Personal Networks Supporting Workplace Learning - A Case Study in the Finnish Defence Forces

Otto Pekkarinen

Department of Leadership and Military Pedagogy, the Finnish National Defence University.
otto.pekkarinen@mil.fi

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Abstract

This paper is a case study researching personal social networks and their meaning to individual-level learning processes in the workplace. The study was based on the knowledge-creation metaphor of learning. Employees' personal networks are seen as an important component of their learning potential and competence. Methodologically, the paper presents a relatively new technique of Social Network Analysis (SNA), namely, the qualitative egocentric network interview, and a new way of presenting research findings in visual form. The context of the study is the Finnish Defence Forces (FDF) and it was conducted in three companies of one brigade-level unit of the Finnish Army. An egocentric network interview was conducted with ten Non-Commissioned Officers (NCO). The interview data was analysed with qualitative content analysis, and the networks were visualised with the Cytoscape software. The egocentric network analysis showed that the people in the same company created a major support structure for the NCOs' workplace learning. However, nearly all NCOs had important network structures that were formed around their individual expertise and tasks. The networks varied considerably in size and composition, but had certain connecting features. The networks had three main components; one, the personnel of the NCO's own unit provided important social support. Two, every NCO had networks related to their own specific task, and three, some NCOs had networks formed through various stages of their life that were still active and useful in their current job. The different ways in which the networks enable and support workplace learning are discussed. In addition, some methodological issues of social network analysis are addressed.

Keywords

Workplace learning, Personal networks, Social network analysis, Egocentric network interview

Introduction

Learning through work has become an increasingly important factor for organisational success. Organisational learning is a line of research that originated in the 1960s. How organisations actually learn is a debatable point, but organisational learning always starts from the learning individual. (Argyris 1999.) Workplace learning is a line of research that analyses these practices and learning at the worker level. However, a common misconception is that individual learning somehow accumulates into organisational learning (Adler & Cole 1993; Berends & Lammers 2010). Worker-level learning needs supportive organisational practices that enable formation and consolidation of team-level knowledge. Team learning has traditionally been understood as a mediating level between the worker and organisational levels of learning. Thus, this article focuses on the social dimension of workplace learning. However, due to the changing nature of work, instead of analysing team-learning, this article studies worker-level learning from the viewpoint of personal social networks.

Social networks have growing support within learning research, and they are viewed as a central part of today's work activity and organisation (Nardi, Whittaker & Schwarz 2002). However, the concept of network itself has multiple different meanings, and is ambiguous and even contradictory, which makes finding shared understanding even harder (Toikka, Miettinen & Tuunainen 2016). In recent years, similar metaphorical concepts such as rhizome (Huhtinen & Rantapelkonen 2014) and mycorrhizae (Engeström 2007) have been used. The growing meaning of networks can be traced back to globalisation, decentralisation of governance, the blurring of lines between public and private sector, and above all, the rapid growth of information networks.

(Mattila & Uusikylä 1999.) The significance of networks in current society has grown so much that van Dijk (2002) actually proposes that we live in a network society.

The changing organisation of activity and work also require new tools for analysing them, in order to capture the essence of change. This article utilises social network analysis in researching workers' personal social-learning networks. A lesser-known technique of social network analysis, namely, the egocentric network interview, is used to analyse these learning networks. The technique allows the interviewees to reflect on their networked support structures, and provides a deeper, more personal understanding of their significance for individual-level learning processes.

The context of the case study is the Finnish Defence Forces (FDF). Along with other sectors of public governance in Finland, the FDF view an organisation's capacity to learn effectively as an important predictor of success. Traditionally, the FDF have relied on extensive basic training in soldiers' competence development. However, due to large structural changes in the FDF's training system, major changes have taken place. The competence development of the Finnish Army's Non-Commissioned Officers (NCO) is based on guided workplace learning and in-service training system. Consequently, there are growing demands on the conscript-training companies to serve as supportive learning environments. Traditionally, experienced instructors have mentored the novices, but the new concept of guided workplace learning puts strong emphasis on planning individual learning pathways and extensive monitoring of the learning outcomes.

