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CHALLENGES FOR KNOWLEDGE TRANSFER IN VIRTUAL NPD - CASE STUDY

Päivi Lohikoski, Department of Industrial Engineering and Management, University of Oulu, P.O. Box 4610, FI-90014, Finland
E-mail: Paivi.Lohikoski@Oulu.fi

Anyanitha Distanont, Department of Industrial Engineering and Management, University of Oulu, P.O. Box 4610, FI-90014, Finland
E-mail: Anyanitha.Distanont@Oulu.fi

Harri Haapasalo, Department of Industrial Engineering and Management, University of Oulu, P.O. Box 4610, FI-90014, Finland
E-mail: Harri.Haapasalo@Oulu.fi

ABSTRACT

Purpose: *Virtual product development teams are geographically dispersed and cross-functional, but yet they work on highly interdependent tasks by communicating electronically in work groups. This among other issues presents new challenges for the management of knowledge transfer. Based on literature, communication methods and practices that are widely used in ordinary work settings are not effective in virtual settings. New competencies and management procedures are needed. The present project uses qualitative methods to study what are the most significant challenges that affect knowledge transfer in virtual work settings in NPD. It is essential for the firms to "know what they know" and use that knowledge effectively, the size and geographic dispersion make it especially difficult to locate existing knowledge and use it where it´s needed. This is why new information on knowledge transfer is needed.*
Methodology: *Qualitative case study that studies and describes the complex issue of managing virtual NPD.*
Findings: *This study provides information about major challenges for knowledge transfer in virtual NPD.*
Theoretical background: *Knowledge Management, Communications and Work- and Organizational Psychology.*
Originality/value: *This study discusses about the ways of leading experts and knowledge transfer in virtual NPD.*

Key words: Virtual Organization; Virtual Knowledge Transfer; Knowledge Management; Virtual Competencies

INTRODUCTION

Within few years more than 1,3 billion people will work in virtual organizations, therefore it is important to understand this development and these work environments characteristics better. (Johns and Gratton, 2013). There are a lot of mixed results whether technology effects and how does it effect on knowledge sharing, therefore more knowledge on virtual collaboration is needed. (Li, 2010; Faraj *et al.*, 2011.) In the world where everything is connected, and changing, the ability to adapt, learn and the ability to renew have become the most important factors of each organization and individual. (Lohikoski, 2011.) Research should therefore focus on understanding how virtual organizations respond to the tensions that arises in constantly and rapidly changing environments.

Success of knowledge workers is crucial to the performance of knowledge-based organizations, which form the basis of our global economy, therefore this study is very significant. There is a need for qualitative studies on this topical area in order to enhance the quality of knowledge management (KM) also in a case company. The above discussion can be condensed into the following research questions:

1. How is knowledge transfer in virtual NPD identified in the literature?
2. What are the major challenges in virtual knowledge transfer in the case project?

Case study organization is a leading global enabler of telecommunications services. With its focus on innovation and sustainability, the company provides a complete portfolio of mobile, fixed and converged network technology, as well as professional services including consultancy and systems integration, deployment, maintenance and managed services. It is one of the largest telecommunications hardware, software and professional services companies in the world.

RESEARCH PROCESS AND METHODS

Research process was started by an extensive literature review in virtual organizations, including cultural issues, communications, virtual work environment´s structure and knowledge transfer theories. Theoretical foundations lie mostly on knowledge management, work- and organizational psychology and human resources management.

Literature review was synthetized on chapter 3.5 and on a table “Characteristics of Virtual NPD according to the literature.” Theoretical basis was outlined and research questions formed for the semi-structured interviews in a case company. Actual study was conducted by qualitative semi-structured interviews, which builds on openness of unexpected. Semi-structured interviews make it possible to find new things and to keep a flexible design that can bring out the nuances and the meanings in a complex, tacit process of managing experts. Managing experts in virtual work environment especially is an area where new information is needed. To ensure exploration, qualitative method is the most appropriate method for conducting a study. (Marshall and Rossman, 1999). Figure 1 represents the research process.

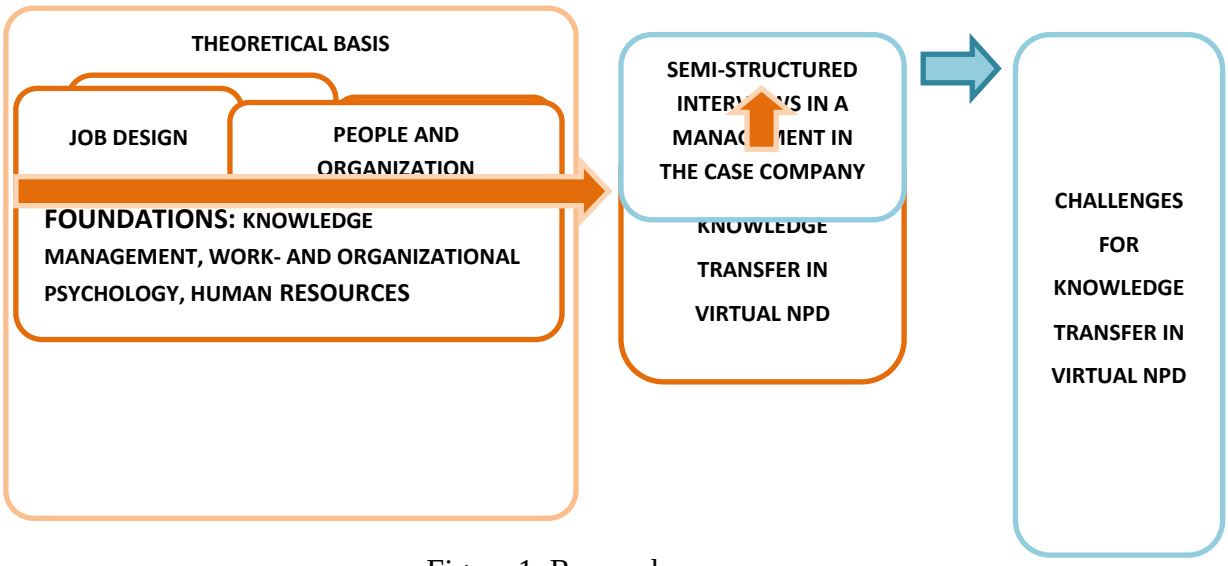

Figure 1. Research process

Study focused on level four managers within a case company. Managers´ work positions are e.g. Head of Product management or Head of Radio Platform Programs. Five of the manager´s position is in R&D, two were in Product Management and one manager´s position is in sales organization. All of their teams are globally dispersed including virtual communication on daily basis in various different locations. These managers had work experience of 14-28y and their work experience in virtual projects was between 10-20 years. According to the results there was a lot of diversity what comes to rating the challenges and in other issues concerning effective knowledge transfer in virtual organization.

