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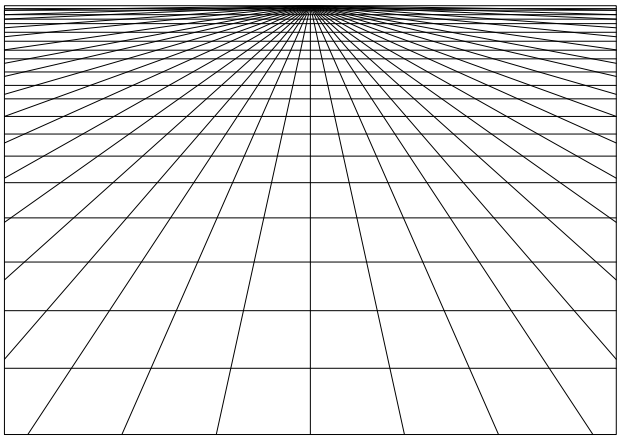

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Understanding the Collaboration and the Information Flow in Bluelight – A Distributed Network

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Synopsis

This thesis aims to explore which factors are needed for a distributed network to collaborate efficiently in developing new innovations. To answer this question not only have theories been used, but data have been gathered from a National distributed network in Norway. The network Bluelight in the field of information security is used as a case study for this thesis. The empirical data is based on 11 interviews from informants with relations to the network.

In order to answer the above core question the case has been discussed against a theoretical framework about Information Technology Communication, local buzz and proximity dimensions. First a discussion about the concept local buzz has tried to give an answer to how the concept implies to the network and whether or not the buzz has been created automatically. Further different dimensions of proximity have gained at explaining how the communication functions in Bluelight and has also explained how the different dimensions can explain how the network has become successful.

This thesis has argued that it has been essential for Bluelight to have much face to face contact for the establishment of trust. When the trust has been established there has been created both a local and national buzz. For this distributed network to collaborate efficiently it has been essential for them to have certain proximity with their members. Close cognitive proximity has given an effective transfer of knowledge because of the absorptive capacity hold by the members. Close social proximity has been part of creating trust. The Arena program has created an institutional framework which has been essential for Bluelight's success. Close organizational proximity has been essential for the flow of competence and knowledge. Which proximity dimensions that is important for a network will depend on which phase they are in. For Bluelight the above proximity dimensions have been essential in their phases for the network to develop effective innovations.

Keywords: Innovation, Proximity, Buzz, Network, ICT

Acknowledgements

Putting together a master thesis is a comprehensive process. I appreciate all help that has been given me in this process. I would first like to thank my informants that made this case possible to conduct. Second I would like to thank my supervisor Åse Kaurin for given me the opportunity to do research on the network Bluelight and for her supervision and words of advice. I will also like to thank Olav Wicken for his words of advice. I will further especially like to thank my counselor Svein Bergum for his valuable encouragement, for his academically challenging supervision and for all the help he has given me in the making of this master thesis. Special thanks also go to my fellow students for making this a special year.

At a more personal level I would like to thank my two sisters Mona and Linn and my good friend Heidi for always encouraging me at times when I almost have wanted to give up writing this past year. It has been a tough year, especially because my partner in the fall got diagnosed with cancer. With two small children, a sick man and the master thesis I am extremely proud to actually finish this multi-disciplinary master study.

I once read a master thesis where a headmaster had said the following: “The project is less”. In many ways this captures how I feel about this thesis. It is the most important thing I ever have written, but it is also a small part of long academic degree. I therefore hope it reflects what I have learned throughout the years.

I hope that my findings can be of value for other researchers or others with interest. This thesis is my contribution to the big “knowledge pull”.

Mette Andersen, Ski, September 29th 2006

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Chapter 1 - Introduction and aim of the study

One of the established facts of economic geography is that many industries and regions tend to cluster, even though transportation and communication costs continue to decline (Storper, Venables, 2002). There is substantial evidence that in the United States between the late 18th to mid 19th centuries, the transportation and the communication improvements were accompanied by an increase in the clustering of economic activity, not its reduction. In the United States, Japan and France the city size remained stable over the 20th century, and the activities has been persistence in the same cities except for a few industries which has changed their geographical centers or abandoned (ibid). However, in an ongoing debate in economic literature there is a question whether firms and individuals need to be co-located to create innovations in an efficient manner. The purpose of this thesis is to take a closer look at a distributed network, which has proved to be successful. In the following chapter I will present the research question for this thesis.

1.1 The research question

There are many reasons for why it is of interest to at look at what factors are needed for a network to succeed. Ever since the mid 1980s science parks (technology parks) have been applied as policy instruments across Europe, both at regional and national level. As mentioned much literature supports the fact that that firms and individuals need to be co-located to succeed. In recent years there have been an increasing number of distributed innovation projects (Hildrum, 2006), and it is therefore of interest to look a distributed network that has succeeded. It is also of interest to find out if local communication (local buzz) is something that happens automatically, which Bathelt et al. (2002) argue. Is it so that by being in a local environment the collaboration and the information flow goes automatically? Other factors that are essential for collaboration and information flow in a network are proximity dimensions. If a network have buzz or not, proximity dimensions might be able to explain why or why not the buzz exist. Accordingly, the research question that forms the basis for this thesis is the following:

The main research question is:
Which factors are needed for a distributed network to collaborate efficiently in developing new innovations?

Further I will try to assess the following research questions:

1. What does the concept Local Buzz mean, and how does it imply to the network Bluelight? Is Buzz created automatically?
2. What is proximity and how can the different dimensions of proximity explain the communication in the network Bluelight? Can the different proximity dimensions explain how the network has become successful?

To be able to answer these research questions I have used theories as well as data from a national distributed network in Norway. The distributed network Bluelight in the field of information security is used as a case study for this thesis. The aim is to discuss the case against a theoretical framework about Information Communication Technology (ICT) local buzz and proximity in order to look at which factors from these theories that are needed for a distributed network to succeed. There are many factors that are needed to be taken into account when it comes to why a network succeed, however for this thesis the above questions are what have been investigated in this particular thesis.

1.2 The structure of the thesis

This thesis is organized in eight chapters. Following the *introduction chapter*, *the second chapter* continues with a broad look at the case study Bluelight. I will try to define the network and shed some light on how the actors in the network collaborate. I will start with explaining what information security is, how Bluelight is organized and how the relations and dynamic are in Bluelight. *The third chapter* presents theories and explanations on what the nature of local buzz is. *The fourth chapter* explores the concept of proximity and looks at how proximity can be divided into five different dimensions and what they means. *The fifth chapter* presents theories on what ICT is and how it has impact on the organizational processes. Theory from this chapter will be used for analyzing both local buzz and proximity dimensions. C*hapter six* describes the method used and C*hapter seven* discusses the theories

(outlined in chapter three, four and five) and the empirical findings, and concludes with some reflections. The case is discussed against the theory of ICT and communication, local buzz and the five proximity dimensions. *The final chapter* will answer the research questions with a summary and conclusion. A summary of the concept local buzz will try to answer how the concept implies to the network Bluelight and further answer the question whether or not buzz has been created automatically in the network. Further a summary of the dimensions of proximity will try to explain the communication in Bluelight and explain how the different dimensions can elaborate for a distributed network to become successful.

Chapter 2 - Case: Bluelight – a distributed network

Bluelight is a national competence network evolving the most central national actors in the area of information security, with the basis from the competence environment in the Oppland/Hedmark area in Norway. Bluelight has been used as a case study for the research presented in this thesis. Bluelight is a distributed network which means that there are nodes (actors/members) in different locations nationwide. To be able to understand what kind of field Bluelight operates in, I will start with clarifying what information security is, followed by explaining what Bluelight is and how the network is organized. Relations and dynamics within Bluelight conclude this chapter.

2.1 What is Information security?

Information is an asset which can be valuable for a business or an individual (Bergum, Nyhus, 2004). Information, information systems (where information is being produced, is stored and developed) and web where information is exchanged, can be vulnerable for threats and must be protected in a secure way. Protection of information means security of the information's accessibility (for the right person, to the right time and in the right form), integrity (that the information is correct and not destroyed) and confidentiality (that information will be secured against intruder's vision) (ibid).

Information security is often used in the same meaning as Information Technology (IT) -safety or Information Communication Technology (ICT) -safety, where information often is stored, developed and communicated by the use of IT-systems. With the increase in the use of IT and ICT there has been an increase in the need for knowledge in information security. There has been an increase in the use of Internet, e-mail and electronic services which has made organizations open up their databases for external users more than earlier. This has made organizations more vulnerable for criminal activities. Some challenges in the field of information security are among others the (Bergum, Nyhus, p. 281):

- Identifying critical IT-infrastructure
- Securing critical IT-infrastructure
- Secure transfer of information (through encryption)

- Development of rules

A concept in the term "security" is the notion of risk which specifies the possibility for a security episode to concur and what damage to expect. Good security demands an involved management, competence, good routines, methodology, and necessary physical and systematic measures. Good information security is necessary to be able to compete in a more international market and to satisfy the law. In May 2001 the international security standard ISO 17799 was established as Norwegian standard 2001 (ibid.).

2.2 What is Bluelight?

Bluelight is a national competence network or cluster[1] evolving the most central national actors in the area of information security, with a basis from the competence environment in the Oppland/Hedmark area of Norway (Pettersen et al. 2006b). The network consists of actors both from companies, public actors and research and development actors. Many of the members of Bluelight have international foundation. The main activities, though, have regional foundation in the competence and the innovation cluster in Oppland/Hedmark with basis in the Innovation environment at the University College cluster in Gjøvik.

The vision of this organization is as follows: Bluelight shall be recognized as the leading competence network in the area of information security in Europe (2006a)[2].

Bluelight's main purpose is to establish an added value for Norway in the field of information security (Pettersen et al. 2006b). Added value means increased business activity, increased competence in society when it comes to identifying threats developed because of the high risk which information security has caused. Added value also means developing useful information for the public administration and how they shall manage information security on all levels practically. A fundamental point of view for Bluelight has been that a broad representation from different actors (both suppliers and users) creates successful collaboration

[1] In this paper the names network and cluster are both used. This thesis will not investigate whether or not network or cluster is the right term.

[2] In May 2004 Bluelight developed their own web-page: http://www.bluelight.no

which will achieve added value. Bluelight represents a broad competence base which involves competence in innovation, internationalization, commercialization and business. Bluelight has succeeded in creating a well working interaction between business-, public- and research and development actors (ibid). The actors have a great ability to compete and cooperate independent of geography. The actors are a heterogenic group which positively influences the capability for cooperation and development. They have an understanding of the market which is unique (ibid).

2.2.1 Background- Bluelight's development

The Oppland/Hedmark area has for many years had an Information Technology (IT) and security related competence environment. The information flow and cooperation in this environment was for many years very low[3]. In 2001 both locally and nationally actors got together and contributed with NOK 11 mill to develop a master study in Gjøvik and to build up a strong field in information security through a period of three years. Among others the actors which contributed were, Thales, Norwegian Tipping, Telenor and Gjøvik Science Park. Through this work the actors developed a productive cooperation when it comes to competence and saw the potential in commercialization. Bluelight had funding for a preliminary project and a three-year main project in the Arena Program (the Arena Program is further explained below in 2.2.4). This has been conclusive for what Bluelight has achieved and is today (Pettersen et al. 2006b).

The network have achieved many results both regional and national, some of them are listed below (Pettersen et al. 2006b):

- The Northern Scandinavia's first master study in the field of information security

[3] It has been hard to measure how much activity this area of competence had before 2001, but answers given me through interviews has showed that the information flow and communication was very low. There were competence environments at Jørstadmoen, the security department at Telenor in Lillehammer, Ibas in Kongsvinger and Norsk Tipping in Hamar, but there was little formalized collaboration, only informal meetings for example at the train between the ones that already knew each other. Conclusion; some competence in the field of information security, but little collaboration.

- The education and research environment called the Norwegian Information security Laboratory[4] (NISlab).
- Research and development (R&D) results with approx 50 finished and approved master thesis, guidance of 8 PhD assignments, 15-20 science publications, and participation in international research projects. Two R&D projects may also be commercialized.
- The process of getting a PhD study has its foundation and will most likely start in 2007.
- Bachelor study in information security.
- The organization Municipal Information security (KInS) as a strategic arena.
- The government has given the environment the credit and trust through establishing Norwegian Center for Information security[5] (NorSIS) with Gjøvik Science Park as operator and with NISlab and Bluelight as the competence surroundings.
- Establishing the national security incubator SECTOR.
- Several concrete innovation projects both products, services: "Biohealth", "Nonstop security", "Security Partner" and "The security card".
- Bluelight has contributed to an awakening among government instances and private and public business communities. Through a planned "branding process" and an active use of media, Bluelight has aroused great attention both locally and national. Information security has been threat oriented but is now more oriented in the direction of problem solving.

