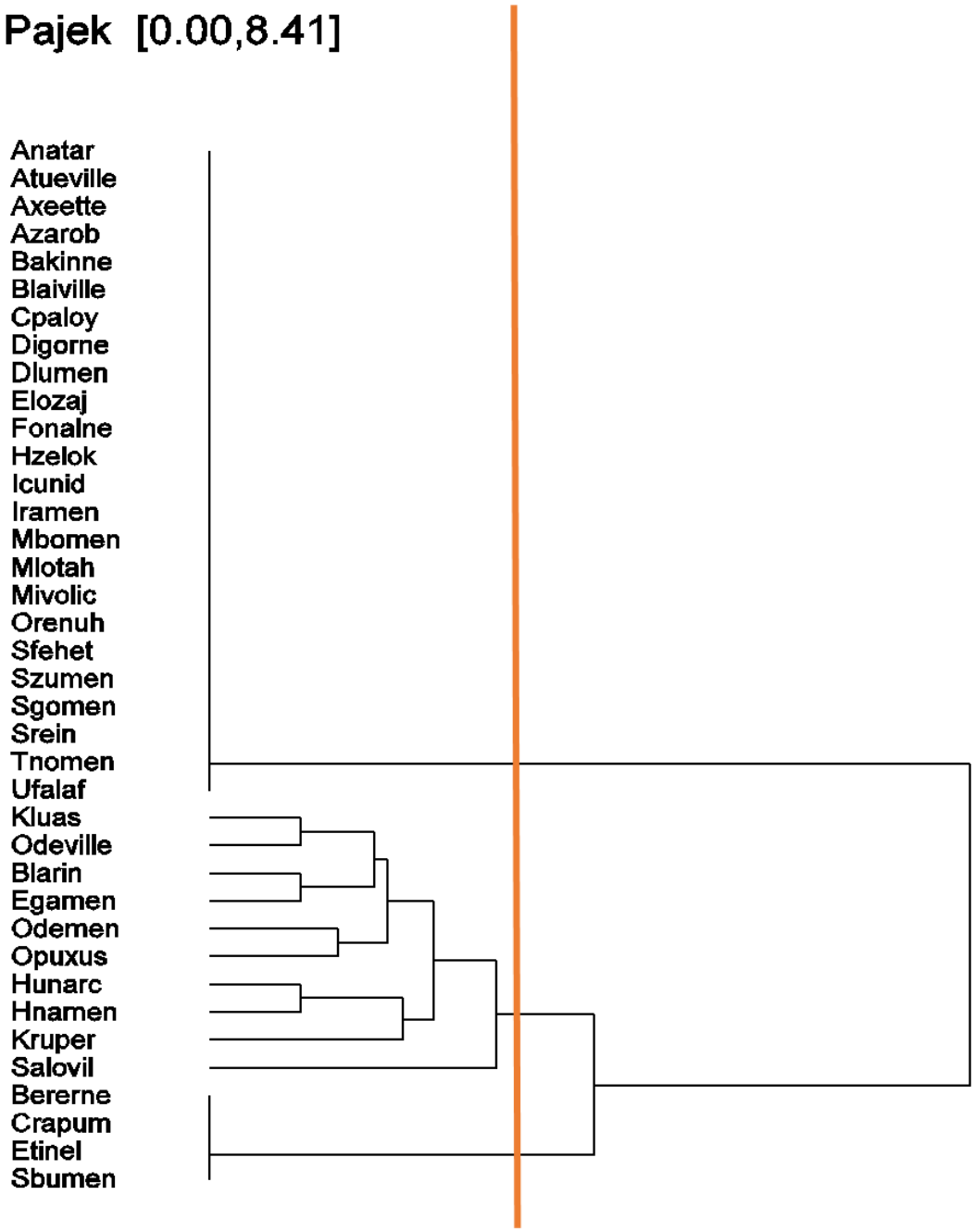

Figure 37 Dendrogram for Network 2.4 (KD SG cognitive presence resolution network)

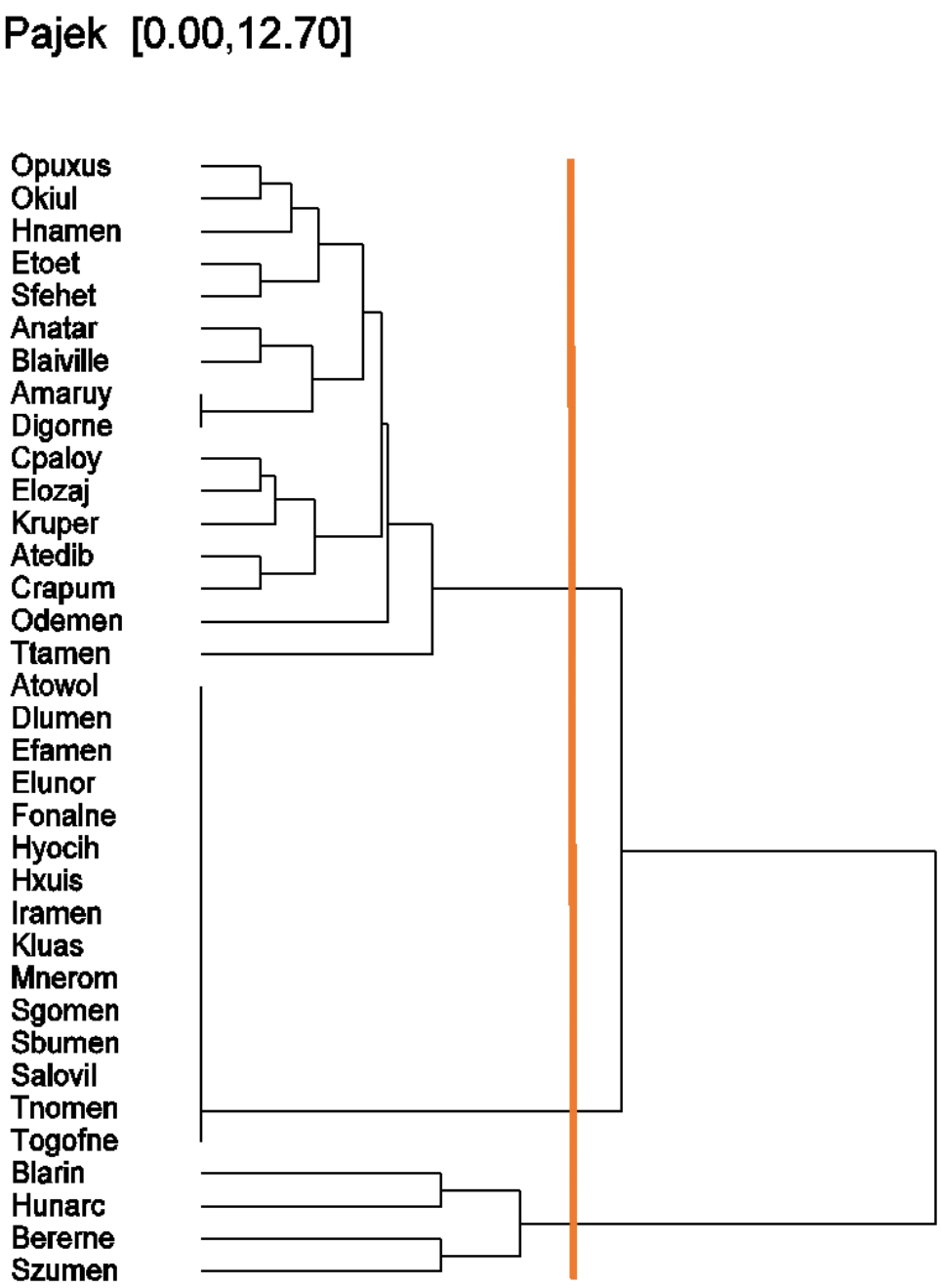

Figure 38 Dendrogram for Network 3.1 (BFV SG social presence affective responses network)

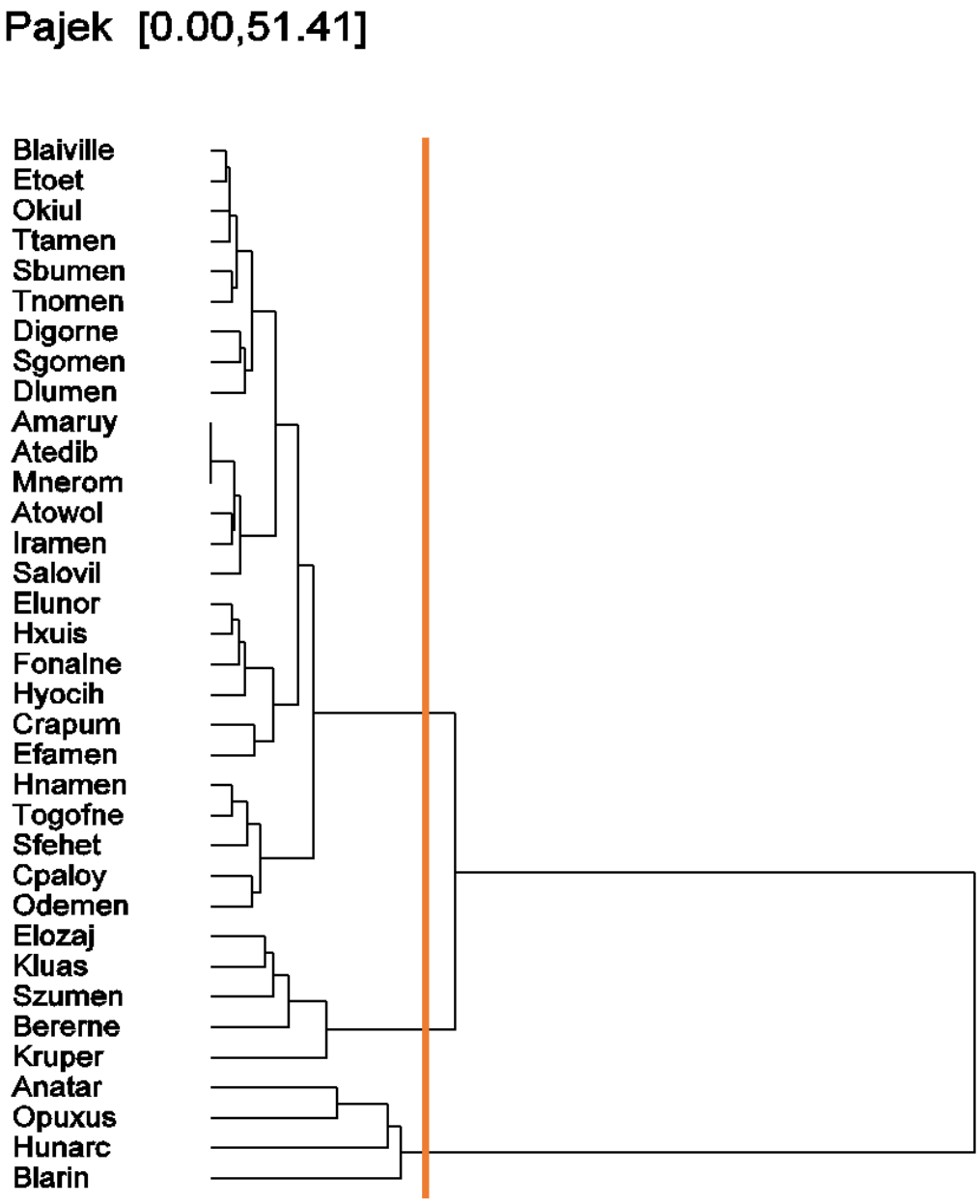

Figure 39 Dendrogram for Network 3.2 (BFV SG social presence open communication network)

