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Open Source Software at Telenor IS

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Problem Description

A survey shall be developed, carried out and analyzed, with the aid of questionnaires, interviews and workshops. The survey will focus on investigating the employee's attitude towards and experience with use of Open Source Software. The survey will also investigate how the employees regard an increased use of Open Source Software, what they regard as the biggest risks, and how Telenor IS can gain any advantages of such a usage. Actual use of Open Source Software in software applications at Telenor IS will be investigated and compared with the responses collected from the survey.

Assignment given: 15. January 2009
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ABSTRACT

Open Source Software (OSS) is becoming a real alternative to proprietary software because of the attractive characteristics it might bring (e.g. reduced costs, independence from vendors and increased innovation). Consequently, adoption of OSS is getting more attention and the industry is adopting OSS in a much larger scale than before.

Telenor IS, the information system branch of Telenor Nordic, has realized that OSS adoption is increasing and noticed the advantages that OSS might bring for them. Therefore they have started a project called *Open Source 2010*. Among this project's goals are finding suitable OSS products to use within the company, and to increase the overall adoption of OSS to avoid "lock-in" to commercial vendors and be able to cut costs.

As part of the Open Source 2010 project, we investigated three issues. The first is what concrete experience the individual employee has with OSS. The second is to examine the employees' attitude towards OSS, and how they assess an increased use of OSS in Telenor IS. The third is exploring which advantages and risks OSS could bring, in addition to which preparations that should be made to ease the adoption of OSS.

To investigate these issues, we cooperated with Telenor IS to develop a survey consisting of both interviews and a questionnaire. To validate, supplement and disseminate the results from the survey, two workshops were conducted with Telenor employees.

This thesis has three main contributions.

1. *Empirical findings* showing that: (i) There is no real difference in attitudes towards OSS between leaders and non-leaders. (ii) A notable amount of OSS is in use, supporting that OSS adoption is increasing. (iii) Leaders are not necessarily aware of all the OSS being used.
2. Identification of several *advantages, risks and preparations* which are important to consider when increasing use of OSS. Several of these are generalizable, and could be considered by other companies planning to adopt OSS.
3. *Increasing the visibility of the OSS project inside the Telenor IS organization*. This is important, so that the individual employee in Telenor becomes aware of the project. In addition to increased visibility, the survey involves the employees and makes their voice heard in the OSS adoption process.

PREFACE

This thesis is the result of the course TDT4900 - Computer and Information Science, Master Thesis and was produced during the spring of 2009. It was written at the Department of Computer and Information Science (IDI) at the Norwegian University of Technology and Science (NTNU).

We would like to thank our coordinators at Telenor IS Paul Skrede and Arne Christian Hårseth, together with the rest of the Open Source 2010 group, for useful input and help. Additionally we want to thank our supervisor Reidar Conradi and co-advisor Øyvind Hauge for helpful guidance throughout the project. Last, but not least, we would like to thank all of the survey respondents and the employees that attended the workshops.

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LIST OF ABBREVIATIONS

- BSD** Berkeley Software Distribution
- CBSD** Component Based Software Development
- FS** Free Software
- FSF** Free Software Foundation
- GPL** General Public License
- GQM** Goal, Question, Metric
- IDI** Department of Computer and Information Science
- L-GPL** Lesser General Public License
- NTNU** Norwegian University of Science and Technology
- OSI** Open Source Initiative
- OSS** Open Source Software
- TCO** Total Cost of Ownership

CHAPTER 1

INTRODUCTION

Open Source Software (OSS) is becoming a frequently used buzzword nowadays. It is daily written about in computer related newspapers and it is getting more and more attention from both individuals and companies. Also in research literature OSS is a “hot” topic, but much of the publications present case studies of OSS products or focuses on why individual developers contribute to OSS communities. Not that much research is present on OSS adoption within a company.

As OSS is starting to become a competitive alternative to proprietary solutions, many companies wish to explore the new opportunities that OSS might bring. With an increasing amount of commercial firms adopting OSS, investigating how this OSS adoption is planned and performed is an interesting topic for research.

Telenor is Norway’s second largest company and the world’s 7th largest telecom operator measured in number of subscribers, with operations in 13 countries [18]. Telenor IS is a part of Telenor Nordic and currently has almost 400 employees. Telenor IS is responsible for a portfolio on approximately 300 information systems, with a varying use of OSS. Until now, Telenor IS has not had any clear strategy on OSS usage. They wish to become more conscious on OSS and therefore wish to investigate the employee’s attitude towards and their understanding of OSS. They also wish to perform a system exploration on the actual use of OSS.

From a researcher’s point of view this is an excellent opportunity to supplement the research literature on OSS adoption. By following the Norwegian IS part of such a large company like Telenor and see how they plan to adopt more OSS, valuable empirical data could be collected.

1.1 Problem Statement

This report presents the master thesis of two students at *Norwegian University of Science and Technology (NTNU)* in Trondheim. The original problem statement of the assignment was the following (translated from Norwegian):

A survey on Open Source Software usage in Telenor will be developed, carried out and analyzed, with the aid of both questionnaires and interviews. Actual usage of Open Source Software in selected parts of Telenor's system portfolio will also be investigated. Understanding around Open Source Software usage will be compared with actual use of Open Source Software.

During the progress of the thesis, the problem statement got some modifications to reflect the actual assignment. The final problem statement of the assignment was as following:

A survey shall be developed, carried out and analyzed, with the aid of questionnaires, interviews and workshops. The survey will focus on investigating the employee's attitude towards and experience with use of Open Source Software. The survey will also investigate how the employees regard an increased use of Open Source Software, what they regard as the biggest risks, and how Telenor IS can gain any advantages of such a use. Actual use of Open Source Software in software applications, at Telenor IS will be investigated and compared with the responses collected from the survey.

To answer the problem statement, five research questions were formulated in dialog with Telenor IS. The first one tries to investigate to what extent the employees at Telenor IS has any experience with OSS. The second looks at how the employees regard an increased use of OSS. The third focuses on implications of increased use of OSS: What are the advantages and possible risks connected with this, and what kinds of preparations that can be made to deal with these issues. The last two research questions focus on the actual use of OSS in Telenor's systems today. The research questions are presented in detail in Chapter 3.

1.2 Research Method

To answer the research questions, several research methods have been used. Figure 1.1 shows the main steps of this thesis: startup, interviews, questionnaire, workshop #1, finalization phase and workshop #2. The startup consisted of both telephone meetings and a meeting at Telenor Fornebu in order to define how the thesis could be beneficial for both parts. The questionnaire's main goals was to investigate the attitudes towards and experience with OSS, which advantages and risks OSS might bring and which preparations that should be made for increased OSS adoption in Telenor IS. It was designed and distributed to 140 of the total 388 employees at Telenor, yielding 86 unique responses. To aid the process of designing and creating the questionnaire four preliminary interviews were conducted with selected employees in the organization. To validate and supplement the results, workshop #1 was conducted. After this all data

was collected and this report was finalized. Finally a second workshop was held to present and disseminate the results of the thesis.

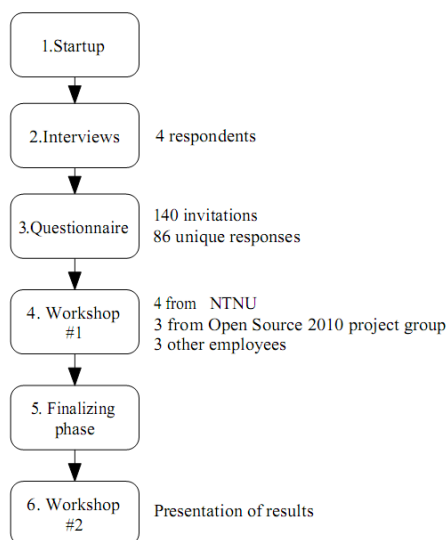


Figure 1.1: Overview of the research process of this master thesis

1.3 Contributions

This report is our contribution to Telenor's project Open Source 2010. It consists of data collected from the interviews, questionnaire and the first workshop. An analysis was then done on the collected data, focusing on the employee's attitude towards and experience with OSS, together with identified advantages, risks and preparations.

From a researchers point of view the main contributions of this thesis could be divided into three parts:

1. **The thesis presents empirical findings on the employee's attitude towards OSS, actual usage of OSS at Telenor IS today and the leader's awareness on this usage.**

This contribution is of value to researchers which is studying OSS adoption, and may suggest that the bottom-up approach is not necessarily in a dominant position anymore.

2. **The thesis identifies several advantages, risks and preparations which are important to consider in order to increase use of OSS.**

This contribution is of value to Telenor, so that their planned OSS adoption will succeed with minimal amount of trouble. It is also of value to other companies planning to adopt more OSS.

3. **The thesis increases the visibility the OSS initiative in Telenor IS to the employees.**

This contribution is of value to Telenor, showing that this is a serious and thought-through initiative with top management backing.

1.4 Content

This report consists of seven chapters:

Chapter 1 - Introduction gives a short introduction to the report.

Chapter 2 - Open Source Software and Free Software is an introduction to Open Source Software, together with advantages, risks and examples of use in industry.

Chapter 3 - Research Context and Motivation states the context and motivation together with the research questions and hypothesis formed for the master thesis.

Chapter 4 - Research Design highlights the research methods used to answer the research questions and validate the hypothesis.

Chapter 5 - Results presents the results of the preliminary interviews, the questionnaire and the workshop.

Chapter 6 - Discussion discusses the results and considers the validity of these.

Chapter 7 - Conclusion and Further Work gives the conclusion of the report, and suggest subjects for further work.

CHAPTER 2

OPEN SOURCE SOFTWARE AND FREE SOFTWARE

This chapter will give an introduction to *Open Source Software (OSS)* and how companies could benefit from OSS. It will also cover some examples of use of OSS in both industry and more specially telecom industry, together with which advantages, risks and challenges that OSS potentially may bring.

2.1 What is Open Source Software?

The history of OSS is subject for a chapter itself, including issues such as the rise of the Internet, GNU and the Free Software Foundation, Linux, Apache, Mozilla, the Eclipse Foundation and the *Open Source Initiative (OSI)* [36]. Unlike commercial software, OSS does not necessarily have a provider or vendor. Instead the “provider” in the OSS context is often a community of developers that may be distributed around the world. Most importantly, OSS is generally free to acquire, use, modify and re-distribute, as long as the legal terms in the actual OSS license are not violated (see Section 2.1.2). *Free Software (FS)* is another term whose definition is almost identical to that of OSS. In principle, we could say that the only differences are ideological, as illustrated in the following quote from the GNU website [13]:

“For the Open Source movement, non-free software is a suboptimal solution. For the Free Software movement, non-free software is a social problem and free software is the solution.”

FS is also more restrictive in terms of which licenses they accept. A definition of FS is “*software (components) with freely available source code which can be altered to fit the developer’s specific need*”. Furthermore FS promotes the four freedoms, namely the freedom to [12]:

0. run the program for any purpose.
1. study how the program works and change it to fit individual needs.
2. redistribute the program to help others.

3. improve the program and release a new version so that the whole community benefits from the changes made.

A precondition for the first and third freedom is that the source code is available for download.

Even though OSS has a slightly different definition than FS, the difference is of no real influence on this report. For the remainder of the report, OSS will therefore be used as a common term for both Open Source Software and Free Software and any other terms existing with virtually the same meaning (e.g. Free and Open Source Software (FOSS) Free/Libre/Open Source Software (FLOSS) etc.).

2.1.1 Types of Software

OSS as other software exists and may be used in various forms. This section gives a short introduction to some main types of OSS used in later parts of the report.

The first type is **stand-alone infrastructure products** like database systems, web servers and application servers. Many of these products are mature and well known, as for example MySQL or PostgreSQL for database systems, Apache for web servers and JBoss for application servers.

The second type is **miscellaneous office or support tools**. Office tools like the OpenOffice package, Mozilla Firefox and Thunderbird and the powerful Eclipse IDE are popular products. Considering support tools JUnit and NUnit (Java or .Net) may be used for testing purposes and SVN/CVS are popular choices for version control of file systems.

The third is **components (and frameworks)** as parts of other software in what is often called *Component Based Software Development (CBSD)*. This has its main advantage in that not everything has to be coded from scratch, and therefore both time and money could be saved. Examples of well known OSS frameworks are Spring and Hibernate.

2.1.2 Open Source Software Licenses

An ordinary copyright protects the intellectual property of the creator(s) and gives exclusive rights to control the distribution of his/their work. An OSS license could be seen upon as an addition to the copyright as it is a legal agreement between the creators of the OSS and the adapter of the component/software. An OSS license grants the user with the four freedoms mentioned above, but may set some restrictions when distributing the OSS component linked with proprietary software, for example when someone wants to distribute a licensed component with modifications. It is important to consider the license of an OSS component in order to not get unclear copyrights and unwanted legal issues. In worst case a person may be sued by the original author for not abiding the terms of the license.

One group of OSS licenses has been developed by a nonprofit organization called *Creative Commons*. They believe sharing of work increases creativity and innovation, and the licenses are developed to cover what they call “some rights reserved” [9]. These licenses work together with the ordinary copyright to be able to get exactly the kind of legal protection that you need.