2.2.2 Members

According to Svein Pettersen the network includes approximately 45 member companies and organizations ranging in size from one person to large international corporations. The

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[4] NISlab is the information security group at the Gjøvik University College

[5] NorSIS has been a three year trial-project initiated by the Ministry of Trade and Industry and has been placed at SINTEF as an operator. NorSIS will be a permanent government organ which shall be a preventive competence centre primary targeted against small and medium sized companies and public sector including counties. A team with four people has been employed in Gjøvik Science Park which shall develop and run NorSIS. NorSIS has a basis of a yearly budget with NOK 6 mill. NorSIS reports to the Minister of Governments Administration and Reform. NorSIS has been a very important and visible goal in Bluelight, the work contribute to an extended relevance and integrity. (Gjøvik Science Park as, 2006).

members include commercial interest (suppliers, user groups and consultants), public sector and academic institutions. The most central actors are presented below in the following table (Pettersen et al., 2006b, p. 1):

Figure 1: Central actors in Bluelight

Companies	**Public actors and organizations**
Telenor ASA (telecommunication)	Gjøvik University College (HIG)
Thales Norway AS (suppliers of hardware and software)	Norwegian school of management BI
IBAS ASA (service provider, data recovery, erasure and forensics)	Norwegian computing center (NR)
PricewaterhouseCoopers DA (consultant)	Army – FSKI/FSA
IKON AS	ICT-Norway (inclusive member companies)
IBM Norway AS	Defense Security Agency
Symantec	ITS Norway
Computer Associates	Norwegian Center for Information security (NorSIS)
Norwegian Tipping (lottery)	Innovation Norway – Oppland/Hedmark
Novell	Norway Research Council
Apropos Internet as	County governor – Oppland/Hedmark
Virosafe	The region of Gjøvik, Norway
Gjøvik Science Park as	Inland area 2010 (Innlandet 2010)

Source: Pettersen et al, 2006b p. 1

For detailed information about the members of Bluelight see appendix. The most important members are there briefly described.

2.2.3 Gjøvik Science Park as

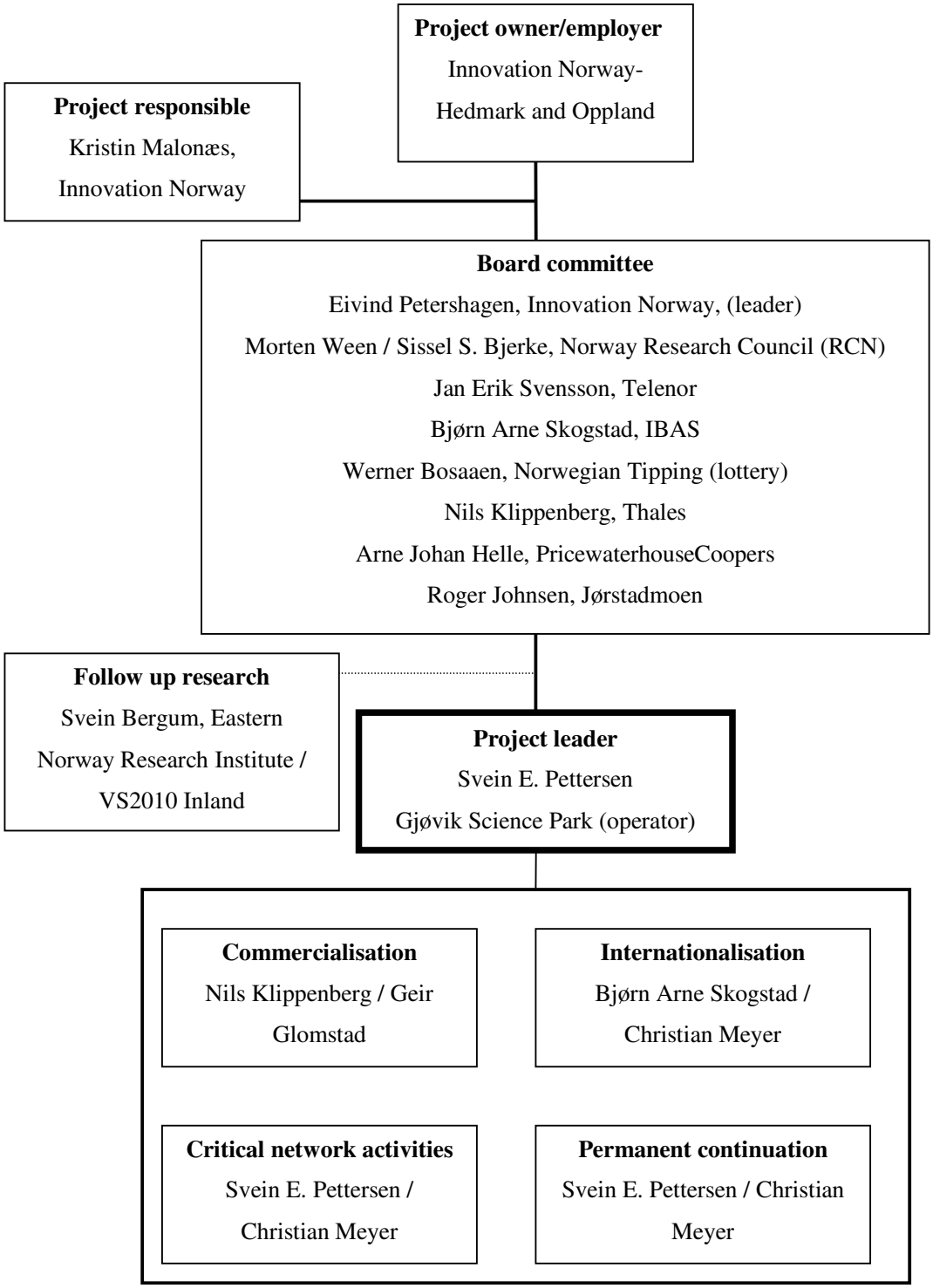
The foundation of Bluelight is Gjøvik Science Park as (GKP) (Pettersen et al. 2006b). GKP is an innovation-company established in 2000. Its main focus is to promote innovation and added value through the stimulation of goal oriented cooperation and innovation. GKP has two strategic goals; innovation network and innovation infrastructure. The company has 23 owners. Among those are Eidsiva Energy, Hydro, Ergo, Nordea, Møller Vital, Mustad, SIVA, Oppland county administration and the Norwegian School of Management BI. GKP has acted

as the project leader for establishing the first master study in information security (in Gjøvik) in the Nordic countries and has been the operator and the project leader for Bluelight for four years. From January first 2006 GKP is also the operator for the governments Norwegian Center for Information security (NorSIS). Based on five years of experience within innovation infrastructure and the important area of incubator, GKP has in cooperation with SIVA established Norway's only national security incubator (SECTOR).

2.2.4 The network organization

Bluelight has through a period of four years been organized as an Arena project through the Arena Program- innovation in network. The Arena Program is a national program which intends to contribute to develop chosen networks/clusters and innovation systems in Norway. As of 1. July 2006 the Arena Program had 20 projects in Norway. The program is under the auspices of Innovation Norway, the Norwegian Research Council and Siva (the Industrial Development Corporation of Norway) (Pettersen, et al., 2006b). Gjøvik Science Park is the operator and the project leader is Svein Pettersen. Gjøvik is the node in the network. Eivind Petershagen from Innovation Norway has been the leader of the board committee. Up until the end of the Arena project Bluelight was organized as the following model will show:

Figure: 2 Organization-model of the Arena-project

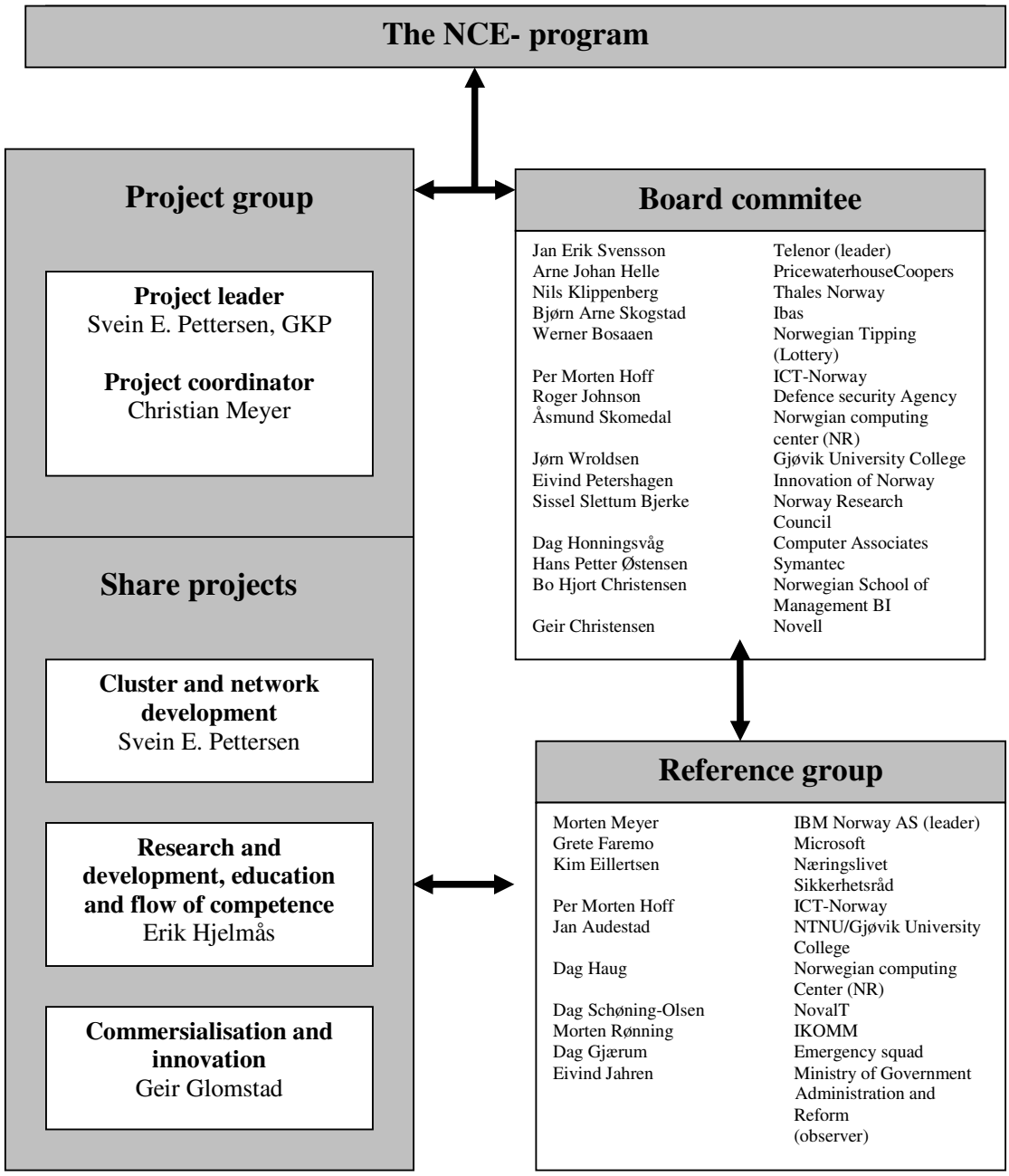


Source: Pettersen, 2006c p. 4/Pettersen, S. 2006, confirmed by e-mail

After closing as an Arena project, Bluelight will reorganize. September 26th 2006 there was a kick-of for the new network organization. The new organization will be a member based competence network, and Svein Pettersen will continue as the project leader. Christian Meyer will become the project coordinator. The organization will be financially based by membership fees, but will also apply for public funding. The main goal for Bluelight is to further establish more added values for Norway in the field of information security. The actors of Bluelight experience that society has established small mechanisms for practicing the recommendations from among other National strategy for information security. Bluelight argue that these challenges can be put in a system and that it is possible to achieve sector and inter-sector normative for what is adequate for information security when it comes to what threats we have today. Bluelight will try to be established as a Norwegian Center of Expertise (NCE) in information security in the year of 2007. NCE is a program that contributes to develop internationally leading clusters which are built on regional and local precedence. NCE will offer financial and professional support for long-term and goal oriented development processes. NCE is part of the national efforts for regional priorities. The model below will show how the organization it thought of being structured[6].

[6] Further information on the structure for the future was not available at the time the thesis was written.

Figure 3: Organization model of the suggested NCE

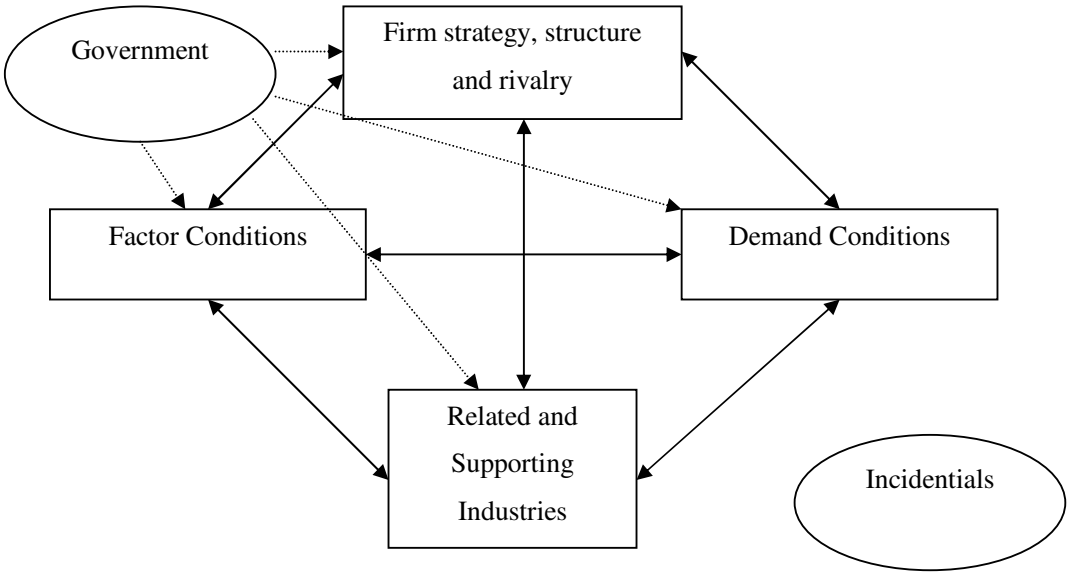


Source: Pettersen, Meyer, 2006, p. 4

2.2.5 Relations and dynamic within Bluelight

Relations and dynamics within Bluelight will be presented and elaborated in this chapter based on Michael E. Porter's famous diamond model[7].