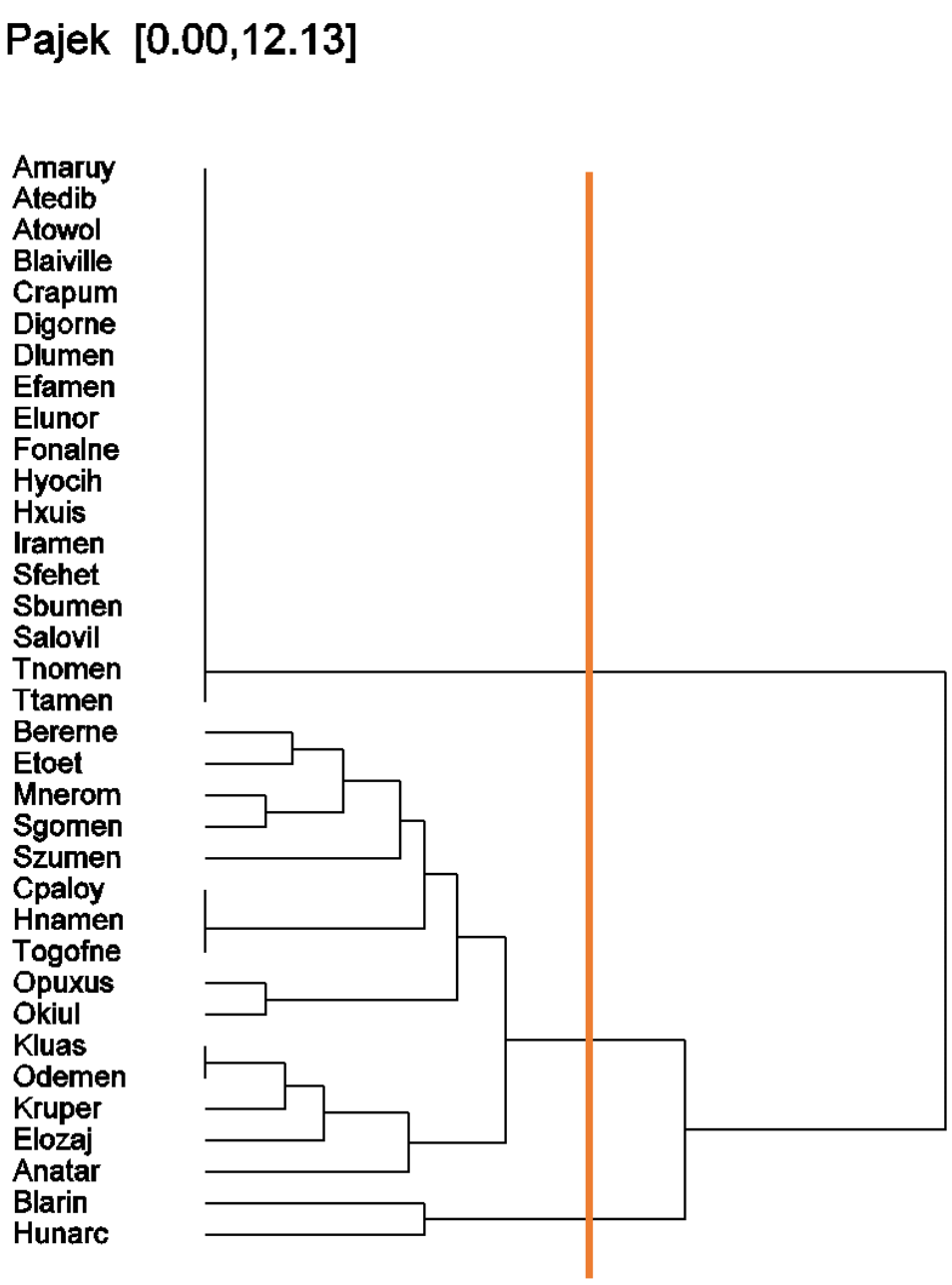

Figure 40 Dendrogram for Network 3.3 (BFV SG social presence group cohesion network)

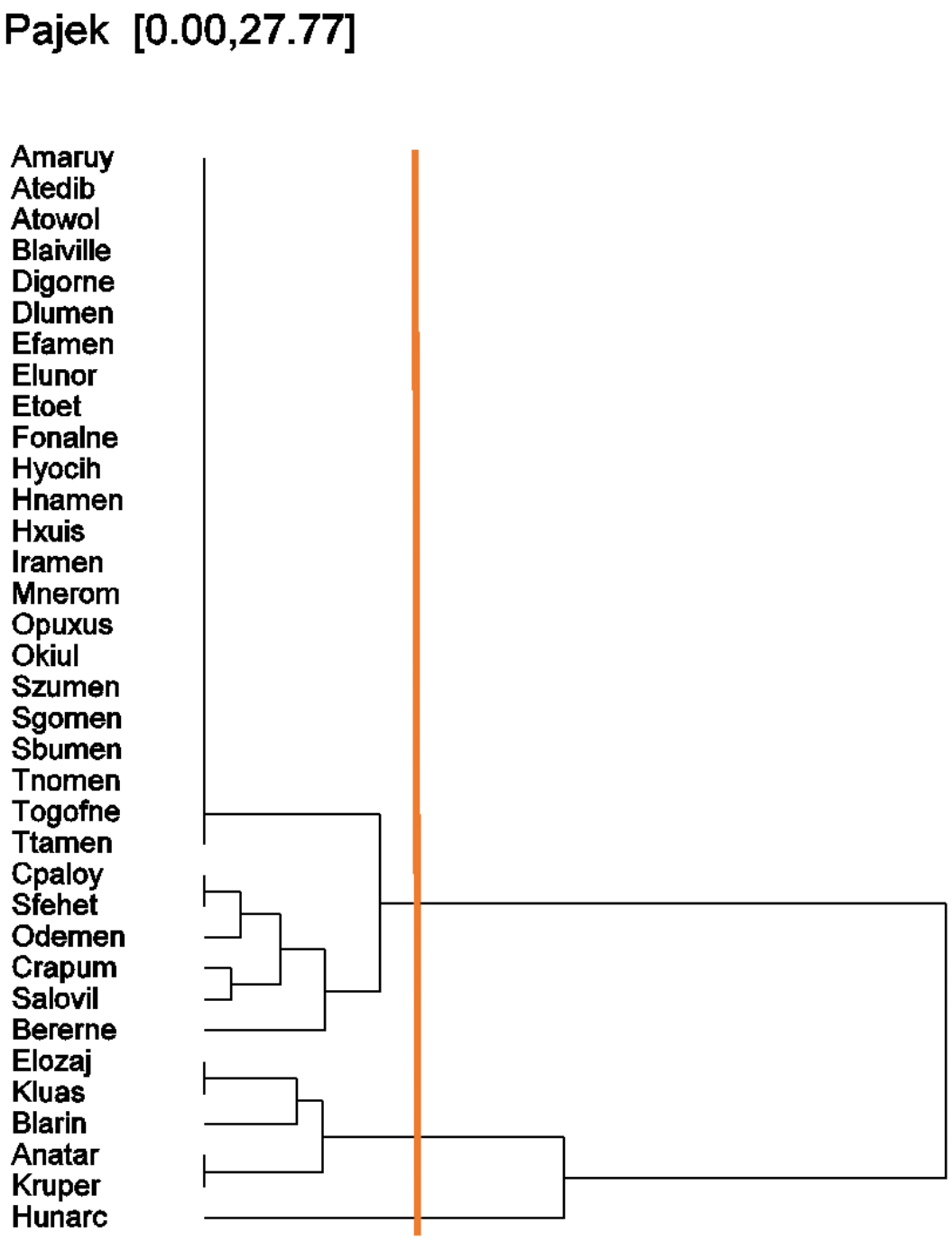

Figure 41 Dendrogram for Network 4.1 (BFV SG cognitive presence triggering event network)

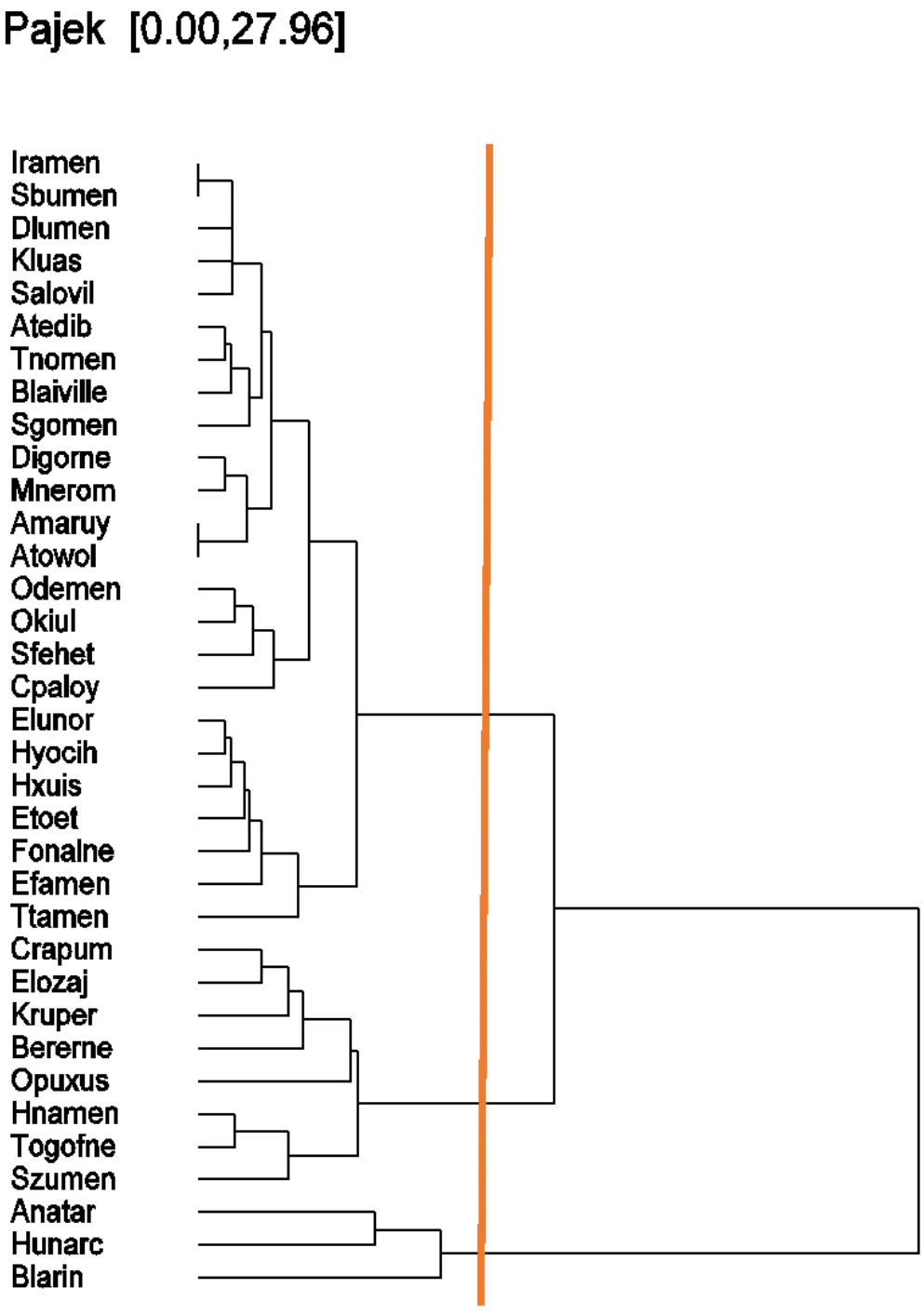

Figure 42 Dendrogram for Network 4.2 (BFV SG cognitive presence exploration network)

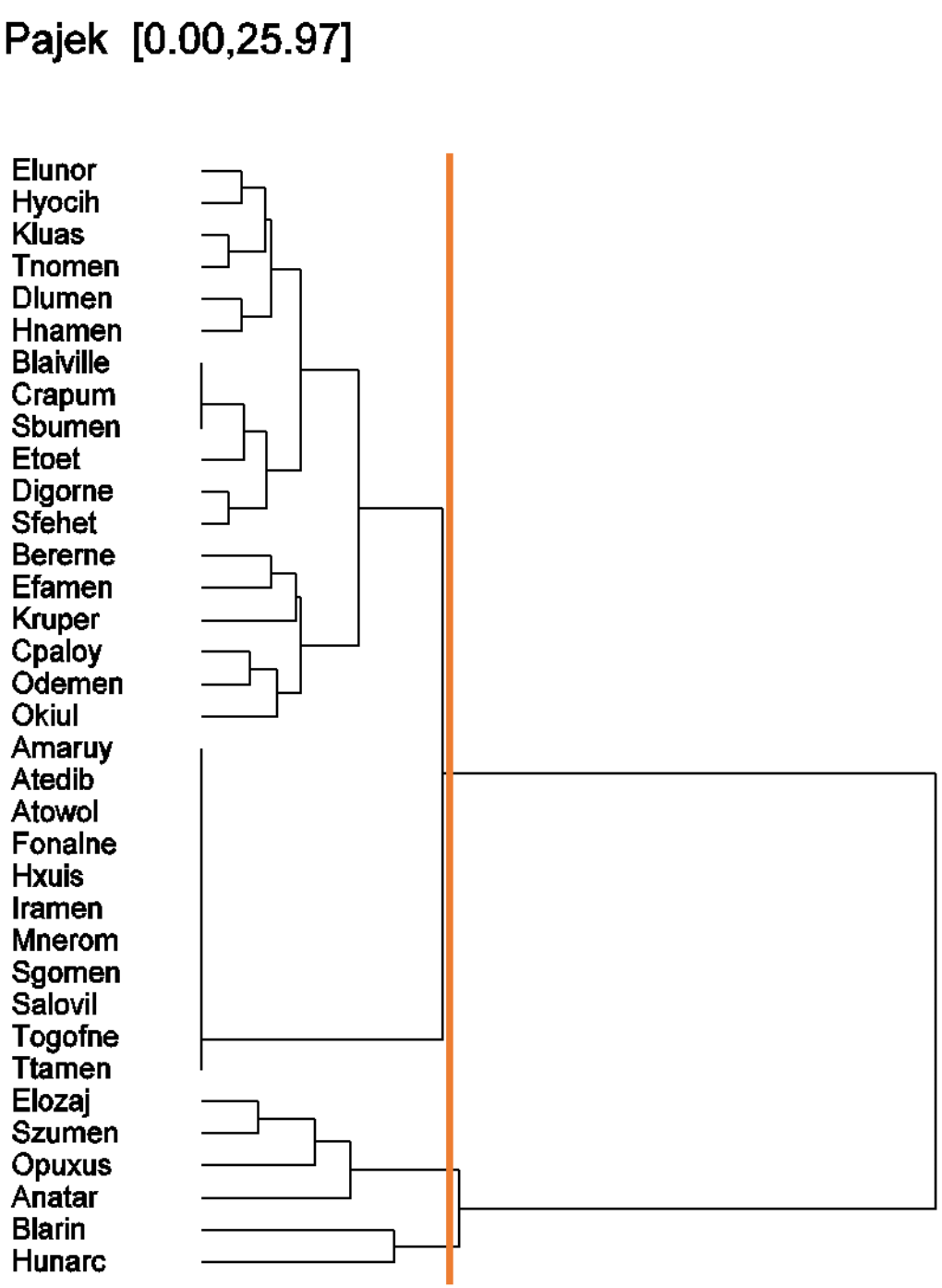

Figure 43 Dendrogram for Network 4.3 (BFV SG cognitive presence integration network)