Personal social networks as a learning resource

Traditionally, learning is defined as a psychological process where the knowledge, skills, and attitudes of the learner undergo relatively stable transformations. Consequently, the traditional view of learning is depicted with the metaphor of knowledge-acquisition (Sfard 1998). This metaphor views knowledge as stable and quantifiable. The learner acquires more knowledge, refines and combines it, and forms a more complete understanding. However, social support is seen as a central component of an effective learning process. The participation metaphor is a commonly used concept when we try to understand the social view of learning (Sfard 1998; Paavola, Lipponen & Hakkarainen 2004). This metaphor emphasises the social construction of knowledge. Communities of practice (Lave & Wenger 1991) is a widely used theoretical concept of the participation metaphor of learning. It views learning as a situated process, where the learner gradually moves from the peripheral areas of learning towards full participation and membership of the community (Lave & Wenger 1991).

However, the notion of participation was formulated by researching traditional handicraft occupations. Work of today is often described as knowledge-rich, and the linear concept of "legitimate peripheral participation" introduced by Lave and Wenger (1991) does not capture the essence of work in the 21st century. Several work communities of today operate in various networked forms, instead of traditional teams (Nardi, Whittaker & Schwarz 2002; Engeström 2008). Traditional organisational boundaries have opened, and today's work requires more and more collaboration between organisations, which often takes the form of multidisciplinary working groups, where experts from different vocational fields come together (Edwards 2010). In addition, the developing field of technology makes new forms of organising and communication possible (Nardi et al. 2002). Several researchers (e.g., Nardi et al. 2002; Engeström 2008; Milligan, Littlejohn & Margaryan 2015) have argued that teams are still relevant, but no longer the centrepiece of labour. Instead, they propose more fluid forms of organisation, such as knots, which refers to constant tying and untying of work activities in order to achieve the goals and objectives of working (Engeström 2001; 2008).

On the worker level, these fluid forms of organisation are realised as social personal networks. Personal networks of the working team's members serve as important knowledge resources that can enhance the working team's knowledge (Nardi et al. 2002; Hakkarainen et al. 2004). The significance of social networks for learning has been emphasised especially within the so-called trialogical knowledge-creation metaphor of learning (Hakkarainen et al. 2004; Paavola et al. 2004). Within the knowledge-creation metaphor of learning, development of expertise requires collective work on a shared object, thus the nature of expertise is seen as more relational and collaborative than before (Edwards 2010; Gorman 2010). The knowledge-creation metaphor combines the aforementioned metaphors, and rejects the Cartesian split of mind and matter into separate entities (Hakkarainen et al. 2004).

The demands of today's knowledge-intensive work require a continuous effort to learn. The third metaphor of learning views learning as a collective, sustained, progressive problem-solving process for producing new knowledge artefacts. (Paavola et al. 2004.) Hakkarainen and his colleagues (2004) call these networked work groups Innovative Knowledge Communities (IKC), which produce new knowledge and social practices that support the knowledge-creation process. They bear a resemblance to communities of practice, but their hierarchy is lower, as novices can add important knowledge to the community with their own personal networks. The innovative knowledge communities can be viewed as communities of practice of the 21st century (Hakkarainen et al. 2004).

Egocentric network analysis as a tool in learning research

Social network analysis, a methodological approach that studies social relations and networks, became popular during the 1990s (Scott & Carrington 2011; Prell 2012).A social network refers to a set of social actors and the relational ties between them. In social network analysis, this network of actors is made visible and analysed to gain a deeper understanding on the logic of its relations. (Robins 2015, 18; Hollstein 2014, 6-7.) The actors can be, for example, individuals, families, work teams, or even organisations (Hollstein 2014, 6; Prell). Social network analysis often utilises quantitative research, but at its core, it is a mixed-methods approach that utilises both qualitative and quantitative research (Hollstein 2014; Robins 2015).