Figure 4: Michael E. Porters diamond model



Source: Pettersen et al. 2006b, p. 9/Porter, 1990, p. 16

Demand conditions

Porter argues that demanding customers in an economy will create firms which constantly will have to improve the competitiveness via innovative products, through high quality etc. (1990). In regards to Bluelight the network consists of both suppliers and customers. The

[7] The model is presented by Pettersen et al. (2006b) in an application for Norwegian Centre of Expertise in Norwegian. The model has here been translated into English and modified with some new arrows by using the original source Michael E. Porter (1990). The model will not be discussed further in this thesis, but is meant to give the reader an understanding in how the relations and dynamic function in Bluelight thus to further understand theory and discussions presented later in this thesis.

proximity existing between customer and supplier has created high innovation productivity because of the suppliers continuously communication with the market (Pettersen et al. 2006b). This has created demanding customers and high requirement.

Firm strategy, structure and rivalry

According to Porter the world is dominated by dynamic conditions, and it is the direct competition that encourages firms to work for increased productivity and innovation (1990). In regards to Bluelight many of the same actors compete over the same customers who generate an increase in the competence both through rivalry and common knowledge exchange (Pettersen, 2006b). According to informants from Bluelight the competition between the actors has not had a negative effect but has rather increased the interaction and the productivity.

Factor conditions

Porter (1990) argues that key factors of production are created, not inherited. Specialized factors of production are skilled labor, capital and infrastructure. Non-key factors or general use factors as non-skilled labor and raw materials can be obtained by any company and do not generate the sustained competitive advantage. However, specialized factors involve heavy sustained investment and are often difficult to duplicate. This leads to a competitive advantage because if other firms can not easily duplicate products, skills and innovations, they are more valuable. Regarding Bluelight, competence has been a resource factor which has been the basis for the creation of activities (Pettersen et al., 2006b). Both at the Gjøvik University College and at the Norwegian Computing Center there substantial expertise exists within the field of information security. The competence that actors in Bluelight have is difficult to duplicate.

Related and Supporting Industries

According to Porter cooperation and contact with related and supporting industries facilitates a flow of information and promotes continued exchange of ideas and products (1990). Through Bluelight several linkages have been developed both through competition, collaboration and social activities. This has established relations between companies, individuals and governments institutions. The project leader, Svein E. Pettersen has taken initiative to several projects and gatherings, but there are also examples of projects which have been performed without the initiative from Gjøvik Science Park (Pettersen et al. 2006b). According to Pettersen et al. mutual trust has been developed among the actors in Bluelight (ibid.). Despite background, actors have been able to collaborate against goals and visions

which gain everyone (ibid.). Both formal and informal links has created an increased information flow which has made it more attractive for new actors to join the network.

In Porters model there are two circles, the government and incidentals. The role of the government is to encourage and push companies to reach for higher levels of competitive performance. The role is also to stimulate and demand for advanced products, to focus on specialized factors and to stimulate local rivalry by limiting direct cooperation and enforcing anti-trust regulations (Porter 1990). For Bluelight the cooperation with the government has given very good results due to planned collaboration with the government and incidentals.

Chapter 3 - The concept of local buzz

To be able to answer the question about which factors are needed for a distributed network to collaborate efficiently in developing new innovations, I will in this chapter look further into the subject of cluster dimensions, phases in networks and clusters and the nature of local buzz. The theory will further be discusses in chapter seven.

3.1 Cluster dimensions

In recent work, Porter (2000, p.254) defines a cluster as "a geographical proximate group of inter-connected companies and associated institutions in particular field, linked by commonalities and complementarities". He also states that the geographic scope of a cluster can "range from a single city or state to a country or even a group of neighboring countries" (ibid.). This broad definition does not explain the economical benefits firms have by being part of a cluster. When it comes to clusters it can be distinguished between the horizontal dimension and the vertical dimension. According to Bathelt et al "The horizontal dimension of a cluster consists of those firms that produce similar goods and compete with one another" (2004, p. 36). The firms do not necessarily need face to face contact, but they take advantage of the benefit from being co-located to other firms which give them the advantage of being informed of their competitor's products and about the quality and cost of production (Bathelt et al., 2004). Because of the co-location the production conditions are similar for all the members of the cluster. The vertical cluster dimension "consist of those firms which are complementary and are interlinked through a network of suppliers, service and customer relations" (Bathelt et al. 2004, p. 37). According to Bathelt et al. (2004, p. 37), Marshall described in 1920 the already process of how variety at the horizontal level would stimulate growth at the vertical dimension; if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. The idea behind this is that when a cluster has been established, it will create a demand for services and supplies. This will make it attractive to suppliers to be close to the firms and the market.

3.2 The nature of local buzz

Storper and Venables (2002, p. 4) define buzz as various forms of face to face contact which they collectively call the "buzz of the city". In a similar way, according to Bathelt et al. (2004) Owen-Smith and Powell use the notion of "local broadcasting", and further Grabher (2001) uses the term "noise" to explain something similar. Common for the idea is that a certain milieu can produce useful information for the perceptive actors to receive. Buzz can be explained as the "information and communication created by face to face contact, the co-presence and the co-location of people and firms within the same industry and place or region" (Bathelt, p. 38).

Storper and Venables (2002) summarize some of they key forces behind face to face contact in figure five. This will further be explained underneath (ibid.).

Figure 5: Buzz

CAUSE	**FUNCTION**	**EFFECTS**	**OUTCOMES**
1. F2F performance: speech as rapid information	Communication/ Transmitting	Parallel sending of many kinds of information about message and sender's intentions	Efficient communication under uncertainty, especially tacit knowledge
1: F2F performance: speech and body language	Understanding/receiving/ observing	Decoding through parallel processing of many things and context	Acting or responding correctly under uncertainty when a message is intended
2: F2F performance: incentives and verifiability	Coordinating/committing /aligning incentives	Co-presence is an investment of time = a forfeitable bond if relationship not pursued. Also, parallel processing about intensions = precursor to trust	Ability to trust and bond where messages and their content is inherently uncertain
3: Socialisation and screening. Producing and	Selection of partners	Signalling that one can judge allows one to "be in the loop". Once in the loop, one	First-mover advantages in innovation and

sharing codes.		has to judge correctly, again	learning
3: F2F performance, display	Motivating	"Rush:" Bio-physiological effects of competition, desire: generate more and better effort	Productivity, creativity, inventiveness, energy

Source: (Storper and Venables, 2002, p. 15)

The first two rows show the advantage of speech as a communications technology. It allows a high degree of communication that is not possible through other media. Communication which takes place face to face is used at many levels at the same time: verbal, physical, contextual, intentional and non-intentional. The second row refers to the advantages of face to face contact for the receiver; face to face gives the receiver the advantage to correct any uncertainty, to decode the transferred information. This does not only affect the planned meetings, but also affect the spontaneously meetings, the moments where it is possible to pick up information by just being at the right place at the right time. It enables the receiver to accept information, to pick up the buzz through the network channels.

The third row refers to the notion that tacit knowledge always has some residual with uncertainty and there will consequently be a need to minimize the incentives for one actor to manipulate the other. It can be developed either by aligning incentives or by developing trust. In the fourth row, Storper and Venables (2002) note what permits individuals to enter into certain kinds of communicational processes, how people identify their partners and their socialization with those partners. Socialization is something produced mostly face to face, from family, schooling, the social and work environment. A social membership can be a precondition for certain kinds of interaction processes such as network membership. The final fifth row shows that face to face contact goes beyond the communication itself. Buzz produces a "rush", meaning that it is motivating and contributes to desire, imitation and competition.

The buzz consists of specific information which is continuously updated through both intended and unanticipated learning processes. "By having the same mutual understanding of new knowledge and technologies, shared cultural traditions and habits in the same field, this stimulates the establishment of convention and other institutional arrangements" (Bathelt et al. 2004, p. 38). Buzz can be planned or spontaneously, organized or accidental meetings.

Actors continuously contribute and benefit from the flow of information the buzz causes, this just by being part of a cluster.

Anyone from the cluster can participate without any investments. According to Bathelt et al. "This sort of information and communication is more or less automatically received by those who are located within the region and who participate in the clusters various social and economic spheres" (p. 38). It should be unavoidable not to receive information, rumours or news about actors and their actions in the cluster. There can be different types of buzz, it can go smoothly or it can be somewhat blocked, depending on the social structure and the degree of trust. Bathelt et al. further argues that a cluster with little trust among the actors is unlikely to have high-quality of local buzz. For the buzz to flow it must go through the channels which the cluster has developed over time, the network of communication and the linkages. The information flow can be a phone-call at work, a talk with a neighbour, or negotiations with a supplier.

Co-located firms are able to understand the local buzz in a meaningful and useful way. Because being part of a cluster stimulates the development of the institutional structure for the actors involved. Firms have a tendency to develop a similar language, technology attitudes and culture and habits. According to Maskell et al., it has also been suggested that with trust in a local environment any insider will benefit from it by default, it will be inherited (1998). "This process of institution building is triggered by the establishment of communities of practice" according to Bathelt et al. (2004, p. 39). Wenger et al. define *Communities of Practice* as following: "Groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (2002, p. 4). According to Hildrum (n.d) participants from the *Community of Practice* are strongly connected around their mutual area of interest, they share the same knowledge and expertise. Such communities can rise within firms, in organizations, and include few or many people. The main point here is that a high degree of relational continuity and strong ties are necessary for overcoming learning-related problems in projects. A cluster with local buzz can increase the development of *Communities of Practice* and can have a positive effect for the cluster.

Either if a network has buzz or not, much or less, the amount of buzz might be explained by looking closer at different proximity dimensions. It is therefore of interest to look closer on

the term proximity. Proximity can be divided into different dimensions, for example cognitive and social. The social proximity is high in a network it might be able to conclude if there is a local buzz or not, but it is also possible to say something more specific about the collaboration in the network. By looking at several dimensions of proximity the next chapter will investigate how the collaboration and information flow function in Bluelight.

Chapter 4 - Proximity and phases in networks and clusters

Proximity is often attached to geographical distance but there are theories which divide proximity into different dimensions. I find this relevant for this research. A distributed network can for example be measured on what kind of proximity is being applied during the collaboration and the information flow. Due to the special characteristic of knowledge creation and innovation processes, proximity can get different meanings in different conditions and phases of these processes. In innovation-related research, proximity has been defined as knowledge flowing from one person to another (Boschma, 2005). Boschma (2004; 2005) separates proximity into five dimensions (cognitive-, organizational-, social-, institutional- and geographical proximity) whereas Hyppia and Kautonen (2005) have chosen to divide proximity into eight dimensions (cognitive-, organizational-, social-, institutional-, geographical-, industrial- or economic-, temporal- and cultural proximity). Below I have divided proximity in five dimensions like Boschma separates them. In innovation-related research several types and dimensions have been defined as essential. I believe Boschmas choice of five dimensions cover what Hyppia and Kautonen has described in their eight dimensions. I will in this chapter present five proximity dimensions which will be further discussed in chapter seven.

I will conclude this chapter with theory about how an organization or a network/cluster develops over time. I find this relevant for this research thus I believe it must have a relevance in which phase a network or a cluster is to be able to establish what the network needs most likely will have. I will discuss this theory in chapter seven along with the proximity dimensions.

4.1 Cognitive proximity

The dimension cognitive proximity has been divided in two by Hyppia and Kautonen (2005) (cultural and cognitive proximity), but they admit that the dimensions are overlapping each other. Therefore, the two dimensions are here chosen to be presented as one dimension. Cognitive proximity or cognitive distance as Nooteboom (2003) describes it, captures the "tension between different actors with different knowledge bases, languages, and different ways of thinking" (Hyppia and Kautonen. 2005, p. 4). Cognition also includes emotions and

different normative perspectives on behavior, which can be said to be cultural related. The cognitive proximity can be essential in innovation-interactive relations where the actor's ability to send, receive and understand the information will decide the success of the interaction (ibid.).