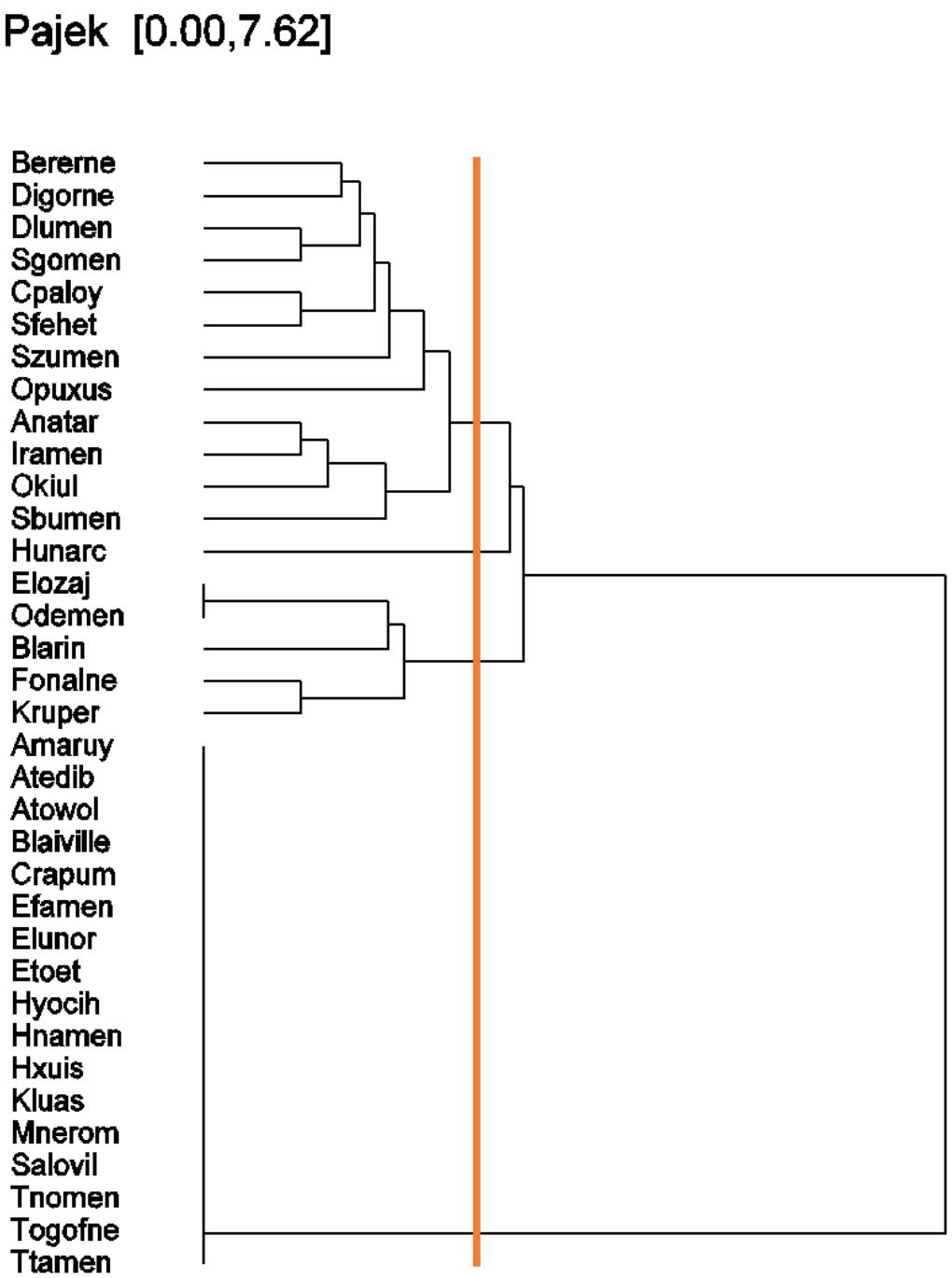

Figure 44 Dendrogram for Network 4.4 (BFV SG cognitive presence resolution network)

APPENDIX D

CHI-SQUARE DATA SETS

CASE	KD_CP_TE	KD_CP_EX	KD_CP_IN	KD_CP_RE	KD_SP_AF	KD_SP_OC	KD_SP_GC
1	1	1	1	1	1	1	1
2	2	2	2	1	2	2	1
3	3	1	1	1	1	1	2
4	1	2	3	1	3	1	1
5	3	1	1	1	1	1	2
6	3	2	1	2	1	1	1
7	1	2	3	1	3	3	2
8	2	3	2	3	3	2	3
9	1	2	3	2	1	3	1
10	3	2	3	1	3	1	1
11	3	1	3	1	1	1	2
12	2	3	2	1	3	2	3
13	3	1	3	3	1	1	2
14	1	2	3	1	2	3	1
15	3	2	1	2	2	1	1
16	3	1	3	1	1	1	2
17	2	3	2	3	3	2	1
18	3	1	3	1	1	1	2
19	1	2	3	3	1	3	1
20	1	1	3	1	1	1	1
21	3	1	1	1	1	1	2
22	2	3	2	3	3	2	3
23	1	2	3	3	2	3	1
24	1	2	3	1	3	3	1
25	3	1	1	1	1	1	2
26	1	1	1	1	1	1	2
27	1	2	3	3	1	1	1
28	3	2	1	3	1	1	2
29	3	1	1	3	1	1	2
30	1	2	3	1	2	3	2
31	1	2	3	1	1	3	1
32	3	1	3	1	1	1	1
33	3	2	1	1	2	1	1
34	3	2	3	2	3	1	1
35	3	1	1	1	1	1	2
36	2	3	2	3	3	2	3
37	3	2	3	1	1	1	2
38	3	1	1	1	1	1	2

Figure 45 KD SG chi-square data set

CASE	BFV_CP_TE	BFV_CP_EX	BFV_CP_IN	BFV_CP_RE	BFV_SP_AF	BFV_SP_OC	BFV_SP_GC
1	1	1	1	1	1	1	1
2	2	2	2	2	1	2	2
3	2	2	2	2	1	2	2
4	2	2	2	2	2	2	2
5	2	3	2	1	3	3	1
6	2	2	2	2	1	2	2
7	1	1	3	3	3	1	3
8	2	3	2	2	1	2	2
9	2	2	2	1	1	2	1
10	2	2	2	1	1	2	2
11	2	2	2	1	2	2	2
12	2	2	2	2	2	2	2
13	2	2	2	2	2	2	2
14	1	3	1	3	1	3	1
15	2	2	2	2	1	2	1
16	2	2	2	3	2	2	2
17	3	1	3	1	3	1	3
18	2	2	2	2	2	2	2
19	2	3	2	2	1	2	1
20	2	2	2	2	2	2	2
21	2	2	2	1	2	2	2
22	1	3	2	3	1	3	1
23	1	2	2	2	2	3	1
24	2	2	2	2	2	2	1
25	2	2	2	3	1	2	1
26	2	3	1	1	1	1	1
27	2	2	2	1	1	2	1
28	2	2	2	1	1	2	2
29	2	3	1	1	3	3	1
30	2	2	2	1	2	2	1
31	2	2	2	1	2	2	2
32	2	2	2	2	2	2	2
33	2	2	2	2	2	2	2
34	2	3	2	2	2	2	1
35	2	2	2	2	1	2	2

Figure 46 BFV SG chi-square data set

APPENDIX E

SOCIOGRAMS

In this section, sociograms for the networks constructed in this study are presented.

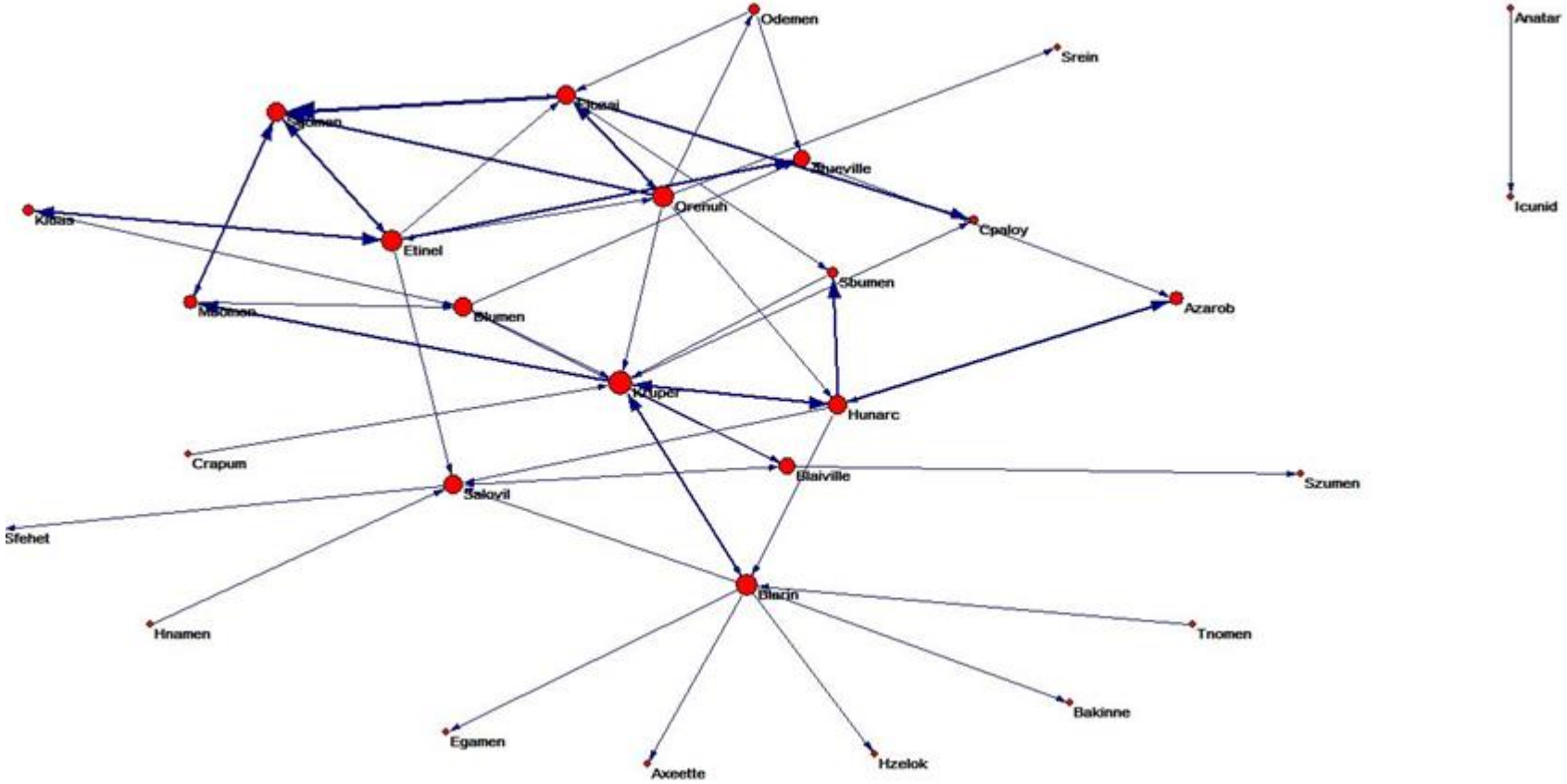

Figure 47 Sociogram of Network 1. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