Social network analysis requires a systemic approach that takes into consideration both the individual and collective levels of activity. The systemic point of view offers theoretical insights in the form of social structures connecting individuals to each other. On the individual level, one can analyse the individuals' capacity to navigate the social structures successfully. A central theoretical concept of networks is connectivity, because at its core, social network analysis is interested in how actors are connected with each other and how information flows between them. (Robins 2015, 9, 12–14; Carrington 2014, 55–56.) However, it is important to note that social network analysis is, above all, a methodological approach that in itself does not offer sufficient theoretical tools to conceptualise the researched phenomena (Mattila & Uusikylä 1999, 7; Toikka, Miettinen & Tuunainen 2016). A theoretical framework creates meaning and content to the actors' connections with each other. Influential theoretical social-network-related approaches are, for example, Granovetter's (1973) theory of strong and weak ties, and Burt's (1992) theory of structural holes. In general, social networks are often seen as positive, but it is useful to note that networks can also be based on various negative factors, such as bullying or even terrorism (Robins 2015, 33). Social network analysis can be divided roughly into two different approaches, the whole network approach and the egocentric approach (Mattila & Uusikylä 1999, 10). A whole network study is interested in all connections in a certain network, and egocentric studies are interested in networks around certain actors (Hollstein 2014, 9).

The egocentric network interview is a technique of social network analysis. The roots of egocentric or personal networks come from the 1960s United States. It provides the researcher with an empirical tool for analysing the personal networks of the participants (Wellman 1993; Hogan, Carrasco & Wellman 2007; Robins 2015; Jewson 2007). Egocentric data can also be gathered with a questionnaire, or separate it from whole-network data (Robins 2015), but one popular technique is the egocentric network interview that is based on the name-generator technique (Hogan et al. 2007; Hatmaker, Park & Rethemeyer 2011). In the network interview, the interviewee draws his/her network on paper, following the interviewer’s instructions. The network interview can be used to form and visualise the participants’ different networks (Palonen 2006; Hatmaker et al. 2011; Hogan et al. 2007, 2–3). The technique used in this article is based on professor Kai Hakkarainen’s interpretation of Hans Gruber’s method, and is a variation of the technique used by Hogan, Carrasco, and Wellman (2007).

In the name-generator technique, the researcher asks the interviewee (ego) to name people (alters) with whom he/she has a connection. After naming the alters, their meaning to the interviewee is discussed, and the interviewee is asked to assess the named alters’ relationships with each other. (Hogan et al. 2007, 2) Mattila and Uusikylä (1999, 19) call this technique the cognitive social structure approach, whereas in regular egocentric networks, the relationships independent of the respondent are not assessed. The network drawing can be used as a memory aid during the interview, where the respondent assesses his/her relations with the alters. Hogan, Carrasco, and Wellman (2007, 1–2, 9) consider visualisation of the network during the interview an advantage compared with traditional network studies, where the network is put together and visualised after the data-collection phase. The drawing serves as a cognitive tool, and allows the researcher to ask specified further questions. The drawing of the network also requires the respondent to assess alters' relationships with each other. Data collection based on paper and pen is a cost-effective and easy alternative to computer-based data gathering, and it has its unique advantages compared to digital network data (Hogan etc. 2007, 17).

The purpose of the network interview is to assess qualitatively the alters' meaning to the respondent. Interview data based on the network enables deeper analysis of the network relations. The researcher can also assess the regularity of the information flow in the network, as well as the means and ways with which people communicate with each other. In addition, the researcher can calculate quantitative statistics from the data, such as the density and the number of network components and isolated alters (Robins 2015).

Research design

This study draws from the knowledge-creation metaphor of learning, and conceptualises the collective dimensions of learning as personal social networks. Employees' personal networks are seen as an important component of their learning potential and competence. The view adopted in the article draws attention to "creation, maintenance, and activation" of these personal social networks (Nardi et al. 2002, 206). Consequently, the unit of analysis in this study is the personal networks of the NCOs. The study seeks to make these personal networks visible, and analyse them further to obtain new knowledge about their meaning for the individual-level learning processes. The article seeks to answer the following two research questions:

1. What kind of personal networks support the Non-Commissioned Officers' workplace learning?
2. How are these personal networks formed?

The collective social support system of the NCOs' workplace learning is approached from the perspective of social networks, to understand the activity-based learning networks instead of following the formal organisational boundaries of the studied organisation (Nardi etc. 2002; Milligan, Littlejohn & Margaryan 2015). The NCOs represent the trainers of the conscripts of the studied companies, and by making their social support structures visible, the researcher can obtain important practical knowledge about the social structures and practices supporting their workplace learning.