The amount of different OSS licenses is constantly rising and in 2006 over 100 distinct licenses were approved by either the OSI or the *Free Software Foundation (FSF)* [10]. The most well-known licenses include the *GNU GPL license*, the *L-GPL license* and the *BSD license*.

The *GPL* is the most restrictive of the mentioned licenses, and if you are to release non-free software with a GPL-signed component you have to release the software itself with the GPL license [38]. This includes releasing the source code. GPL is probably the most used license, almost half of the components at SourceForge were licensed under GPL as of July 2007 [40]. The *L-GPL* license is a bit less restrictive since it only demands that modifications of the component have to be released as L-GPL. In contrast to these two licenses, the (new) *BSD* license¹ is much more liberal, and you could without problem release your software including proprietary software without needing to release the source code as well.

The OSS licenses could be divided into two main groups; *viral* or *non-viral*. Since the word *viral* has been adjudged to have negative connotations [10], the term *reciprocal license* is used instead. GPL is an example of a reciprocal license, BSD is a non-reciprocal license. When considering an OSS component the adapter must also carefully assess what license the component has and which consequences this license has for the software that is being developed. *Copyleft* has become a well known term to describe how a license ensures that the licensed software has the same freedoms in the modified versions as it had in the original version. GPL is the most widely known copyleft license.

2.2 Advantages, Risks and Challenges with Open Source Software in Industry

The reasons for OSS adoption in a commercial company range from reducing license costs, increase innovation and independence from vendors to an (possible) improvement quality and reliability and being able to read and or modify the source code [24]. In an expert evaluation of 134 solutions in the Italian software industry results show that OSS solutions are more innovative than proprietary solutions [25]. In a field study of European companies, the interviewed managers saw the business benefits extremely important, and especially escaping vendor lock-in and increased collaboration and innovation [26].

Typical fear factors of OSS adoption may be the lack of a specific vendor to turn to for support and updates and increased learning costs [15]. Another barrier to OSS adoption may be lack of internal IT resources and expertise, which includes getting an understanding of the license and understanding the overall costs [32]. Also the lack of reliable information about OSS products may prove as a barrier for OSS adoption. In an Australian study the main reason to reject OSS was managerial support [17]. The managers are concerned about reliability, support, available resources and do not see the need for OSS technology within the company. Lack of managerial commitment may in turn lead to an “bottom-up” approach to OSS [31]. In the mentioned European

¹The original BSD license had an “advertising clause” that required all work derived from the BSD-licensed work to include an acknowledgment of the original authors, this was removed in the “new” BSD license of July 22, 1999.

study technical issues like compatibility and lack of expertise were mentioned [26]. As with the advantages, the business issues posed a bigger challenge and lack of support was an important challenge to consider.

Commercial companies that consider OSS adoption have several issues that need to be addressed. Examples of issues may be cost/advantage, availability of source code, maturity of product, vendor lock-in and external support [41]. The authors of this paper argue that all these moments could create either claims or counterclaims. The cost/advantage needs a careful consideration of *Total Cost of Ownership (TCO)*, including both acquirement costs and switching (including both migration and training) costs. This has to be done at a product level, as it makes no sense to do a general OSS vs. commercial software comparison. The availability of source code could be an advantage if the adapter wants to modify it, but in many cases, especially when mature OSS products is used, this may not be necessary or even possible in terms of getting a grasp of all the code. The maturity of a product could be measured by the activity in the community and the possible presence of other successful adoption in larger commercial firms. Avoiding “lock-in” is a usual thought when considering OSS instead of proprietary software. However dependently on the knowledge and experience in the organization considering the OSS products to adopt, the organization may still be dependent on an external vendor to provide support, updates and services. An additional issue may be that the external support may not exist for some type of “immature” OSS.

The conventional way of thinking is that OSS works best for “low-level-system-oriented” technology and that more complex systems are better suited choosing commercial alternatives [6]. This is not necessary true, and in Brydon and Vinings case study from 2008 they show that SugarCRM has the potential to challenge large commercial CRM systems.

2.3 Use of Open Source Software in Industry

OSS could be used in the industry to support development and reduce TCO. Beaumont Hospital in Ireland, uses OSS to aid their information system infrastructure development, and has a goal to reduce its TCO by over €20 million within five years [11]. Additionally a positive “spin-off” experienced by the hospital is having a better connection between its IT-department and the users of the systems, as the users became more involved in identifying and acquiring OSS solutions. On the downside however, the comfort of having a commercial partner to give support is a risk the hospital had to face. They had to get used to acquiring support from bulletin boards and similar solutions instead of talking to a vendor. To mend some of these issues, they choose to acquire StarOffice instead of OpenOffice, and consequently paying for support directly from Sun.

The FLOSS report of June 2002 reports varying degree of usage in the three countries investigated [29]. In Germany the adoption of OSS was quite high (43.7%) while it was a bit less in UK and Sweden (31.5% and 17.7% respectively). The numbers for Germany and Sweden are supported by the Operating System Counter (IOSC)² in 1999, which reported Linux use on 42.7% of the German hosts and 16.9% of the Swedish hosts. Gartner reports even higher numbers in their survey of May/June 2008

²<http://leb.net/hzo/ioscount/>

[22]. Of the 274 end-user organization worldwide, 85% of the companies reported use of OSS and Gartner Inc. believes the last 15% will follow within the next year.

The integration of OSS components into software solutions in the Norwegian software industry is also significant according to Hauge et al. [20]. Of a sample of 569 companies nearly 50% reports usage of OSS components in their software. This number is a bit smaller for software houses which limit to 35%. The percentage is believed to be even higher if all types of OSS software were considered and not only the integration of components. As these numbers are high, it is clear that OSS solutions are getting more and more mature and are able to compete with commercial/proprietary solutions. By 2010 it is predicted that FLOSS-related services could get a market share as high as 32% of all IT-services [14].

This section has given some examples of OSS usage in industry, but OSS adoption has not been given as much attention as e.g. motivation of individual developers contributing to the communities [15]. OSS adoption is a subject that needs more research and empirical data.

2.4 Use of Open Source Software in Telecom Industry

Many telecom companies report usage of OSS to various degrees. This section will give some examples of telecom companies that successfully use OSS to cut costs, increase innovation or help standardize software. These examples of successful adoption will help show that OSS may be used within large domains such as the telecom domain as well as it can in other domains.

The first example of a telecom company with a defined strategy towards OSS is *Telecom Italia (TI)*. TI is the leading Italian telecom company and has 7,3 million broadband connections together a gigantic and advanced network consisting of 107 million Km in copper lines and 3.8 million Km of optical fibers [23]. As many other companies TI is also always looking on possible ways to reduce its TCO on solutions for all Operating Support System processes that exists in such a big Telecom Company [2]. If these systems could be realized using OSS clearly this could create savings in form of reducing the amount of proprietary software licenses. TI is still in a start-phase of this OSS approach, but after a pilot running for over two years on a mediation layer called Network Neutral Element Manager (NNEM) they conclude that the OSS approach is feasible and NNEM successfully manages about 10,000 devices today [4].

While TI still is in a start phase of their OSS initiative they are positive that they through this approach will reduce their TCO and aims to propose standards within the Telecom Community [2]. Many companies believe that because of the sharing collaboration with direct competitors, OSS may be a bad choice. In TI's experience this is not correct. They argue that without sharing, the different telecom companies will end up with almost the same systems with multiplied cost, and therefore it may be wiser to standardize the solutions.

A second example from the telecom industry is *Vodafone's "betavine" initiative*. This is a web portal created and maintained by Vodafone that allows anyone to create and test one another's mobile applications [19]. These mobile applications could be downloaded from any wireless network, and it thus not limited to Vodafone's. The gain for

Vodafone is insight in the newest technologies and trends, and they are able to ensure that the new applications are compatible with their network [7]. Vodafone was also able to get this “betavine” community to test a software add-on that enabled Internet access to mobile broadband customers based on Linux.

Users of “betavine” are able to explore new alpha and beta versions of mobile software, or in the case of developing own software protect their intellectual property by a license. The amount of downloads and comments from the community could prove to be valuable feedback to further develop the mobile application. The total amount of members of the “betavine” community has passed 10300 by April 2009.

AT&T, the American telecom company, is investing in *OpenClovis*, which offers an open source application service platform for the telecom industry [42]. Vice president-marketing Subbu Iyer of OpenClovis says the following about this cooperation:

One reason AT&T invested in us is they do see the adoption of OpenClovis software helps them drive costs down in the network (...) We're cutting the cost of maintenance as carriers drive us to push down costs. The only way to keep pace with those demands is to find other ways of reducing cost. Open source is the best way.

The Spanish telecom operator *Telefonica* has initiated the *Morfeo project* which operates in the service oriented architecture (SOA) domain [1]. Its main goal is to speed up the development of software standards in this domain. The Morfeo project has implemented its own version of a “SourceForge” portal which hosts the Morfeo project and subprojects. As SourceForge, the Morfeo portal offers source code, binaries, bug trackers, documentation, mailing lists and so on [8].

As a final example *Deutsche Telekom* has spawned its own open source cloud-computing vendor named *Zimory*. Zimory is used to find and use free server capacities in distributed data centers and has created an “marketplace” for computing capacity [16]. According to the company’s chief technology officer the implementation of the cloud service is completely open source [27]. Zimory has also been able to gain support from *Microsoft’s* “*unternimm was.*” initiative which “helps accelerate fast-growing and high-potential startup companies” [43].

These five examples show that the telecom industry could benefit from OSS as well as they do in other business sectors. Additionally collaboration between different competing companies on non-critical business software may help reduce costs by avoiding creating the same software at multiplied costs in addition to standardize the software used.

2.5 Chapter Summary

This chapter has described what OSS is, how OSS could be used and legal issues that exists around OSS. Further, advantages, risks and challenges connected with OSS have been discussed. And finally examples have been given of adoption of OSS in industry and in the telecom domain.

It should be clear that OSS is getting a higher market share, but research on OSS adoption in commercial companies is not overwhelming. Additionally from the discussion of risks and challenges it seems the managers and leaders tend to be sceptical on how their company could benefit from OSS, which may result in a “bottom up” approach to OSS.

CHAPTER 3

RESEARCH CONTEXT AND MOTIVATION

This chapter will give the context and motivation for the thesis. In addition it will present the research questions and three hypotheses that we want to investigate throughout this study.

3.1 Research Context

This section gives a short introduction to the Norwegian telecom industry, Telenor and Telenor IS's Open Source 2010 project. Additionally it will present how the master thesis will be beneficial for Telenor.

3.1.1 Norwegian Telecommunication Industry

Until the 1980s, Telenor was the only and monopolistic telecom operator in Norway providing home telephones. Telenor is still considered Norway's leading telecom operator, with an estimated market share exceeding 90% in 2001 [33]. In 1993 *NetCom GSM* was introduced as the first competitor to Telenor on the mobile market. In the end of 2007 there were 35 registered companies offering mobile telephone services in Norway [34]. Still the mobile market is dominated by these two operators, Telenor and NetCom, claiming a shared market share of approximately 75%.

3.1.2 Telenor

Telenor is a Norwegian based telecom company with headquarters at Fornebu in Oslo [18]. The company was founded in 1855 as The Norwegian Telegraph Administration, and is today ranked as the world's 7th largest mobile operator, with over 166 million mobile subscriptions and revenues of 111 billion NOK in 2008. Today Telenor has over 38 800 employees distributed over 13 countries. Telenor is listed on both the

Oslo Stock Exchange and the American stock exchange NASDAQ. The Norwegian government is the main shareholder with a share of 53%.

Telenor IS is a software development division under Telenor Nordic. It has about 400 employees and uses a considerable amount on development each year. Telenor IS has a large portfolio of approximately 300 information systems, with limited use of OSS. Telenor IS is divided into seven main departments and two "value chains", Mobile and Fixed, who operates across these departments.

3.1.3 The Open Source 2010 project

Open Source 2010 is a project started by Telenor IS to increase the focus on OSS in Telenor. The last part of the project name "2010" is an implication that an OSS pilot is planned to be in production by year 2010. The main goals of the project are to verify to what degree it is possible to replace existing software with OSS. This includes pointing out an OSS strategy as well as providing sufficient information to developers at Telenor to start using OSS.

3.1.4 Purpose of Master Thesis

Telenor IS desires to be more conscious on their use of OSS and therefore wish to investigate the different system environments attitude towards OSS and their understanding of OSS usage. To aid the process of investigating the employee's attitude and understanding of OSS, a survey on OSS usage in Telenor will be developed, carried out and analyzed, with the aid of both questionnaires and interviews. Actual usage of OSS in selected parts of Telenor's system portfolio will also be investigated.

3.2 Research Motivation

Gaining an in-depth analysis on how the Norwegian IS department of such a large company as Telenor develops strategies for OSS adoption is an excellent research opportunity.

As mentioned in Chapter 2, OSS adoption is a subject that requires more research and empirical data. Throughout this case, we are able to follow a big international telecom company and their efforts and planning towards a more strategic approach to OSS. Additionally investigating the attitudes of the employees regarding OSS adoption, their experiences, and Telenor's actual use of OSS today are interesting topics for research.