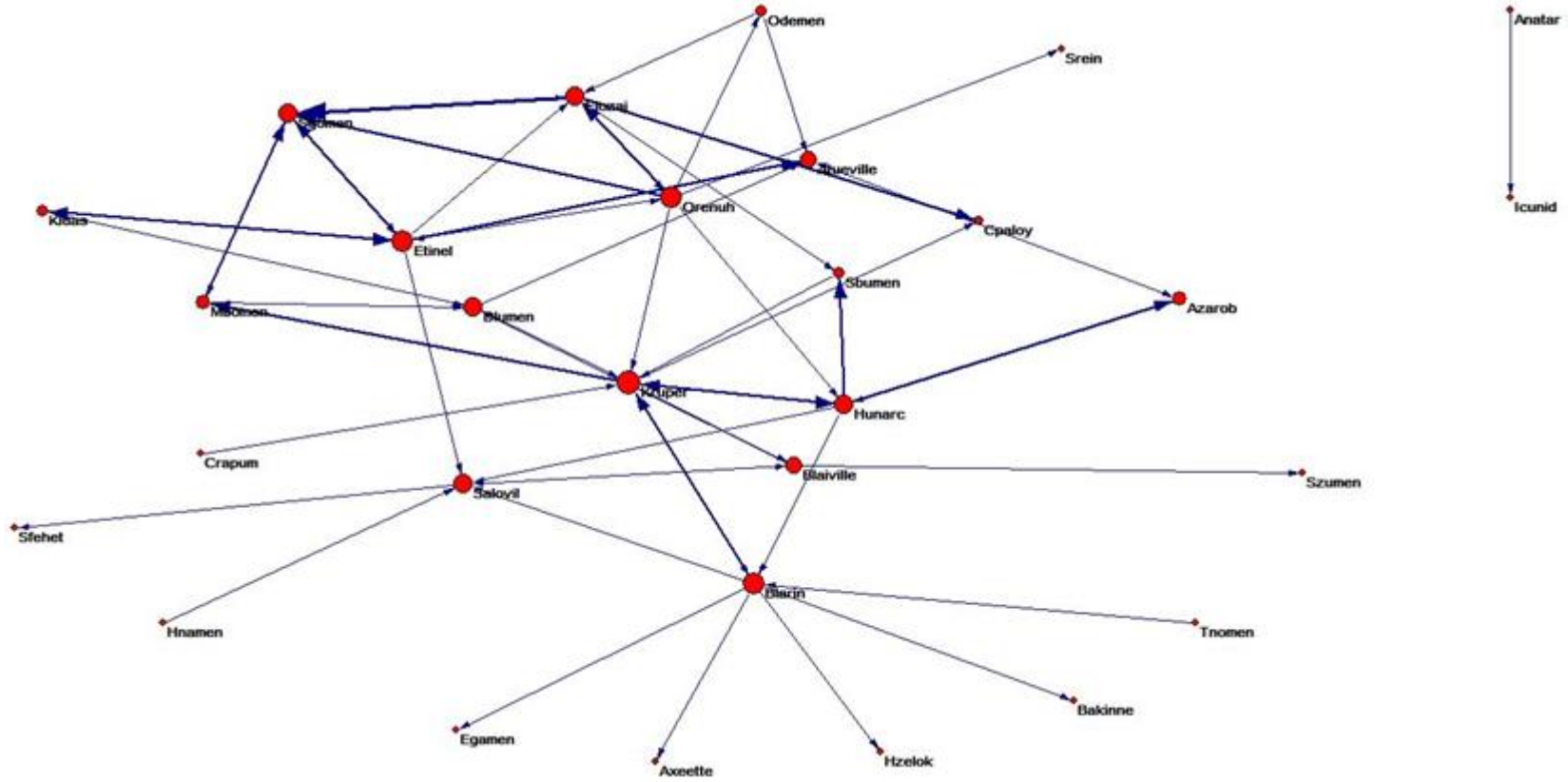

Figure 48 Sociogram of Network 1.1. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

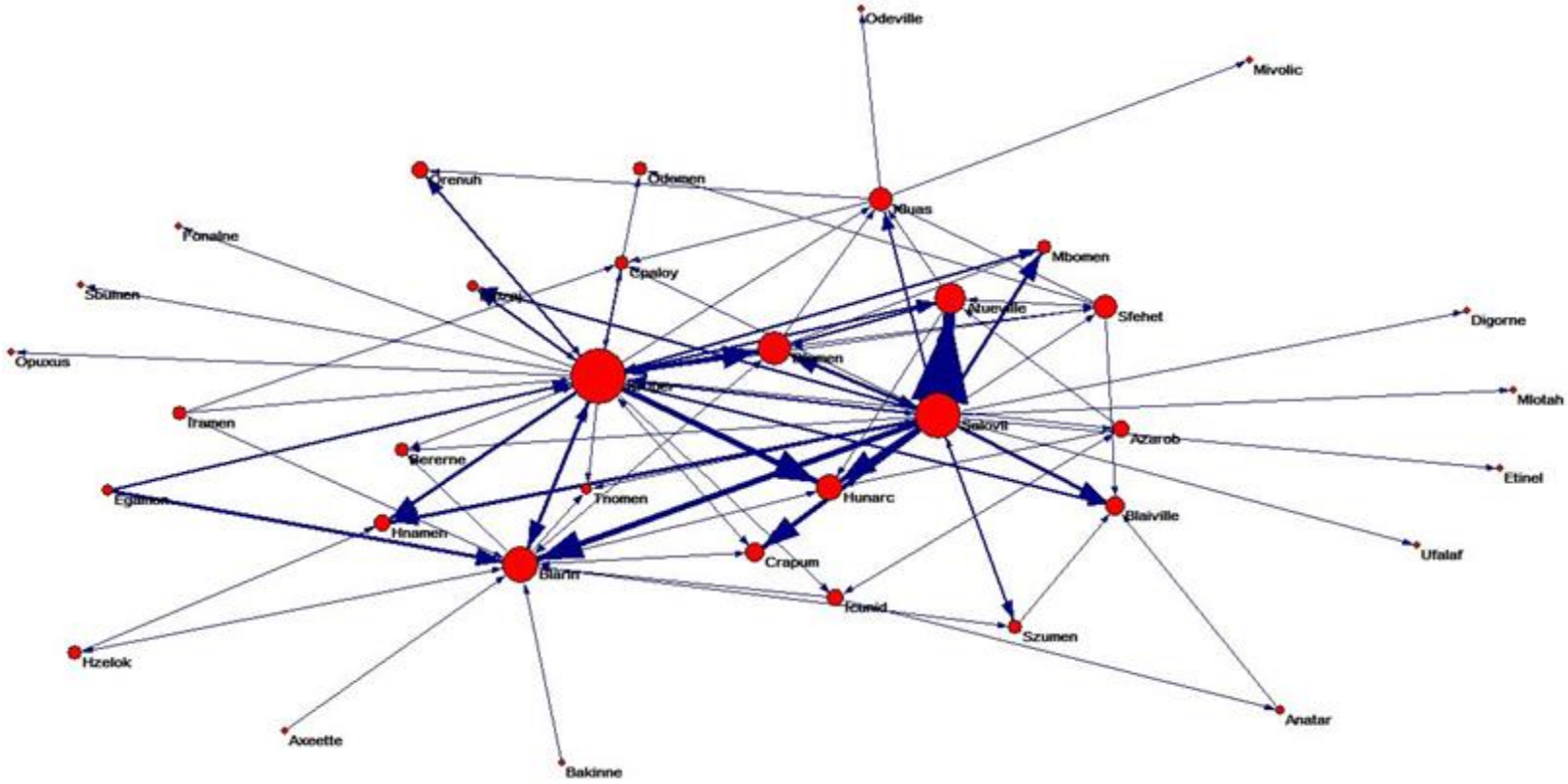

Figure 49 Sociogram of Network 1.2. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

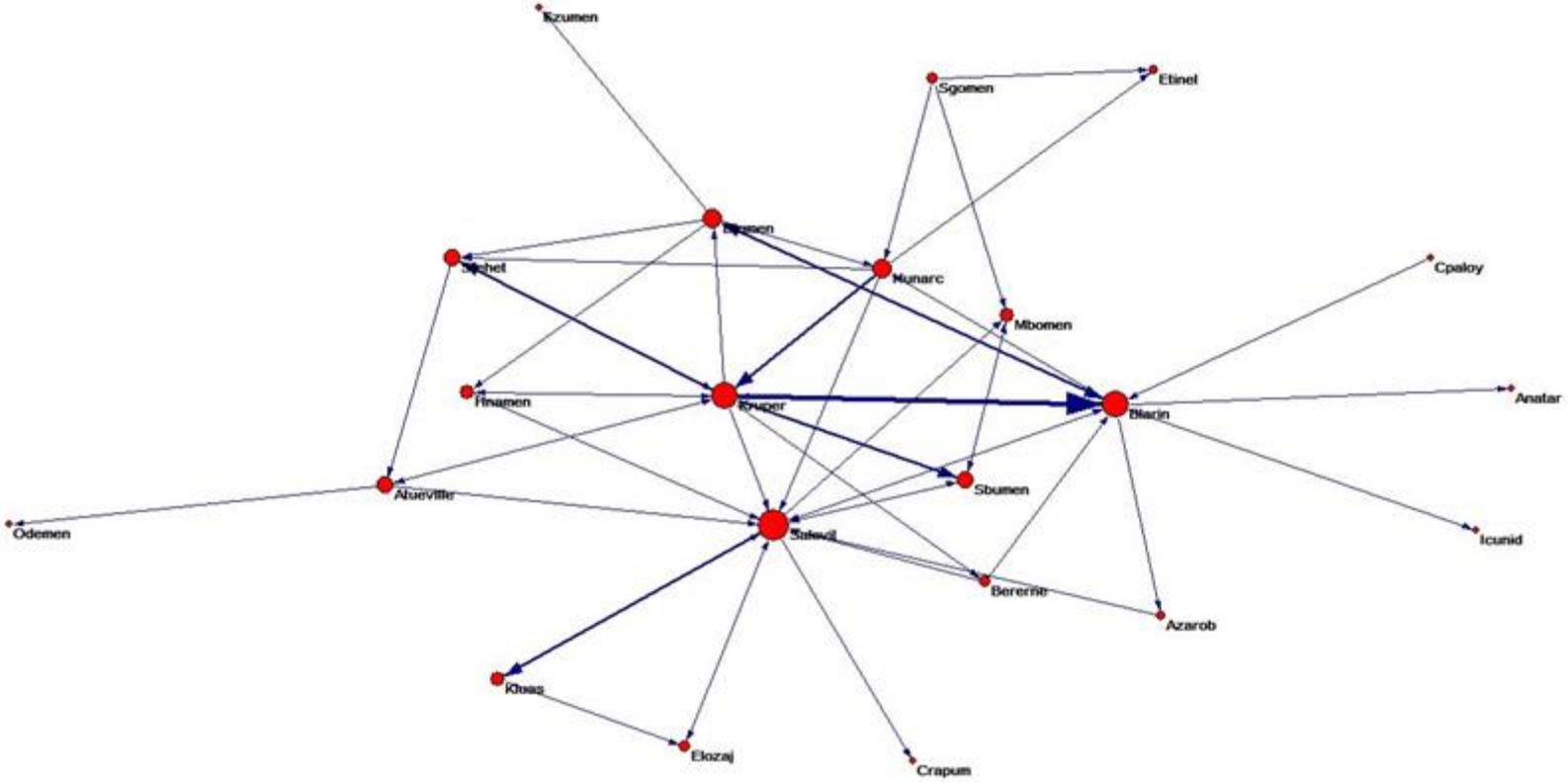

Figure 50 Sociogram of Network 1.3. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

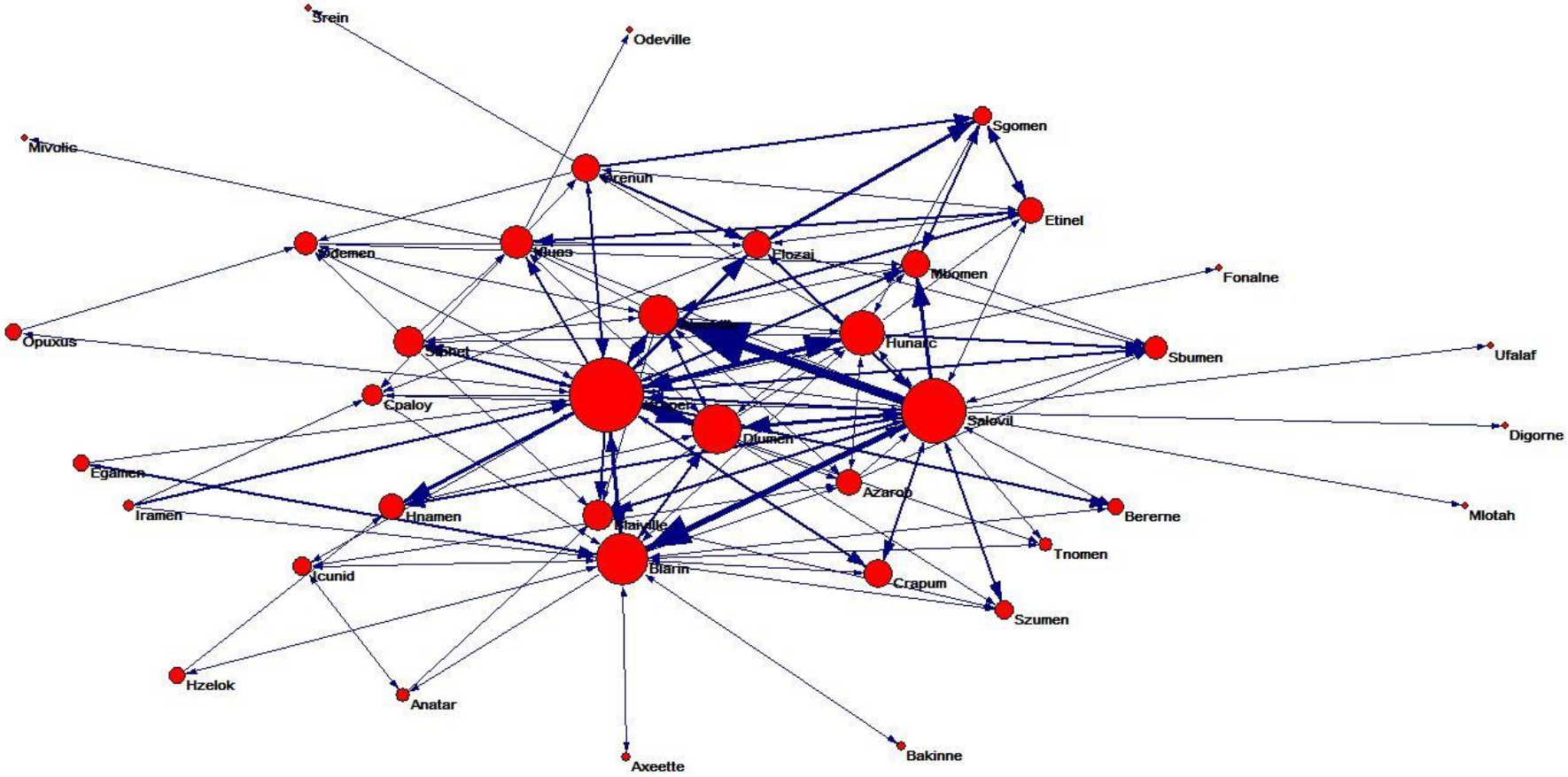

Figure 51 Sociogram of Network 2. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