VIRTUAL NEW PRODUCT DEVELOPMENT (NPD)

Virtual product development teams are geographically dispersed and cross-functional, but yet they work on highly interdependent tasks. This among other issues presents new challenges for the management of both explicit and tacit knowledge transfer. (Zigurs, 2003.) Global virtual teams are generally matrix-managed, culturally diverse and communicating mainly by using ICT. These virtual teams change form and dissolve rapidly due to rapid changes in a market. These team members also work for several different projects with competing priorities, therefore there are many risks involved when it comes to project deliveries on time. (Daim *et al*., 2012.)

Competition at the market has increased enormously and Cooper (2001) suggests following ingredients for the success: new technologies, intelligence, mobility and speed. Business environment is changing rapidly, which means opportunities can´t be missed. Pace of new product innovation has sped up and it has become increasingly important to leverage existing in-house competencies, resources and capabilities into new product projects. In global companies the only way to establish these kinds of teams rapidly is to form a virtual product development team. Modern technology can integrate mechanisms and systems and in this way provide a suitable platform for sharing internal and external resources. (Riege, 2005).

1. Knowledge and knowledge transfer

Communication and knowledge transfer are very closely linked together, effective communication enhances knowledge transfer and vice versa. Effective knowledge transfer can be achieved by integrating project requirements over organization boundaries. This can be done by providing guidance and standardized way of transferring knowledge, linking transferring processes together, creating a database for managing requirements and of course using the right transfer method for each purpose. (Distanont *et al.*, 2012). There are many types of knowledge in literature, but in this study focus is on explicit and tacit knowledge. Explicit knowledge is formal knowledge that is easy to transmit between groups and individuals as Nonaka and Takeuchi (1995) has studied. Explicit knowledge is usually represented in a form of specifications, codes, numbers or different kinds of formulas. Explicit knowledge comes from tacit knowledge and this conversion of knowledge needs special attention especially in product development. Explicit knowledge can be seen as a source of competitive advantage.

However, tacit knowledge is personal knowledge, insights, know-how and deep understanding of contexts and it is usually hard to communicate formally to others. It develops in extended periods of time and therefore is highly personal and unique. Thus it is needed within organization to convert tacit into explicit knowledge and therefore secure competitive advantage in innovation and new product development. (Nonaka and Takeuchi, 1995.) Tacit knowledge is implicit used by organization members at their work and at making interpretations on their world in general. It is hard to pronounce, because it can mainly be used in action when doing tasks at work. Only human beings led by tacit knowledge have the capability to generate new knowledge. (Choo, 1998). Brown and Gray (1995) here: Choo (1998), adds that tacit knowledge means intuition, judgement and common sense – capacity to accomplish tasks without questioning everything. With groups, tacit knowledge can exist in relationships and distinct practices and social networks that emerge over time. It has been studied that sharing and finding relevant information becomes very difficult if the number of members exceed two hundred or three hundred. Stock of all the knowledge in an international company´s is scattered in offices and plants, complex mix of products and services is vast. It becomes very challenging for the expert to find what he needs. In summary: Knowledge is valuable only if it is accessible. (Davenport and Prusak, 2005.)

2. Tools for knowledge transfer

Johns and Gratton (2013) present that there are several platforms, where it is possible to have the company of other professionals. Company´s responsibility is to offer technologies that support higher achievement. Malhotra *et al.* (2007) outline that there are several ways when sharing knowledge virtually. Most companies have different kinds of cloud services, a virtual database, which can be far more than just a storage place for documents. Virtual living team rooms (Ms. LotusNotes) might be used in sharing knowledge, there are also company specific virtual meeting tools that can be used. However it is crucial that there are common rules about versioning the documents, about sharing and not sharing materials and about when to comment and communicate on team´s work.

Structure of meetings and virtual projects knowledge sharing is very important in virtual organizations. Organizations have discovered that the closer the work technology is to one´s own personal use of devices the faster new technology is adopted. (Johns and Gratton, 2013.) Virtual organization member´s patterns of communication: "when, why, how, how often and with whom they communicate?" can reveal a lot organization´s communication practices. These micro-interactions shape dynamic negotiation of member´s multiple interests and expectations. (Im *et al.*, 2005.)

3. Communication and virtual competencies

Many uses of technological resources are socially constructed between customers, internal and external functions. Considering this, technological change makes virtual organization´s operating environment very complex system where everyone is influenced by others. (Foss and Robertson, 2000). All the communication processes are influenced by people´s routines, which don´t operate in isolation. Organizational virtual capability is something which relates to integration and joint operation of routines. In this way organization is an effective operator that transforms the employee into the collective and makes it possible to generate more knowledge and skill and in this way give an unique character to the organization and to an individual. (Metcalfe and James, 2000). Badrinarayanan and Arnett (2008) go beyond that stating that team members of successful virtual NPDs develop superior decision making skills, perform future activities more efficiently and in addition to that, become more competent in acquiring, disseminating and processing information.
Anantatmula and Kanungo (2010) stresses the point that virtual teams and organizations need highly skilled individuals that need to participate extensively in conversations (good communication skills), having trustworthy behaviour (credibility) and having collectivist value (culture). According to Wang and Haggerty (2009) there are four factors that effect on individual virtual competencies:

- Early face to face meetings and training can help overcome the problems in technology
- Increasing technology skills and general familiarity with lean media.
- Assimilating other employee´s backgrounds
- Creating interpersonal relations with team members.