3.3 Research Questions

The research questions formed for this master thesis is as follows:

- **RQ1:** Which type of experience do the employees in Telenor IS have with Open Source Software?
- **RQ2:** How do the employees in Telenor IS assess an increased use of Open Source Software within the company?
 - **RQ2.1:** Are there any difference in the attitudes between leaders and non-leaders?
 - **RQ2.2:** Are there any difference in the attitudes between the two different value chains: Fixed and Mobile?
 - **RQ2.3:** Are there any difference in the attitudes between those who have worked in Telenor for many years vs. those who have worked for a shorter period of time?
- **RQ3:** What are the implications of increased use of OSS in Telenor IS?
 - **RQ3.1:** Which advantages could an increased use of OSS in Telenor IS bring?
 - **RQ3.2:** Which risks should Telenor IS be aware of?
 - **RQ3.3:** Which preparations could Telenor do in order to benefit from the advantages and reduce the risks coupled with an increased use of OSS?
- **RQ4:** To what extent is OSS in use in Telenor IS today?
- **RQ5:** Which OSS products are in use in Telenor IS today?

RQ1 will divide those who have heard of OSS, those who have used it at work and those that have actively participated in an OSS community. RQ2 will cover the attitudes of the employees towards an increased use of OSS in Telenor IS. RQ3 will investigate which organizational steps that Telenor IS should perform to help adopting OSS successfully. Finally RQ4 and RQ5 will survey which OSS products that are in use in Telenor today.

3.4 Hypotheses

The following section presents three hypotheses which are to be investigated through the questionnaire. These are formed to support upon RQ2 which addresses the question if there are any difference in attitude between different groupings in Telenor. Each hypothesis consists of a null hypothesis, noted H_0 , and an alternative hypothesis, noted H_1 .

- **H1 - OSS in Telenor:**
 - H_{1_0} : The majority of the employees at Telenor IS have a negative attitude towards OSS. $H_{1_0} : \#_{Negative} > \#_{Positive}$
 - H_{1_1} : There exists a positive attitude towards OSS at Telenor IS. $H_{1_1} : \#_{Negative} < \#_{Positive}$
- **H2 - Leaders vs. non-leaders:**
 - H_{2_0} : The non-leaders (developers, testers, architects, maintenance personnel etc.) and the leaders have an equal positive attitude towards an increased use of OSS at Telenor IS. $H_{2_0} : \mu_{Leaders} = \mu_{Non-leaders}$
 - H_{2_1} : In general, one of the groups (non-leaders or leaders) is more positive

towards an increased use of OSS at Telenor IS than the other. $H2_1 : \mu_{Leaders} \neq \mu_{Non-leaders}$

- **H3 - Fixed vs. Mobile:**

$H3_0$: There is no significant difference in the attitudes of those working in the Fixed value chain of Telenor IS and the ones working in the Mobile value chain.

$H3_0 : \mu_{Fixed} = \mu_{Mobile}$

$H3_1$: Between the two value chains Mobile and Fixed, one has a more positive attitude towards OSS than the other. $H3_1 : \mu_{Fixed} \neq \mu_{Mobile}$

CHAPTER 4

RESEARCH DESIGN

This chapter will present the research methods used throughout this thesis, together with how we plan to analyze the data. The outline of these research methods are presented in Figure 4.1.

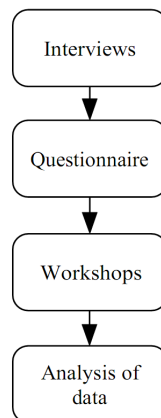


Figure 4.1: Outline of the research methods used in this thesis

Firstly some time was used to define the problem domain of the thesis and how both parties (NTNU and Telenor IS) could benefit from the research. Following, four preliminary interviews were performed to be able to create a questionnaire. Using the results from the interviews, the questionnaire was designed, tested and published to employees in Telenor IS. In order to verify the results gathered and gain additional input, a workshop was held during the analysis of results. Towards the end, a second workshop was held to disseminate the results to Telenor IS. These points are further elaborated in the following sections.

4.1 Preliminary Interviews

To aid the process of designing the questionnaire four preliminary interviews were conducted with persons from different sectors of the Telenor IS organization at 5th of February 2009. The interview methodology is often divided into two main types, namely structured and unstructured interviews, each method with their own advantages and disadvantages [21]. Since the main purpose of the interview was to collect data for the questionnaire, a semi-structured interview method was chosen as the most suitable. In advance to the interview, an interview guide was made to provide a basis structure, or theme, to the interview. Apart from this, very few questions were determined prior to the interviews. This makes it easier for the interviewer to adjust the conversation to the input from the interviewee. Ordinarily interviews are conducted by one interviewer; however in an unstructured interview it can often be beneficial with two interviewers. Since the main purpose of this interview was to collect as much data as possible, and use it as a kind of brainstorming towards the questionnaire, it might be too difficult for one interviewer to handle. Therefore we chose to use the two-person approach, one leading the session and the other taking notes and asking follow up questions to the interviewee.

The invited employees attending the interviews were split in two dimensions, leaders/non-leaders and Fixed/Mobile, see Table 4.1. Interviews was conducted on Telenor campus at Fornebu Oslo and lasted for about 30 minutes each. In addition to extensive notes during the interview, a voice recorder was used as a backup solution to the notes. This proved useful since we were not able to cover everything just by notes.

#	Position	Telenor Division	Year ^a	Education
1	Chief engineer	DWH & BI ^b	2000	MSc Information Security
2	Leader	Mobile	2002	MSc Electronics / Telematics
3	Developer	CRM & Channels	2007	Bachelor degree
4	System specialist	Middleware Fixed	2001	MSc Telematics

Table 4.1: Interview respondents

^aYear of employment.

^bData Warehouse & Business Intelligence

4.2 Questionnaire Design, Sampling and Data Collection

To be able to answer the research questions listed in Section 3.3, a questionnaire was designed, tested and sent to a sample of the Telenor IS organization. The answers were collected and the results will be presented and analyzed in the following chapters. The questionnaire was anonymous and self-administered, meaning that the respondent completes the questionnaire without the researcher present [28]. A questionnaire was used to be able to collect a wide amount of responses. Oates argues that questionnaires are suitable in research situation where the data is obtained from a large amount of people, and in a standardized form, asking the same question to many respondents.

Figure 4.2 shows an decomposition of the questionnaire work, that contains a development phase, quality assurance, establish population and sample and finally data collection. The following subsections describe these four phases in more detail, and the final questionnaire is presented as Appendix B.

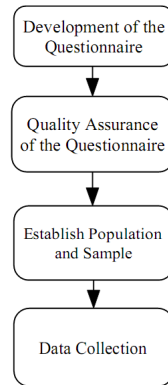


Figure 4.2: Main phases of the questionnaire work

4.2.1 Development of the Questionnaire

The largest issue when creating a questionnaire is how to make it as understandable and unambiguous as possible. The latter is important as the researcher and the respondents do not have the ability to ask each other clarifying questions. Therefore it is important that all the respondents understands the questions in the same way.

Next, it is important to consider what is called content validity, which is that the questionnaire generates the data that the researcher is interested in. To address this we created some main topics that we wished to answer through the questionnaire, and carefully considered each question in the questionnaire against these main topics. If there seemed to be a mismatch, the question was excluded from the questionnaire.

In the questionnaire the following type of questions were used:

- **Open and closed questions:** In order to get more qualitative and informative data, open questions were used. To get more standardized data closed questions were used.
- **Check one and check many:** E.g. "age" and "which of the following have you used in an OSS community".
- **Quantity questions:** E.g. "How many office support systems do you use on a daily basis".
- **Degree of agreement - the "Likert scale":** Answer a statement on a scale from strongly agree to strongly disagree.

The "Likert scale" was used in some other variations also like the scale ranging from "best with OSS" to "best with commercial software" and the scale ranging from "strong advantage" to "strong disadvantage".

Using the results from the preliminary interviews conducted with four employees at Telenor IS we started the process of designing the questionnaire. The first step was

a brainstorming phase where a list of different research topics were listed and discussed. These topics were then narrowed down into five main topics that we wanted the questionnaire to answer, and these are presented in Table 4.2 together with their corresponding RQ.

#	Main Topic	RQ
1	To what extent the developers at Telenor IS has experience with use of OSS?	1
2	To what extent OSS is used at Telenor IS today?	4
3	What are the general attitude towards OSS in Telenor IS?	2
4a	Which possible benefits could an increased use of OSS bring?	3.1
4b	Which potential risks and pitfalls could an increased use of OSS bring?	3.2
5	How can Telenor IS prepare for an increased use of OSS?	3.3

Table 4.2: Main topics for the questionnaire and their corresponding Research Questions(RQ)

To ensure that all of our main topics were covered we used an approach named GQM [3]. GQM is an acronym for Goal, Question and Metric which was originally designed for evaluating errors and defects at NASA. The basic idea behind the model is to provide a structured way to define goals for a project, and be able to find the “minimal metric”. The measuring model consists of three steps or levels:

- **Goal - Conceptual level**
The first step is to define the project as different goals that we want to achieve. These goals specify the purpose of the measure, what should be measured and viewpoint.
- **Question - Operational level**
Each goal is then broken down into several major questions that together characterize the original goal.
- **Metric - Quantitative level**
The last step is to allocate metrics to each question. This is to allow it to be answered in a quantitative way.

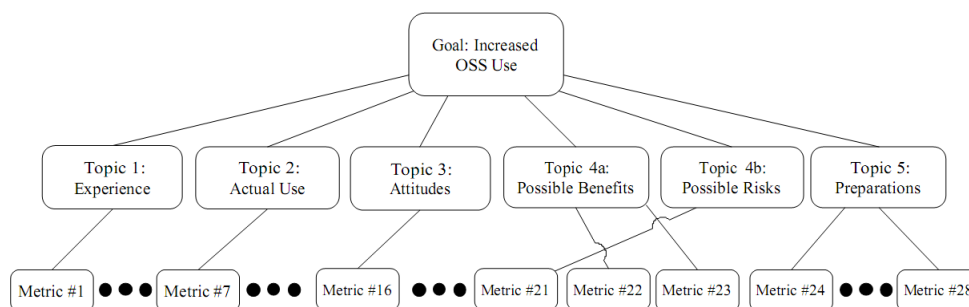


Figure 4.3: Goals, questions and metrics for the questionnaire

In Figure 4.3 our main topics from Table 4.2 are decomposed into metrics. Each metric is one question in the questionnaire. The mapping between main topics and the questions in the questionnaire is given by Table 4.3. T-id is an abbreviation for the main

topic given in Table 4.2 and Q-id is an abbreviation for the question number in the questionnaire.

T-id ^a	Q-id ^b	Summary
1	1-6	Experience with use of OSS, participation in community and use of OSS office support systems
2	7-15	Use of various OSS products in Telenor IS.
3	16,17,20,29	Advantages OSS have vs. commercial software and vice versa
4a	18,19,22,23	Possible benefits and suggested domains for increased use of OSS
4b	18,19,21	Possible risks connected to an increased use of OSS
5	24-28	How Telenor could update the competence of its employees and which organizational steps would need to be performed to ease the adoption of OSS

Table 4.3: Mapping between topics and the questionnaire's questions

^aMain topic

^bQuestion number

4.2.2 Quality Assurance of the Questionnaire

While creating the questionnaire, several different techniques were used for quality assurance. The questionnaire was pilot-tested on classmates, and supervisors at both NTNU and Telenor IS were used to gather as much comments and feedback as possible. In the last phase of the design, ten employees at Telenor IS were invited to a pilot test of the questionnaire.

In the first testing phase, two classmates were used to conduct the first walkthrough of the questionnaire. From the feedback we got from this walkthrough, several improvements were done to the questionnaire. Among the comments we got were several connected to the understanding of the questions and being able to avoid ambiguity.

In the last step in ensuring the questionnaires quality, ten employees at Telenor IS were asked to participate in a pilot-test of the questionnaire. In the pilot-test each question was equipped with a comment field where the responder could comment on the question. Among the feedback were that a few questions needed clarification to keep them from being ambiguous and make them more self-explanatory. We also learned that the difference between development environment and production environments in Telenor IS is rather small. Most of the responders commented on the question: "Do you have any experience with production environments at Telenor IS?" One of the respondents made the following comment:

".. In principal none of the employees in Telenor IS has any experience with production environments, since all software maintenance is outsourced."

Among the other comments gathered was input on Telenor specific terms, departments and positions.

Department	# Employees	# Invited	C ^a	# Responses	RR ^b
CRM&Channels	52	21	40%	12	57%
Strategy&Architecture	20	18	90%	9	50%
Sourcing&Programs	7	1	14%	1	100%
Process&Compliance	13	2	15%	1	50%
O S S ^c	64	19	30%	14	74%
Mobile value chain	81	33	41%	18	55%
IT Operations	45	11	24%	10	91%
Fixed Value chain	74	24	32%	14	58%
DWH&BI	29	10	34%	6	60%
Other ^d	X ^e	1	N/A	2	N/A
Total	388	140	36%	86	61%

Table 4.4: Sample of the questionnaire

^aDepartment coverage.

^bResponse ratio of invited employees.

^cOperation Support Systems

^dThe “Other” department is for those who do not work in one specific department.

^eAn “X” is used since we do not have an exact number of how many that are working across departments.