Actors with a wide gap in their knowledge base (different knowledge and skills) can find it difficult to communicate information with each other (Collins and Vecci, 2005), for example it may be difficult for a person with no computer skills to understand what a computer programmer need of information to create a well working program. For firms to be effective communicators they need to be cognitively close (Noteboom, 2003). They need to understand the same cognitive language. Therefore, within this context, cognitive proximity enables firms to interact, to have an effective transfer of knowledge. Thus, the effective transfer of knowledge requires an absorptive capacity[8] to identify, interpret and exploit new knowledge. However, when firms are too close in terms of cognitive proximity this may have a negative effect to learning and innovation. Boschma (2005) argues that there are at least three reasons for why some cognitive distances should be maintained to enhance interactive learning. Firstly, knowledge building often requires dissimilar, complementary bodies of knowledge. If the firms are too similar the knowledge bases may be too equal. Secondly, cognitive proximity may lead to cognitive lock-in, also well known as the competency-trap (Levitt and March, 1996). When firms have had successful habits and routines it may be difficult to abandon these and adopt new ones. Thirdly, if firms are too close, cognitive proximity increases the risk for unintended spillovers. New ideas and new innovations may be talked about over lunch but without the intention to give away the information for others to maybe produce the same product.

4.2 Organizational proximity

"Organizational proximity indicates the level of integration in the relations, both vertical and horizontal, between actors in an innovation process" (Hyppia and Kautonen, 2005, p. 4). Organizational practices are very relevant to the issue of interactive learning (Boschma, 2005). A common knowledge and competence base is essential for bringing firms together

[8] According to Cohen and Levinthal (1990) prior related knowledge gives the ability to understand new knowledge and use it for commercialization. This is the premise of the notion of absorptive capacity.

and enabling interactive learning. Knowledge creation also depends on the capacity to coordinate the information flow. Networks (organizational arrangements) do not only coordinate the knowledge transactions but enables the transfer and exchange of information and knowledge. According to Boschma (2005) some studies have included organizational proximity with the cognitive dimension. Thus, Boschma (2005) separates the cognitive dimension from organizational for analytical purposes and believes that organizational proximity is beneficial for learning and innovation. However, too much organizational proximity can be damaging for learning and innovation. Boschma (2005) argues that there are at least three reasons why some organizational distances should be maintained to enhance interactive learning. 1) "There is a risk of being locked-in in specific exchange relations". Too strong relations may limit access to new channels, intra- and inter- organizational networks may only interact in closed and inward looking systems. 2) Hierarchical form of governance lacks the mechanisms to give feedback which makes it difficult for interactive learning to take place. 3) Organizational proximity with a hierarchical form is unlikely to provide flexibility. The tighter and more dependent the relations are, less initiatives are undertaken and rewarded.

4.3 Social proximity

According to Granovetter (1985; Boschma, 2004; Collins and Vecci, 2005) the notion of social proximity originated from the literature of embeddedness. The theory indicates that the structure of relations between actors, the social ties are of crucial importance for the explanation of economic outcomes (Collins and Vecci, 2005, Boschma, 2004). Embedded relations consist of mutual trust, kinship, commitment and common experience which facilitate a free flow of knowledge and in the long run enables effective interactive learning (Hyppia and Kautonen, 2005; Boschma, 2004). An organization may need the awareness of social proximity to be able to learn and innovate. A trust-based relationship has a higher degree of possibility to transfer tacit knowledge than one in a market, according to Boschma (2004). Giving away tacit information to someone you do not trust will always have a certain degree of risk involved. Lundvall (in Boshcma, 2004, p. 9) claims that "social proximity encourages a social and open attitude of communicative rationality, rather than a pure, calculative, and narrow market orientation towards minimizing costs. This is often regarded as a prerequisite for interactive learning". Effective interactive learning needs relationships based on trust. If problems occur in a relationship which is not based on trust it can easier dissolve then one based on trust (Boschma, 2004). If the trust is missing, the relationship is

most likely one with less strong bonds and is not of much value to lose. However, too much social proximity (socially embedded relations) may weaken the learning capability of an organization and too much social distance may be damaging for interactive learning and innovation (Boschma 2004).

4.4 Institutional proximity

"Institutional proximity is associated with the institutional framework that guides and controls the behaviour of organizational and individual actors" (Hyppia and Kautonen, 2005, p. 5). Edquist and Johnson (1997, p. 46) define institutions as "sets of common habits, routines, established practices, rules or laws that regulate the relations and interactions between individuals and groups". The institutions can be divided into formal and informal institutions, formal being laws and rules and informal being cultural norms and habits. They commonly influence the way actor's co-ordinate their actions, meaning that the actors share both cultural norms and habits, being a common language, habits, and a shared law system securing intellectual rights and ownership (Boschma, 2004). Together the institutions provide economic growth and interactive learning (Boschma, 2004). Maskell and Malmberg (1999) support the notion that information flows easier with a small cultural distance, common language and shared values.

A strong institutional presence can play an important role for industrial growth and innovation in regions according to Collins and Vecci (2005). Much literature has been published on the role policy has had on European countries - especially on how the local and regional governments have played their role in providing a framework for regions to establish networks, industrial districts and so on. In Norway the Arena program establish networks and clusters, has played a major role in providing districts with economic funding and guidance. The Arena program has helped the networks promoting a shared group identity and to strengthen the local voice in certain regions. Overall, a strong cooperation between the private and public actors has showed to be crucial in the implementation of institutional initiatives, which has been determining the degree of success for certain regions (Collins and Vecci, 2005).

However, too much institutional proximity may not be beneficial for localised firms. Boschma (2004, p. 12) argues that too much institutional proximity can be "unfavourable for

new ideas and innovation, due to institutional lock-in and inertia." On the other hand he acknowledges that too little institutional proximity "might be harmful to collective action and innovation due to a lack of social cohesion and weak formal institutions" (Collins and Vecci, 2005, p. 18).

4.5 Geographical proximity

The concept proximity is often thought of as the physical distance between actors. As the above dimensions show, this is not the case. According to Boschma (2005, p. 69) geographical proximity "refers to the spatial or physical distance between economic actors". Much literature supports the fact that firms that are co-located bring people together and have a high transfer of tacit knowledge, but the larger the distance, the more difficult will the transfer of tacit knowledge be (Boschma, 2004; 2005). This may also be correct for codified knowledge because the knowledge transfer may need tacit information. Boschma further say that empirical studies show that firms that are co-located tend to show a higher innovative performance then firms located different places. Firms that are co-located tend to have more face to face contact and can develop trust more easily then by not being co-located. Trust often leads to more personal and embedded relationships between firms (Boschma, 2004; 2005). Geographical proximity can also change actor's norms and habits which can have influence on interactive learning and innovation (ibid).

Rallet and Torre (in Boschma, 2004; 2005) showed in a study that tacit knowledge may be transferred through long distances without geographical proximity. The need for geographical proximity is rather weak when there is a strong central authority (organizational proximity) which can coordinate the tasks needed to be executed. It is also important that the actors have the same cognitive experience. Thus, the exchange of tacit knowledge needs face to face contact. The need for physical contact can be arranged by bringing people together by travel and meetings now and then. In their study, Rallet and Torres showed that there was no need for permanent co-location.

Breschi and Lissoni (in Boschma, 2004; 2005) found that social proximity and not geographical proximity played a significant role in knowledge spillovers. The importance of social networks, based on personal friendship and working experience provided most

knowledge. Tacit knowledge can be said to be shared between members of communities of practice, wherever they are located.

"Geographical proximity may not be necessary because other forms of proximity may function as substitutes to solve the problem of coordination" (Boschma, 2004, p. 71). Boschma is questioning the role that geographical proximity can play. He recognizes that other forms of proximity may act as substitutes for geographical proximity to enhance interactive learning. Thus, interactive learning may be enhanced by geographical proximity, but too much geographical proximity may also be harmful for interactive learning and innovation. Being too close on the one hand can make firms risk a lack of openness to the outside world, and too far on the other hand may make firms lose spatial externalities. He suggests that to solve spatial lock-in non-local linkages can be established.

Collins and Vecci (2005) mention in their paper that an overall key criticism of Boschma's (2005, 2004) five dimensions of proximity, is that in his desire to delineate the different types of proximity he has over-defined these dimensions. He has separated the social and cognitive and the institutional and the organizational and this might seem a little artificial. Boschma does acknowledge that it is often is hard to detangle other forms of proximity from geographical proximity (2005). However, by using the theory about proximity presented, and also summarized in figure 5 below, it is possible to look at the framework and see if it can provide an explanation of why some relations communicate well and others do not.

Figure 6: Five forms of proximity: some features

	Key dimension	**Too little proximity**	**Too much proximity**	**Possible solutions**
1. Cognitive	Knowledge gap	Misunderstanding	Lack of sources of novelty	Common knowledge base with diverse but complementary capabilities
2. Organizational	Control	Opportunism	Bureaucracy	Loosely coupled system
3. Social	Trust (based on social relations)	Opportunism	No economic rationale	Mixture of embedded and market relations
4. Institutional	Trust (based on common institutions)	Opportunism	Lock-in and inertia	Institutional checks and balances

5. Geographical	Distance	No spatial externalities	Lack of geographical openness	Mix of local 'buzz' and extra- local linkages

Source: Boschma, 2005, p. 71

In conclusion, the proximity dimensions (cognitive, organizational, social and institutional) all play their role in building different coordination mechanisms, such as innovation and cooperation in and between companies. In some circumstances they can be substitutes for geographical proximity, alone or in different combinations. They may in different combination promote innovation. Physical closeness on its own is not a necessary condition neither for innovation nor cooperation. It is essential for each proximity dimension that the actors must not be too close or too far apart.

Information communication technology (ICT) has an impact on organizations, including Bluelight. It is of interest to take a closer look at what influence ICT has on the organizational processes. I have so far looked at how non-technological factors have influences collaboration and development of new innovations. I will now present theory on ICT and organizational processes.

4.6 Phases in networks and clusters

According to Bergum (2006) the use of the concept phases are often used in dynamically descriptions on how an organisation or a network/cluster develops over time. He further argues that according to "The cluster policies whitebook" (in Bergum, 2006) clusters will in general go through the following phases below (ibid., p. 2), thus, durability and content will vary depending on the situation.

Agglomeration: A collection of a number of companies and other actors in on region

Emerging cluster: A cluster arises and develops. In this phase the actors start to collaborate around a core activity, and realise that there are common possibilities through links and connections.

Developing cluster: When new actors in the same or related activities come together or become attracted to a region, new relations develop between these actors. Often a name or a web site, a common term, is attached to the region or the activity.

The mature cluster: A mature cluster has reached a critical mass of actors. Relations have been built outside the cluster, to other clusters/activities/regions. There is an intern dynamic of establishing new company through joint ventures, spin offs etc.

Transformations: As time goes and markets, technologies and processes change, the cluster will change. For the cluster to survive, and to avoid lock-in and to decay, the cluster needs to innovate and adapt the circumstances. The cluster to change into one or several new clusters which focus on other activities or the change can be in the way products and services are delivered.

Chapter 5 - Information communication technology (ICT) and organizational processes

The development of Information Communication Technology (ICT) has probably had influence on organizations and its innovation processes. Thus, there are many uncertainties and speculations about what kind of effects ICT have on the innovation process. Will there for example be a less need for face to face contact? I will in this chapter present a theory[9] on what ICT is and look at the subject ICT and communication. The theory will further be discussed in chapter 7.

5.1 What is ICT?

ICT is a broad subject concerning the use of technology in managing processing information. In particular, Information Technology (IT) deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information. The meaning of ICT also includes the possibility to connect people, functions and different units both in and between organizations (towards customers, distributors and other partners).

The development of ICT affects organizations in many ways; ICT creates possibilities to develop new products, the production of more complex products, a reduction in production cost and distribution cost and the development of new markets. ICT gives us the possibility to communicate better and faster, produce more and faster, and transport better and faster.

The production and other related work assignments can more than before be processed independent of time and place. Large amounts of information can be processed, analysed and transmitted. Co-workers can work physically separated. The new technology has opened up for inter- related network and organisations. Organisations can be attached through common communication platforms independent from time and place, across regional and national boarders. E-mail, Internet, video conference and satellite communication are examples of new electronic infrastructure.

ICT makes it easier to store large amounts of information. The large amounts of information are also available in a different way than earlier, computer programmes has made it easy to access and retrieve the information. The communication options have increased, and communication is possible without face to face contact, over the phone, through data communication as e-mail, video conference, telefax, web pages and son on. ICT has made communication less independent on physical contact, and there is less need for face to face communication between people. It is also possible to communicate indirectly through databases and e-mail.

ICT affect the possibility to process information, as well on the process on how decisions are made in the organizations. More information can be processed faster earlier, and different systems can help people reduce uncertainty when decisions are made and make it easier to choose between alternative solutions. It is also easier to communicate the result of the decision process through e-mail or an Intranet system (a intern Internet in a company). It must also be mentioned that ICT gives increased possibilities to coordinate activities. When information of what you do is available in a database, persons can adjust to each other without communicating directly.

5.2 ICT and communication

Communication is a comprehensive concept which can be analyzed in different ways. The easiest perspective is to say that the goal for the communication process is to transfer information. The information an organization has a need for varies from organization to organization, depending on the structure of the organization, surroundings, management and technology relationship among others.