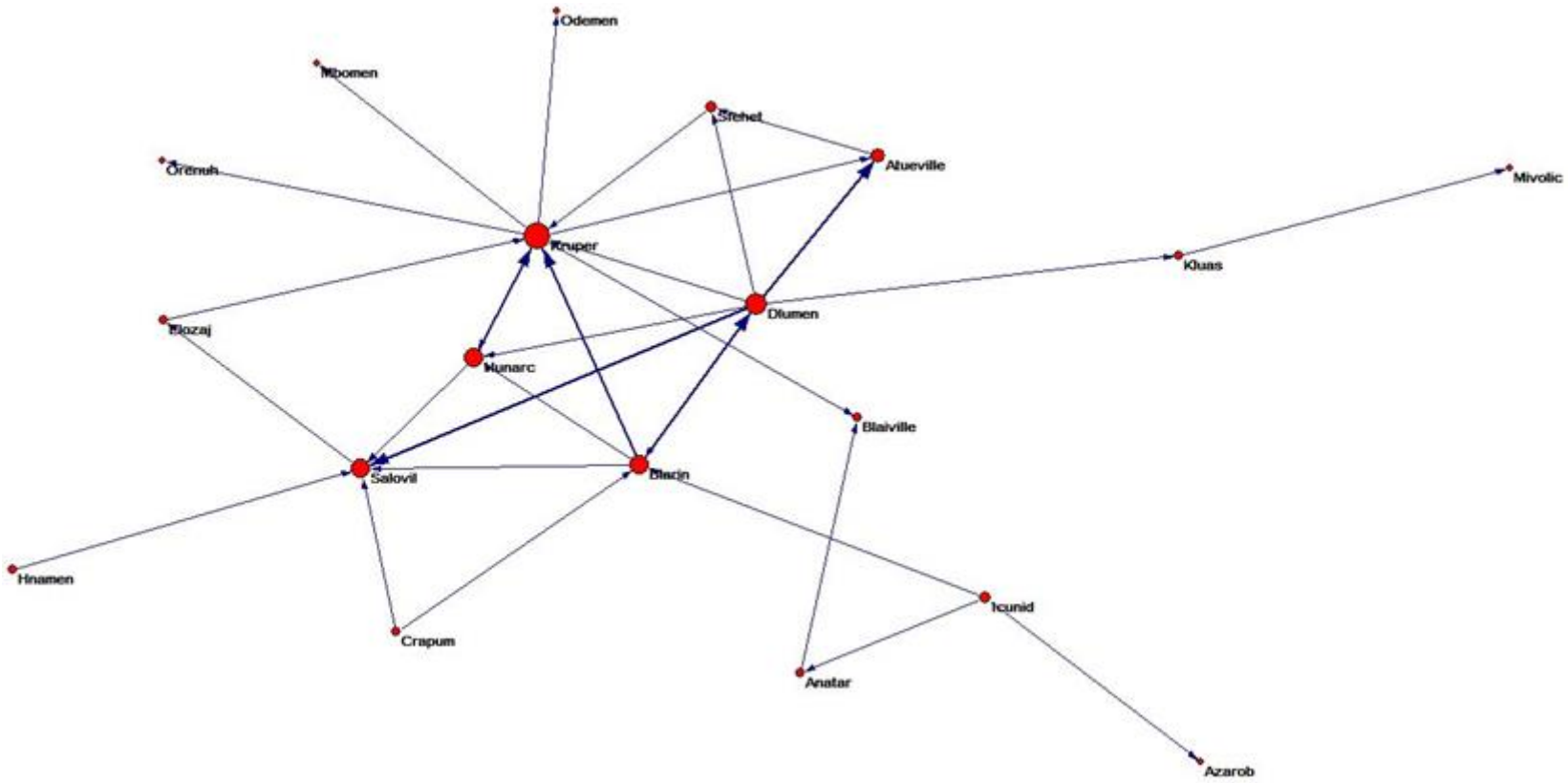

Figure 52 Sociogram of Network 2.1. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

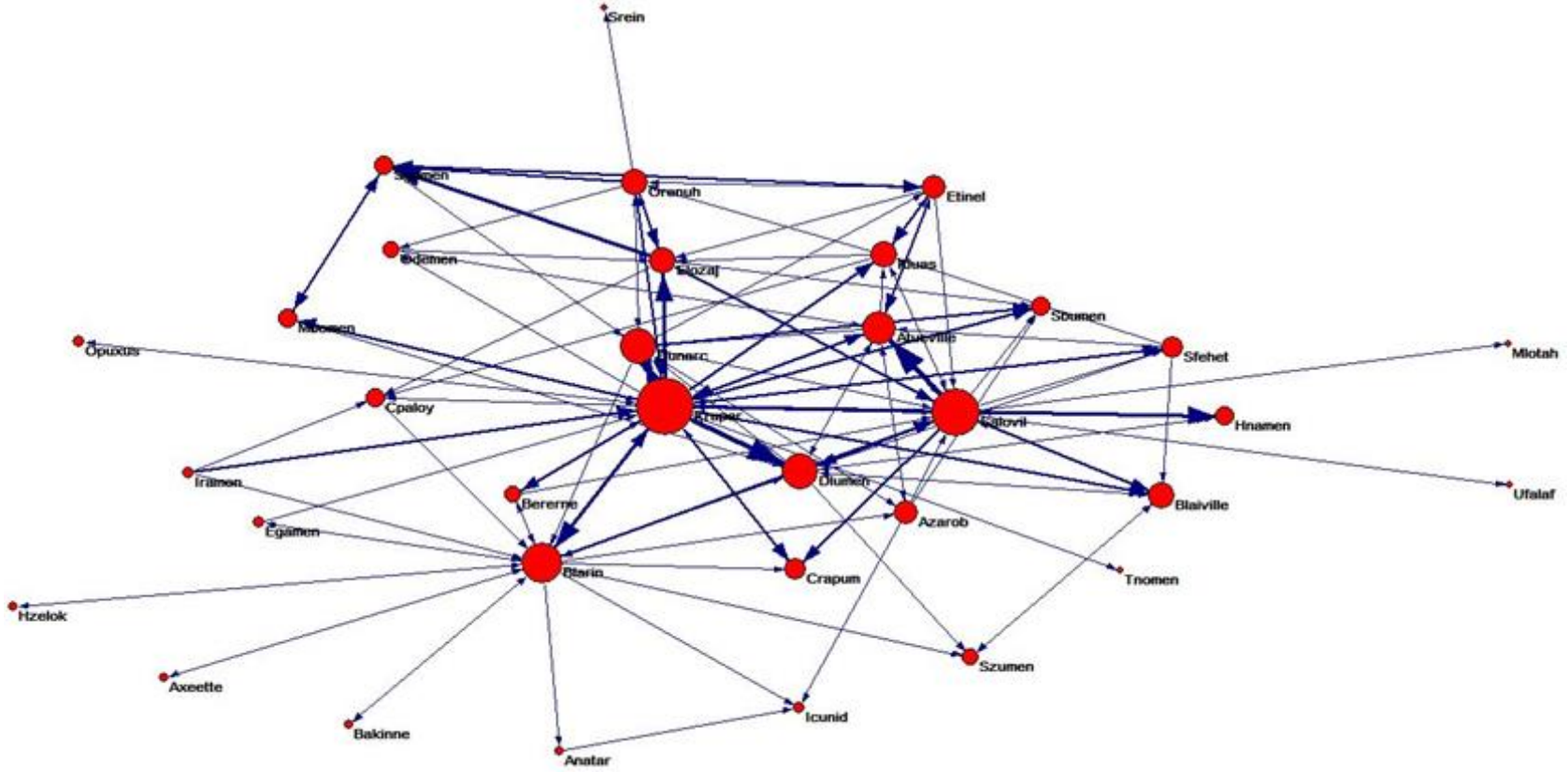

Figure 53 Sociogram of Network 2.2 One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

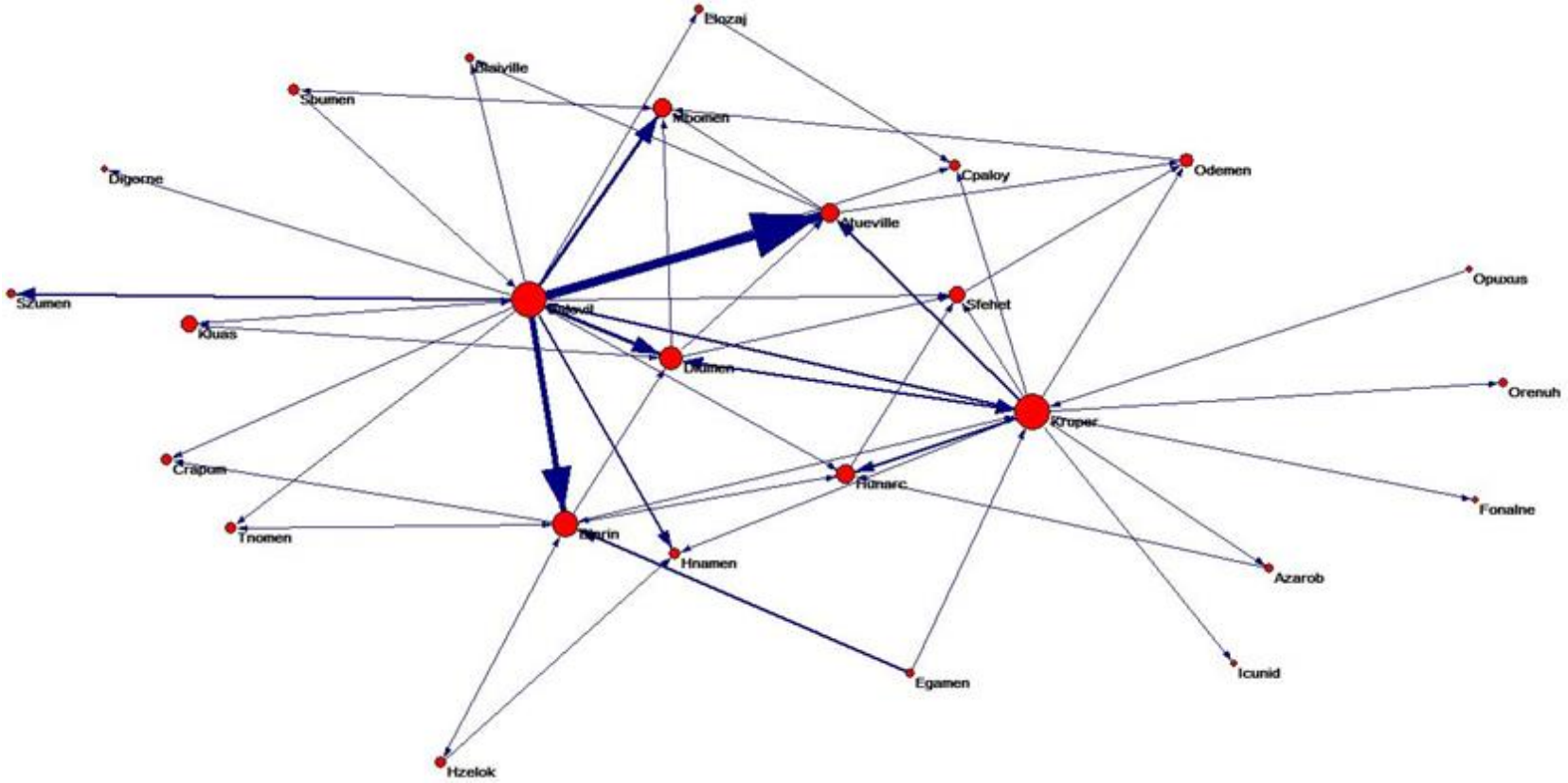

Figure 54 Sociogram of Network 2.3. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