Research suggests that virtual team members cannot rely on simply transferring their behavior in traditional teams and expect to be successful in virtual environments. Explicit training in communication practices across different cultures and what constituted a timely response between the international teams are essential in making that virtual team a success. (Zigurs, 2003.) Success in current work environment and in a future requires employers that support and encourage employees work preferences. Employers also need to customize work environment so that it motivates and engages different personalities working together. (Johns and Gratton, 2013.)

Goodwill is hard to observe virtually, expectations about actions and the actions themselves need to be made as explicit as possible. Common set of procedures and communication norms are needed to prevent misunderstandings. Absence of communication norms lead members communicating his/her own ways, which doesn´t necessarily mean good knowledge sharing practices and distrust starts to develop. (Malhotra et al., 2007).

4. Virtual team´s job design

In virtual organizations structure is a fluid object, which is more like a dynamic space than a typical organization structure. In virtual organizations boundaries, norms, participants, artifacts, interactions continually change all the time. All organizations change, but these kinds of organizations change all the time. (Faraj et al., 2011.) Job design has been frequently researched in HRM sciences and it has been important variable for organizations that benefit from employees´ sharing knowledge. It is a crucial part of organization structure and it basically means the following things: identifying the relevant tasks and activities and allocating them across employees in a way that allows expert´s specialization fully to benefit organization. (Foss et al., 2009.)

There is a causal chain leading from certain kind of job design leading to particular job characteristics that have an impact on employees´ motivation to share knowledge. That all effects knowledge sharing behaviors of employees´. Organizational and group knowledge sharing are usually based on individual behaviors and their drivers. (Parker and Wall 1998, here: Foss *et al.* 2009) According to Riege (2005), in order to achieve continuous growth in business, knowledge-sharing practices need to become a day-to-day procedure. Successful sharing and goals depend on the three main factors: motivation, organization structure and modern technology. Flat and open structures make transparent knowledge flows possible and that provides culture of learning. Also strategy and goals are easier to link to people´s daily lives and in this way provide clear directions and feedback processes.

5. Cultural issues and collaboration

Schein (1996) presents that culture is a set of basic tacit assumptions about how the world is and ought to be. Culture is a group of people that share and determines their perceptions, thoughts, feelings, and, to some degree, their overt behavior. Cultures arise within organizations based on their own histories and experiences. It manifests itself at three levels: the level of deep tacit assumptions that are the essence of the culture. Also the level of espoused values reflecting group´s wishes to be ideally and what it wants to be publicly. Finally there is the day-to-day behavior that represents a complex compromise among the espoused values, the deeper assumptions, and the immediate requirements of the situation.

Any strategic plan must begin with clear goals, but especially in virtual organizations it´s crucial to focus more on collaboration, because it is the foundation of innovating faster and better. This kind of a purpose in mind right decisions can be made and leadership becomes more effective. (Johns and Gratton, 2013). Also Distanont et al. (2012) offer solutions to better human related knowledge transfer in collaboration. First it is important to organize face-to-face communication, especially at the beginning of the project. It also crucial to improve stakeholders´ skills, enhance social relationships between team members and assign right people to the right project. Knowledge sharing depends on the quality of informal and formal conversations between employees, and it is the organizational culture that decides how and with whom these conversations take place. (Paghaleh et al., 2011).

According to Kankanhalli et al., (2007) special characteristics of virtual work need to be identified and made known to team members through training to avoid conflict and to secure effective work along the project. Where possible cultural diversity could be minimized by

through appropriate selection of virtual team members, also in high-complexity tasks functional diversity can be enhanced to promote discussion about work tasks. Tasks conflicts need to be resolved integratively or distributively in order to improve performance. Giving feedback and quick response to the work well done is crucially important in virtual work environment. Possible conflicts in virtual teams are broadly categorized into two main types: relationship and task-based conflicts. Relationship based conflicts involves issues like mutual dislike, personality clashes and general annoyance of among team members. Some conflicts can be severe for team´s performance, but other´s can actually help team to perform better. Especially task-related conflicts seem to be more common and more severe in virtual organizations than in traditional teams. Task-related conflicts are usually based on functional differences caused by different backgrounds, assumptions and understanding based on their previous training and experience. (Kankanhalli et al., 2007.)

ISSUES EFFECTING KNOWLEDGE TRANSFER IN VIRTUAL ORGANIZATIONS BASED ON LITERATURE

Table 1, 2, 3 and 4 summarizes the main characteristics of knowledge transfer in virtual organizations latest research by using Distanont et al´s, (2013) solutions to overcome challenges in knowledge transfer. These classifications of this theory are based on division of Management, Working Process, Communication and Transfer Process as figure 2 represents:

Figure 2. Overcoming challenges in knowledge transfer. (Distanont et al., 2013).

Table 1. The main characteristics of knowledge transfer in virtual organizations in Management

Establish and maintain trust Special attention for mechanisms and communication processes in establishing trust is needed. Cognitive-based trust is the most relevant type of trust in virtual context.	Bergiel *et.al*, 2008; Malhotra *et al*.,, 2007; Denni *et a*l., 2013; Anantatmula & Kanungo, 2010; Holste and Fields, 2012; Atkinson and Butcher, 2012; Mitchells and Zigurs, 2009; Maude, 2011; Peters and Mantz, 2007; Han and Harms, 2010; Holton, 2001;
Conflict resolution strategies Potential issues causing conflicts should be acknowledged and strategies for proper conflict resolution methods should be planned beforehand.	Bergiel et. al, 2008; Zigurs, 2003, Maude, 2011; Kankanhalli *et al*.,, 2007; Holton, 2013;
Strong leadership Leader´s presence, support, control and motivation skills are needed in virtual collaboration. Shared goals, clear communication and competence in managing experts is needed.	Bergiel *et al.* 2008; Faraj *et al.*, 2011; Malhotra et. al, 2007; Dennis et.al., 2013; Snowden and Boone, 2007; Zigurs, 2003, Luther and Bruckman, 2011; Merat and Bo, 2013; Ivan *et.al.*, 2012; Cooper *et.al*., 2004, Goh, 2002;
Rewarding and feedback Rewarding and feedback processes need to be planned and established to support virtual collaboration and goals.	Malhotra *et.al*., 2007; Dennis *et.al*., 2013; Snowden & Boone, 2007; Zigurs 2003, Lam & Lambermont-Ford , 2010; Kankanhalli *et.al*, 2007; Cooper *et. al.*, 2004; Goh,2002;
Job satisfaction Virtual environment can cause feeling of isolation and lack of social contact, also multitasking and fluid working roles can in some cases decrease satisfaction at work.	Dennis *et al*., 2013; Kankanhalli *et al.*, 2007;
Less hierarchy and social conventions In virtual organizations structure is a fluid object and interaction is easier and less formal in virtual context.	Faraj *et al*., 2011; Lam and Lambermont-Ford , 2010;
Recruitment of talented employees Virtual environment enables recruitment of talented employees without changing geographical location. Moving away from home country isn´t necessary.	Bergiel *et. al* 2008; Holton, 2001; Faraj *et al.*, 2011; Ivan *et al.*, 2012;