According to Bergum there are experiences and studies that show the relevance for the communication structure in organizations. The conclusions are the following (2004, p. 17):

- ICT can contribute to new communication-network in organizations
- Communication can easier be established with people you do not know

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[9] [9] Theory in chapter five is based on a paper written by my counsellor Svein Bergum, 2004

- ICT makes communication non-personal and less dependent on status and prestige
- ICT gives more direct communication, and less and more vertical information hierarchies
- ICT can contribute to increased communication in all directions in an organizations, and will make the coordination easier

From what is mentioned above, there is a great potential for ICT to be used for organizations not being co-located, located in different regions. But, it is of importance to understand that communication is part of a social context. Electronic communication often needs a basis of face to face contact and an established trust. ICT is therefore often used between people who already have the established trust and they use ICT because of its effectiveness. By using a cell-phone or e-mail it is thus possible to develop new innovative communication structures independent of time, place, culture and social structure. This works for communication without much personal engagement.

Above reasoning comes from theories about choice of *media richness* in organizations (Bergum, 2004). The theory differs from rich media and thin media. *Rich media* will be media with personal communication like face to face and video conference. A *thin media* will be a phone call because you do not see the other person which you talk to. The phone will thus be richer than e-mail because the e-mail does not happen in the presence. The theory of media richness has a message which recommends communication with complex objectives to use a rich medium as personal meetings. Other objectives may use a choice of *thin media* like for example e-mail, telefax or a letter. A criticism of the theory of media richness according to Bergum (2004) is there are often several criteria which affect choice of media; these can be time pressure, geographical distance, norms, and relations between sender and receiver.

Chapter 6 - Research method

In this chapter I will outline the methodology used for the writing of this thesis. First I will present how the case study was chosen and what initial preparations that were taken before the writing of this thesis started. Further I will present how data was collected and what kind of interviews that were executed. The interview design and data management will conclude this chapter.

The informants were guaranteed discretion. The names of the informants and the companies and organizations will therefore not appear throughout the thesis.

6.1 Reflexivity

In this thesis I have refereed to myself as I, because of the social anthropological research tradition where the enquirer, or the researcher, uses her/himself as a tool in the investigation (Buraczewska, 2006). Kirby and McKenna (in Robson, 1993, p. 22) say that;

> "Remember that who you are has a central place in the research process because you bring your own thoughts, aspirations and feelings, and your own ethnic, race, class, gender, sexual orientation, occupation, family background, schooling etc to your research".

This implies that what is written in the thesis is what the researcher, here I, has experienced and interpreted from observations, interviews and reading.

6.2 Case study

6.2.1 Case definition

According to Miller (1991) finding good cases for research depend on three factors.
First, it is good to look for occasions of unexpected or unintended change in the underlying structures, such as power hierarchy, technology or human resources. It can be interesting to

find subjects which can generate new knowledge with reference to existing theory. The present case study, Bluelight, is an example of this since Bluelight is a distributed network which has achieved much since it was started in 2001. It seems like this organization with its distributed network has become a success without being co-located. This is not in line with much of the arguments presented in different literature, which has made it interesting to further look into this matter.

Second, organizations that are working differently than the standard, common practices in their field, are good cases. They provide an opportunity to study the impact and performance of new ways of operating that are unlikely to appear in the traditional organizations. The Bluelight network is relative young and is alone in being a network in the field of information security in Scandinavia. Therefore the network may function as an interesting case for the study of uncommon organizational practices in the field of information security.

Third, research through the use of the prior factors is likely to yield new knowledge that can be used to generate new types of organizations. By the use of the knowledge that has been generated it is possible to learn about alternative ways of organizing. Given the organizational structure of Bluelight it might be possible to conclude with some advice concerning strategic questions and policy spending on innovation.

6.2.2 Initial preparations

Prior to the research preparations were performed through a series of discussions with fellow students, my supervisors and others at the Centre for Technology at the University of Oslo. I read up on the Bluelight network through documents and by using the Internet, trying to identify potential research fields. There were many aspects to look at, but in a meeting with Svein Bergum[10] I managed to come up with an idea on what to focus on.

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[10] Svein Bergum is my counsellor and has been doing research on the network Bluelight since they were established.

6.3 Data collection and management

6.3.1 Semi-structured interviews and data sources

The collection of data is the crucial operation in the designing and execution of good research (Miller, 1991). The quality of the collected data determines the quality of the research (Robson, 1993). To understand what Bluelight is and how the information flow and collaboration function a series of semi-structured interviews were conducted. I have chosen interviews as the most important data gathering technique since this is described as a method well suited to receive information on peoples own perception of the phenomenon in question (Kvale, 1996; Hammersley and Atkinson, 1998). Semi-structured interviews are interviews with a loose interview guide that can be modified to enhance the interview session (Robson, 1993).

A total of eleven interviews were conducted for this study. Nine were interviewed in person and two were performed as telephone interviews. My experience was that it did not matter for the outcome that two were conducted as telephone interviews. The first telephone interview was my sixth interview, and I believe that the experience from the first five was an advantage and gave me the confidence to be able to perform a telephone interview with a good result. The last interviews were more detailed because I during the course, increased my knowledge of the field I was doing research in. I could focus the questions more into what I really wanted to know.

The informants were mostly men, in different age groups, and with higher education. Two women were interviewed. The criteria for my selection of informants were mainly their background, experience and the role they represent in and for Bluelight. Seven of them are representatives from the area Gjøvik. The informants orally gave their consent to the interviews and were guaranteed anonymity.

Obviously, an important methodology question is whether the informant represents the view of the company/organizations as a whole or just the informant. To ensure validity the questions were asked to ensure the outcome to be either for themselves or the company. Another general concern is that the representative could have been aspired to represent Bluelight in a good light when talking to me. This might imply that the informant avoided telling me things that would be negative for Bluelight or elaborated more on things he or she

felt was very good. I can not of course be sure of this, but I feel that this is somewhat compensated by also collecting data from other sources. There is one milieu though that I feel that I should have had more interviews from, and that is from the academic milieu. However, this is taken into consideration in the discussion. To further ensure reliability and validity all the informants were given the opportunity to read through the thesis before it was delivered. It was sent to everyone approximately two weeks before the due date. Small changes were done after that point.

A large number of text documents including reports, the application for NCE status, board committee documents and more were collected to gain further insight about Bluelight and its activities. Among them were evaluation reports of both the Arena program and Bluelight and case documents from board meetings. Various public papers were used as supplement. Two seminars were attended, “Exit Arena” and “Technology cities” and one conference, “FRAMPÅ06” where the thesis outline was presented.

6.3.3 Design of the interviews

In many cases a study is based on a set of theoretical proportions. This has also been the case for this study. When writing the interview-guide the chosen core question for the thesis was not yet finalized, however it was enough to be a powerful aid in guiding the analysis indicating where and what attention to focus on. The somewhat established core questions worked as a powerful tool for creating the right questions. By having many and open questions, I have not been able to use all the collected data for this thesis. The interviews mainly concerned the following segments:

- Background information of the informants.
- The most important factors behind decision to become a member of the network.
- What experiences the informant has had with collaboration with others in Bluelight.
- Their impression with the collaboration within the network.
- Whom the informant collaborate with? How are the bonds, local, regional, global?
- What kind of contact the informant have with others, face to face, digital etc.
- Success factors for the network.
- Questions concerning co-location.
- What is needed for the establishment of trust?

- What kind of communication is transferred, tacit or codified knowledge?

The interview guide is attached in the appendix. Other open questions were also asked, but the attached interview guide will give some idea on what questions were asked.

6.3.4 Data management

All of the interviews were conducted with a voice recorder and transcribed shortly after completion. By doing so, it is less likely to lose any data and it is possible to retain as much data as possible. In my case it would have been impossible to be as efficient as I have been by only using field notes and personal memory. The use of a voice recorder also rules out misinterpretations that can easily happen with the use of only field notes and personal memory. After completing the interviews the transcripts were read carefully several times and similar information were grouped together. This process revealed tendencies in the data. To ensure validity and reliability of the collected data it is essential to systemize and structure it. This also makes it easier to retain data for future analysis (Huberman, Miles, 1994). By grouping and systemizing the data it reduced the amount of data which was essential for the writing of the thesis.

Chapter 7 - Results and discussion

In this chapter I will aim at showing which factors were needed for a distributed network as Bluelight to collaborate efficiently in developing new innovations. The theory introduced in chapter three, four and five will be discussed against the empirical findings in Bluelight. The concept local buzz will be discussed and how it implies to the network Bluelight. I will also discuss whether or not the buzz is created automatically. Different dimensions of proximity will be used to try to explain the collaboration in the network and also to explain how the network has become successful.

7.1 Buzz and cluster/network dimensions

A network or a cluster in one region or an industry in the same area of expertise has the advantage of the possibility to collaborate. In some regions and industries there is a high degree of interaction which increases the knowledge creation and the development of innovations. I have concentrated some of the interviews from actors of Bluelight from the Gjøvik region to especially try to investigate whether or not there has been and is a local buzz in Gjøvik. I have also tried to investigate whether there have been and is a national buzz in the industry of information security. In chapter 3.2 buzz was defined as face to face contact. This has been the starting point for this discussion, further the investigation will show that buzz in Bluelight might be a little different. In this chapter I will start with a brief discussion about what kind of network or a cluster Bluelight is. Thereafter the term local buzz will be discussed against the empirical findings from Bluelight.

7.1.1 Cluster dimensions

Bluelight has been spoken and written of as being both a cluster and a network both from members and others I have been in contact with. One informant called Bluelight a fake cluster, in the “Norwegian Centre of Expertise application” Bluelight was mainly called a cluster and other informants have mentioned that the name has shifted related to the setting it has been used in. In a conversation with project leader Svein Pettersen the conclusion was that Bluelight mainly should be presented as a competence network in information security. I will

not decide which of the terms is the right definition, cluster or network. However, I will try to shed some light on what kind of network or cluster Bluelight is. Compared to Porters definition of a cluster, Bluelight is not a geographical proximate group. But Porter's broad definition also states that for a cluster, the geographic scope can range from a single state to a country which is very much correct for Bluelight. Further following Porter, Bluelight can be compared to (being a cluster) according to horizontal and the vertical dimension. Bluelight consists of some firms that produce similar goods and which can compete with one another. On the other hand, the vertical dimensions with firms which are complementary and interlinked through the network of suppliers, service and customer relations, can stimulate the growth of the horizontal dimension. By having productive collaboration and interaction, within the network this can stimulate to further innovation. According to Bergum (2006), Bluelight can also be called a functional business cluster which as the case is for Bluelight, consists of members from many different geographical locations. Bluelight consist of the most evolving actors in the area of information security nationally, with the basis in the inland area of Norway.

7.1.2 Local- and national buzz

It seems today that with enough face to face contact it is possible for buzz to be created in a local environment or in a certain industry. Buzz seems to be an economically important factor which contribute to the increase of economic activity, thus in a time age where both physical transportation costs and the ability to send information has declined significantly. When it comes to the use of ICT, several of the informants have experienced ICT as an important communication tool. However, it can not replace physical contact. According to several informants it is essential to have face to face contact especially when it comes to making decisions. Decisions that have needed face to face contact have been decisions concerning strategic planning, the NCE application and so on. Without the physical meetings that the board committee has from time to time, it would have been difficult or impossible to achieve what Bluelight have done in the past years, according to several informants. E-mail and phone can be used between the meetings; e-mail has especially been widely used in the process of getting ready documents and report which are to be presented at board meetings or distributed. Informants have mentioned that it has been very efficient to use e-mail for sending out and getting comments on cases and reports. Face to face contact is not only used for board committee meetings, but also at seminars, informal meetings and social events.

Several informants have experienced the establishment of new strong relations from informal and social events which has taken place with face to face contact. The face to face contact created a trustworthy relationship which led to business collaboration. One informant had experienced a very resplendent arrangement and had discussed with others that the event had been very expensive. But the outcome was new relations which he/she had not been able to achieve without the face to face contact. Some of the informants had also experienced that the lack of face to face contact can create misunderstandings. By having face to face contact it is easy to correct any uncertainty.

It is essential how the actors are established in the network, how they identify each other, the establishment is often produced through face to face contact. It is almost a precondition for network membership. Many of the actors who founded Bluelight knew each other from before and trust had been established through face to face contact. In the process of establishing Bluelight, personal connections were of importance. When it comes to ICT, it is often used more after the establishment of trust. When the trust base has been established, e-mail with important and trusted information can be given and received according to several of the informants. However, it is still a necessary need to have face to face contact for important decisions to be made. Decisions needed to be made at board meetings according to informants. It is often said about ICT that it is not the technology itself but how the technology is integrated and used that will decide if the use of ICT is positive or negative.