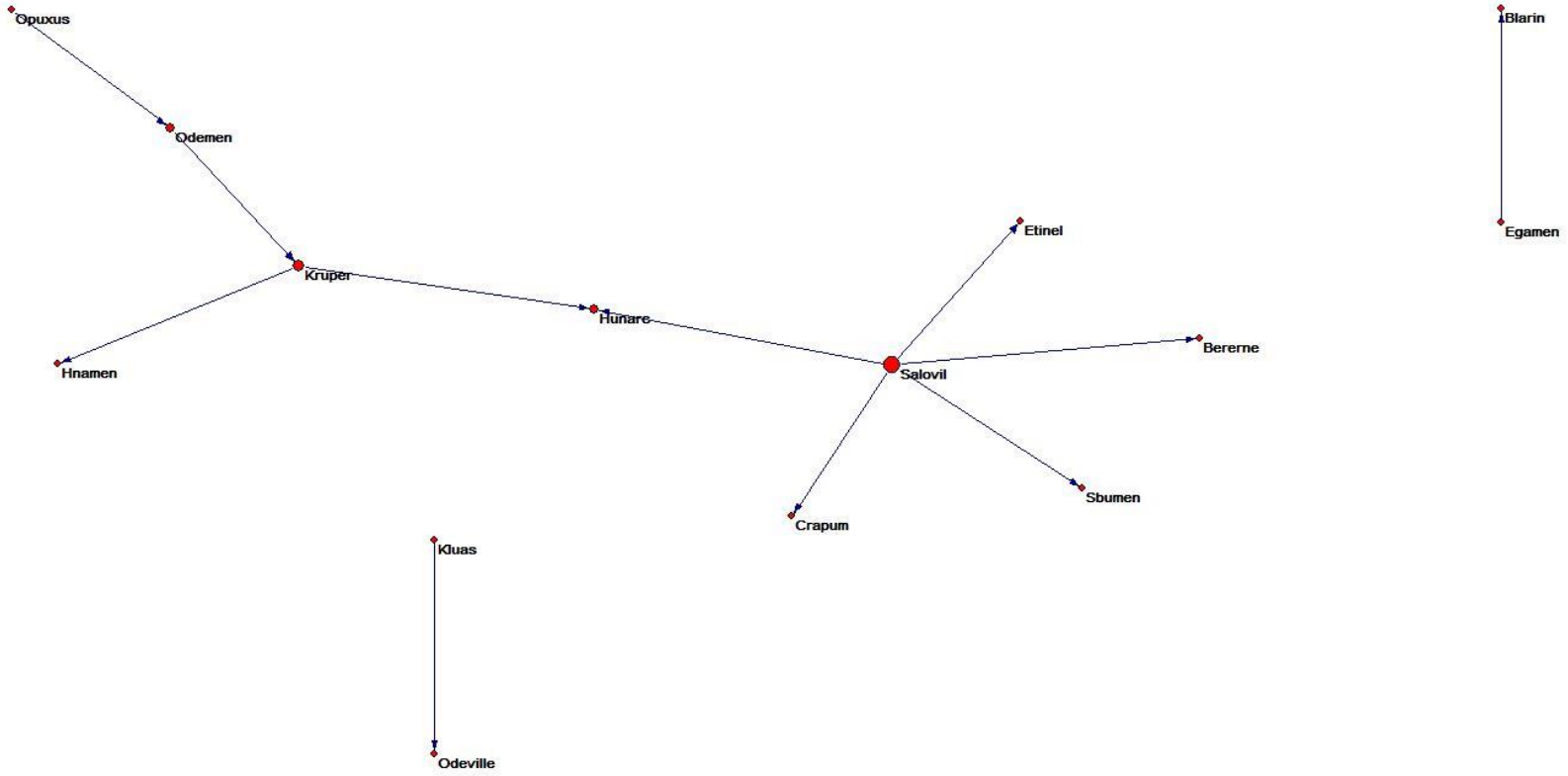

Figure 55 Sociogram of Network 2.4 One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

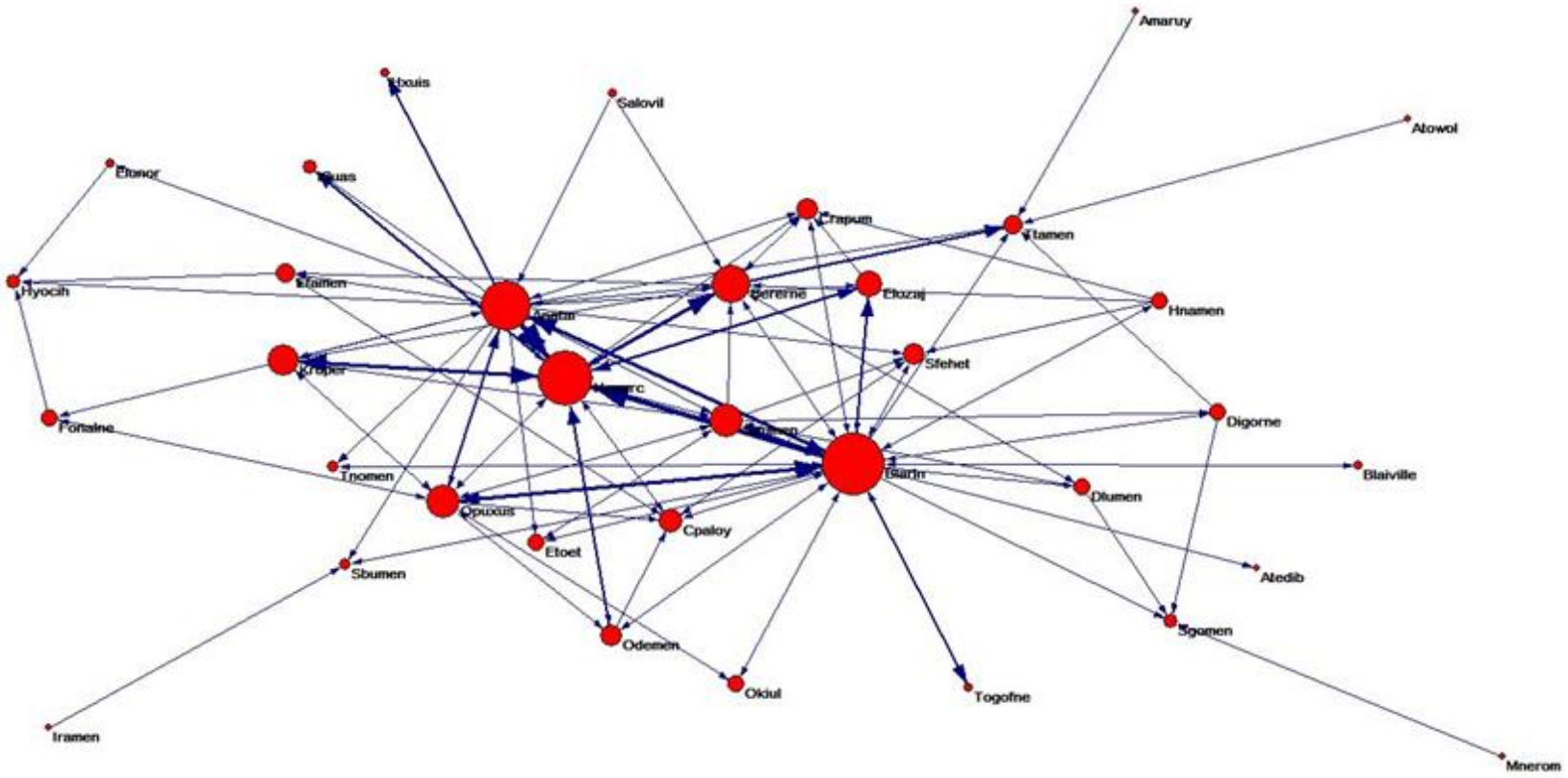

Figure 56 Sociogram of Network 3. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

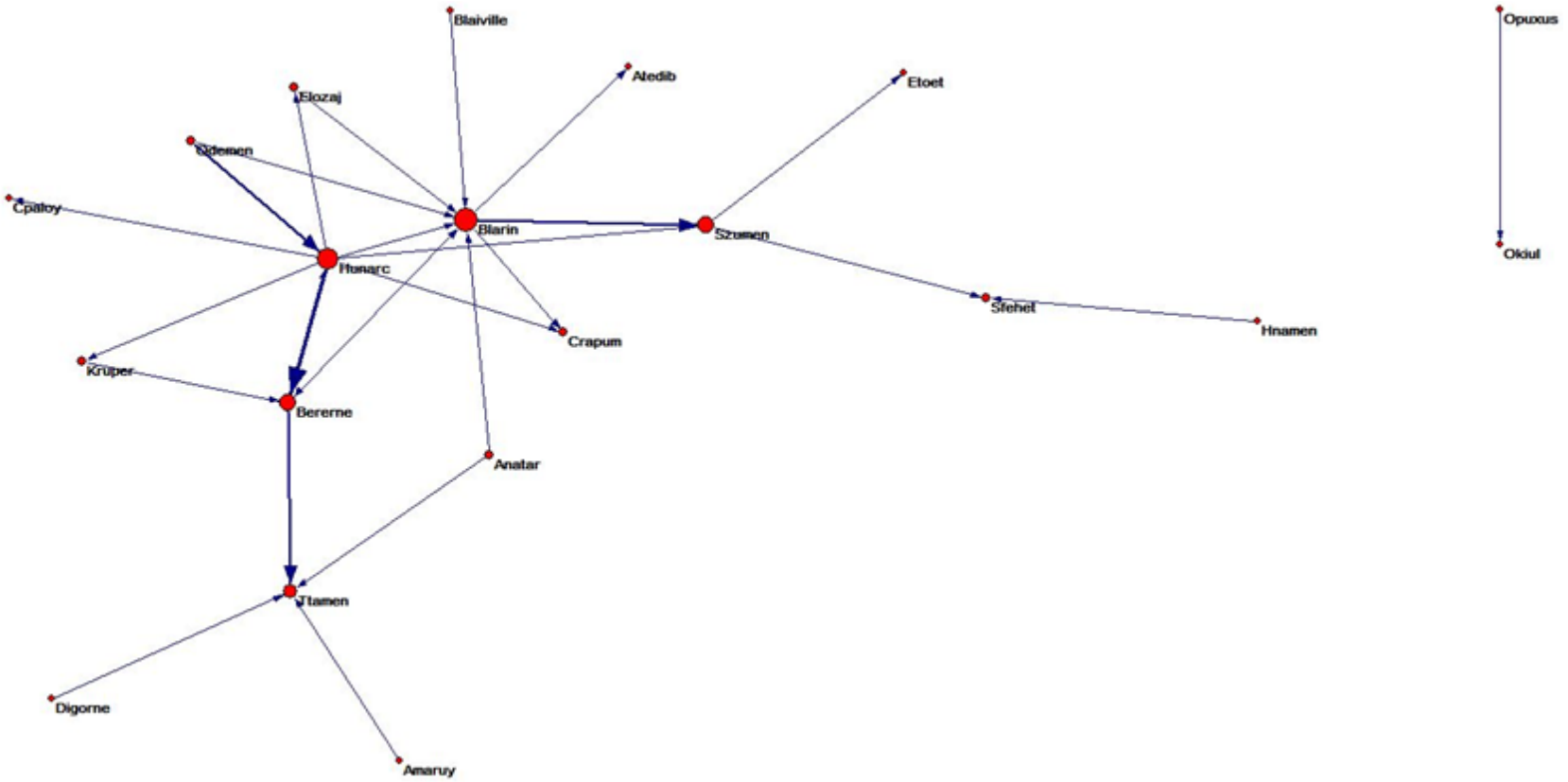

Figure 57 Sociogram of Network 3.1. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

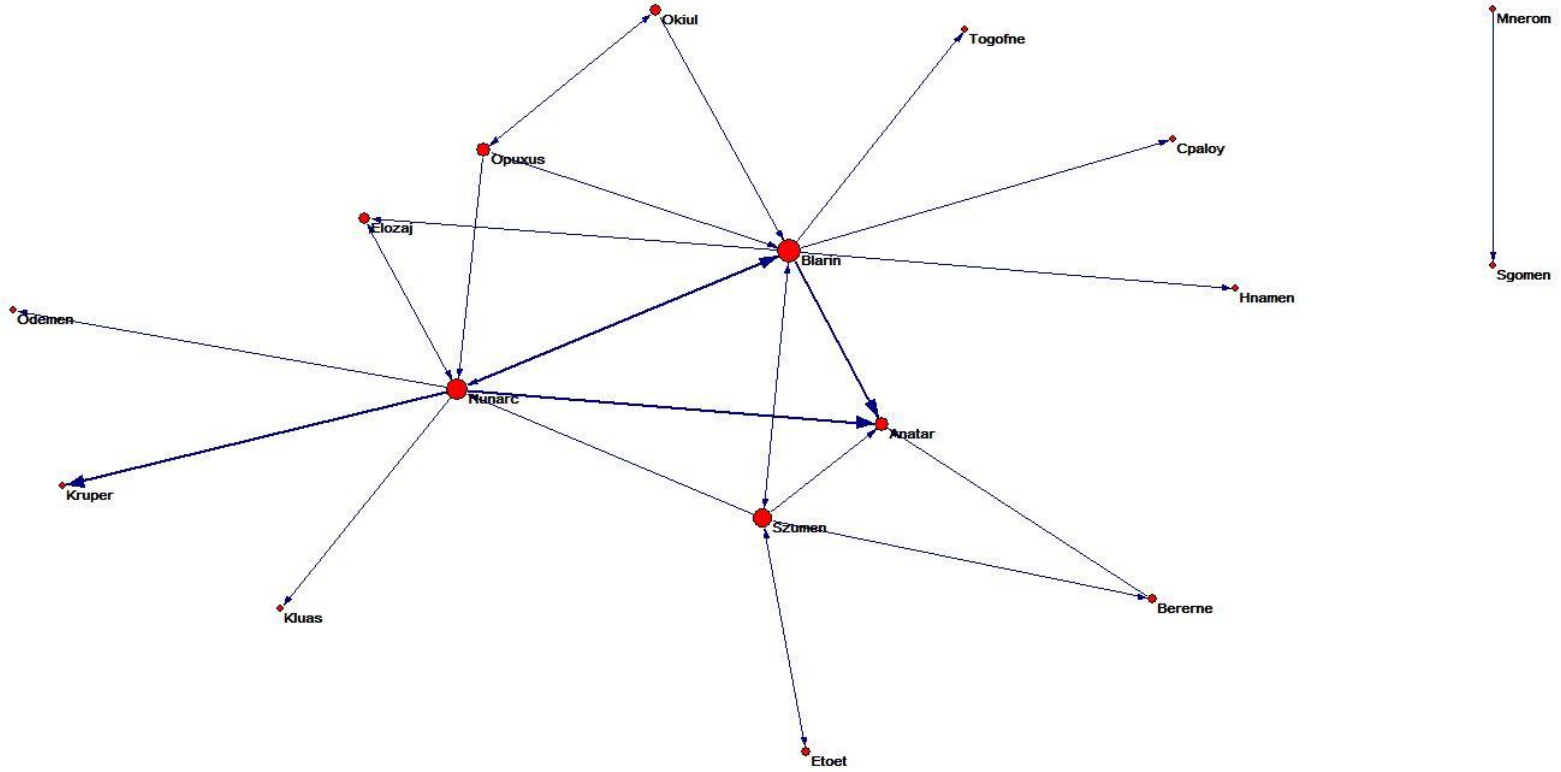

Figure 58 Sociogram of Network 3.2 One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