The research is a case study in one brigade-level unit of the Finnish Army located in Southern Finland. The unit consists of battalion-level units, which, in turn, are divided into company-level units. The main task of the unit is to train peacetime and wartime troops for the FDF. The studied unit employs approximately 400 people. Empirical data was gathered with egocentric network interviews from the NCOs (n = 10) of three companies, which were chosen from different battalions to provide better potential for generalisation of the results (e.g., Larsson 2009). The interviewees' age was between 25 and 39 years, with a mean age of 29 years.

All interviews were recorded to make rich qualitative analysis possible. In all, there was 370 minutes and 12 seconds of interview data. In the case study, NCOs recalled different people who had helped their workplace learning, and noted them on paper. The guiding question in the network interview was "who has helped you the most in carrying out your job tasks during last six months". The interviewees were given an A3-sized paper, and they marked themselves (ego) in the middle of the paper. They then positioned the names around the ego as they felt represented reality most accurately. Finally, they circled similar alters in groups, and connected alters who knew and communicated with each other, to the best of their knowledge. After the interview, a picture of the drawing was taken, in order to save it for further analysis (Hogan etc. 2007, 16). The interview data was analysed with qualitative content analysis. The egocentric network data was visualised with the Cytoscape software, which was found to be useful for small network data.

The studied companies had three to four NCOs working during the case study, and the researcher felt that reporting the networks individually would not be very informative. Instead, it was decided to combine the networks of the NCOs serving in the same company. This enabled a more holistic view of the NCOs' learning networks and their interconnectedness. To ease the qualitative analysis, the researcher visualised the alters in geometric shapes that were labelled accordingly. To make the visualisation clearer, it was decided to mark the same company's alters with an ellipse, the unit's alters with a round rectangle, alters from elsewhere in FDF with a hexagon, and finally, civilians with a diamond. The regularity of communication was also taken into account. Frequently communicating alters were connected with straight lines, and more infrequent communication with a dashed line.

Results of the egocentric network interview

The results are presented one company at a time. At first, the Cytoscape visualisation of the combined learning networks is presented. Then, the networks are analysed qualitatively, also utilising excerpts from the interview data. Quantitative analysis in the form of quantification was also used to make the data richer and more precise.

The combined egocentric networks of the NCOs in company 1

The first company studied was an infantry unit with three relatively inexperienced NCOs, with work experience ranging from under a year to five years. The combined egocentric networks of the NCOs in company 1 is presented in Figure 1.