Several of the informants has the interpretation that there was either no, or very low collaboration in the field of information security in Norway or in Gjøvik in the year of 2000. Some met at a meeting now and then or at a conference. The meetings were not productive in the meaning that the contact created shared projects which could have given economical growth. There was also no initiative to increase the competence in the area of information security. There was very little physical and virtual contact. In other words; it was little buzz. After the establishment of Bluelight, the information flow and the interaction among the actors in Bluelight nationally has changed. Several of the informants have mentioned that much and the success behind Bluelight must be credited to the coordinator Svein Pettersen. He has according to the informants, been the node in the network. He has taken initiatives to meet the actors where they work or live, has made it convenient for them. He has in cooperation with other actors of Bluelight created a buzz both nationally in the field of information security and locally in Gjøvik. The buzz has not been created automatically as

Bathelt et al. argue (2002). The field of information security has been strong locally. However, there has been a need to organize a structure for conscientious collaboration to be able to realize the potential. The Arena program has given Bluelight the institutional framework for accomplishing the structure. By having created a buzz, the actors have been able to take advantage of each others knowledge base. For the active members I will argue that the buzz is high, it is unavoidable not to receive information at a meeting in the hall, at the office or at a conference. The buzz may be news about actors and their actions in the network.

As mentioned earlier, Bluelight has achieved much since they started. They have in the process established both new and maybe also stronger relations with new and old actors in the same industry. The board committee have had many meetings since they started and have built a stronger bond, the environment in Gjøvik where Gjøvik Science Park is established has grown, the number of relations has grown and the collaboration and the information flow has increased. Locally, my interpretation from the informants is that in the Gjøvik region, the information flow and the collaboration is high between the actors of Bluelight, with the exception towards NISlab where the trust and the information flow is lower. According to some of the actors, there is a high collaboration to one or two researchers at NISlab, and not much inwards. Several informants have mentioned that an increase in the collaboration towards NISlab would be of great value for the network. More collaboration will gain everyone involved; collaboration with projects is something both sides can take advantage of. According to Svein Pettersen, there will be put resources into increasing the activity towards NISlab by establishing meetings. The collaboration might therefore in the nearest future be increased.

One problem, which have been mentioned by more than one actor, is that it might be difficult for the academically actors to see what they can gain from the interaction with the other actors in the network. There might be a cultural and a value difference between the academic and the business profession. However, this has not been a topic for this thesis and needs to be further investigated. One explanation might be that the cognitive- the geographical and the social proximity distance is lower towards NISlab then towards the other actors. Thus, it has been difficult to establish at which point the buzz has changed drastically: was it after NISlab increased in size or maybe after NorSIS was established in the Gjøvik Science Park? This will, however, need to be further investigated.

The number of actors in Gjøvik has increased drastically. There are approximately 10 actors in one building from SECTOR, KInS, NorSIS and Gjøvik Science Park, and further approximately 25 people at Gjøvik University College, which is a total of approximately 35 people involved in Bluelight in Gjøvik. Many of the actors in Gjøvik are located in the same building whereas NISlab is located in a different building. According to Allen (1975) the connection with the communication volume and distance goes drastically down if you are more than 30 meters from another person. A study concluded that the difference had the same outcome if the distance was 30 meter or if the distance was to another town. This might be one explanation why the interaction is lower towards NISlab.

The buzz is for many positively productive, but also for some blocked because of the social structure and the lack of trust. The information flow goes through channels developed by the network, through social and business related linkages. By being at the right place at the right time, it is possible to pick up buzz through the network channels. These linkages could be improved towards the academic milieu, both socially and business related. This also goes for the actors which is less active in Bluelight. It seems like the social and the cognitive proximity is too far for many actors between the academic and the business related environments. It has been suggested by informants that there could be held more work shops and meetings where actors could get to know more about each other, what the individual actors have of knowledge base, what kind of projects they are working on and so on. It is of importance to establish new links for collaboration to develop for Bluelight to achieve their goal of being a network, all the actors will then have the opportunity to interact and take advantage of each others knowledge base.

From informants located in Gjøvik I have the understanding that the motivation and the spirit is very high for the actors to further do what they can for Bluelight to accomplish established goals. This comes from both the private and the public sector. As mentioned earlier, the concept Communities of Practice can rise within firms or organizations. My interpretation is that the board committee can be seen as a Community of Practice. They have been driven to the same goal with a passion for an increase of competence in the field of information security. They have shared much of the same knowledge and expertise. They have had different areas of responsibility but this has deepened their knowledge and expertise through interaction among each other on an ongoing basis. I also believe that the concept Communities of Practice might be the case for Gjøvik Science Park and maybe for NISlab.

Even though my interpretation is that they have different goals within the milieu, they might interact as a community of practice.

From my experience, a cluster or a network does not have to be co-located to establish buzz. As mentioned earlier, Bluelight is a distributed network which has been able to establish local buzz in Gjøvik and a national buzz in the field of information security. Buzz is not something that happens over night, but needs to be developed gradually. By being cognitively close and with the use of ICT they have accomplished that many of their members have a high flow of collaboration and information flow. The concept buzz does not necessarily only have to be face to face contact, but can be virtual interaction which often is a result from face to face contact. The use of ICT and e-mail is a result of face to face contact and trust. Being part of a cluster or a network can stimulate the development of the institutional structure, but this can develop a local region or a national community in a specific area. The buzz is not necessarily something that happens automatically, sometimes it has to be initiated and created.

By using theory about phases in networks and clusters, and proximity mentioned earlier I will in the next chapter discuss how the collaboration and information flow function in Bluelight.

7.2 Proximity, phases and Bluelight

Using the theory about proximity presented earlier as a framework, I look at the network Bluelight to see if this can provide an explanation of which factors are needed for a distributed network to collaborate efficiently in developing new innovations. I will investigate how different proximity dimensions can explain the collaboration in the network Bluelight, and see if they can explain how the network has become successful. I will start this discussion by investigating which phase Bluelight is in to be able to understand which proximity dimensions that have been of importance for the collaboration. I will further look at each of the proximity criteria in turn. The divide of the different proximity dimensions have been important factors to be able to explain how the distributed network functions. Further I find it relevant to look at which phase Bluelight is in, thus, this will also explain which dimensions that is relevant for Bluelight.

7.2.1 Cognitive proximity

According to the informants most members of Bluelight share the same cognitive framework. Most of them are middle aged men with higher education. The education is among many also in the same field of expertise; many are engineers and some have an economically education. Their common platform has made it easy to send, receive and understand the information interacted. There has been an effective transfer of knowledge because of the absorptive capacity hold by the members. They have been able to identify, interpret and exploit the transferred knowledge because of their low gap in the knowledge base. They are close and might from time to tome compete for the same business, but so far this have not been a problem for the members. There is a high degree of openness and trust among the members. Boschma (2005) argues that if the actors are too cognitive close their knowledge base may be to equal or the closeness may cause lock-in. From the informants and by investigating reports and documents it seems like many of the actors, not only the informants share, the same cognitive framework, and that it is not too close to be too equal. The informants do not believe that they are in a lock in or have had one, thus this is something that must be further investigated. One reason for this may be that they have a high degree of openness in the network and cooperate with many outside the network. Boschma also say that if the cognitive distance is too close this may cause unintended spillovers. Actors in Bluelight have not experienced this to be a problem; some have been careful with whom they talk and others point to the openness and the trust which is essential for Bluelight.

My interpretation is based on above arguments that the cognitive distance is close. Not too far and not to close. There are other important factors which have had and have influence on the collaboration and the information flow in Bluelight. This will be further investigated below.

7.2.2 Organizational proximity

The foundation of Bluelight is Gjøvik Science Park. Gjøvik Science Park has for four years been the operator with Svein Pettersen as the project leader. He has been called the “node” in Bluelight. The wheel that makes the organization runs. Pettersen has been the one who has coordinated the information flow, who has taken the initiatives for actors to meet and get together. He has traveled complied to make it convenient for the actors. He has made it possible for the information flow to be successful especially between the main actors in the organization, with reference to the model in chapter 2.2.4. This includes the project owner

Innovation Norway-Hedmark/Oppland, the project responsible Kristin Malonæs, the board committee, the follow up researcher Svein Bergum and the project leader Svein Pettersen. As mentioned earlier, the buzz in Gjøvik has increased, and the result is that the collaboration and the information flow today are very good. The reason for this accomplishment is a product of how the institutional framework has been organized. The information flow towards the rest of the actors has not at all times been a success. My interpretation for this is that there have been other priorities that have come first. According to Pettersen this will be improved in the nearest future. It is not the information flow itself that has not been a success, it is the amount of information transferred. The information flow in the board committee has been a success in the creation of new knowledge which has been beneficial for learning and innovation. The board committee has achieved much by cooperating together. They have also on their own initiative collaborated on interrelated projects, and this could however have been elaborated more. Boschma (2005) argues that too much organizational proximity may be damaging for learning and innovation or it may also create a lock-in. Too strong relations may limit access to new channels. For Bluelight, my understanding from conversations with the informants is that for many actors the organizational proximity is close. The information flow- and transfer is high among the main actors in the organization including one sub group located in the same building as Gjøvik Science Park. I believe the organizational proximity is to far part to the rest of the network. There are members that are not active. During the fall, as I understand it, Bluelight will put more resources into achieving this goal which probably will make a difference for economic growth, knowledge transfer and new innovations in the nearest future.

7.2.3 Social proximity

According to the informants there is a high degree of trust in some sub groups in Bluelight, where the board committee is one group and the environment in the building where Gjøvik Science Park is located is another. Members of the board committee are actors from different areas of Norway, so in this case geographical location has no importance. Having trust facilitates a free flow of knowledge and interactive learning. Quote from one informant: “It is a good feeling to be able to hold meetings in places around in Norway knowing that relations in Bluelight will take care of us when we come, knowing the right people are very important to succeed”. Another quote from a second informant: “The good thing about Bluelight is that there is a very open and informal flow of competence and information. This is maybe one of

the reasons why everything has gone as well as they have for Bluelight". A trust-based relationship has a higher degree of possibility to transfer tacit knowledge, and Bluelight with its openness creates a low risk for giving away information and gives a higher possibility to transfer tacit knowledge. As a third informant put it; "it's the informal things that creates relations, and when the relation is more than just business, you know they will not cheat you". Boschma argues that too much social proximity may weaken the learning capability of an organization, and too much social distance may be damaging for interactive learning and innovation (2004). It is difficult to measure if the social proximity is too close or too far, however, my understanding is that the main actors and part of the Gjøvik environment have a positive close social proximity, but some of the others in the network are too far part. By being too far part I mean that they are not much active. By organizing work shops, seminars and meetings with a social event it is possible to establish social proximity among more members. Many of the informants have built new relations with very good results with other companies in the network. As mentioned earlier, one informant had experienced a very resplendent arrangement and had discussed with others that the event had been very expensive. But the outcome was new relations which he/she had not been able to achieve without the social event. With the social proximity they have been able to connect on a new level and cooperate in inter-related projects.

7.2.4 Institutional proximity

From conversations with the informants I have an understanding that the main actors and the informal and the formal rules are mostly the same when it comes to cultural norms and habits. Many have the same background of educations which creates a certain kind of culture and norms, many have also worked in the same companies which also establishes some common values and norms. The fact that Bluelight have had few conflicts according to several informants might be a result from their common platform and rules. They share the same language, both literary and intellectual. The information in Bluelight flows easy, and as Maskell and Malmberg (1999) mention, the information flows easier with a small cultural distance, common language and shared values. There is a difference, though, between the academic and the business milieu. It is hard to point out what the difference is, but my interpretation from the informants is that there might be a cultural distance and a set of different values or priorities. Thus, this must be further investigated.

As mentioned in chapter 2, Bluelight has been able to establish a bachelor and a master programme. There is some collaboration with students writing thesis's for companies, and some of the collaboration has been successful. Some of the informants do not regard at this as optimal. There is still much that can be done to achieve better collaboration. According to Collins and Vecci (2005) a strong institutional presence can play an important role for industrial growth and innovation in regions. In chapter 2.2.5 Michael E. Porter's diamond model is used to show the relations and dynamic in Bluelight. As mentioned the collaboration with Bluelight and the government has given very good results. The Arena program has played a major role in providing Bluelight with economic funding and guidance. It has helped the group promote a shared group identity and to strengthen the local voice in the regions. More than one informant has mentioned that there is a very high spirit in Gjøvik to promote Bluelight, both in the private and the public sector. A strong cooperation between the private and the public actors have shown to be crucial in the implementation of institutional initiatives (Collins and Vecci, 2005). Without being a part of the Arena program it is hard to say if Bluelight would have existed today. For Bluelight my interpretation is that the Arena program has given Bluelight an institutional framework which has been essential for their success.

7.2.5 Geographical proximity

Bluelight is a national distributed network with most of the members located in the Oppland/Hedmark area of Norway. Much literature supports the fact that firms that are co-located bring people together and have a high transfer of tacit knowledge, but the larger the distance, the more difficult will the transfer of knowledge be. Bluelight has proved to differ. For Bluelight it has been essential to establish a group that share a common trust among the members. This has been done by among others things face to face contact. One informant said following: "When we have trust, distance does not matter".

Co-location can be replaced with more temporary forms of geographical proximity, such as meetings, short visits, and when needed longer secondments. Several of the informants believe that without this possibility Bluelight would not have achieved what they have managed to do in the past years. Boschma (2004;2005) argues that firms that are co-located tend to show a higher innovative performance then firms located different places, but he also say that firms that are co-located tend to have more face to face contact which develop trust.