4.2.3 Establish Population and Sample

Population and sample are two closely related terms [37]. The population refers to all possible cases, for example all inhabitants in Norway, while a sample is a selection from this population. In this study the population is all employees in the Telenor IS organization and the sample drawn from this population are the selected respondents to perform the questionnaire. 140 of 388 employees were invited to participate yielding 86 unique responses. The sampling was done by our supervisors at Telenor and they were selected to cover a mix over two dimensions in particular:

1. The value chains: *Fixed* and *Mobile*
2. The two main categories of employees: *Leaders* and *non-leaders*¹.

In addition all of the departments of the organization were covered by the sample, see Table 4.4. Letting the Telenor supervisors choose this sample was seen as the best way to pick respondents. This due to their knowledge of the different departments, value chains, positions etc. Also, they had an easier job at getting the e-mail of the selected respondents than what we could have done our self. The sampling was done by looking at the employee list of the different departments, and choosing persons they though may have time for the questionnaire and which have conscious opinions on OSS. Due to this, two departments were only partly covered because the Telenor supervisors considered these departments to be peripheral to use of OSS and therefore have limited conscious opinions on OSS.

Considering the validity of this sample having the supervisor pick a so called “purposive sample” is justified by what the survey is going to address. A “purposive sample” is a sample where the sample is hand-picked to get respondent which are likely to pro-

¹A leader is a person with administrative responsibilities which is not directly involved with development of systems. A non-leader is every person that does not fall in the leader category (e.g. developers, testers, IT-architects etc.)

duce valuable data to answer what the research wants to investigate [28]. That two departments were a bit less covered than the others does not have a dramatic effect since the research questions and hypothesis do not make any distinction between the different departments in Telenor IS. The amount of responses is also of an adequate size with a 61% response rate. Limitation and validations will be further discussed in Section 6.6.

4.2.4 Data Collection

An invitation was created and sent using the leader of Telenor IS as the sender. This was done in order to show that the survey is important to the company and to possibly get more responses than if we sent a mail from two students that is not part of the organization. The questionnaire was published on 24th of February 2009 and a reminder was sent 3rd of March 2009. 42 responses were generated before the reminder and 44 after the reminder was sent and till the questionnaire closed the 16th of March.

Questback [35], a web survey tool, were used to implement and distribute the questionnaire. Due to an already existing license on Questback at Telenor IS, this fell as the obvious choice of tool. Questback provided support for designing and distributing the survey and the distribution was done through an e-mail invitation sent to all the participants. Some of the other functionality offered by Questback was the possibility to export the data from the survey to different data formats, including SPSS, Excel and Word.

4.3 Workshops

During our thesis two workshops were conducted. Workshop #1 was used to validate and supplement the results from the survey. Workshop #2 disseminated the results of the thesis to the Telenor IS organization.

4.3.1 Workshop #1

Workshop #1 was conducted at Telenor campus, Fornebu on the 18th of March 2009 and it lasted for about three hours. A workshop is a form of structured brainstorming within a group. Facilitators provide material and guidance, and the participants at the workshop try to get a deeper understanding of a topic [5]. We used Post-its so that each individual could write down some notes in an individual phase of the brainstorming. Following this, these notes were attached onto a shared blackboard/wall where everyone was free to move, re-arrange and group each note to fit together with the others.

This workshop was an opportunity to let us show how the analysis was going, in addition to provide new and valuable input to the analysis of the survey. The workshop was divided in two separate sessions, half an hour presentation of results and about two and an half hour of workshop discussion.

In the first session we presented the main findings identified during analysis of the questionnaire, aided by a PowerPoint presentation. This was useful to both show our

progress to Telenor, and validate the results. We allowed the participants to comment as we presented the material, and it was useful in order to clear up any misunderstandings or obscurity in the material we presented.

Following this session the actual workshop were carried out. During the first session we identified some issues we wanted to elaborate during the workshop to gain more input and new views/opinions on them. Three topics for discussion were identified during the analysis:

- **Topic 1: Possible benefits from an increased use of OSS**

Introduction: Some mentioned benefits collected from the questionnaire were: reduce costs, availability of (good) documentation, attract new competent manpower, apply pressure to suppliers and avoid “lock-in” and better quality of software.

Question 1: How can Telenor be able to take advantage of such OSS benefits?

- **Topic 2: Risks and pitfalls**

Introduction: OSS may cause potential risks and pitfalls. Some issues collected from the questionnaire were: lack of support, distribution of responsibility, increased demands for qualifications in the organization, difficult to keep overview of which software that is used, lack of functionality and/or non-functional qualities and understanding licenses.

Question 2: Which possible risks applies to Telenor IS?

- **Topic 3: Arrangements for increased use of OSS**

Introduction: There are many ways to prepare for increased use of OSS, and some may be more adaptable to Telenor than others.

Question 3: What could Telenor do in order to make most of the advantages and cope with the risks identified in *Topic 1* and *Topic 2* respectively?

Attending at the workshop were four from NTNU (the authors of this report and our supervisor and co-advisor) three from the Open Source 2010 project group and three invited employees from Telenor. After concluding the workshop both parties (Telenor representatives and NTNU representatives) expressed that were satisfied with the outcome of the workshop, since many issues were discussed and new views and thoughts were brought to light.

4.3.2 Workshop #2

A second workshop was conducted at Fornebu the 8th of June 2009. The workshop was divided into two sessions. The first session was an open sessions where all the participants from the questionnaire were invited. The purpose of this session was to present and disseminate the findings discovered thorough our thesis. This was also a good opportunity to inform the employees at Telenor IS about the work that is done with the Open Source 2010 project. The second part of the workshop was used to summarize our thesis and the cooperation between NTNU and Telenor IS.

4.4 Data Analysis

The interview analysis started by listening to the recordings. Next, the information of all four interviews was summarized and main themes were identified. The main purpose of the interviews was to get some first input on Telenor IS use of, attitudes towards and experience with OSS. Additionally the interviews were used to gain some insight on Telenor specific information that may help develop the questionnaire.

After collecting the responses of the questionnaire the analysis was performed using color encoding on printed reports of responses. Occurrence count of words such as mentioned Telenor Systems or OSS products were also performed. Additionally basic statistic methods were used during the analysis. By using means, standard deviation and variance it was possible to get a deeper understanding of the data collected. Additionally the T-test was used to compare two normally distributed populations are equal using their mean and standard deviation. The most normal way of using this test is to test if the null hypothesis $H_0 : \bar{X}_1 = \bar{X}_2$ is true within a given alpha-level α . If there is a significant difference between the two groups, the null hypothesis is rejected. To aid this process the statistical tool SPSS version 16.0 was be used to calculate the t-values. Data was extracted from Questback to SPSS format and further analyzed within the SPSS tool.

During the analysis of the questionnaire, Workshop #1 was conducted. This workshop was a good way to validate the results from the questionnaire and provide additional input on selected topics. Some of the analysis was done at the workshop as the individual post-it notes was organized in categories. Next, notes and photos taken during the workshop were used to aid the further analysis of results.

CHAPTER 5

RESULTS

This chapter will present the results of this thesis. Starting with the preliminary interviews in Section 5.1 moving on to the results of the questionnaire in Section 5.2 and ending with the results of Workshop # 1 in Section 5.3.

5.1 Results from the Preliminary Interviews

Through the interviews several advantages and challenges connected to an increased use of OSS were identified. Additionally some preparations Telenor IS should make prior to OSS adoption were suggested. These are presented in the following subsections.

5.1.1 Advantages with Open Source Software in Telenor IS

The main advantages identified by the respondents are summarized in the following list:

- **Avoid “lock-in” to commercial vendors.**
Apply pressure to existing vendors by having (OSS) alternative solutions, which may lead to reduced costs.
- **Advantages associated with OSS communities**
Strengthen Telenor’s brand and reputation and availability of qualified personnel.

By looking at OSS alternatives, Telenor hopes to be able to find solutions that may save money and avoid further “lock-in” with commercial partners. A respondent commented that by having OSS alternatives, this may help to apply pressure to the commercial vendors and reduce the license costs if the commercial product is chosen. The license costs were mentioned by all of the respondents. They believe Telenor uses a significant amount of money on software licenses and support contracts. The respondents think these could be reduced by using OSS.

Additionally Telenor's brand and reputation could get a boost by using and contributing more to OSS communities. Finally the availability of qualified personnel and resources in the OSS communities may prove advantageous for Telenor, so they do not risk being too dependent on a few persons/providers.

5.1.2 Challenges with Open Source Software in Telenor IS

As with the advantages, challenges identified by the interviewees are summarized in the following list:

- **Support related issues.**
Issues like lack of support during and after development, the need for new support partner(s), potential negative effect on the influence on the provider and the requirement of getting the maintenance provider to agree on the OSS initiative.
- **Increased need of organizational competence.**
May need internal OSS "monitor-system" and carefully consider the maturity of the organization.
- **Unclear liability.**
Issues like responsibility and when to update.
- **Existence of suitable OSS alternatives.**
An OSS product which is equivalent to the commercial may not exist, or the migration costs may be too large.

All of the respondents mentioned support, both during and after development is done, as an extensive challenge if Telenor is to use more OSS. This is due to the fact that Telenor does not have enough resources to continue giving support to a solution them self after the development is complete. Therefore a support partner is necessary to aid this. Another option is to pay for an enterprise solution of the OSS in cases where this is available. Additionally it is crucial that Telenor get their primary maintenance provider to approve this increased initiative on OSS.

A few of the respondents also noted that they believed that the ability to influence the provider will be reduced by using OSS.

A challenge related to support is the human and organizational competence needed for an increased use of OSS. The interviewees believe the personal competence of the Telenor IS employees is adequate to not cause any problems. However at an organizational level the competence has to improve. This means that the organization must make preparations to aid the OSS adoption, and create an overall OSS strategy that the employees must follow. An internal system that monitors the "OSS-scene" for fixes, updates and alternative software might prove necessary to be able to succeed with the OSS initiative.

Additionally Telenor may have to get more mature in order to adopt more OSS. On the question on what has to be done to get Telenor mature enough to adopt more OSS one of the interviewees answered the following:

"I think one has to become more conscious about OSS. In Telenor IS our systems goes through a large chain of products. A lot of these are commercial products but additionally one of these products is Apache [OSS]. I do not think many people know this, and that it exists without any support

agreement, it just works as it is. If we are able to bring out examples like this then I think we can be able to put down some myths existing, like OSS products crash all the time and do not work satisfactorily... That is one thing, another is that it is difficult to turn a big hippopotamus like Telenor when it first have started to swim in one set course.”

Additionally the maturity of the OSS product is important to consider so that the product is likely to coexist and be updated/supported in the future.

Using commercial software the commercial partner is more responsible when it comes to updates and security fixes in general. With OSS however this responsibility is laid more on the adapter, and he needs to stay updated on both new updates and reported security flaws. Additionally the issue of safety and liability was mentioned by several respondents. Using a commercial partner, the partner may be held responsible if a critical failure happens, this is not necessary the case with OSS and a clear “scapegoat” may be difficult to identify.

Finally the costs of migrating systems from proprietary software to OSS are most likely to be extensive. This is an issue that needs careful calculation. Also, one of the interviewed leaders noted that clear savings in money from usage of OSS was doubtful in the Telenor context. This because it is believed that most business critical systems does not have an OSS equivalent, and those who have do not save Telenor big money.

5.1.3 Preparations to aid Open Source Software adoption in Telenor IS

Through the interviews, two specific preparations were mentioned to reduce risks and aid the adoption of OSS.

1. A stepwise approach to the OSS adoption.
2. Available clear guidelines on how the employees may use their time in OSS communities.

Several of the respondents mentioned that a stepwise approach to OSS adoption is necessary to avoid big problems. Telenor has many large telecom systems with high demands on performance and availability. Therefore a hasty migration to OSS without a specific and carefully considered plan may prove disastrous. As one of the interviewees said:

“Personally, I am a fan of evolution not revolution.”

Next it is important that Telenor defines clear guidelines on how and how much each developer is to participate in OSS communities. An intersection between getting influence in the OSS communities and being able to do their “ordinary” job is a task that the interviewed leaders considered important.

5.2 Results from the Questionnaire

The demography of the 86 respondents of the questionnaire is given by Table 5.1. What should be noted is the relatively long average experience in Telenor and ICT which are quite high. Because it was possible to select multiple positions, some variance is present in this variable. It was also difficult to give exact numbers of how many of the respondents that works in Fixed or Mobile as it was possible to choose both value chains.

Variable	Value
Age	83.7% within 31-50 years
Gender	83.7% males
Education	55.8% Master degree, 19.8% Bachelor degree
Position	40/60% Leaders vs. non-leaders
Value chain	50/50% Mobile and Fixed
Average experience in Telenor	10 years
Average experience with ICT	18 years
Average experience with OSS	5 years

Table 5.1: Demography of questionnaire respondents

The following subsections will cover experiences within the Telenor IS organization, attitudes towards an increased use of OSS, possible benefits and risks that an increase use might bring, input on preparations for increased use and finally some results on actual usage of OSS in Telenor IS today.

5.2.1 Experience with Open Source Software within Telenor IS

From the analysis of the questionnaire responses it is clear that there is a varying amount of experience towards OSS among the Telenor IS employees as could be seen in Table 5.2.