Table 2. The main characteristics of knowledge transfer in virtual organizations in Communication

Virtual communication Effectiveness in task related communication is stronger in virtual environment. Dislike isn´t revealed in virtual discussion and cultural differences aren´t so significant.	Gressgård, 2011; Hardwick *et.al*, 2013; Wang and Haggerty, 2009; Badrinarayanan and Arnett, 2008;
Communication skills Verbal, written, oral, cultural knowledge and language skills are needed in order to ensure efficient communication between parties. Goal is usually to generate action, change or create common understanding.	Bergiel et.al, 2008; Holton, 2013; Faraj *et al*., 2011; Malhotra *et al*, 2007; Dennis *et al.*, 2013; Snowden and Boone, 2007; Maude, 2011; Luther and Bruckman, 2011; Cooper *et al*., 2004;
Members are knowledge transfer agents Networking virtual organization is possible across time, location and organizational boundaries.	Wang and Haggerty, 2009; Johns and Gratton, 2013; Zheng *et al*., 2011; Hardwick *et al*., 2013; Ivan *et al.*, 2012;

Table 3. The main characteristics of knowledge transfer in virtual organizations in Transfer process

Technology Modern technology can integrate mechanisms and systems and in this way provide a suitable platform for sharing internal and external resources. Technological failures can risk project deliveries on time.	Gatlin-Watts *et al.*, 2007; Badrinarayanan and Arnett, 2008; Cooper, 2001; Goh, 2002;
Multiple time zones & geographical dispersion Multiple time zones can be a challenge in a global multicultural company, when there is a need for shared meetings.	Bergie *et. al*, 2008, Badrinarayanan and Arnett, 2008; Faraj *et a*l., 2011; Dennis *et al*., 2013; Zigurs 2003; Li, 2010; Kankanhalli *et al.*, 2007;
Virtual competencies Virtual social skills, virtual media skills, Ict - skills and virtual self efficacy.	Wang and Haggerty, 2009; Faraj *et al*, 2011; Dennis *et al*., 2013; Luther and Bruckman, 2011; Foss & Robertson, 2000; Kankanhalli *et al*., 2007; Zigurs 2003,

Table 4. The main characteristics of knowledge transfer in virtual organizations in in working process

Training for virtual work is needed Characteristics of virtual collaboration should be acknowledged and training provided to enhance communication among team members. The sense of "we" rather than sense of "I" needs attention.	Zigurs, 2003; Kankanhalli *et al*, 2007; Han and Harms, 2010;
Relationship building and teaming Relationships and roles between team members need to be planned, identified and evaluated.	Gatlin-Watts *et al*., 2007; Holton, 2013; Wang and Haggerty, 2009; Faraj *et al*, 2011; Malhotra *et al*., 2007; Dennis *et al*., 2013; Snowden & Boone, 2007; Senge *et al*. 2007; Zigurs 2003; Kankanhalli *et al*., 2007; Greer, 2008; Goh,2002:
Passion, creativity and originality of multicultural team members Cultural and personality issues need to be considered and planned when forming teams, sharing tasks, communicating and giving feedback.	Bergiel et. al, 2008; Johns & Gratton, 2013; Holton, 2001; Badrinarayanan & Arnett, 2008.; Gressgård, 2011; Gatlin-Watts et al., 2007; Faraj *et al*., 2011; Luther and Bruckman, 2011; Dennis *et al.*, 2013; Li, 2010; Snowden and Boone, 2007; Maude, 2011; Kankanhalli *et al*., 2007; Gressgård, 2011;
Effective new product development New product innovation has become increasingly important and rapid in its nature. In-house competencies, resources and capabilities need to be leveraged into new product projects. In global companies this is done by modern communication technology in virtual product development teams.	Badrinarayanan and Arnett, 2008.; Gressgård, 2011; Luther and Bruckman, 2011; Kankanhalli *et al*., 2007; Cooper *et al.* , 2004;
Temporary convergence Human and Ict -related delays need to be planned and taken into consideration when planning a virtual project.	Faraj *et al*., 2011; Li, 2010; Zigurs 2003,
Tacit knowledge transfer Face to face meetings are needed and knowledge transfer in virtual collaboration needs extra attention.	Holton, 2013; Wang and Haggerty, 2008; Dennis *et al.*, 2013; Zigurs 2003, Distanont *et al.* 2012; Hardwick *et al*., 2013; Wang and Haggerty, 2009;

EMPIRICAL STUDY

Empirical study in a case company was conducted by semi-structured interviews in April 2013. Seven informants were chosen, based on their availability and ability to contribute the study from the management team of 20. Interviews took place in company ´s premises. Four of the informants´ positions within a company are e.g. Head of Program Management in R&D, two are Heads of Product Management and one informant´s title is Head of Sales. Informant´s ages were from 41 to 51 years. Two of the informant´s educational background

was M.Sc. Eng. and five were B.Sc. Eng. Informants had work experience from 18-28 years, from which 10-20 was in virtual organizations. Questions for the interviews were sent to informants beforehand. Each interview lasted from 35 up to 50 minutes and they were recorded and transcribed.
After the interview, informants were asked to rate the challenges in virtual knowledge transfer in a scale of 1-5 (1= no challenge, 2= minor challenge, 3= average challenge, 4= significant challenge, 5= major challenge). Challenges were added, calculated and summaries were made from each topic. As a main finding you can see the great variety and relatively big differences in opinion within informants. Main findings of the challenges are represented in figure 3.