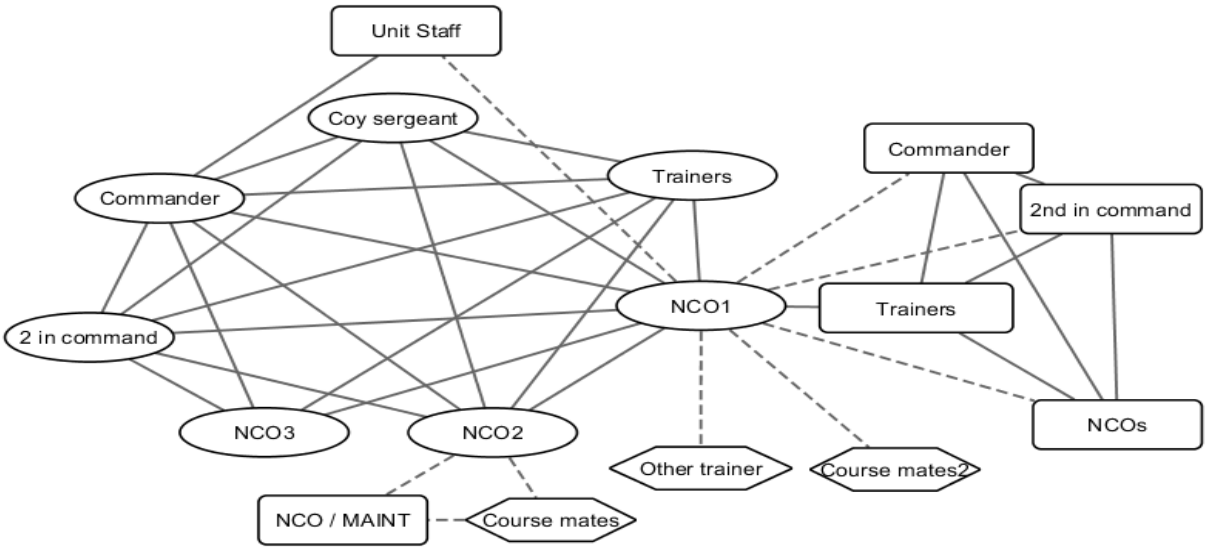

Figure 1: The combined egocentric networks of the NCOs in company 1

Drawing on the visualisation, one can state that the NCOs' own company formed a clear collective, accounting for 53% of the whole networks' social relations. The network as a whole reached out to other companies, and even other units and outside the FDF. However, contact with actors outside the company was weaker than inside the studied company. Especially NCO1 had several outside contacts, which formed 31% of his network. NCO2 kept in touch with a former course mate serving in the same unit in the local maintenance centre. NCO3 did not have any contacts outside his own unit.

NCO1 was the most experienced NCO in the company, and the Commander and other NCOs thought that he had an important role in mentoring the other NCOs, because he knew all the "tips and tricks" (NCO2). He had served in the unit for five years, and this showed in his network, which had many contacts in the unit outside his own company. These contacts were mainly his former colleagues, with whom the NCO was still in touch. The majority of these contacts served in a nearby company, which enabled interaction with one another. In addition, a former colleague who had been transferred to another unit was still a part of the NCO's network. The NCO described these contacts as "competent people, who are also a little bit more experienced… they have been here for years and are easy to talk to". The interactions were mainly based on friendship instead of work-based needs. The NCO also had as a part of his network his former course mates, who kept in touch infrequently on matters related to their training branch.

The Commander was seen as an expert of management, but simultaneously, the NCOs valued his infantry-branch competence, so he was seen as the head trainer of the company. Staff Sergeant was seen as an expert in material-related management and administration, but he was also a mentor for many of the younger trainers. Especially NCO3 told that the Staff Sergeant had supervised many of his first exercises, and had frequently given him constructive feedback. NCO2 also kept in touch with his course mates in branch-related matters. He said, "people do things a little bit differently in other places so it is useful to ask now and then how you are

handling this matter". He mentioned especially a former course mate serving in the maintenance centre, who could sometimes help him in transportation and maintenance-related issues.

NCO3 had five years of working experience, but he thought that only the Commander and the more experienced trainers were important for his learning. His interactions with people outside his own company were infrequent, so he did not feel that they had an impact on his learning.

The combined egocentric networks of the NCOs in company 2

The second company studied was an infantry unit with three relatively experienced NCOs. One NCO had over 10 years of work experience, and two others had three to five years of work experience. NCO2 had much expertise and experience from his job before serving in FDF that helped him in his current job. The combined egocentric networks of the NCOs in company 2 is presented in Figure 2.