Type of experience	Fraction of respondents
Used in Telenor IS	30-45%
Regularly use in Telenor IS	20-25%
Used resources in a OSS community	75%
Contributed to an OSS community	30%

Table 5.2: Experience with OSS within Telenor IS

30-45% *has used OSS* at Telenor IS at some time (especially office support systems), while 20-25% *regularly uses OSS* at Telenor IS (e.g. operation systems, web servers, databases or components/frameworks). The variance in these numbers is due to that these are results made up by several different sub questions.

11 of the 14 persons that answered that they used components/frameworks on a daily basis are working in either CRM & Channels or Mobile VC department. This is something that could imply that this department may use more OSS than what other departments do.

Element	Fraction of respondents
Website (project page)	52.9%
FAQ	50.6%
Wiki	45.9%
Download	45.9%
Discussion boards/Forums	40.0%
Documentation	38.8%
Quick start / Getting started or similar	32.9%
Revision control systems (CVS/SVN)	32.9%
E-mail lists	21.2%
Bug tracker	12.9%
None of the above	25.9%

Table 5.3: Experiences with use of elements in OSS communities

Approximately 75% reported that they *have used a/several resource(s) in an OSS community*, see Table 5.3. What is more interesting is that about 30% *has contributed to an OSS community*, see Table 5.4. Of these, 3 persons listed to have been an originator of an OSS project.

Type of involvement	Fraction of respondents
Submitted an error report	18.8%
Actively participation on forums or e-mail lists	17.6%
Submitted a change request	14.1%
Fixed an error	8.2%
Added or changed functionality	8.2%
Added documentation	4.7%
Adapted software to Norwegian conditions	3.5%
Originator of an OSS project	3.5%
Have not been involved in an OSS community	70.6%

Table 5.4: Fraction of active involvement in OSS communities

5.2.2 Attitude towards Open Source Software and Validation of the Hypotheses

The general attitude towards OSS in Telenor IS is positive. When asked “Do you think Telenor IS should adopt more OSS?” 80% answered yes, 16.5% was uncertain and 3.5% did not know, see Figure 5.1. None of the 86 respondents answered “no” to the question. This genuine positive attitude was supported by the remaining questions in the questionnaire. But even though the employees were positive to OSS, they also had a reflected attitude towards OSS. They consider it as an alternative to commercial software and not necessary the solution in every case.

In Section 3.4 three hypotheses were presented. The first one (H1), stating that there exists a general negative attitude towards OSS among the employees at Telenor IS. The second and the third one address the difference in attitudes between respectively leaders and non-leaders (H2) and the two value chains, Fixed and Mobile (H3). To

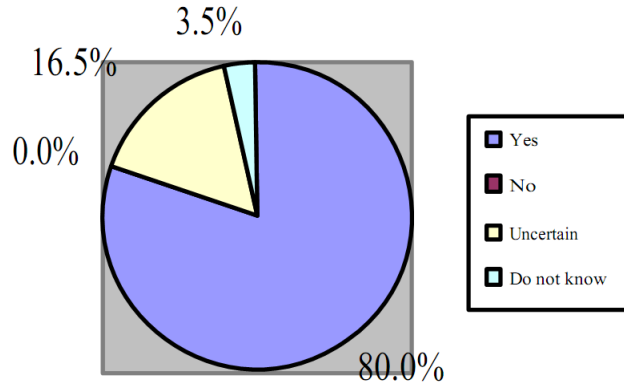


Figure 5.1: Do you think Telenor IS should adopt more OSS?

validate the hypotheses a two tailed student t-test were used, with a 95% confidence interval and a α on 0.05.

Hypothesis H1 states that the general attitude towards OSS among the employees at Telenor IS is negative. To test this hypothesis, we defined a null hypothesis, H_{10} , and an alternative hypothesis, H_{11} :

- H_{10} : The majority of the employees at Telenor IS have a negative attitude towards OSS. $\#_{Negative} > \#_{Positive}$
- H_{11} : There exists a positive attitude towards OSS at Telenor IS.
 $\#_{Negative} < \#_{Positive}$

In Table 5.5 we see that 68 of the 85 responders answered yes to the question “Do you think Telenor IS should adopt more OSS? ”.The probability that there exist a generally negative attitude towards OSS at Telenor IS can therefore be rejected, and therefore also H_{10} . This support the hypothesis; that there exists a general positive attitude towards OSS at Telenor IS.

Alternative	# Responses	Percent
Yes	68	80%
No	0	0%
Doubtful	14	16.5%
Do not know	3	3.5%

Table 5.5: Attitudes towards OSS

The second hypothesis, H2, claims that there are a significant higher percentage of the non-leaders than the leaders that has a positive attitude towards OSS. Of all the questions in the questionnaire, only three alternatives had a significant variance see Table 5.6. This hypothesis was created on the basis of the responses we got in the preliminary interviews as well as the written about “bottom-up” approach to OSS [31].

- $H2_0$: The non-leaders (developers, testers, architects, maintenance personnel etc.) and the leaders have an equal positive attitude towards an increased use of OSS at Telenor IS. $\mu_{Leaders} = \mu_{Non-leaders}$
- $H2_1$: In general, one of the groups (non-leaders or leaders) is more positive towards an increased use of OSS at Telenor IS than the other.
 $\mu_{Leaders} \neq \mu_{Non-leaders}$

Statement	Mean non-leaders	Mean leaders	\hat{p}
Brand & Reputation	4.05	3.39	0.008
Top management commitment	4.67	4.21	0.006
“Supervisor” of OSS domains/products	4.40	3.97	0.010

Table 5.6: Attitudes of non-leaders vs. leaders concerning increased use of OSS

Some variance between the two groups was found on the question considering different reasons for choosing OSS in prior to commercial software and vice versa. The first statement there were some difference in opinion were the statement concerning Telenor’s *brand and reputation*. Here the leaders think OSS and commercial software is equal while non leaders thinks OSS has an advantage. The second difference is found in the statement that deals with *backing from the top management*. The leaders agree that the management has to be involved, while the non leaders strongly agree. Finally the third difference is found in how important it is to have “*supervisors*” of *specific OSS domains/products*. Here the non- leaders agree more strongly that some individuals need to keep track of selected OSS domains. The hypothesis can therefore be rejected on all points, except the three questions described above.

The final hypothesis, H3, claims that there is no real difference between the two value chains Fixed and Mobile. Here, as for H2, only a few statements had a significant difference, see Table 5.7. The first is *support during development*, which Fixed values higher than Mobile. Next, it may be interesting to note that Mobile thinks that *support in production* and *availability of documentation* is slightly better with commercial software than with OSS. Another difference in opinion is found on the question concerning OSS as a *source of motivation*. The employees from Mobile strongly agree on this, while Fixed agrees. Except the small variance found in the questions above, the null hypothesis can be rejected.

- $H3_0$: There is no significant difference in the attitudes of those working in the Fixed value chain of Telenor IS and the ones working in the Mobile value chain.
 $\mu_{Fixed} = \mu_{Mobile}$
- $H3_1$: Between the two value chains Mobile and Fixed, one has a more positive attitude towards OSS than the other. $\mu_{Fixed} \neq \mu_{Mobile}$

Statement	Mean Fixed	Mean Mobile	\hat{p}
Support during development	3.92	3.15	0.019
Support in production	3.46	2.65	0.025
Availability of documentation	3.85	2.75	0.002
Source of motivation	4.15	4.65	0.023

Table 5.7: Attitudes in Fixed vs. Mobile concerning increased use of OSS

5.2.3 Possible Benefits of Open Source Software

One question in the questionnaire dealt with what advantages or disadvantages that an increased use of OSS could bring. The scale used was ranging from “*large advantage*” (5), “*neither/nor*” (3) and “*large disadvantage*” (1). The mean of all listed statements were neutral or better and they are all listed in Table 5.8.

Statement	Mean	Std. Deviation
Licenses costs	4.56	0.86
Independence from providers	4.48	0.88
Apply pressure on providers	4.41	0.93
Motivational factor for employees	4.16	0.99
Availability to read and modify source code	4.10	1.01
Confidence and experiences with provider	3.26	1.18
Existing contracts with providers	3.19	1.28

Table 5.8: Advantages and risks connected to increased use of OSS in Telenor IS

The horizontal line separates those which are clear advantages from those which are not that clear. The three highest valued statements were, not surprisingly, “*licenses costs*” (4.56), “*independence from providers*” (4.48) and “*apply pressure on providers*” (4.41). The two statements that had the lowest average were “*confidence and experiences with provider*” (3.26) and “*existing contracts with providers*” (3.19). Reasons for the gap between the two lowest and the rest may be because these two was a bit ambiguous. Several of the respondents reported, through the comment field to the question, that they did not know exactly how to value these statements on a scale from advantage to disadvantage.

Statement	Mean	Std. Deviation
Maintenance costs	4.15	1.15
Development costs	4.05	1.13
Possibility to run pilot-tests (alpha/beta tests) before release	3.94	1.20
Improve Telenor’s brand and reputation	3.76	1.17
Adaptability to existing systems	3.68	1.32
Development time	3.64	1.13
Influence on provider (add new or changed functionality)	3.64	1.43
Availability of external expertise and experience	3.48	1.35
Availability of support during development	3.32	1.33
Available information (manuals etc.)	3.24	1.43
Functional requirements (adequate functionality)	3.19	1.17
Non-functional requirements (quality, reliability, security, scalability, performance, usability etc.	2.95	1.26
Availability of support in production	2.87	1.38

Table 5.9: Reasons for Telenor IS to choose OSS instead of commercial software and vice versa

Somewhat connected to this is the question concerning reasons for choosing OSS over commercial and vice versa. The scale used here was ranging from “*best with OSS*” (5), “*OSS and commercial are equally good*” (3) and “*best with commercial software*” (1). Table 5.9 presents the mean of the statements and most of them were valued towards OSS. The horizontal line separates those which are better with OSS from those which are equal or better with commercial. The most important ones were “*maintenance costs*” (4.15), “*development costs*” (4.05) and “*possibility to run pilot-tests (alpha/beta tests) before release*” (3.94). The only two that had a slightly lean towards commercial software were “*non-functional requirements*” (2.95) and “*availability of support in production*” (2.87). But as a “3” on the scale equals that OSS and commercial software is “*equally good*”, these are not necessary totally negative towards OSS.

Following the open question of the questionnaire considering possible benefits from an increased use of OSS, many opinions were collected and they are summarized in the following list:

- **Cut costs.**
On acquirement, license, support and unused functionality.
- **Motivation for the employees.**
Benefits like increased motivation because of interesting technologies, availability of source code and access to competent manpower.
- **Vendor independence.**
OSS may help to avoid lock-in and serve as a way to apply pressure on providers.
- **Quality aspects.**
Advantages may be adaptability with existing systems, better usability and availability of documentation.
- **Long term benefits.**
E.g. Increased standardization, innovation and increased support.

Firstly the, maybe, most obvious benefit from OSS is *reduced costs* which also many of the responses in the questionnaire reflect. The cut in costs of acquiring the software and the license costs almost goes without saying, but what may be of equal importance according to the respondents is the costs saved on unused support contracts and unused functionality. Many of the solutions used today have support contracts which are rarely/never used; therefore this may be a perfect place to cut costs. Especially this is the case in internal test- and development environments in Telenor IS. This is supported by the following quotes from two of the respondents:

“... may choose to pay for support if one actually need it (often it is not needed).”

“I assume that Telenor may save much on support that is never used. I myself have not very good experience with support from one of our commercial vendors.”

For the employees in Telenor IS, OSS may be a *new source of motivation*. The technologies that OSS uses often are innovative, interesting and fun to work with. Being able to use various technologies that OSS products include may be inspiring for the employees. Having more control and insight over the software as a “white box” instead of a “black box” could further prove to be a motivational factor. Additionally an increased use of OSS could attract new competent manpower in form of developers in the OSS

community, or new potential employees that enjoy working with OSS solutions.

Vendor independence is reported as a benefit in two ways. One is to be able to apply pressure to suppliers by informing them that you are considering OSS options. OSS could then serve as a way to apply pressure on the vendor as a basis for negotiation. Next, somewhat connected to this point, is to avoid “lock-in” to specific vendor or supplier, which is beginning to be an issue in Telenor IS today. In such a situation where Telenor IS strongly depends on a specific vendor or supplier, it proves easier for the vendor to increase the license costs to their advantage. On the question of why Telenor IS should increase their use of OSS one respondent answered:

“Because we are a technology company with competent developers. It is better to tinker with things that are meant to be tinkered with than buying a commercial complete package and afterwards do further development on this. Telenor uses large amounts of money on commercial complete packages with functionality we do not use anyway, and then do so many specializations on complete packages that they no longer is a complete package.”

Quality aspects that are believed to be bundled with OSS usage is better usability and adaptability with existing systems and programs. Additionally the fact that the source code is available for review or modification has a positive effect on the extendibility of the system. What respondents mentioned explicitly was that such modifications should only be done where it proves to give a significant advantage. Further it is important that the employees has to be aware of and avoid a situation of “anarchy”, where there is no real control on the code base. This in turn may lead to problems when a new release of the OSS product is released.

Also several mentioned *availability of (good) documentation* as a positive quality aspect with OSS. Some of the employees have experienced lacking or non-satisfactorily documentation of the commercial products used today. They believe that this documentation could be better in the OSS case. Additionally some believes that the support of OSS products may be better than what is provided by the commercial partners today, which is emphasized by the following quote:

“...Many points out that support and documentation from commercial actors are superior to OSS. My experience is that this is the other way around. OSS products often have very active communities with dedicated users that are more than willing to help out. Support from the commercial actors are often expensive, hard to get and inadequate.”