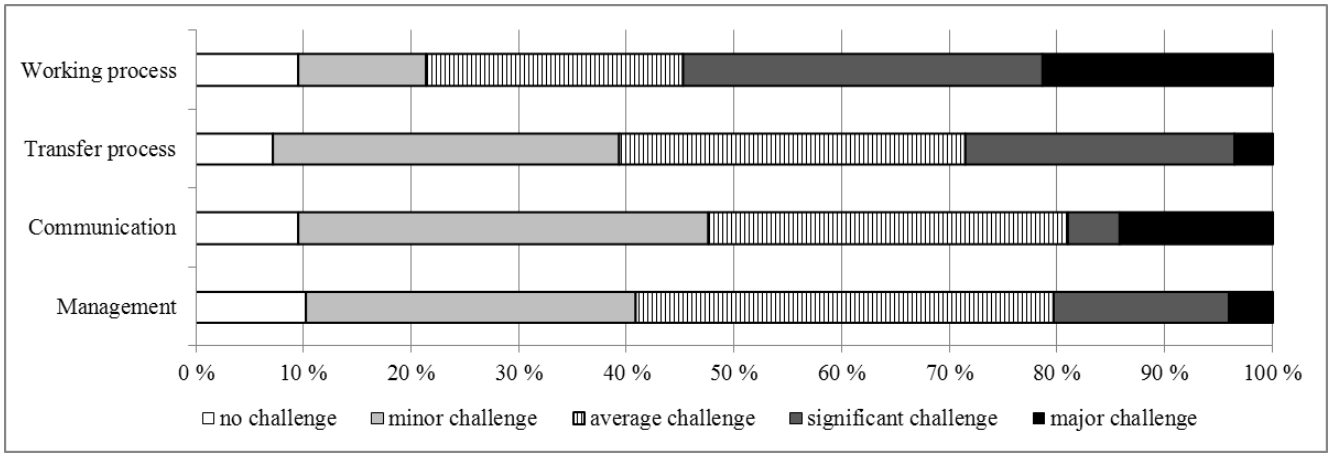

Figure 3 . Summary of challenges in knowledge transfer in virtual NPD.

1. Challenges in management

Trust has a very significant role in virtual NPD according to all informants. Trust develops in face to face communication according to over half of the informants. Some informants presented that trust can also develop also over time when communication is frequent and happens on regular basis. Above that informant C emphasizes the role of accurate information and expertise:

”It is definitely so that if you trust someone, you don´t have to double check the issues from other sources. If I tell something, then I know its valid, but if you receive information and you don´t know or trust the sender of a message, then you need to double check. In my experience… I´ve got a hunch when something isn´t right and whether that information can be used or not. So: Trust matters, and it only comes with time.”

Trust issues were rated everything from minor until major challenge. Informant E saw only minor challenges in trust, and what is standing out from informant E´s answers is that he relies strongly on fact -based communication and professional competence:

“If you trust someone, you tell more openly about things. All the facts will be discussed. There are all kinds of trust, but competence related trust is received by your own actions and by your performance at work. The fact that you have earlier taken care of things reliably and successfully is one thing. Well, that is The Most Important thing.”

Informants that saw trust as an average challenge, emphasized more formal documentation and structure of messages, or importance of phone calls instead of face to face conversations. Informant that saw trust as a major challenge emphasizes strongly face to face communication instead of just using fact based formal communication via ICT. Figure4 presents the challenges in management:

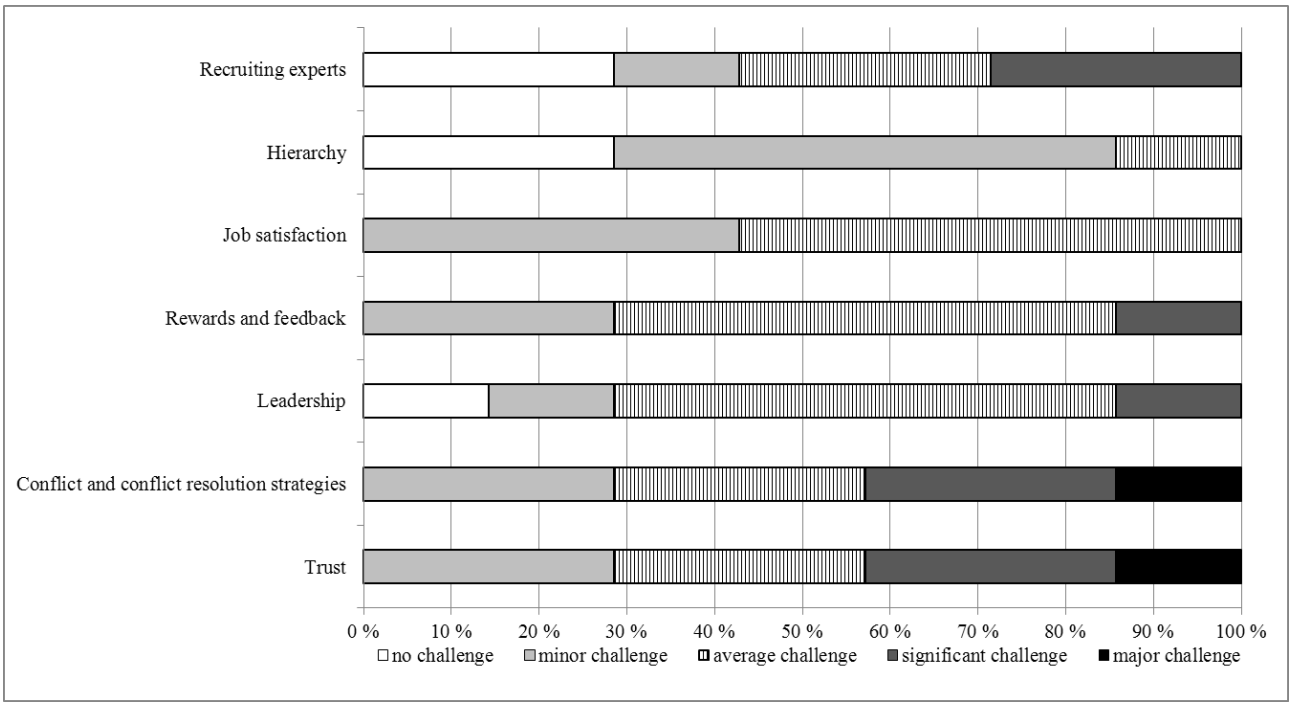

Figure 4. Challenges in management

Conflicts and conflict resolution strategies were marked mainly as average or significant challenge, but one informant considered conflicts are a major challenge and one informant as minor challenge. All informants mentioned competence related conflicts between sites the most common issue behind conflicts like informant G describes:

" I´d say conflicts are based on professional pride and identity. Sometimes there can be kind of a "invented here –attitude" that is basis for conflicts. You don´t want to transfer knowledge or something like that. It has something do with power, but I can´t understand or define that, because power is something you definitely don´t get with that kind of behavior. It is manager´s responsibility to solve those issues by building trust again."

Other issues causing conflicts were time differences, which make it difficult to find time for meetings together and also availability of relevant information becomes more difficult. What is interesting is that there aren´t conflict resolution strategies available and therefore managers are mainly the negotiators and mediators in solving conflicts. One informant mentioned co-operation teams and projects, which have been able to solve conflicts in the past. According to one informant, conflicts could be avoided by preventive actions e.g. proactive information sharing and by having shared discussions. Two informants mentioned importance of fact- based conversations in solving conflicts like informant E presents:

"Well, I start solving these issues fact-based, that what has gone wrong, what is the problem and start from there. We check the issue and see what is behind that conflict. Then all the people that are involved get together so that everyone has the same information, same knowledge and same right to give comments. So no mediators, we solve those conflicts together, only based on facts."

Generally leadership was seen as an average challenge, but what was interesting and very descriptive of this study as a whole, was the fact that there were altogether 24 different kinds of characteristics mentioned when informants were asked about qualities of a good virtual leader. Almost all informants said that most important skill is an ability to lead people, four mentioned that active and frequent communication is important, but after that was more variety. Informants mentioned skills and characteristics like written and oral communication skills, honesty and integrity, availability 24/7, professional competence, openness and prioritizing skills. Informants also mentioned e.g. strategy knowledge, trust, supportiveness and decision making skills and innovativeness and an ability to see the big picture.

These managers seem to do their work very personally with their own unique ways and experience. All the views in characteristics of a good manager mean that further studies on this topic are needed. Also availability 24/7 issue was mentioned by all informants at course of the interviews and it seems like some better knowledge on combining professional and personal life might be needed in order to enhance virtual leader´s job satisfaction and efficiency. Two informants said at the interview that they find it difficult to leave the office during the day 8-16, even if there was a chance to take care of some personal issues while working. Successful work in virtual organizations is hard to define, because it is hard to measure. In literature there are views that emphasize successful combination of work and home and views that are concentrated on performance metrics at work. (Muna and Zennie, 2010.) Further studies in successful combination of professional and personal life are also needed.

2. Challenges in communication

When informants were asked about the qualities of effective virtual communication, they mostly pressed the importance of taking the message receiver into account. Also planning the content and outlook of the message right was mentioned important. Decisions and information letters need to be written and sent ad hoc according to almost half of the informants. Only few mentioned the importance of clear and succinct e-mails, which is a significant part of virtual communication according to the theory. Also 12 other qualities of good communication were mentioned, which means there is a variety of different ways and variety of different kinds of practices when communicating virtually. Communication is a very crucial factor in manager´s work as informant B states. According to him, most delays in NPD are based on communication problems:

"Communications are the biggest, or communication problems are the biggest causes for failures, when failures appear in any project. If something is wrong somewhere, it is usually based on challenges in communication. Often about 80% of problems arise when people don´t know something or it has been a communication problem."

One informant had participated in virtual communication training and he had evaluated his own virtual communication competence more than others. Also training issue was seen as a bigger challenge with this informant, which might mean that he is aware of the issues concerning virtual collaboration and connection of virtual communication competencies. This same informant mentioned that lack of face to face communication is a minor challenge, where those that evaluated their own virtual communication competence weaker than others´ saw that lack of face to face communication is a significant or a major challenge. Communication training is also discussed in working processes. Figure 5 represents challenges in communication category:

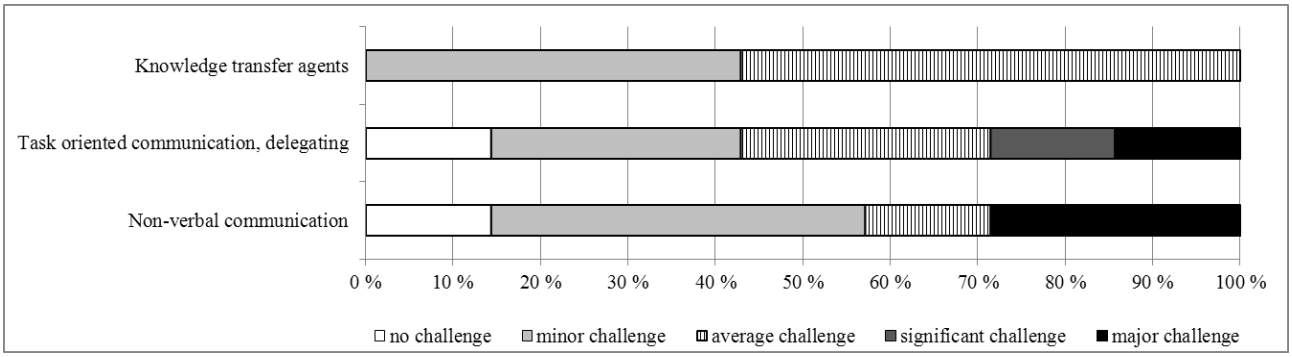

Figure 5. Challenges in communication

3. Challenges in transfer process

All informants stated at the interviews that there are problems in ICT they use, but when rating the challenges, there was a lot of variety. It is surprising that it seems like informants had accepted the unbalanced situation with task-technology-structure fit. There are tools for social interaction and networking, but they are not used according to these informants due to many of reasons, but most importantly lack of time. They also didn´t see those tools beneficial and useful to their work. There are also problems with availability and reliability of some virtual meeting tools.
In rating the challenges, ICT was marked as a significant challenge, as an average challenge and as a minor challenge, but some informants saw no challenges at all. In generally informants said in the interviews that there are too many tools and people don´t seem to know where to find relevant information like informant A describes:

“E-mail is the most common tool and it is ok. In meetings we use Webex, so we show slides, but it is unstable tool, but when it works it´s fine.. Then we have Team Site, Community Site, My Site etc.. but I don´t know about those.. You never know where anything is. They have brought in new tools and it has become a mess. I mean those tools work, but from the user perspective it takes too much time to think where and when is the data and communication of some project or a person. I mean idea is good, but implementation is undone. Kind of a culture that we start doing something and then we over do it. It is hard to find the “golden mean”.

Virtual communication competencies were an interesting issue. All informants gave higher ratings to challenges in virtual competencies to themselves than to others.

Time differences and geographical dispersion were also mentioned by all informants, however it was surprising that time differences weren´t any greater challenge. Three informants mentioned that it can even be a benefit e.g. in testing new products. When working day ends, it starts in another location and testing products can be made continuously and effectively in this way. Figure 6 summarizes the challenges in knowledge transfer process:

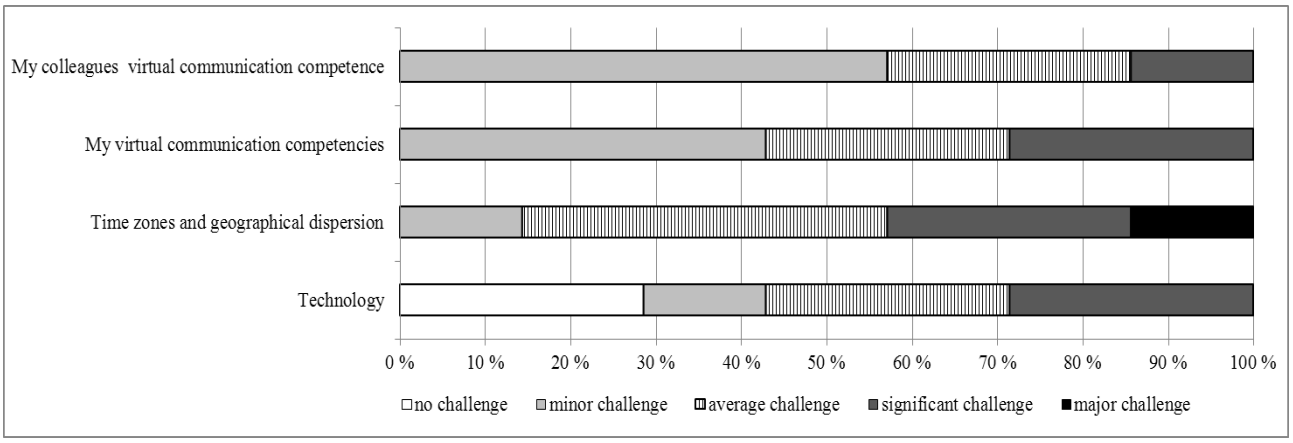

Figure 6. Challenges in knowledge transfer process

4. Greatest challenges are in working processes

From managers´ perspective the most challenges are found in issues concerning working processes. In working processes the relationships, tacit knowledge transfer, effective NPD, and temporary convergence were the most challenging issues as described in figure 7.

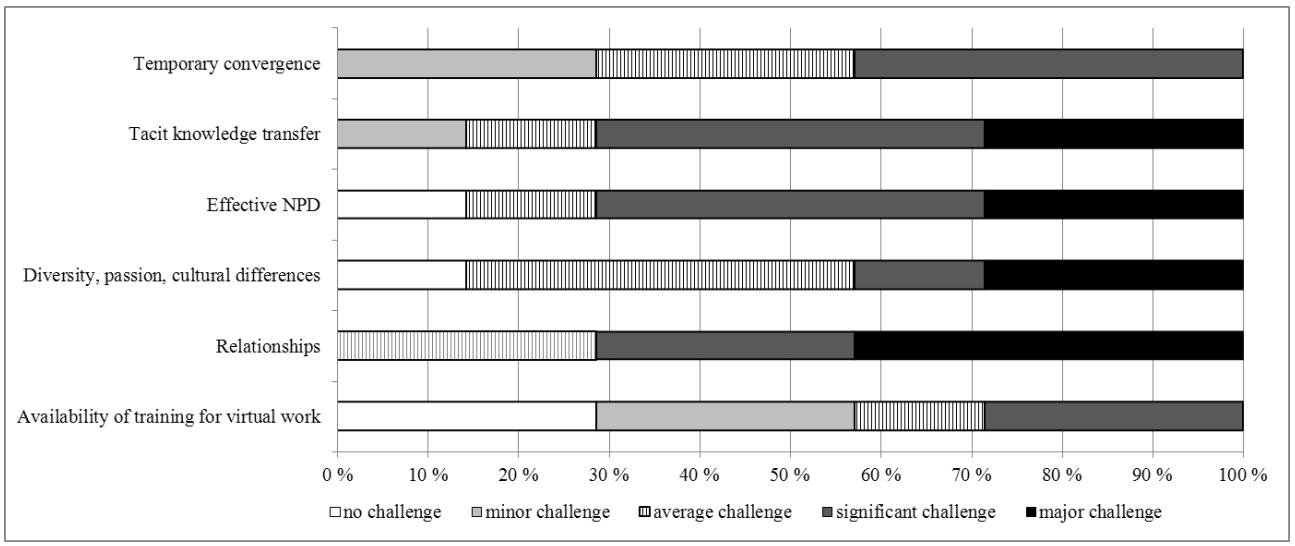

Figure 7. Challenges in working process

Greatest challenges in working processes were found in building and maintaining relationships within multicultural virtual environment, which was stated as a average, significant or major challenge by all except one informant, who stated that it isn´t a challenge

at all. All informants were familiar with cultural differences and all informants mentioned that they are considering cultural issues when sharing tasks and giving feedback. All informants had lived abroad and/ or participated cultural training. Informant F describes the importance of taking the message receiver´s background into consideration when sharing tasks, doing follow ups and giving feedback:

"Delays in a project happen because sometimes a person simply doesn´t know what to do, so communication hasn´t been good enough. So then we come to the issue, how important the successful virtual communication is. If you know who the person is, you know how to communicate the issue clearly, then you do the follow up to see that is it going anywhere and what direction is it going. Then depending on the culture, the feedback conversation is different with each individual. Other cultures can´t take feedback, but you just have to get the message through somehow. Those faults and failures need to be fixed."