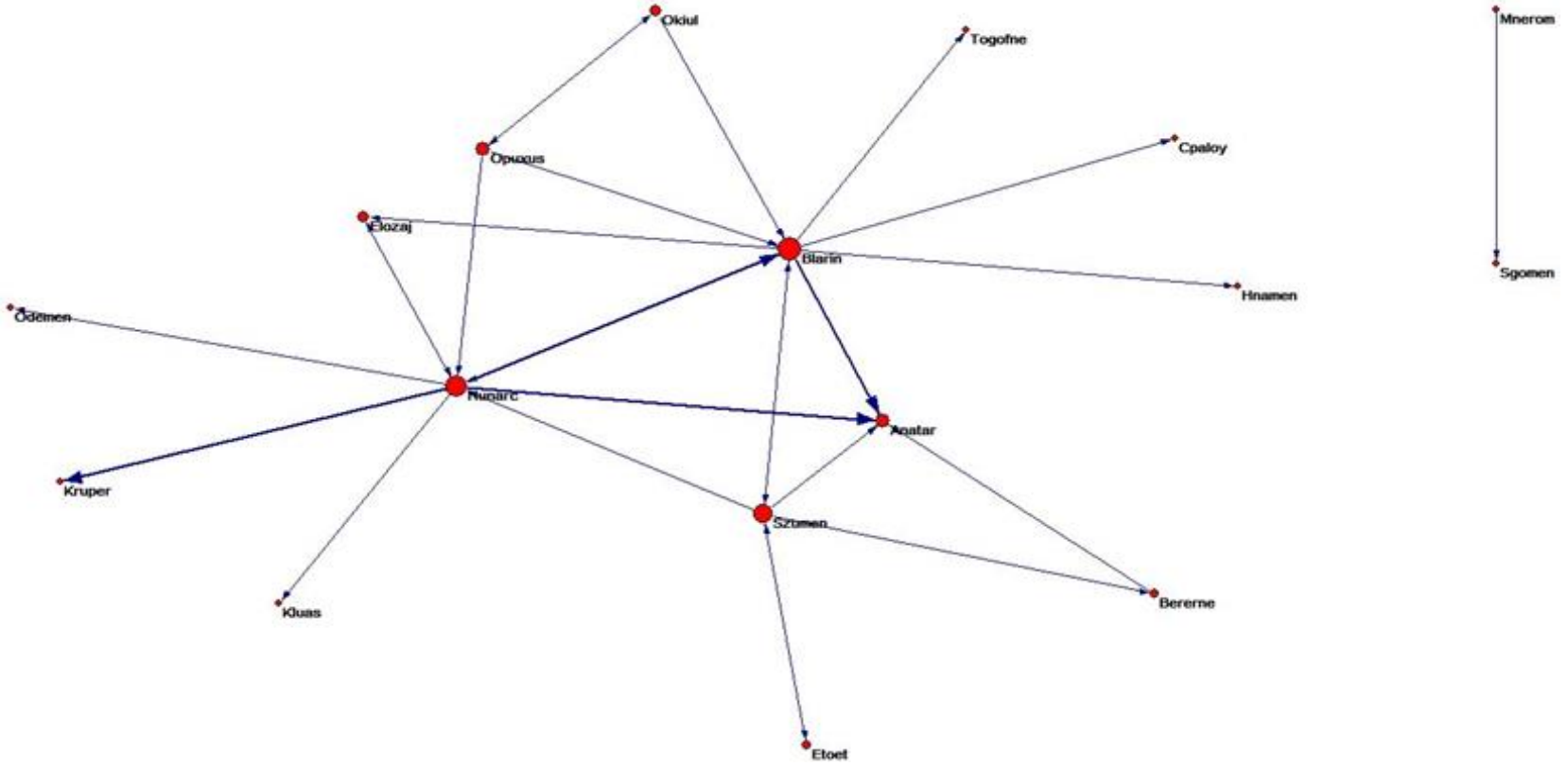

Figure 59 Sociogram of Network 3.3 One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

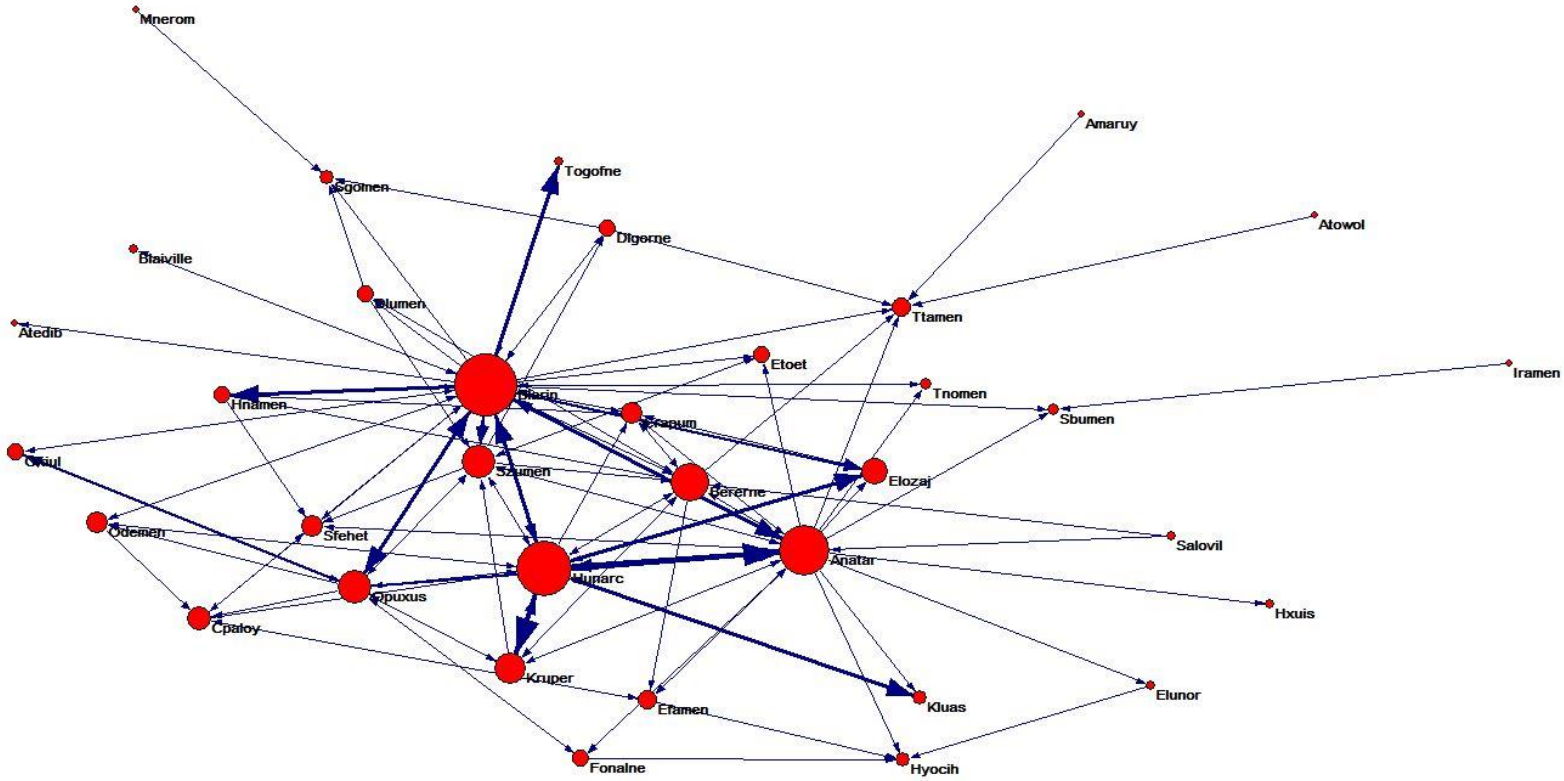

Figure 60 Sociogram of Network 4. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

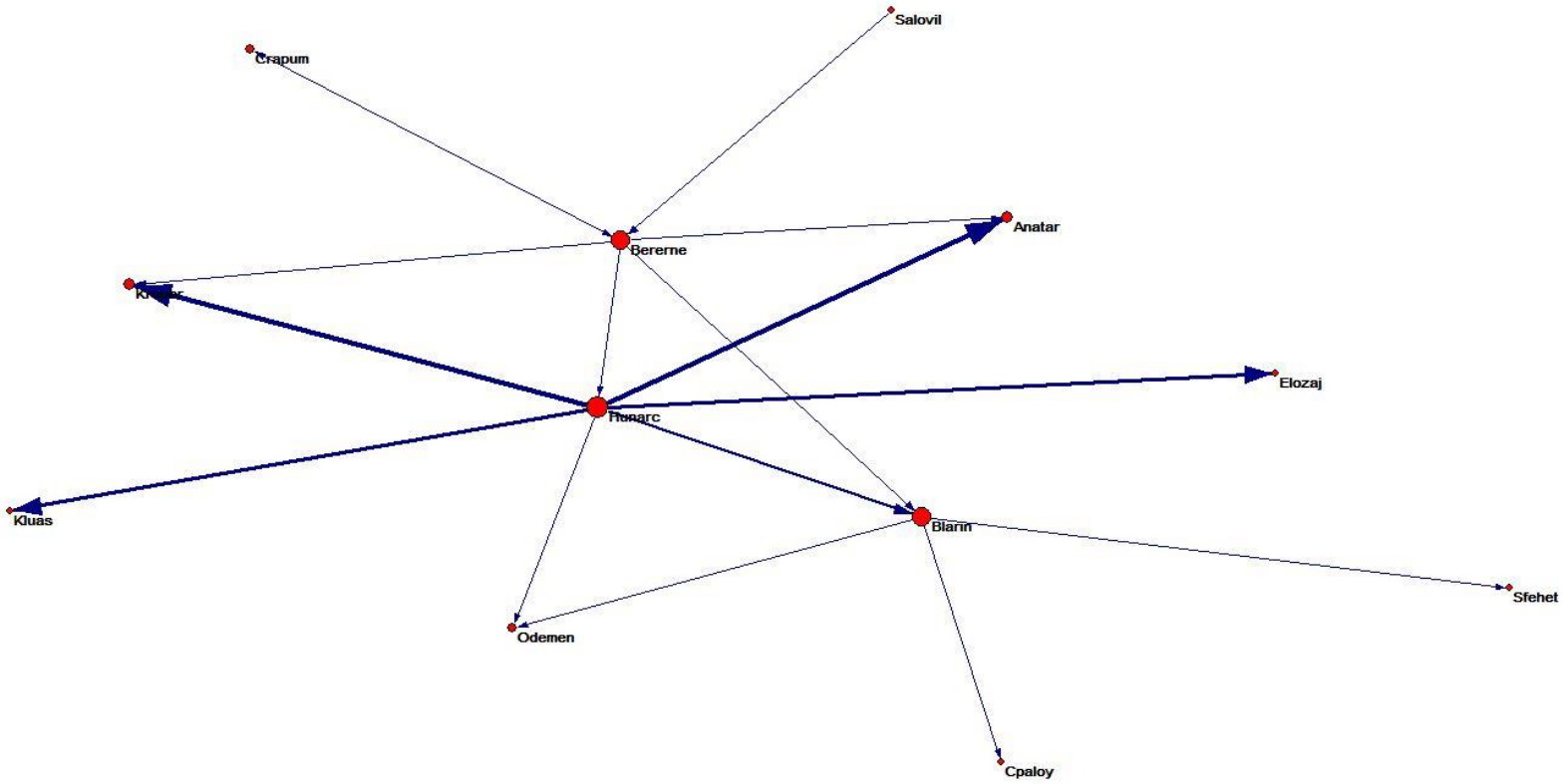

Figure 61 Sociogram of Network. 4.1 One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