Rallet and Torre (in Boscham, 2004; 2005) showed in a study that the need for physical contact can be arranged by bringing people together by travel and meetings now and then. There was no need for permanent co-location. The study of Bluelight shows the same. Breschi and Lissoni (in Boschma, 2004; 2005) found that social proximity and not geographical proximity played a significant role in knowledge spillovers. This is also what my findings show for Bluelight. The social networks, based on personal friendship and working experience has provided most knowledge. Tacit knowledge can easily be shared where there is trust among the actors. As Boschma (2004) also argues my findings also show that geographical proximity may not be necessary because of other forms of proximity which may function as substitutes to solve the problem of coordination. Boschma argues that too much geographical proximity may be harmful for interactive learning and innovation, that being too close can make firms risk a lack of openness to the outside world, and too far on the other hand may make firms lose spatial externalities. For Bluelight my interpretation is that the geographical proximity is not too close in a negative manner, some are geographically close and some are located further away. They have openness to the outside world with many collaborating actors both from Bluelight and others, both from the private and the public sector. Geographical proximity does not seem to be relevant for Bluelight, as many members travel to Oslo and other places. From the answers to the informants this does not seem to be relevant for the collaboration and the information flow. One effect of the establishment of Bluelight and the buzz is that it is easier for people to travel to Gjøvik because of the milieu established there.

7.2.6 Bluelight and phases

Bluelight has completed the process of being an Arena project after three and a half years. According to Bergum (2006), during a meeting held in November 2005 a representative from SIVA claimed that Bluelight was in the mature phase. From the definitions mentioned earlier in chapter 3.2 the conclusion is that Bluelight is in the mature phase. Bluelight has passed the three first phases in a time-period of four to five years. According to Pettersen (2005) Bluelight is a good example of something that would not have come as far as they have without the help from the Arena program. The institutional framework has been essential for what Bluelight has accomplished.

By definition Bluelight is in the mature phase, however, when it comes to the demand of having dynamic and the establishment of companies this needs to be further investigated. All actors of Bluelight are not at the same level active and many new members have not been established in the period. The largest expansion has happened in the competence environment at Gjøvik University College and at the Gjøvik Science Park (Bergum, 2006). What has happened in Gjøvik is impressive, they have gone from having a project leader in Gjøvik to having 35-40 people in the area of information security. One other aspect of being a mature cluster is that relations have been built outside the network. Today some relations are organized through Bluelight, but many of the companies and the competence environments have relations outside Bluelight internationally. Thus, there is a potential to develop this further. When it comes to commercializing, spin offs and ventures this is the area where Bluelight have potential for improvement. They have spent much resource on increasing the competence in information security and will now put more resources into this field. Most likely this will create changes. Because of the change by having been an Arena project there might be a need for Bluelight to make some changes and go into the transformation phase in the future.

7.3 Reflections

Future investigations of the topic proximity dimensions should cast the net wider and analyze more in detail the different proximity dimensions in collaboration with actors from one or more case studies. I feel that the institutional proximity dimension especially could have been explored more than this analysis has, thus it is a complex area of expertise. In this case study the informants have mentioned that there might be a divide between the academic milieu and the private sector when it comes to norms and values, and this is an area that need further investigation. Future research should expand the number and type of studies of innovation collaborations across different industries and innovation types and compare different types of collaborations. When it comes to types of studies surveys could be sent out to all actors in a network/cluster, this in a combination with interviews would most likely give a valid result. It will yet always be hard to establish the validity, would the result be the same if someone else had done the interviews? Open questions can give a certain possibility for different interpretation.

The concept of local buzz is a vague expression and very much focused on face to face contact. As it turned out for Bluelight, the buzz is not something that happens automatically. In the debate about buzz I feel that the concept comes short by mainly taking into consideration the face to face contact and the local environment. As the case study has shown face to face contact is essential, but in an analysis there are other aspects that also need to be considered. For example can the contact be supported by ICT, the contact can be virtual and electronic. In this global time age the buzz should be considered to exist in regions with large distances and include interaction outwards from the region, including international interaction. Future investigation of buzz in Bluelight should investigate when the buzz was established, and at what point the national and the local buzz was established. Another interesting aspect is, when it is possible to establish that there in fact is a buzz, and how many people need to be active to actually call the communication buzz? Was it after the establishment of NISlab that the buzz increased or after NorSIS was established in Gjøvik? The concept of buzz and the proximity dimensions can be further investigated. It could be of interest to investigate how long the actors had known each other before the social proximity was close; for example how many meetings had to be arranged for the trust to be established?

Although this case study reflected the empirical relevance for the theoretical framework, it is still crude and more work is required to better outline the different challenges and opportunities that most organizations meet.

Chapter 8 – Summary and conclusion

In this thesis I have used theories as well as data from a national distributed network in the field of information security. The empirical data is based on 11 interviews from informants with regards to the network. The distributed network Bluelight is used as a case study for this thesis. The aim have been to discuss the case against a theoretical framework about Information Communication Technology (ICT) local buzz and proximity in order to look at which factors from these theories that are needed for a distributed network to succeed. There are many factors that are needed to be taken into account when it comes to why a network succeed, however for this thesis the above theories are what have been investigated in this particular thesis.

We now return to the main research question of this thesis: Which factors are needed for a distributed network to collaborate efficiently in developing new innovations? In this chapter I will try to answer this question by summarizing theory and discussion. First a summary of the concept local buzz will try to answer how the concept implies to the network Bluelight. Further I will try to question whether or not buzz has been created automatically in the network. With a summary of the above and the dimensions of proximity I will try to explain the communication in Bluelight and how the different dimensions can elaborate on how the network has become successful.

8.1 Buzz and Bluelight

The concept buzz has been defined as various forms of face to face contact by among others Storper and Venables (2002), Bathelt et al. (2002) and Grabher (2001). Common for the idea is that a certain milieu can produce useful information for the perceptive actors to receive. According to Bathelt et al. buzz can be explained as the "information and communication created by face to face contact, the co-presence and the co-location of people and firms within the same industry and place or region" (p. 38).

From analyzing the theory about buzz my understanding is that buzz is more or less local, and has to be from physical contact. When performing interviews with my informants I have

asked questions with regard to buzz as not only being face to face contact, but also virtual contact, interaction through e-mail and phone.

My experience is that the collaboration and the information flow have had its starting point from face to face contact. The physical contact has been essential for the ability to establish trust for further collaboration. In a time age where both physical transportation costs and the ability to send information has declined significantly buzz, seems to be an economically important factor.

When it comes to the use of ICT, several of the informants have experienced ICT as an important communication tool. E-mail and phone is often used more after the establishment of trust. When the trust is established the informants felt comfortable with sending sensitive information digital. The use of e-mail has made communication more effective, especially when reports and documents have needed to be quickly commented. According to informants e-mail was experienced as very effective in the process of the writing of the NCE application. However, it is still necessary to have face to face contact for important decisions to be made. Informants have mentioned that important decisions that have needed face to face contact have been decisions concerning strategic planning, the NCE application and so on.

Several of the informants have the interpretation that there was either no, or very low collaboration in the field of information security in Norway and in Gjøvik before 2000. There was probably a little more buzz in the field of information security in Oppland/Hedmark then in the local Gjøvik region, and this small buzz was part of the creation of Bluelight. However, there was very little physical and virtual contact. After the establishment of Bluelight, the information flow and the interaction among the actors in Bluelight nationally and locally has changed. Svein Pettersen, the project leader has from several of the informants been called the node in Bluelight. He has taken initiatives to meet actors, travel to meet them, to make it convenient for them. He has in cooperation with other actors of Bluelight created a buzz both nationally in the field of information security and locally in Gjøvik, the buzz has not been created automatically as Bathelt et al. (2002) argue. The Arena program has worked as a institutional framework which has built a structure for conscientious collaboration for Bluelight to be able to realize their potential.

From my experience, a cluster or a network does not have to be co-located to establish buzz. Bluelight is a distributed network, yet the network has been able to establish local buzz in Gjøvik and a national buzz in the field of information security. By being cognitive close and with the use of ICT they have accomplished that many of their members have a high flow of collaboration and information flow. The concept buzz does not necessarily have to be only face to face contact, but can be virtual interaction which often is a result from face to face contact. The use of ICT and E-mail is a result from face to face contact and trust. Buzz can be local or national, in the same area of expertise or in a local community. Being part of a cluster or a network can stimulate the development of the institutional structure, but this can develop for a local region or a national community in a specific area. The buzz is not necessarily something that happens automatically, but gradually needs to develop, sometimes it has to be initiated and created for a network to efficiently develop new innovations efficiently.

8.2 Proximity dimensions and the communication in Bluelight

Boschmas framework has been useful in exploring how the collaboration and information flow function in Bluelight. It has also been useful in exploring why cooperation does not happen and why innovation happens. Using this framework it is possible to see that Bluelight without being co-located can collaborate efficiently and does not have to be co-located to be successful. Some dimensions are too close or too far part, but this does not imply to all actors in Bluelight in the same dimension. The following figure summarizes how I interpret the different dimensions as it was in the beginning for Bluelight in 2000 and in 2006.

Figure 7: Bluelight and proximity dimensions in 2000 and 2006

Proximity	**Bluelight, in the year 2000**	**Bluelight, in the year 2006**
Cognitive	Close	Close
Organisational	Too far apart	Close/For some actors too far part
Social	Too far apart	Close/For some actors too far part
Institutional	Close/For some actors too far part	Close/Too far part
Geographical	Not relevant/no role played	Not relevant/no role played

My understanding is that the cognitive proximity has not changed from 2000 till today. The actors mostly share the same cognitively framework. They are male, have higher education,

many in the same area of expertise and are middle aged. There has been an effective transfer of knowledge because of the absorptive capacity hold by the members. Their common platform has made it easy for the actors to send, receive, interpret and exploit information. The cognitive proximity is close. Cognitive proximity has partly been responsible for how the network has become successful.

The organizational proximity has for Bluelight been successful. One reason for this is how the Arena program has worked as an institutional framework for Bluelight. Svein Pettersen has been the one who has coordinated the information flow, who has taken the initiatives for actors to meet and get together. He has traveled to make it convenient for the actors. He has made it possible for the information flow to be successful especially between the main actors in the organization which together has accomplished many goals for Bluelight (with reference to the model in chapter 2.2.4). With "main actors" I mean the board committee, Innovation Norway, and the follow-up researcher Svein Bergum. However, for many of the other actors the organizational proximity it is too far part. As I understand it, there need to be put more resources into including more members. It is not the information flow itself that has not been a success, it is the amount of information transferred and the lack of interaction. The organizational proximity thus has partly been responsible for how the network has become successful.

The social proximity is for many actors close. Several informants mention that there is a high degree of trust in subgroups in Bluelight, where the board committee and the environment where Gjøvik Science Park is located are two of those groups. Social proximity is important for building trust which leads to collaboration, interactive learning and development of new innovations. One informant said the following; "it's the informal things that create relations, and when the relation is more than just business you know they will not cheat you". Many of the informants have built new relations with very good results with other companies in the network. With the social proximity they have been able to connect on a new level and cooperate in inter-related projects. For many of the other members the social proximity is too far part. More resources should be used on building new relations and trust among more members. The close social proximity has partly been responsible for how the network has become successful.

From conversations with the informants the institutional proximity among the members seems for many close, especially for the board committee and the group located with Gjøvik Science Park. They share the same language both literally and intellectually by having much of the same education and background, my interpretation is that the cultural distance is small. The institutional framework from the Arena program has been essential for what Bluelight has accomplished. It has provided the group with a shared group identity and has strengthened the local voice in Gjøvik. However, from several of the informants it has been mentioned that there might be a divide between the academic milieu and the private sector, and that there is a difference in both values and culture. This is a topic that has not been prioritized for this thesis and need more research.

Much literature support the fact that firms that are co-located bring people together and have a high transfer of tacit knowledge, but the larger the distance, the more difficult will the transfer of knowledge be. Bluelight has proved to differ. Co-location can be replaced with more temporary forms of geographical proximity, such as meetings, short visits, and when needed, longer secondments. Several of the informants believe that without physical contact, the face to face contact Bluelight would not have achieved what they have managed to do in the past years. Geographical proximity does not seem to be relevant for Bluelight. The geographical distance has not changed from the date Bluelight was established until today, yet the buzz has drastically increased both locally and nationally.

Above arguments and reasoning have showed that it has been essential for Bluelight to have much face to face contact for the establishment of trust. When the trust has been established there has been created both a local and national buzz. For this distributed network to collaborate efficiently it has been essential for them to have proximity with their members. Close cognitive proximity has given an effective transfer of knowledge because of the absorptive capacity hold by the members. Close social proximity has been part of creating trust. The Arena program has created an institutional framework which has been essential for Bluelight's success. Close organizational proximity has been essential for the flow of competence and knowledge. Which proximity dimensions that is important for a network will depend on which phase they are in. From having been a collection of a number of companies and other actors in one region to becoming a mature network or cluster there are many factors that have needed to be there. For Bluelight the above proximity dimensions have been essential in their phases for the network to develop effective innovations.

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Appendix

Members

The member information (Pettersen et al. 2006b) is translated from Norwegian to English taken from the NCE application.