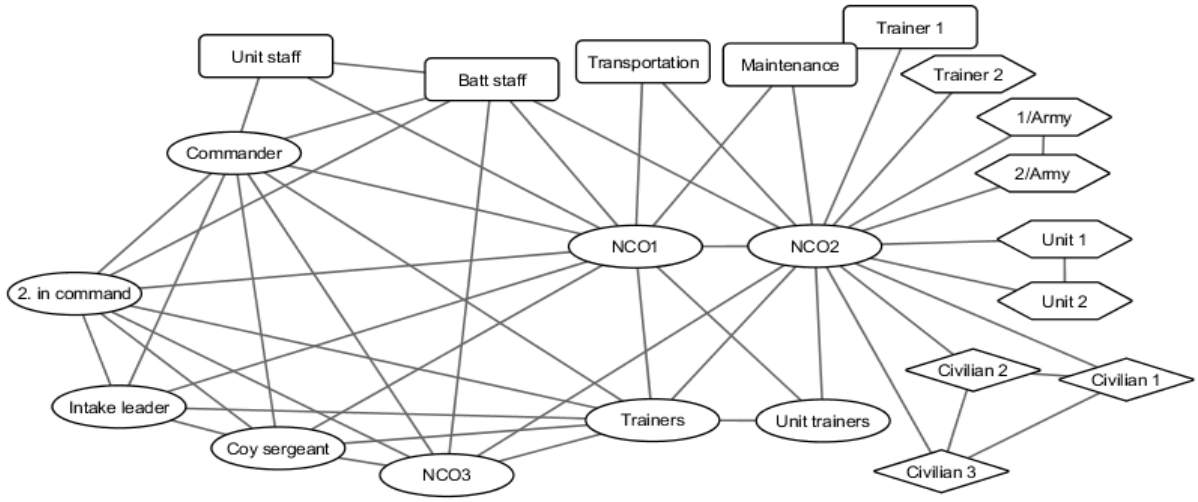

Figure 2: The combined egocentric networks of the NCOs in company 2

Drawing on the visualisation, one can state that the NCOs' own company formed a collective that accounted for 42% of the whole networks' social relations. The network as a whole reached out to other companies, and even other units and outside the FDF. However, contact with actors outside the company was weaker than inside the studied company. Especially NCO2 had several outside contacts, which formed 38% of his network. An interesting observation was that two NCOs (NCO1 and NCO2) named the trainers of another unit (Unit trainers) as being as important to their learning as people from their own company. This became understandable, when they pointed out that the two companies had many shared training responsibilities, and had many common exercises and large training events. NCO2 described them as "battalions' other similarly experienced trainers, who have special knowledge and competence that you can rely on".

The company Commander was viewed as director of operations, and the NCOs often made sure that the training activities were carried out "as he has planned" (NCO2). The company Commander was seen as the expert in management-related issues, and he, the 2nd-in-Command, and the Coy Sergeant formed the "managerial cell" of the company (NCO1). The leader of the intake was consulted often in training-related matters and smaller details; "he's the one who gives guidance on training details even more than the Commander" (NCO2)

Interestingly, all NCOs named an older officer from the battalion staff as part of their learning network. He was described as "master of the training branch" (NCO3) and "godfather" (NCO2), and the NCOs had frequent discussions about "training guidelines" (NCO1) with him. Two of the experienced NCOs had contacts in the logistic centre (maintenance & transportation) useful during planning of training events. NCO2 also had a few

contacts from his previous position (trainers 1 & 2), who were still important to his work, because "they can tell you all you need to know about my branch" (NCO2).

NCO1 had served in the unit for almost 10 years, which explained his strong networking to different actors around the unit. His network was relatively stable and supported his work. He described his network by saying "you always learn new things when you interact with different people around the garrison". NCO2 had a surprisingly large network that included people from different army units (1 & 2/Army, Unit 1 & 2) and even civilians (1-3). His network outside his own unit consisted of a couple of experienced trainers in Army School, so his network was essentially one of training-branch expertise: "the guys there can always tell you the latest developments in the field and recent training guidance given out". The civilian network included a former colleague of the NCO, who was still working in the same branch in a civilian corporation. The NCO occasionally kept in touch with them, and described them as having similar expertise due to their respective jobs sharing several similar characteristics, thus providing him with "informal and experience-based support and they provide a different point of view to your work problems". The contacts of NCO2 were largely personal contacts formed during different phases of his career that supported and enlarged his expertise in his own field. NCO3 was relatively new in the unit under study, so his network consisted mainly of people from his own company and various other people from the unit, who were important for carrying out his tasks.

The combined egocentric networks of the NCOs in company 3

The third company studied was a unit specialized in certain training branch with four NCOs, who were relatively experienced, ranging from two to nine years. The division of labour was a little different compared with the other companies. The combined egocentric networks of the NCOs in company 3 is presented in Figure 3.