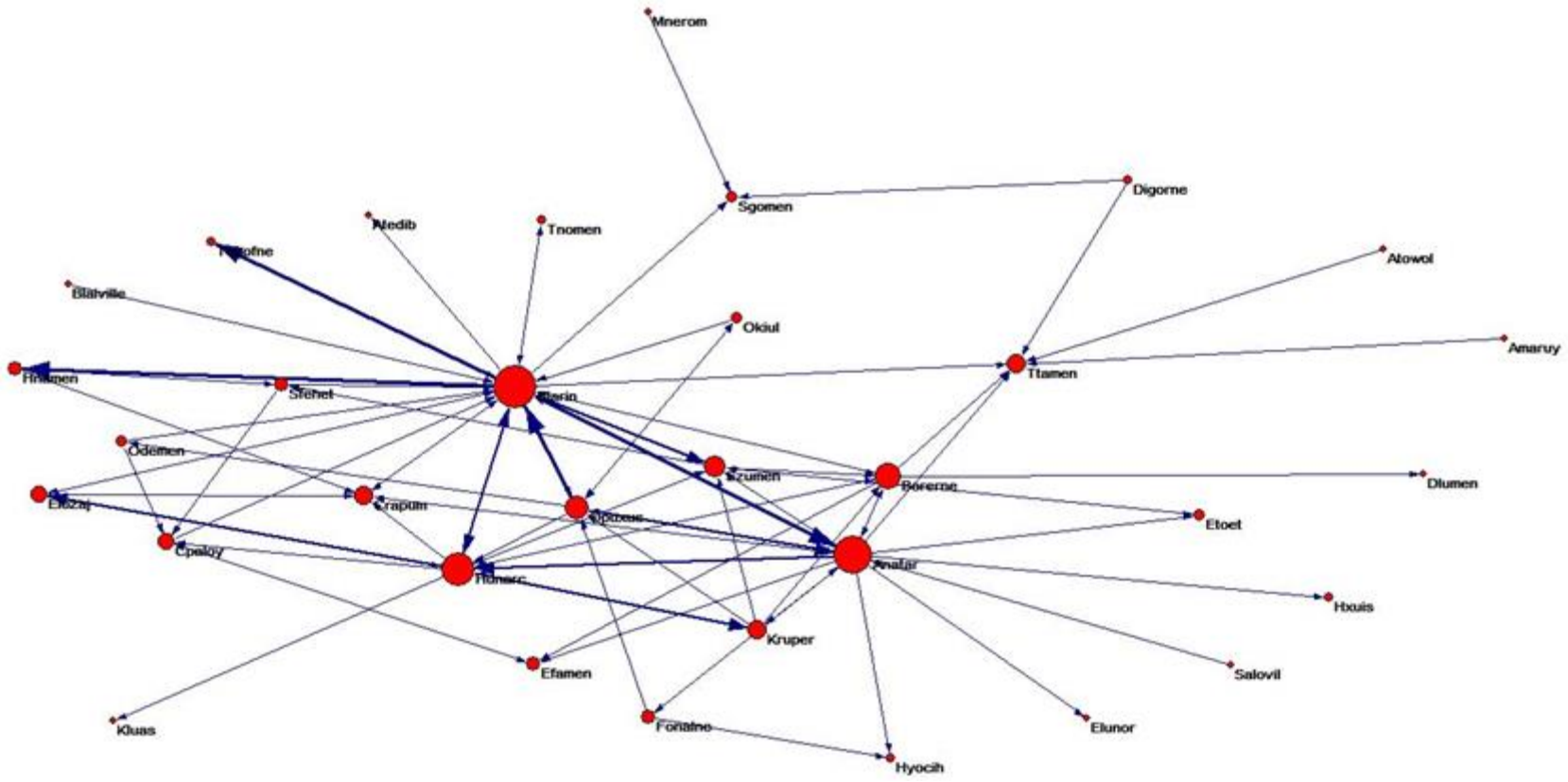

Figure 62 Sociogram of Network. 4.2. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

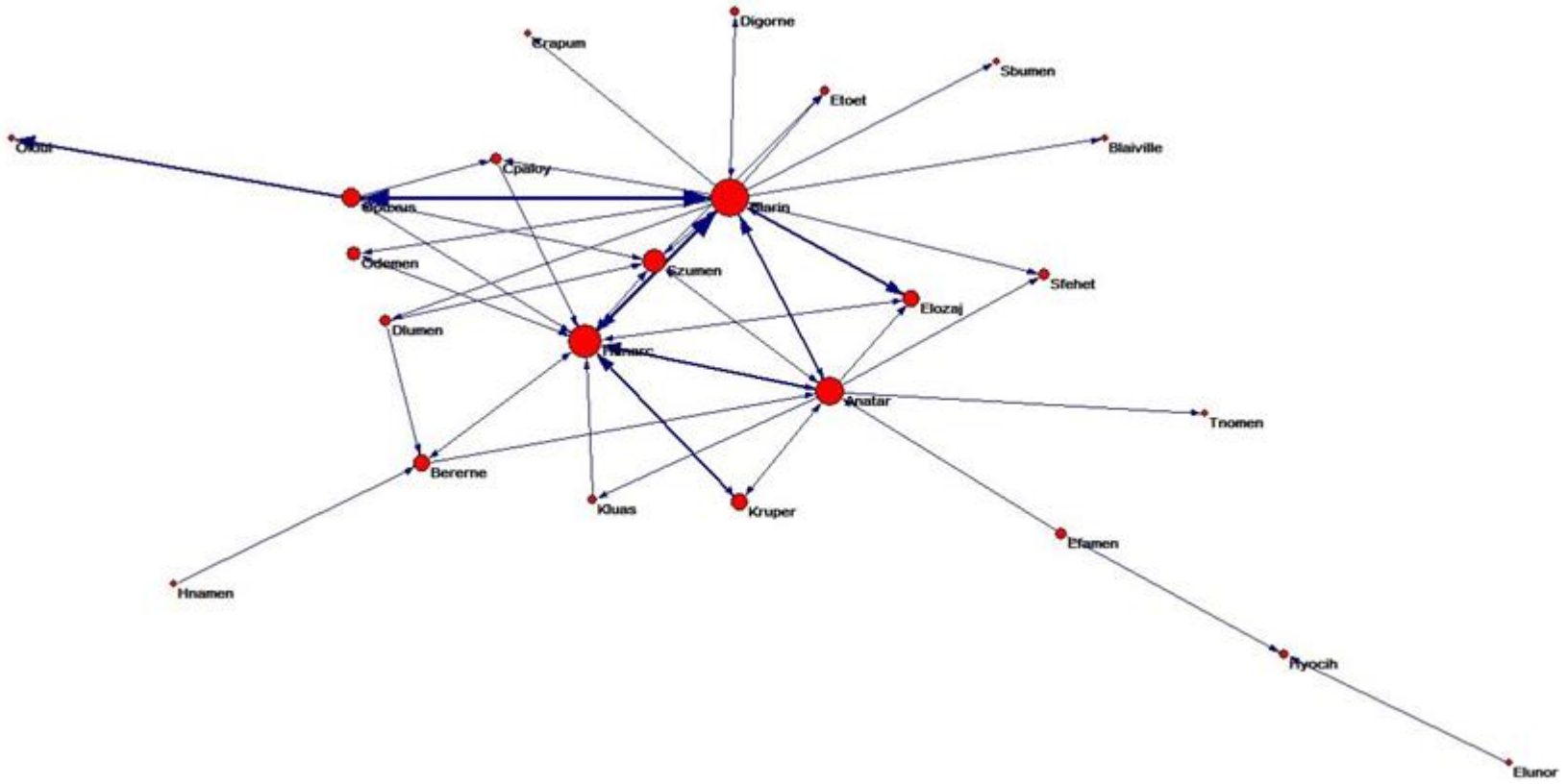

Figure 63 Sociogram of Network. 4.3. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

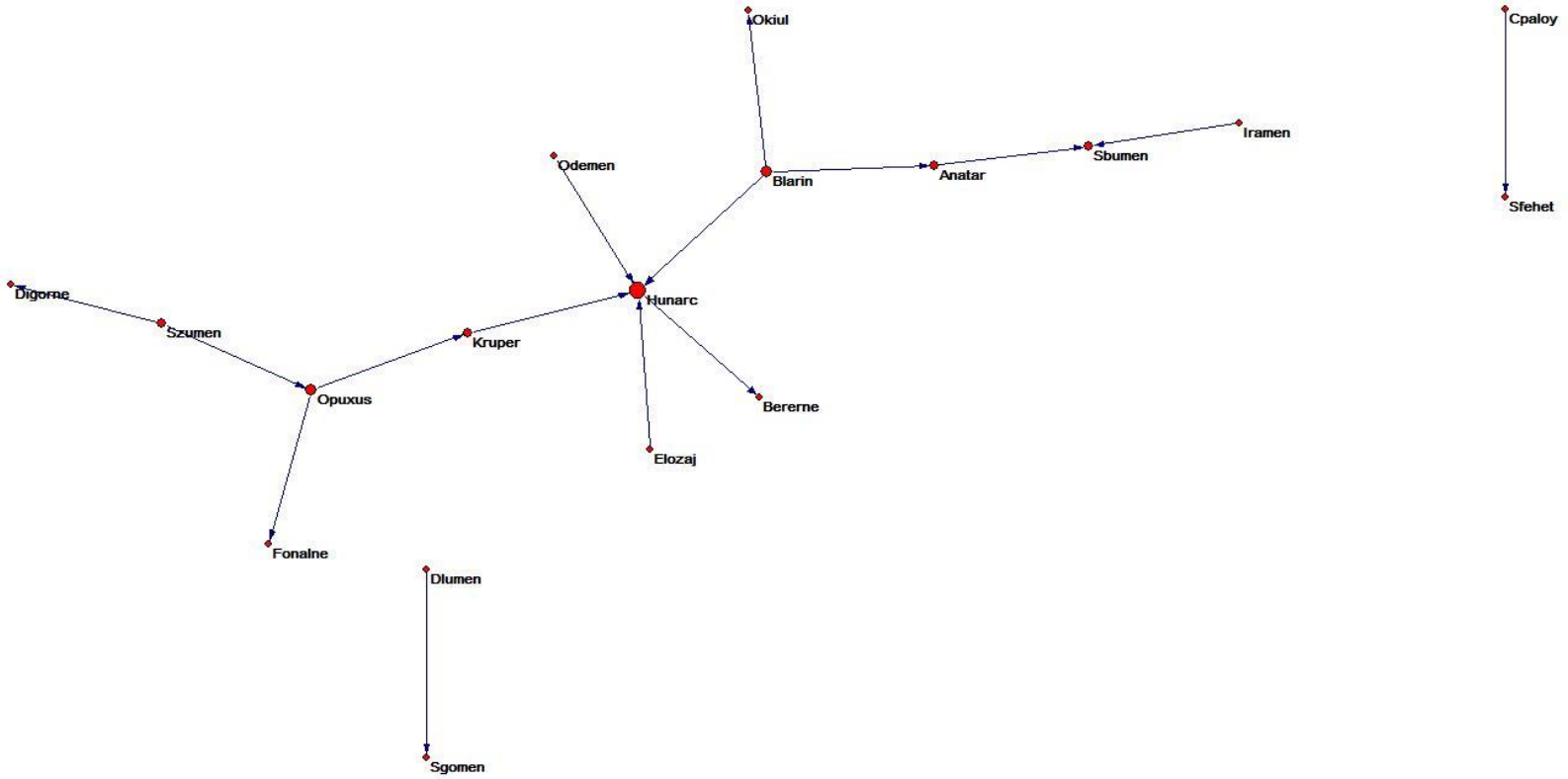

Figure 64 Sociogram of Network. 4.4. One-mode directed network. Node sizes represent all degree values. Line widths represent line values. Network energized by using Kamada- Kawai algorithm (separate components) in Pajek.

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

Degree	Institution	Year of Graduation
M.S.	Middle East Technical University Educational Sciences (Curriculum and Instruction)	2008
B.S.	Middle East Technical University Computer Education and Instructional Technology	2005

WORK EXPERIENCE

Year	Place	Enrollment
Apr. 2016-Present	Technical Assistance for Capacity Development of Employees and Employers via Information and Communication Technologies (ICT) Project	Non Key Expert
Dec. 2012-Apr. 2016	Türksat A.Ş	Project Manager
Apr. 2009-Dec. 2012	Enocta	Project Manager
Feb. 2007-Apr. 2009	Meteksan Sistem A.Ş.	Instructional Technologist
Sept. 2005-Feb. 2007	Büyük Kolej	Computer Teacher

FOREIGN LANGUAGES

English (Advanced), German (Beginner)

PUBLICATIONS

1. Tufan, D., Yıldırım, S., & Günel, B. (2014). A Social Network Analysis of Learning in Corporate Training Context: Analysing Sosyal 2.0 as a Space For Networked Learning. In *Proceedings of the 9th International Conference on Networked Learning 2014* (pp. 386–390). Edinburgh.

2. Hancı Karademirci, A., & Tufan, D. (2012). Employees' Perceptions of a Mobile Learning Implementation: A Case of the Central Bank of the Republic of Turkey. Presented at the IV. International Future-Learning Conference on Innovations in Learning for the Future 2012: e-Learning, İstanbul, Turkey.

3. Yıldırım, Z., Sevim, N., Kara, N., & Tufan, D. (2011). Professional Development Needs and Preferences of Early Career Academics and Their Perceived Faculty Characteristics for Successful Teaching. Presented at the 3rd International Conference on Educational Sciences (ICES'11), June 22-25, Famagusta, North Cyprus.

4. Tufan, D. (2010). The Effectiveness Of E-Learning In Corporate Training Programs -How It Is Managed And Evaluated? Presented at the IODL&ICEM Joint Conference and Media Days, Eskişehir, Turkey.

5. Tufan, D. (2010). E-Learning Completion and Dropout: Factors and Findings of Practice Aiming to Increase Participation in E-Learning in Corporate Environments. In *Procedings of 3rd International Future-Learning Conference On Innovations in Learning for the Future 2010: e-Learning* (pp. 415–422). İstanbul, Turkey.

HOBBIES

Cooking, writing, singing, reading, travelling.