Long term benefits reported is that of better standardization, and being able to influence the standardization process of the telecom domain. Connected to this is the increased innovation by using OSS, this because the OSS products often use new and state of the art technologies. Commercial software may be restrained by the enormous code base and history of the product. This is especially the case for large vendors with big products.

5.2.4 Possible Risks and Pitfalls of Open Source Software

As with the possible benefits, risks and pitfalls were collected in a similar question to that of the benefits and they are summarized in the following list:

- **Potential need of organizational changes.**
Change to development model, need to build up “professional-communities”.
- **Increased focus on individual factors.**
Increased demand for people/skills, OSS is something new.
- **Loss of overall software overview.**
Issue bundled with easy free of charge available components. May also experience update problems and reduced standardization.
- **Lack of liability.**
Issues like responsibility and might have to consider new “maintenance suppliers”.
- **Hard to select the right product.**
Products may lack functional/non-functional requirements or have compatibility issues.

One main subject produced from the responses is which *organizational changes* that may be necessary in order to successfully adopt more OSS. Changes to the development processes from traditional waterfall to more agile processes were expressed as a possible change that has to be made. There do not necessarily need to be a connection between OSS and agile processes, but it may prove useful to tune the organization to better fit the new way of thinking. Another thing that may prove useful is to systematically build-up “professional-communities” connected to OSS. These could be the “experts” in the domain, and a source for information and guidance when a choice is to be made, as elaborated by the following statement:

“It [increased use of OSS] demands more deliberate and systematic build up of strong “professional-communities” and frameworks and platforms for development and maintenance. This expertise has to be internal if not the continuity and possibility for government will be difficult.”

Several mentioned that if Telenor IS are going to use more OSS it *increases the demands for relevant qualifications in the organization*. You do not necessarily have a vendor to rely on, and must be able to do much of the work yourself. Additionally if OSS is to replace commercial software this may be replacing “well-known technology” to something new and unfamiliar, with all risks this could bring.

Next a risk is that Telenor could lose its *overall software overview*. Due to OSS nature, with freely available software, it could be very easy to just add a component or piece of code. With many people doing this and not necessarily reporting everything that is added, the software portfolio may become large and over-complex. This could be seen upon as a sort of “anarchy”, and could cause unwanted problems. Additionally when this portfolio grows, it becomes harder to keep track on individual releases of different components/software, which in turn could turn out to be a security risk. In contradiction to what some mentioned as a possible benefit with OSS, some reported that the standardization by increasing OSS use could be insufficient. In the case the standardization is sufficient it may be difficult to maintain if employees makes changes to the OSS. Also the availability of source code may cause unnecessary changes, which

also is unwanted in case the software has an update, and all the extra code and possible created “glue code” has to be reproduced.

Then you have the *issue of responsibility*, for example who is to “blame” when a system fails, or when a complex problem occur? In order for Telenor IS to focus more on OSS they have to get their “maintenance suppliers” to agree to the initiative. It is expressed that Telenor IS do not have the necessary resources to do the maintenance themselves. It may also be necessary to find new partners with updated qualifications within the OSS product domain. Also a person expressed that Telenor may have to help improve the “maintenance suppliers” qualifications in a period of transition of the system.

Finally an issue is that the “right” product might not exist. OSS alternatives may suffer from a lack of functional and/or non-functional qualities, maybe especially security. Another possibility is that the product may be incompatible with existing systems. A remark made by a respondent was that it may prove difficult to choose the right product among many possible alternatives, which could almost be seen upon as a “positive” statement.

5.2.5 Preparations for Increased Use of Open Source Software

As seen from Table 5.10 and Table 5.11, most of the given alternatives were valued almost equal. The likert scale was used on the question where 5 corresponds to *strongly agree* and 1 to *strongly disagree*. The two statements that differs from this genuine agreement is “*Restructure the business model of Telenor IS*” and “*Hire external consultants with updated expertise*”. This is most likely due to bad formulation of the statements which was specifically mentioned in the comment box to the questions. The respondents had difficulties in understanding the two statements.

Organizational steps to make	Mean	Std. Deviation
Start one/several pilot projects to show possible effects of OSS	4.54	0.85
Make the OSS initiative visible for all employees	4.48	0.63
Make visible the OSS already present in the organization	4.44	0.85
Top management commitment to the OSS initiative	4.42	0.95
Give individuals/groups responsibility to watch selected OSS product domains	4.15	0.93
Improve both internal and external knowledge management (e.g. with a Wiki, message boards, mailing lists, blogs or similar)	4.14	0.94
Hire new employees with OSS experience	3.96	0.99
Hire external consultants with updated expertise	3.06	1.19
Restructure the business model of Telenor IS	2.74	1.12

Table 5.10: Organizational steps to make in order to prepare for increased use of OSS

Arrangements to update employees' qualifications	Mean	Std. Deviation
Offer possibility to participate in OSS communities	4.31	0.89
Offer possibility to self-tuition in OSS concepts and "OSS way of thinking"	4.29	0.88
Offer possibility to attend relevant courses	4.12	0.94
Offer possibility to attend relevant conferences	4.10	0.85

Table 5.11: Arrangements to update the qualifications of the employees in order to successfully adopt more OSS

Strategies for Increased Use of Open Source Software

Through the many comments given in the open text fields of the questionnaire, several strategies for increased use of OSS were proposed. The most commonly mentioned were:

- **Better collaboration.**
Between Telenor IS and their "application maintenance" suppliers.
- **Finding good pilot projects.**
To gain experience and test products.
- **Offer freedom to contribute to OSS communities.**
May prove good for employee motivation and Telenor's brand and reputation.
- **Choosing mature OSS domain/products.**
To reduce risks of products that cease to exist.

The most frequently mentioned strategy was that Telenor has to carefully consider the *collaboration* between themselves and their "application maintenance" suppliers. This may also lead to a possible selection of potential new sub contractors, in the case where new competence is needed.

Next, many respondents stressed the issue of *finding good pilot projects*, to be able to verify what Telenor IS could gain from an increased use of OSS. This is also a great opportunity to obtain experience with OSS products and be more prepared for a larger adoption.

The possibility for developers to *contribute to the OSS communities* with code, tests and similar was considered important among many of the respondents, and seen upon as a motivational factor. By contributing to OSS communities it is also believed that Telenor's brand and reputation could get an extra boost.

It may prove important that Telenor IS chooses *products/domains that contains mature OSS products*. This is done to minimize the possible risks of not having a vendor, and feel safe that the OSS do not cease to exist "overnight". A good example is the database system domain, which has several mature products. It is also of much importance to understand licenses to avoid any legal issues with the software used.

Target Areas for Increased Use of Open Source Software

Respondents expressed that a target area for increased use has to be where it can give an economical advantage and where competent employees are available. Further, many believed that internal systems are a good place to start. Several mentioned database

systems, application servers and web servers as possible domains suitable for an increased use of OSS, as could be seen from Table 5.12. The table lists the most frequent mentioned area/domains for increased use of OSS.

Target area/domain	Frequency
Database systems	25
Application/web servers	14
Operating system	12
Development (source code, libraries, components etc.)	10
Tools (for development, bug track etc.)	8
Office support systems	6
CRM systems	3

Table 5.12: Target area/domain identified for increased use of OSS

One of the respondents put it this way:

“The reason for choosing an OSS solution has to be because of its quality. At some domains OSS is of better quality, then we should choose it because of that and not just because it is OSS”.

Which in a way summarize many of the comments given through the questionnaire, that the average Telenor IS employee is positive but have reflected attitude towards an increased use of OSS. OSS should be used were it could give Telenor IS an advantage.

5.2.6 Actual Use of Open Source Software in Telenor IS

Two questions in the questionnaire were:

1. Could you mention up to five Telenor systems that uses OSS software?
2. Could you mention up to five OSS products that are in the mentioned systems?

Telenor System	Frequency
COS	21
ORIGO	12
METRO	10
NMS-IP	9
Win Admin	7
Telenormobil.no	5
FHS	5
Online.no	4
Sirius	4
Radius	4
Telenor.no	3
Tacos	3
Webline	3

Table 5.13: Telenor-systems containing OSS

OSS	Frequency
Spring	20
Apache	17
MySQL	11
JBoss	11
Perl	9
Hibernate	6
JUnit	6
JLog	5
Linux	5
Maven	4
Ant	4
FreeRADIUS	3
Java	3

Table 5.14: OSS found in Telenor-systems

Resulting from these questions were 48 unique Telenor systems and about 50 unique OSS software products. This is a considerable amount of different systems, and the systems that were mentioned by three or more respondents are presented in Table 5.13. Of the 86 answers received, 53 persons listed something at this question. 16 persons listed 5 systems, 32 persons listed one to five systems, and 5 listed zero or do not know. The OSS products mentioned by three or more respondents are presented in Table 5.14. Here 50 of the 86 respondents listed something. 15 listed five OSS products, 28 listed between one and five, and 7 listed zero or do not know.

5.3 Results from Workshop # 1

The following subsections are a collection of the main results gathered through the workshop conducted at Telenor's campus Fornebu on the 18th of March 2009. The topics for the workshop was created on the basis of questionnaire results as presented in Section 4.3, and they were supposed to validate and supplement the already gathered data. The workshop group consisted of four participants from NTNU, three from the Open Source 2010 project group and three invited employees from Telenor IS. The workshop was split into two main sessions. The first session gave a short presentation of the findings from the questionnaire. This presentation was also used as an introduction to the next session of the workshop.

The following subsections will give the results from the three topics (benefits, risks and arrangements).

5.3.1 Topic 1: Possible Benefits from an Increased Use of OSS

The first topic in the workshop addressed the possible benefits an increased use of OSS might bring to Telenor. Some of the potential benefits mentioned in the questionnaire were used as an introduction to the issue.

After an individual brainstorming the participants jointly combined the Post-its together in groups with virtually the same meaning. These were then given a collective name which more or less described the different comments. The topics that were given most attention are presented in Table 5.15. One of the groupings that received most attention, were the possibility of reduced cost associated with licenses. OSS often comes at a lower license cost than commercial software, and in some cases, the license is free of cost. OSS might also work as a way to apply pressure to get the commercial parties to lower their license cost. Further, quality was mentioned as a possible benefit with OSS. The projects often follow new standards, and are easy to access and test.

Support is frequently mentioned as a possible risk with an increased use of OSS, this will be further discussed in the next subsection. The workshop revealed that support may also bring possible benefits. Some of the mentioned benefits were the availability of product documentation and help. OSS products are often created and supported by a large OSS community which provides fixes and patches when a problem arises. Another solution to the possible risks associated with support might be to outsource the support to capable partners.

Groupings	Notes
License	Reduced costs, apply pressure on commercial actors.
Apply pressure on providers	Having available OSS alternatives.
Quality	Easy to test, more contributors, better standards.
Support	Better documentation and access to support, increased quality, faster bug fixing.
Innovation	Improved foundation for innovation.
Competence	Demanded by customers, access to new manpower, interest and knowledge among employees.
Fun	Inspiration, fun, attract idealists.

Table 5.15: Possible Benefits from an Increased Use of OSS

Innovation, competency and fun at work also received a lot of attention. OSS can work as a motivational factor for many of the employees, and might also be attractive for further employees. This can result in a better working environment which can develop into innovative solutions and increase the employee's competency. Letting the employees participate and contribute in OSS communities can result in "spin-offs" and unexpected ideas. Having an employee contributing to a community may help influence the development in a desirable direction. OSS communities are often faster to take usage of new technology and development tools and environment. Giving the employees an opportunity to participate in such an evolution might also suit as a motivational factor.

For a complete summary of the benefits discussed in Topic 1 of the workshop please consult Appendix C (text in Norwegian).

5.3.2 Topic 2: Possible Risks and Pitfalls from an Increased Use of Open Source Software

The second topic at the workshop addressed the subject of possible risks and pitfalls with an increased use of OSS. The collective names of the groups given most attention are presented in Table 5.16

Groupings	Notes
New support partners	New business partners must be provided.
Top management commitment	Lack of managerial backing.
Process changes	Difficult to introduce to some communities, requires new guidelines.
Competence	Lack of internal competence and expertise.
Anarchy	No real OSS strategy might lead to chaos.
Quality	Insufficient and inadequate functionality.
Maturity	Avoid immature products and OSS communities.

Table 5.16: Possible risks and pitfalls connected to an increased use of OSS

As discussed in Topic 1 (see Section 5.3.1), support is often seen upon as inadequate or non-existing in OSS. If a business critical system fails, it is important that there exists a support organization that can handle the issues fast and in a correct matter. In order to overcome these risks, a possible solution is to find new partners that Telenor can cooperate with. Introducing a new partner might introduce new risk as also mentioned at the workshop. It is important that the support organization is trusted and can handle situations fast and correct if a problem occur.