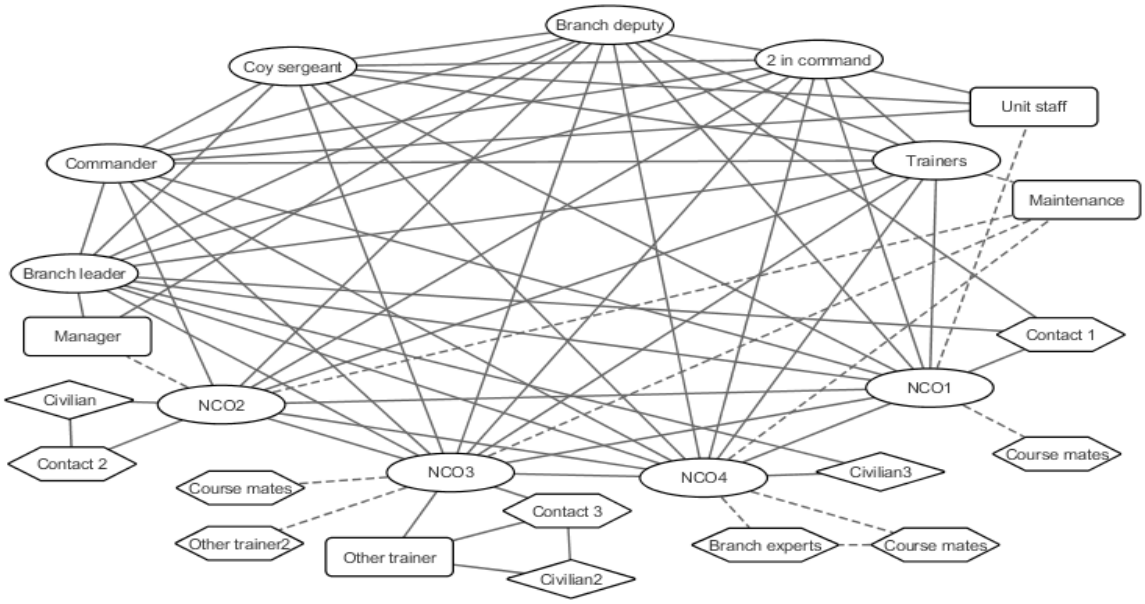

Figure 3: The combined egocentric networks of the NCOs in company 3

Drawing on the visualisation, one can state that the NCOs' own company formed a clear collective that accounted for 61% of the whole networks' social relations. All the NCOs interacted frequently with other trainers of the company, but in addition, they all had their own separate areas of responsibilities connected with their own tasks. These individual networks consisted mainly of people from other units and civilians from the same branch. The NCOs had frequent collaboration with these outside contacts from other units and civilians.

The NCOs considered the Commander as "very skilled in his branch-related knowledge" (NCO2), valued his expertise, and felt that he was easy to approach (NCO1 & 3). Much like in other companies, the Commander,

2nd-in-Command, and Staff Sergeant formed the "administrative cell" of the company (NCO4). Central actors in the company's training network were branch leader and deputy, who "control all the training activities and financial decisions" (NCO2). Branch leader and deputy coordinated all training activities, and the NCOs kept in touch with their own separate networks directly. The NCOs had many individual responsibilities and much expertise.

The NCOs handled many of their responsibilities directly with their FDF contacts and civilian contacts. The NCOs described their contacts as "important collaboration partners" (NCO2 & 3) and even as a "safety-net" (NCO1). The NCOs were in charge of the day-to-day management, and the contacts were responsible for the actual training. The NCOs had contacts with the unit staff and logistic centre (maintenance), which supported them in administrative duties. Three NCOs kept in touch with their course mates with WhatsApp, email, and telephone. The information they exchanged was branch- and training-related, so the course mates formed a low-hierarchy branch-expertise network. One NCO also kept in touch with branch-trainers from Army school, because their knowledge was "more general and different" (NCO4).

Discussion

The aim of this article was to make visible the personal social networks supporting the workplace learning of Non-Commissioned Officers working in the companies of the Finnish Defence Forces. The research questions addressed the nature of these social networks and how these personal networks are formed. The egocentric network analysis showed that the co-workers in the same company formed a major support structure for the NCOs' learning. However, nearly all NCOs had important network structures that were formed around their individual expertise and tasks. For instance, the NCOs specialised in a certain branch needed much detailed technical knowledge that they received from outside their company, for example, from contacts in the unit's logistic centre. These NCOs were experts in their own branch of training, so they could not have sufficient support and information from their own company. The network structures supported the NCOs training and job-related activities organically, as they were formed in the same manner in which the work activities were organised. Several NCOs collaborated regularly with trainers from other companies. The network analysis made visible the fact that there were few centralised support structures. Instead, the NCOs own specialised networks helped them with many technical and detailed problems and challenges. The size of these personal networks varied considerably, ranging from four to sixteen alters with a mean of 11 alters, which emphasises the important role of social relations to the individual learning processes.