In virtual projects in this field of business innovating fast is crucial. Therefore effective collaboration is needed and leading effective virtual teams is possible, if cultural issues are taken into consideration. (Johns and Gratton, 2013). Success in any collaboration between people and organizations is based on quality of relationships that shape cooperation, trust, mutuality and joint learning. It is important to have face-to-face meetings first, like informant C states:

"If we have met face to face, for some reason trust develops even after the first meeting and after that sharing knowledge is easier. If we haven´t met at all, there always is a risk that people stay in silos."

According to these managers everything can be handled virtually, except negative personal issues, redundancy notices and critical feedback meetings, but it was also stated by half of the managers, that if you have met face to face even once, everything can be handled virtually after that. What is interesting is that according to one informant, everything can be handled virtually. Face to face conversation isn´t necessarily needed at all.

Building relationships within teams, the practices varied even more. Most informants stated that quality and characteristics of team co-operation isn´t evaluated. Some informants said that in economically tough times there hasn´t been recreational team building events, however one manager mentioned that creative and strong team leaders can organize low budget team building events in any times. There were also other ways to enhance team´s performance e.g. horizontal interaction with cross-review, monthly information sharing meetings for formal and informal communication and voluntary informal communication. In summary, there aren´t official procedures in evaluating team building and performance, team building practices are based on each manager´s personal experience and preferences and evaluation is only done if team fails or performs exceptionally well.

Challenges in virtual NPD divided opinions: most informants stated that virtual organization structure makes NPD more difficult like informants E and B present**:**

"Of course we always hope that everything would be done in one site. It has been noted that it is the clearest and simplest way to do it. Then only support from other sites, but that isn´t always in balance with us. So I can say that NPD suffers a bit. There always is some kind of

tension when you don´t know the people. There are new people here and there..and when you don´t yet have experience in working with these people, it takes time, more time for these designers to build trust and to create and to prepare things, so there´ll always come surprises..."(E)

"Well, it does effect.. We haven´t been able to make it and in this moment we have projects that are just plain chaos and they´ve been divided into six, seven even eight different sites. So you can imagine what kind of challenges there are when it comes to sharing information, communicating, sharing work packages, negotiating and integrating… So in my opinion it is mission impossible and virtual Npd shouldn´t even exist." (B)

However some informants thought that virtual NPD is a strength and built-in this business, like informant G suggests:
" First of all, when it comes to developing complex products like this, there are only very few places in a world where you can find all the needed competencies within same walls, so basically we are forced to this kinds of geographical dispersiveness. Then the virtuality helps us to develop these kinds of products, we can make them together. So virtuality is built in and all the sites and teams and organizations compliment each other. For some reason, in a world... there are these kinds of knowledge centers..."

Availability and participation in communication training wasn´t seen challenging among the informants. Most informants had participated communication training a long time ago. Only few informants mentioned training portal, and only one named relevant virtual communication classes that are available. Almost all informants hadn´t participated virtual communication classes at all. One informant stated that he hadn´t participated any communication or virtual communication classes and he didn´t even know if there is such training available. Importance and meaning of virtual communication training clearly isn´t recognized.

In summary, there is a lot of variety in manager´s perspectives in a complex multicultural environment. Less than half of the informants thought that virtual NPD is strength, mainly because of a inbuilt wide social network and contact surface globally. Rest of the informants thought that innovativeness can decrease and time differencies can cause inefficiency and difficulties in decision making. Informants that saw virtual NPD beneficial, stated that it is possible when preparations for virtual meetings are made in advance and time differences are taken into consideration when making plans.

Virtual NPD work is sometimes done also at home, which means that combining work and home successfully is needed in virtual work. Successful virtual work is beneficial to the company, but it is also beneficial to the manager working in virtual projects. According to Badrinarayanan & Arnett (2008), team members of successful virtual NPDs develop superior decision making skills, perform future activities more efficiently and also become more competent in acquiring, disseminating and processing information.

CONCLUSIONS

Research suggests that virtual team members cannot rely on simply transferring their behavior in traditional teams and expecting it to be successful in virtual environments. (Zigurs, 2003.) New kind of communication competencies for virtual collaboration is needed. Communicating without proper training to virtual collaboration leads people into communicating with their own ways, and that can lead to development of distrust. (Malhotra et al., 2007.) Organizational knowledge sharing improves, if personal networks are respected and organizations take part in improving them. In such case also cross-cultural knowledge sharing can be improved. (Li, 2010.)

This research´s validity is in studying by qualitative methods the complex issue of knowledge transfer in virtual NPD. Informants had relatively long history in virtual organizations, which is important when collecting this kind of research data. In this study it was surprising, how much diversity there are within managers that operate in a same company. This research confirms the fact that traditional ways of communication might not work in best possible ways when leading experts in virtual organizations. Challenges and problems are recognized in human related issues, but the connection between virtual communication competencies and relationship building and tacit knowledge transfer hasn´t been recognized.

More information on virtual competencies in organizational and individual level is needed and on their meaning and role in efficient and successful knowledge transfer process. Also characteristics of leadership and role of trust on knowledge transfer should be studied further in virtual organizations. Limitations of this study include analysis of only one company. Further studies in characteristics of virtual competencies and virtual leadership are needed in order to enhance the quality of work and job satisfaction of employees in global virtual organizations.

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