Apropos Internett as
Apropos Internett as is a consulting company with their main focus in e-learning. They have an interest in increasing competence and wish to contribute with an establishment and commercializing of products and services. Apropos Internett as had in 2005 a turnover with 16 millions where 4 millions was with customers in UK, USA, Japan and Germany and 0,5 millions to information security. The company has 23 employees and 3 of these works with information security. The company spent in 2005 0,8 millions on research and development.

Computer Associates (CA)
Computer Associates International is among the world's largest software companies. CA was founded in 1976, and their headquarter is located in New York in USA. They have 150 offices in 145 different countries and have customers in more then 140 countries. The Norwegian part of the business includes development, implementation, sale and education. CA had in 2005 a turnover with USD 3,5 billions. The company has 15300 employees in the world and has 75 employees in Norway.

Eidsiva Vekst AS
Eidsiva Vekst AS is a daughter company of Eidsiva and includes the corporations aim for development of new products and services and for technology development in the corporation in general. Eidsiva aims for innovation and development among other through investments attached to new technology and ownership within renewable energy, broadband, electricity security and remote heating.

The department for defense FSA – Army

The department for Defense/ Center for protection of critical infrastructure (FSKI) is established at Jørstadmoen in the county of Lillehammer. The centers main goal is control of the information security in the defense and has the bachelor study in information security by the Defense engineering college. FSKI has 15 employees and 4 draftee personnel and a budget with 14,5 millions.

The union KInS

The union KInS is a member organization with approximately 90 members. Their goal is to increase the information security in counties and county administrations. The organization has one half position and is based on voluntary work.

Gjøvik Science Park as (GPS)

GPS's area of expertise is innovation and creation. 9 persons are employed with the aim to identify, establish and to implement innovation projects with regional foundation and international potential. The most important goal is to create more competence intensive companies in the region of Gjøvik. GKP had in 2005 a turnover with 10 millions.

Norwegian School of Management BI

The Norwegian School of Management BI delivers research based knowledge and competent candidates witch contributes with better practices in both private and public companies. BI is Norway's third largest education institution with 18500 students. The School can offer bachelor, master and PhD studies. BI has one of Europe's largest science environments within the fields of economy, management and marketing with approximately 330 scientific employees. BI had in 2004 a turnover with 886 millions. The operation have 716 employees.

Gjøvik University College (HiG)

HiG has approximately 1.700 students and 200 employees, and is organized in five institutes in the field of technology and the field of healthcare. NISlab (Norwegian Information Security laboratory) is located at the institute for information science and media technology, which is the field in information security at HiG, and which is very much a product of the collaboration between HiG and central companies in Bluelight. HiG started the first master programme in information security in the Northern countries 2002 through cooperation with KTH in Stockholm and Bluelight-actors. HiG had in 2005 a turnover with 130 million NOK.

16 employees work with information security, with a budget with 5 million NOK. HiG have over the last years had a remarkable increase in the research effort and the school is working on establishing a PhD education. The research is concentrated especially on media technology and information security. Several of the employees have research competence. The operation spent in 2005 15 million NOK on research and development, where 2 mill was spent on research and development in information security.

Ibas

Ibas Group has 28 years of experience as a supplier of data reconstruction, erasing of data and data research and is owned by the company American Kroll Ontrack. Ibas has offices in the Nordic countries, England, Germany, Poland, France, Singapore and USA, and agents and distributors in many European and Asian countries. Ibas develop their own products, and has technology and the competence to secure important data. Ibas wish to cooperate with Bluelight, for both recruiting and to increase the competence in information security, and also to be an active team player so information security is attended to. Ibas has 166 employees, 121 international and 45 in Norway. The operation had in 2005 a turnover with 173 millions, where 35 % is national and 65 % is international. Ibas is represented in ten countries and all the activity is attached to information security.

IBM Norway AS

IBM Norway is one of Norway's largest consulting organizations. Together with partners IBM offers knowledge and experience about important industries. When business processes change, IBM help clients with knowledge based industry competence, services and technology. IBM delivers some of the most scaled and secure internet solutions in the worlds. When they build solutions like this, they do it with hardware and software, services and first class solutions from both IBM and from partners and distributors. IBM had in 2004 a turnover with $96.5 billions. The operation has 320.000 employees in the world. IBM has some of the world's most extraordinary research departments which make sure the products that are sold include what is new on the market when it comes to technology development. IBM makes investments yearly for over five billions dollar in research and development. IBM has since 1990 received more approved patents in the USA then any other company.

IKON AS

IKON AS is a senior IT consultant company located in Lillehammer. IKON has a conscious and focused aim for chosen services and industries where they have expert knowledge. IKON offers services in among others project management, information security, ICT management and expert knowledge for managements in larger public and private operations. IKON is involved in large public projects where security solutions have a very high focus: Emerngencynett, The Defence and The Norwegian State Educational Loan Fund. In the private sector they work with documentation and security components in Telenor Cinclus, Norwegian Hydro and Sparebank 1. IKON had in 2004 a turnover with 57,5 millions. From this was 5 millions directly related to information security. The operation has 40 employees, and 4 which work with information security. The operation spent in 2004 0,5 millions in research and development.

ICT-Norway

ICT-Norway is dedicated to create good business and developments possibilities for their members, to front their interests and offer effective value added services. This included being a resource for daily information about the industry, its actors and important themes which are set at the political map which attach the ICT-industry.

ITS Norway

ITS Norway is a member based union which work to promote ITS as a instrument and a service offer in all transportation, railroad, air, sea and road. ITS use advanced ICT in transportation areas for operative goals. This supports the industries options in the knowledge and the product development, to strengthen the public and the private business involving international influence according, standardising and funding for research and development. ITS Norway tries to prepare research and development program both national and through EU. ITS Norway is a member of NITS, ERTICO (ITS in Europe).

Norwegian computing center (NR)

NR is an independent private establishment, and a not commercial research institute, which process research- and development missions for industry, business and administration both in Norway and international. NR is leading in fields as multimedia, multi channel communication, ICT security, and has one of Europe's best environments in static modeling. The main focus is technology and systems for information security. NRs establishment and

competence will fit for any operation as NCE IS to support the development of new industries, evaluate technological choices and to contribute directly for research and development. It is natural to contribute to the flow of competence and the consciousness of different forms for risk attached to the use of electronically information. NR had a turnover with 48 millions, where 90% where in Norway. The operation has 50 employees, which all are in Norway. In the field of information security there are 10 employees working. The operation works primarily with research and development, so 100% of the cost is attached to research and development, and from this 20% is from information security.

Novell

Novell is a global company with over 5000 employees. If you need secure, safe products and cost efficient IT environments Novell can help to drift, simplify, secure and integrate heterogenic IT environments for low cost.

Oppland County Administration

Oppland county administration is responsible for communication, dental services, culture and sports, protection of the culture, regional development, advanced training, the county library. OFK had in 2004 running expenses with1,7 billions. OFK has approximately 1900 employees.

NorSIS

NorSIS has as a goal to improve the security and to reduce the vulnerability for information and communication technology in society in general. The primary group is small and medium sized operations both in private and public sector also including the counties. NorSIS shall as long as it is possible comply with the needs of the citizens. All groups in society shall be able to take advantage of the services of NorSIS. NorSIS was established at Gjøvik Science Park January 1.2006. The centre has 4 employees and a budget with 6 millions NOK.

Norwegian Tipping - lottery

Norwegian Tipping AS is owned by the government and administrate number games and sports games in Norway on behalf of the government. The company is located in Hamar. ICT is an essential factor in today's game operation, and information security is very important to be able to run an operation as our interests has faith in. The products and services offers mainly in Norway, but Norwegians internationally can under certain circumstances play our

games through the Internet. The main interest area and goal with participating with Bluelight is the knowledge development and the flow of information security. Norwegian Tipping had in 2004 a turnover with 9612 millions. The operation has 365 employees, all in Norway. Five employees work with information security. The establishment spent in 2004 72,3 millions on research and development and approximately one million on research and development in information security.

PricewaterhouseCoopers AS, Norway (PwC)

PwC is one of the world largest networks of accountants, lawyers and counselors, and delivers a broad specter of professional services. The services from PwC in Norway includes revision and related counselling, including assistance in verification, controlling and restructuring processes, and also for transaction support and financial counselling. PwC had in 2004 a turnover with approximately 17,699 USD millions. The operation is represented in 130 countries and has 130 000 employees internationally. In Norway the turnover in 2005 was 998 millions and the number of employees was 900. In Norway approximately 25 people work with information security, and 30 millions of the turnover is attached to information security. Internationally, approximately 6000 work with information security. PwC spent in 2005 approximately 80 millions on research and development. PwC has their own development department in USA as produces methods and frameworks for all the companies in PwC. Part of this is publicised for all our customers as for example “Information Security – A Strategic Guide for Business”.

Symantec

Symantec is one of the worlds leading operations in solutions to help individuals and companies to secure that the information is safe, available and has necessary integrity. Symantec has their main office in California and has operations in more then 40 countries. The operation has over 14 000 employees in the world and had in 2004 a turnover with USD 1879 millions. In Norway there is 24 employees. Symantec spent in 2004 252 millions on research and development. Symantec has more centers for research and development around the world.

Telenor

Telenor has its main office in Norway and is a company which is far ahead when it comes to technology and also when it comes to security. Telenor have put large resourced at home and

especially in EU connection in research and development. Telenor exports mainly competence to build new Mobil operations, something they have done in 11 other countries. Telenor has a strong interest of seeing several expert fields in Norway on the top with the rest of the world and sees large advantages with gathering industries as Bluelight. Telenor had in 2005 a turnover with approximately 69 billions. The operation ir represented in 12 countries, with half of the sales in Norway, and half internationally. Telenor has approximately 12 000 employees in Norway and the same number internationally. In Norway approximately 75 people work with information security. Internationally many houndreds work with information security.

Thales/ Thales Norway

Thales Norway is center of excellence in strong crypt for defense use. Thales is heavy in information security for Critical infrastructure, inclusive emergency net, plane safety, harbor safety, transaction safety in bank, finance and ticket systems. Thales had in 2005 a turnover with approximately EUR 11 billions, in Norway NOK 350 millions. Thales Norway must finance their own investments in products and market. The operation is represented in 50 countries, and has a total of 60 000 employees. In Norway there are 175 employees. Thales Norway is among the largest development environments in ICT safety with 60% share of export of a security related sales with approximately 140 MNOK. In Thales approximately 15 000 of the employees work with information security internationally. In Norway there are 70 employees. Thales has a focus on research and development, and the budget internationally was in 2005 with EUR 2 billions, approximately 400 millions was for information security. In Norway there was put approximately NOK 150 millions on research and development, where NOK 80 millions were attached to information security.

University of Oslo – AFIN

The department for administration information science (AFIN) is a result of a inter field cooperation with the University of Oslo. The department is controlled by a subject assembly with representatives from the juridical, the social science, the mathematical- scientific and the history-philosophic faculty in addition to representatives from the department. The department belongs administratively to the juridicial faculty and is co-located with the institute for court information science. AFIN works primarily with the use of ICT in large organizations.

Virosafe

ViroSafe Norway AS is Norwegian and was established in 2001 and is a importer and distributor of security software, as anti virus. The operation owns the concept the Security card, which is a new developed e-learning concept for education of employees in IT-security. The operation had in 2005 a turnover with 6,6 millions, which as a whole is in information security. The operation has 7 employees and is localised in Hamar. The operation spent in 2004 0,5 millions on research and development in information security.

Interview guide

- What is your age?
- What kind of education do you have?
- Very briefly can you mention what your background is?
- What is the main activity of your company or organization?
- Which factors where behind your decision to become a member of Bluelight?
- Whom do you cooperate with in Bluelight? Are these bonds strong? Local? Regional? Global?
- Positive or negative factors of the collaboration?
- At meetings, what kind of cases or questions are raised, are there any that can not be mention out loud?
- How can trust be established?
- Where are most of your customers established?
- How is the communication organized in the network? Much communication with face to face contact? Is it times necessary with face to face contact? Digital contact? Contact through e-mail, phone, teleconferences, and video conferences?
- What impact has ICT for the communication? Experiences?
- Why has Bluelight become a success..? Same intellectual and literary language? Same background of education? Joint background? Other factors?
- Should any of the activities of Bluelight be co-located in Gjøvik? Which one and why?
- Which activities have been co-located? What has the experience been?
- Negative and positive effects by being a distributed network?
- How is the communication and the information flow in Gjøvik?

- Whom do you collaborate with in Gjøvik?
- How has trust been established?
- Has the communication increased over time? Because of the established trust?
- Has the digital communication increased or changed after the establishment of trust?
- At what point are electronically media used?
- Has the establishment of the network increased the contribution to research and development in the Gjøvik region?
- What kind of communication is being transferred? Codified knowledge (technical manuals, documented information)?or tacit knowledge (information which is not written, modes of conduct)? Or maybe both?
- Knowledge leakage/spillovers- are you afraid that knowledge and ideas can leak to other actors in the network? or to outsiders? Give you competition? Elaborate..?
- What have you as a company/organization/institution achieved by being part of Bluelight?
- What did you expect as a result by becoming an actor of Bluelight?
- If you had not been a part of Bluelight, would it have made a difference when it comes to economic increase for the company/organization/institution?
- What do you think are the reasons for Bluelight's success?
- What are the advantages and disadvantages of being a distributed network?