To be able to have a good and well defined OSS strategy, it is important that this is decided at the top management level. Therefore it is crucial with top management backing. The OSS strategy can function as a "best practice", a guideline to how and what kind of OSS that is recommended. Finding suitable pilot-projects can also be a good way to find out to which extent OSS can be used in Telenor. This can also be a way to make the employees, as well as the management, realize the possibilities that lies in OSS. Giving the developers more responsibility to freely choose suitable components and products can work as a motivational factor as well as increase their technical competency. But this might also introduce a risk of getting a state of "anarchy". This can lead to an over-complex product portfolio that no one has control over. A non-existing strategy might also lead to OSS being chosen over other products only justified by the fact that it is OSS, almost as a "religious" choice. As a participant at the workshop commented:

Open Source Software should be chosen on the same basis as commercial software.

To cope with these risks, some guidelines must be provided and included in an overall OSS strategy.

A well defined OSS strategy will also aid the process of finding products that fulfill the requirements set by Telenor. It is important that the products that are chosen are of good quality and that they are chosen because of its advantages and not just because it is attractive to use OSS. One aspect that was mentioned at the workshop was that it is important to choose a product that is mature and has the prospect of being supported over a longer period of time. Choosing immature products can introduce an unnecessary risk.

For a complete summary of the risks discussed in Topic 2 of the workshop please consult Appendix C (text in Norwegian).

5.3.3 Topic 3: Arrangements for Increased Use of OSS

The last topic discussed at the workshop was the possible arrangements that need to be done to address an increased use of OSS. The collective names of the groups given most attention are presented in Table 5.17

Telenor is already using some OSS in their systems. This use of OSS, together with experience from other telecom companies, can be used to point out the advantages that OSS might bring. It is also important that the employees at Telenor have a sufficient understanding of what OSS is and how and where it can be used. This can be done by providing the possibility of attending conferences, classes or letting them use time for self study. Giving a/several employee(s) responsibility for a specific domain within

Groupings	Notes
Competence	Give employees time and resources to attend conference and seminars.
Responsibility	Give (group of) employees responsibility for OSS domains.
OSS strategy	Provide a overall OSS strategy.
Set standards	Use a standardized portfolio.
Pilot	Selection of a suitable Pilot project.

Table 5.17: Arrangements for increased use of OSS

OSS might also be a way to increase the internal competency in Telenor. This may function as a “center of excellence”.

As discussed under Topic 2 (see section 5.3.2), a sort of top management commitment is desired. This can be achieved by creating an overall strategy or guidelines. Standardization may also be a way to set boundaries for the developers and help them choose components and products that holds an adequate quality.

Pilot projects might be a suitable way to initiate use of OSS. This may also be a good way to persuade employees that are sceptical. The attendees at the workshop stressed the fact that an introduction of OSS in Telenor should be done in an incremental fashion, and should not be rushed into.

For a complete summary of the preparations discussed in Topic 3 of the workshop please consult Appendix C (text in Norwegian).

CHAPTER 6

DISCUSSION

This chapter will go through each of the research questions and finally discuss limitation and end with a discussion around validity and restrictions of the study. RQ4 and RQ5 are not as thoroughly covered as the rest due to lack of data, this is further elaborated in Section 6.6.

6.1 RQ1: Experience

Research question 1 was: “*Which type of experience do the employees in Telenor IS have with Open Source Software?*”. From the results presented in Section 5.2.1 it is quite clear that experience with OSS is present in Telenor IS, but that these experiences are quite varying. Some have used OSS at home (OpenOffice, Firefox etc.) and others have used it more actively and at work. But overall there seems to be some experience present in the average employee of Telenor IS.

What is interesting to note is that 30% of the questionnaire respondents reports to have contributed to an OSS community in some way. Three points are more frequent than the others: “*submitted an error report*”, “*actively participation on forums or e-mail lists*” and “*submitted a change request*” as could be seen in Table 5.4. The component/program has to be used a bit if the user is to submit error reports or change requests, since the error has to be found and the lacking functionality has to be confirmed missing. Active participation on forum and e-mail list is interesting since it implies that the employee has quite some experience with the component/program. Following these points, 8.2% reports to have either fixed an error or added/changed functionality. This is also valuable OSS experience which Telenor IS may take advantage of.

As presented in Section 5.2.4, individual factors like expertise and experience is important when adopting more OSS as also noted in [15]. But since as many as 30% report to have contributed to an OSS community in one way or another, Telenor IS have more easy access to valuable information and people to ask questions. The adoption may therefore be smoother than the case if only a few had this kind of experience with OSS.

These experienced employees could act as “OSS champions” and help start an OSS “professional-community” within Telenor IS.

6.2 RQ2: Attitudes

Research question 2 was: “*How do the employees in Telenor IS assess an increased use of Open Source Software within the company?*”. The question had three sub questions:

- **RQ2.1:** Are there any difference in the attitudes between leaders and non-leaders?
- **RQ2.2:** Are there any difference in the attitudes between the two different value chains: Fixed and Mobile?
- **RQ2.3:** Are there any difference in the attitudes between those who have worked in Telenor for many years vs. those who have worked for a shorter period of time?

As presented in Section 5.2.2 a significant amount of respondents answered yes on the question concerning increasing the use of OSS in Telenor IS. Throughout the rest of the questionnaire the responses were almost exclusively positive towards OSS. Of course many stated that OSS should not be used just to use it, it should be used were Telenor could gain an advantage, either in form of saved money, increased innovation or better standardization.

This positive but reflected attitude towards OSS is good to avoid a possible OSS “anarchy”. With anarchy we mean that the control over what OSS that is adopted is not governed. Especially it may be too easy to just add an OSS component to solve a task, since the component is freely available for download. This kind of situation is unwanted since it could have dramatic consequences on Telenor’s software overview and a loss of overall control may occur. It is therefore both positive and crucial that the employees consider OSS as an alternative to commercial software and not necessary the solution in every case.

Considering the sub questions RQ2.1 and RQ2.2 there are no real difference in the attitudes of leaders and non-leaders or between the value chains Fixed and Mobile. Only on a few issues there was some irregularity in the answers. Additionally, answering RQ2.3, we did not find any significant difference in the attitudes between those with much experience in Telenor IS versus those with less experience. The two groups were divided on the middle value of Telenor-experience, and a student t-test was performed on these.

Our findings suggest that managers, or leaders, might have a more forthcoming attitude towards OSS than what other published research reports. Goode presents some barriers that might prevent managers from adopting OSS in their organization [17]. In this Australian survey many managers did not see how their company could benefit from OSS. Our findings indicate that the difference in opinions between the leaders and the non leaders are less significant than what previous research have reported. This might imply that OSS is becoming more mature, which was also predicted by Fitzgerald [10].

This increased maturity might be exactly what we are seeing here: OSS is becoming a real alternative to commercial software. The quality of the OSS products are continuous rising, and often the innovation and standardization offered by these are better than with commercial alternatives [25].

6.3 RQ3: Implications of Increased Use of OSS

Research question 3 was: “*What are the implications of increased use of OSS in Telenor IS?*”. The question had three sub questions:

- **RQ3.1:** Which advantages could an increased use of OSS in Telenor IS bring?
- **RQ3.2:** Which risks should Telenor IS be aware of?
- **RQ3.3:** Which preparations could Telenor do in order to benefit from the advantages and reduce the risks coupled with an increased use of OSS?

The three next subsections will discuss these three sub questions in turn and give some indication on what we believe are the most important points to consider. These are summarized in Table 6.1 together with a short description on whether the advantage, risk or preparation is generalizable to other companies.

Advantage/Risk/Preparation	Generalizable to other companies?
A1: Avoid “lock-in”	Yes
A2: Reduce costs	Yes , if compared to proprietary solutions
A3: Potential “spin-offs”	Yes
R1: Lack of support and liability	Depends on if the company needs such services
R2: Loss of software overview	Yes
R3: Increased demands for qualifications	Depends on the existing qualifications in the organization
P1: Carry through a pilot	Yes
P2: Create an OSS “professional-community”	Yes
P3: Top management support	Yes

Table 6.1: Selected advantages, risks and preparations that we believe are important to consider

6.3.1 Selected Advantages of Increased Use of Open Source Software

Presented in Section 5.2.3 and Section 5.3.1 were a lot of advantages or benefits that an increased use of OSS might bring to Telenor IS. In this section we will try to point out which we believe are the most important ones, and the ones that are most likely to be advantageous for Telenor IS.

The most important advantage of this OSS initiative is to avoid “lock-in” to commercial vendors, which also is supported by the European field study from 2007 [26]. Until now, a few commercial vendors have had a sort of monopoly when Telenor IS is considering new solutions. As the commercial vendor had been in such an advantageous situation, they could more easily set their fees at their wanted level without Telenor being able to do too much about it. Just having OSS as an alternative solution might prove to be a kind of “coercion tactic” towards the commercial providers, by applying pressure of having alternative solutions at hand.

Connected to this, an important benefit from an increased use of OSS is reduced costs on maintenance, development and licenses. As a considerable amount is paid for commercial software today, it is clear that savings could be made. Many OSS products exists that most likely could work just as well as the commercial software for a fraction of the costs associated with the commercial software. The website *Open Source Alternative* lists OSS alternatives to popular commercial software, and could be used to find suitable solutions [30]. Additionally, Telenor IS pays large amount for support contracts that are rarely/seldom used, thus the savings may be even higher. In cases where support is crucial, enterprise solutions could be an alternative or a support supplier with expertise in the wanted OSS product/domain might exist.

Finally, an advantage that maybe is not that clear at first is all indirect effects and “spin-offs” that an increased use of OSS might bring. Examples may be new contacts, new social networks, new ideas, increased innovation, promote standardization etc. “Spin-off” was not a word explicitly mentioned during the interviews, questionnaire or workshop, but we believe it is a good term to cover the indirect effects that OSS may bring. Even though these are not as visible as the concrete savings on commercial software licenses, they may be of equal or even greater value in the long run.

6.3.2 Selected Risks of Increased Use of Open Source Software

As with the advantages, risks were presented in Section 5.2.4 and Section 5.3.2. In this section we will try to point out the ones we believe are the most important risks to avoid, and the ones that we believe has the largest probability to make problems for Telenor IS.

First and foremost, as also noted by a large amount of respondents, support and liability is a large risk if Telenor is to increase its use of OSS. This risk was also noted by many respondents in [26]. Support and liability is a risk because Telenor IS does not have enough resources to maintain and support the systems after development them self, and therefore is dependent on having a maintenance supplier or a support supplier. However, given that these exist, the risk is not that great.

Further, an increased use of OSS could lead to a loss of a main software overview, which in turn could lead to serious problems. As the software portfolio grows and gets larger and complex, one problem that could emerge is update problems. Especially this is the case if Telenor IS implement changes to the OSS used, or if they have to write extensive amounts of so-called “glue-code” in order to get the OSS working with the existing systems or with other OSS components. A worst case scenario is when an update with desirable functionality or with important security fixes emerges, all the changes and possible glue-code that may exist has to be reproduced.

To reduce this risk, a well defined strategy has to be developed and implemented in the organization. This has to be done in such a way that all employees clearly know of it and understand the importance to comply with the guidelines provided. With this strategy carefully implemented in the organization the risk could almost be neglected.

Finally an important thing to consider is the increased demands for expertise and experience in the organization which an increased use of OSS demands. This was also considered important in many of the companies in the European field study [26]. By using OSS Telenor IS has to stand on their own, and does not necessary have a vendor

to turn to as they have with commercial software. OSS is something new, and it may demand more internal competence and qualifications, in order to take full advantage of the OSS initiative and reduce other risks that may emerge.

6.3.3 Selected Preparations for Increased Use of Open Source Software

In the questionnaire we listed a set of different preparations that Telenor IS should consider in order to increase use of OSS. As noted in Section 5.2.5, all the listed alternatives was considered important, and it was difficult to see which of the preparations that was most valuable.

Even though the preparations and arrangements gathered through the interview, questionnaire and workshop were produced to be Telenor specific, we believe that many of them may be generalizable to other companies that plan to adopt OSS.

In our opinion the most important preparations to benefit from the advantages and cope with the risks are:

- Carry out a pilot.
- Establish an OSS “professional-community”.
- Top management support.

As also indicated by the project title of Telenor IS’s OSS initiative (Open Source 2010), we believe that carrying out a pilot is the most important preparation Telenor IS could do. There are many reasons for this. Firstly, to prove that it is possible to implement the Telenor-systems with OSS as well as with commercial software. This is wise both to support the believers and to convince the ones that are more sceptical. Secondly, this increases the visibility of the OSS initiative, and thus helps to spread the information of the commitment to all the employees in the organization. Thirdly, by first implementing a pilot, this could give valuable experience with OSS integration, which could be taken advantage of later. In order to gain full advantage of this, some kind of transfer of experience, or experience database should be established (for example a Wiki).

The discussed transfer of experience brings us to the next important preparation we believe is crucial for a successful increased use of OSS, that is establishing an OSS “professional-community”. This could work as a “center of excellence”. Having such a group is also a pre-emptive measure to cope with “R3: increased demands for qualifications”. Participating in such a group are often the ones that has interest in the subject or domain, and with such an interest commitment and enthusiasm often follows. These “OSS champions” could serve as good contact points for help, support and advice as they maybe should have a larger overview of the OSS domain and the products that Telenor choose to adopt. This group of people could have weekly or monthly meetings to exchange experiences and discuss relevant questions.