Course mates formed a surprisingly frequent support structure that was not necessarily very active, but the resource was activated when needed. They provided expertise and experience-related support that expanded the NCOs localised unit-related knowledge. In conclusion, it can be said that the NCOs' networks had three main components; firstly, the personnel of the NCO's own unit provided important social support. Secondly, every NCO had individual networks related to their own specific task, and thirdly, some NCOs had networks formed during various stages of their life that were still active and useful in their current job. The networks were often formed around local task-related activities, so local on-the-job training is essential for a novice to be able to make full use of these networks. (cf. Hatmaker et al. 2011.)

The research findings support the notion of traditional teams as important learning resources (Nardi et al. 2002). Despite the changing nature of work, studies researching workplace learning should be based on a situational socio-cultural view of learning (Lave & Wenger 1991), as workplaces and the organisation of labour are different and job characteristics are unique. Results from a single empirical context should not be generalised without careful consideration of the context of learning (e.g., Larsson 2009). However, the results also supported the growing importance of personal social networks for individual learning processes (Milligan et al. 2015). Nearly all of the NCOs had personal contacts around the studied units and even outside of their work community. These contacts supported the formation and deepening of branch-related knowledge, so it can be said that they were as important as the personnel of the NCOs' own company. It should be noted, however, that all the components of the networks served their own purpose, so it is not advisable to compare them with each other in a competitive manner (cf. Hatmaker et al. 2011, 412–413). The networks had also some common features with the theory of innovative knowledge communities (Hakkarainen et al. 2004). Their hierarchy was low and even the relatively young trainers had their own contacts formed around their area of expertise. The personal networks were often activated when the NCOs worked on shared objects such as preparing and conducting larger exercises (c.f., Hakkarainen et al. 2004; Edwards 2010).

The second aim of the study was to present a relatively new and lesser-known technique of social network analysis, namely, the qualitative egocentric network interview, and highlighted a new way of presenting egocentric-network-related research findings in a visual form. A social network often brings to mind large network structures with quantitative statistics, but this paper provided a concrete empirical example of how to do a qualitative network study making use of a pen-and-paper technique. Computer-based network software provides plenty of possibilities for a network-oriented researcher, but this paper aimed to enrich the field of social network analysis with a different methodological approach (Hogan et al. 2007). Especially, the interview data concerning the visualised networks enables the researcher to get more detailed data of the network, and provides complementary information as compared with quantitative data. In addition, the visualisation of the network can be planned to support qualitative analysis with different shapes and even colours. Both network approaches provide intriguing and complementary research possibilities, which support the notion of social network analysis as a mixed-methods approach (Hollstein 2014).

The study was based on the trialogical knowledge-creation metaphor of learning (Hakkarainen et al. 2004; Paavola et al. 2004). The trialogial view of learning combines the individual and social views of learning, showing that both approaches are needed for providing a holistic understanding of learning (Sfard 1998; Hakkarainen et al. 2004). This approach recognises the individual as the learner, and at the same time, views the social structures around the learner as important components of the learning process (Billet 2001). These social structures were conceptualised as personal social networks (e.g. Nardi et al. 2002; Milligan et al. 2015). The networks were positioned as the unit of analysis, allowing the researcher to grasp their scope and range fully. This approach combines the different metaphors, and allows the researcher to capture the micro-level individual features of the learning process, as well as make the social formations around the individual visible without losing sight of the learning individual (Nardi et al. 2002).

This study also served as an example of how theoretical frameworks are essential for a good network study (e.g., Mattila & Uusikylä 1999; Toikka et al. 2016). The case study analysed social networks supporting workplace learning. The researcher might also have asked about collaboration or social support (e.g. Palonen 2006), in which case, the formed networks are often similar, but connected with a slightly different theoretical lens. Therefore, it is important to make sure the network data is valid and connected with a certain theoretical framework.

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The author is a postgraduate student at the Finnish National Defence University studying workplace learning. In case of any questions, please contact otto.pekkarinen@mil.fi