Finally we believe that top management support is very important. It is also of much importance that this commitment is expressed and made visible to the employees. This to show that this is something that Telenor IS believes will work and not just a thought left unexplored and non-supervised. The project group Open Source 2010 is a good start for this, but it is important that this not just dies after the pilot is put in production. The mentioned “professional-community” is a natural extension for the project group.

6.4 RQ4: Extent of Actual Use of Open Source Software

Section 5.2.6 pointed out that a notable amount of OSS is in use in Telenor IS today. Even though office support tools are out of the original scope of Telenor IS Open Source 2010 project, we find it interesting to note that 55% specifically mentioned regularly use of OpenOffice at home or at Telenor IS. This was mentioned in an open text field concerning office support tools in regular use. With such a high percentage the switching costs from a proprietary solution to OpenOffice may not be as high as feared on beforehand.

Our analysis suggests that there might be more use of OSS at Telenor IS than the management at Telenor is aware of. This may be a consequence of not having a well defined strategy towards OSS. In an open question in the questionnaire as many as 48 unique Telenor-systems was mentioned as systems that contains OSS. These are from a total of approximately 300 possible systems.

In turn, the lack of overview may lead to e.g. unclear license conditions or problems with support since the system gets more complex. Lack of software overview is something that may be the case in other companies also.

6.5 RQ5: Open Source Software Products in Use

Research question 5 was: “*Which OSS products is in use in Telenor IS today?*”. In section 5.2.6 we can see that 50 unique OSS software products were mentioned when we asked if the responders could mention up to five OSS products that could be found in Telenor IS’ systems. An interesting point about the top five mentioned products, are the fact that all these are all mature and well known OSS products. The list includes products as Spring, Apache, MySQL, JBoss and Perl. Another trend in these results is that many of the mentioned products are found in the web domain.

6.6 Limitations and Validity of Study

This section will discuss limitations and validity of the study. Especially validity issues with the design of the questionnaire will be discussed, as this is the main part of this thesis. The questionnaire is provided in Norwegian as Appendix B.

In this survey OSS and commercial products were compared as two phenomena and not as individual products. This comparison could be seen upon as a bit problematic because there exists few/none characteristics which are general to either of the two phenomena. We were aware of this, and so were several of the respondents. As the survey’s goal is to assess the Telenor employees’ attitudes towards OSS in general, and not concrete advantages or disadvantages with concrete products, we find this comparison feasible.

Additionally, a limitation of the study is that the planned scanning on actual use of OSS in Telenor IS (see the problem statement in Section 1.1 and purpose of master thesis in

Section 3.1.4) was not performed . Three factors made this scanning problematic:

1. Finding a suitable tool for the scanning.
2. Getting appropriate access to the systems and source code.
3. Telenor was not able to get any help in due time.

OSS discovery¹ was mentioned as a tool that could aid this process. After some consideration of the tool, and the practical details of getting access to the source-code of all systems to be analyzed this approach was rejected. We also tried to find other tools and solutions for doing this without success. As a last effort, Telenor contacted one of their “maintenance suppliers” to get assistance on the analysis. Unfortunately this process showed to be time-consuming and the scanning was not finished in time for us to analyze the data.

Since the scanning was not completed, RQ 4 and RQ 5 (see Section 3.3) lacked sufficient, relevant data to answer thoroughly. The data produced from the questionnaire was used as the only source of information.

There are several challenges related to design of questionnaires, among these are phrasing the questions in a way which is easy to understand for all respondents and selecting the right question type. Even though we performed a two stage quality assessment of the questionnaire we had two minor issues with the questionnaire. First, the alternative “*restructure the business model of Telenor IS*” in the question considering what organizational steps Telenor IS should do to prepare for increased use of OSS was difficult to understand.

Second, in order to investigate actual use of OSS in Telenor, question 14 and 16 of the questionnaire could have been better mapped to each other. We asked for five Telenor-systems in question 14 and for five OSS products in those systems in question 16. We could have instead asked for Telenor systems and OSS in that system in one single question, so that the OSS was directly connected to a Telenor-system. The results produced by the questions asked were a lot of Telenor-systems and OSS with an unclear relation to each other. On the other hand by asking two non-related questions we were most likely able to identify a larger sample of OSS components, than what could be produced by a single question.

Finally, the term “purposive sampling” was introduced in Section 4.2.3, meaning that the respondents are picked if they are likely to have experience in the domain. This kind of sampling is not the best to gather representative data. The sampling was done by our coordinators at Telenor alone. We could have more actively participated in this process, and drawn a more random sample from the population in order to get more representative data. However, this could have led to fewer and less information rich responses. We therefore believe that this kind of sampling was a good choice for this survey.

¹<http://ossdiscovery.opensource.collab.net/>

CHAPTER 7

CONCLUSION AND FURTHER WORK

This chapter summarizes the main contributions of this thesis. In addition it presents subjects for further work.

7.1 Summary

The purpose of this thesis was to investigate the attitudes towards, and experience with OSS among the employees at Telenor IS. Additionally the survey looked into which advantages and risks OSS could bring together with which preparations that should be made to ease the OSS adoption. To aid the investigation preliminary interviews were conducted with four employees at Telenor IS. This made the basis for the design of the questionnaire, which was distributed to 140 employees at Telenor IS and resulted in 86 responses. In addition to the questionnaire, two workshops were used to validate and elaborate some of the issues that came up from the survey and disseminate the results to the organization. The first workshop focused mainly on implications of increased usage of OSS. This included risks, possible advantages and necessary preparations. The second workshop was mainly for presentation and dissemination of results and to perform assessment of the work and cooperation between NTNU and Telenor IS.

7.2 Contributions

The contributions from this master thesis can be divided into three main parts. The first part provides *new empirical data to the subject of OSS adoption*. The second presents *a range of advantages, risks and preparations* which are valuable to Telenor and, to various degrees, are generalizable to other companies. Finally the third part focus on more *Telenor specific contributions*, and how the work of this thesis help to increase the visibility of the OSS initiative in Telenor IS to the individual employees.

This thesis provides empirical data from a large telecom company on OSS adoption, which is a subject that still lacks a sufficient amount of research. The most important empirical findings are:

- **There is no significant difference in attitudes towards OSS between leaders and non-leaders.**

This is something that in a way contradicts the “bottom-up” approach written about in research literature. Even though this is a case study of a single company, it is interesting to note that the leaders have an equal positive attitude towards OSS as that of the other employees.

- **There is a notable amount of OSS usage.**

According to the respondents of the questionnaire, as many as 50 of the 300 Telenor IS-systems contain OSS. These exist even though Telenor IS does not have a defined OSS strategy. The number of systems adopting OSS is likely to increase as the Open Source 2010 project moves on. This supports other research stating that OSS adoption is constantly increasing.

- **Actual use of OSS within an organization could be more extensive than one might think.**

This may lead to unwanted legal issues (violation of OSS license) or an unclear overview of which software that is in use in different parts of the organization.

The collected advantages, risks, and preparations to aid OSS adoption are many, and we have tried to point out which ones we believe are the most important for Telenor IS. Many of these issues are generalizable and may be of value to other companies considering OSS adoption. They may help to create guidelines for an overall OSS strategy within other companies. The three preparations we suggest are most important for Telenor IS to implement are:

- **Carry through a pilot.**

This is a way to minimize the risks of OSS adoption and get valuable experience with its use and which eventual challenges that might arise.

- **Create an OSS “professional-community”.**

Having a “center of excellence” which could support selection, evaluation and implementation could prove advantageous. The employees in this group should be more updated on the “OSS-scene”, and monitor the relevant OSS communities for fixes, updates and alternative software which Telenor wants to pursue.

- **Top management support.**

This is as crucial for OSS adoption as it is when considering proprietary software. This support together with an OSS strategy will help the employees and the organization in the OSS adoption process.

It is important to make the OSS initiative visible to the employees of Telenor IS. By conducting interviews, carry through a questionnaire and holding two workshops, the OSS initiative gets more visibility within the organization. Even though the respondents of the questionnaire were almost without exception positive towards an increased usage of OSS, they demonstrate a reflected attitude towards OSS. OSS should not be used invariably, it should be used where it could give Telenor an advantage. This is a valuable attitude which, if used correctly, will help the OSS adoption process in Telenor to progress easier. To maintain the attitude towards OSS and ease the adoption, an OSS strategy has to be developed and properly disseminated to the whole organization.

Additionally, a Telenor specific finding is that the experience with OSS within Telenor

IS is varying from small use to active involvement. Most of the employees (75%) have used OSS in some way, and a smaller fraction of these (25%) have more actively contributed in OSS communities. This smaller fraction of employees could be of great value for Telenor, and may be pioneers for developing an OSS “professional community” in Telenor IS.

7.3 Further Work

In this section we will present three subjects which may prove interesting for further work. The first is a *follow up on the Telenor IS case*. The second is doing a similar *case-study of another large (Norwegian) company which is looking into OSS adoption*. The third is to further *analyze actual use of OSS in Telenor IS* today.

A *follow-up study* of the results of Telenor’s Open Source 2010 project is a possible research opportunity. In this follow-up several points could be investigated such as which risks that proved to be real, what was successful with the OSS initiative and what caused problems. Next, it could be interesting to see which preparations Telenor decided to put in motion, and how these are perceived to have helped ease the adoption of OSS. Additionally, seeing actual use of OSS in Telenor after a given time period could also be interesting to investigate. Finally, connected to the increased adoption of OSS, it could be interesting to see if the attitudes towards OSS changes with increased use of OSS.

Another possibility for further research is to conduct *a similar case study in another large (Norwegian) company planning OSS adoption*. This could prove useful to possibly validate the findings found through this study and gain more input on OSS adoption. Looking at the attitudes towards OSS among the employees of that company, could either validate or contradict what we have found through this thesis. Investigating actual use may produce input on if actual use of OSS within a company is more extensive than one might think.

Finally, since the planned scanning of actual use of OSS in Telenor IS was not performed in time, *an analysis on actual use of OSS in Telenor IS* could be a possible opportunity for further work. This includes finding an appropriate way to perform the scanning, identify or develop a tool to do it, and analyze the results this scanning produces.

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APPENDIX A

INTERVIEW GUIDE

This appendix contains the interview guide that was used in the preliminary interviews conducted at Telenor campus. The interviews were carried out in Norwegian, therefore the guide also is in Norwegian.

Intervjuguide

Vi er to masterstudenter ved NTNU i Trondheim som samarbeider med Telenor's OS2010 prosjekt og vil undersøke litt rundt Open Source Software (Åpen kildekode) i Telenor Norge.

Holdninger:

1. Hva forbinder du med Open Source Software?

Erfaring:

2. Hvilke Open Source Software produkter er du kjent med/jobbet med?
 - a. Hvor i Telenor brukes Open Source Software i dag?
 - i. Hvordan ble dette tatt i bruk? Hvem bestemte det?
 1. Bottom up?
3. Hva mener du er viktig når Telenor skal velge en Open Source komponent/produkt?

Open Source Software i Telenor:

4. Hvilke fordeler/ulemper ser du med bruk av Open Source i Telenor?
5. Hvilke fremtidige utfordringer/konkurransfordeler ser du med bruk av Open Source i Telenor
6. Hvilke (eventuelle) risikomomenter ser du med bruk av Open Source i Telenor?
7. Hva må legges til rette for økt bruk av Open Source Software?
 - a. Hvilken kompetanse må opparbeides personlig?
 - b. Hvilken kompetanse må opparbeides i organisasjonen?
 - c. Hindringer?
8. Hva slags inntrykk mener du andre (i Telenor) har til Open Source Software?
9. Hvor (og når) mener du det for Telenor:
 - d. passer å innføre mer Open Source Software?
 - e. ikke passer å innføre mer Open Source Software?
10. Har du ellers noe å tilføre i sammenheng med Open Source og Telenor

Personlig informasjon:

11. Hva er din stilling i Telenor IS og i hvilken avdeling jobber du?
12. Hvor lenge har du jobbet i Telenor?
13. Hvilken utdanning har du?
14. Hvilken teknologier jobber du hovedsakelig med?

APPENDIX B

QUESTIONNAIRE

This appendix contains the questionnaire used in our research. Since the work language at Telenor is in Norwegian, the questionnaire was written in Norwegian.

Open Source Software i Telenor IS-24.02.2009

Som et viktig ledd i Telenors satsing på økt bruk av Open Source Software har det blitt opprettet en prosjektgruppe, Open Source 2010. Noe av hensikten med prosjektet er å verifisere i hvilken grad det er mulig å erstatte eksisterende basis programvare med Open Source Software. Gjennom dette prosjektet har det (i samarbeid med NTNU i Trondheim) blitt utformet en spørreundersøkelse.

Svarene i denne undersøkelsen vil bli behandlet konfidensielt og vil være en god mulighet for å komme med innspill og kommentarer til det pågående prosjektet. Spørreundersøkelsen tar for seg temaer som erfaringer, kompetanse og holdninger hos de ansatte knyttet til Open Source Software i Telenor IS. Videre ønsker vi å kartlegge hvordan Telenor IS kan legge til rette for økt bruk av Open Source Software.

De spørsmålene som er markert med en stjerne (*) er obligatoriske og må besvares før du kan gå videre i undersøkelsen.

Om du har noen spørsmål til selve spørreundersøkelsen så kan de rettes til:

Tron André Skarpenes
tron-andre.skarpenes@telenor.com
977 89 119

eller:

Ketil Sandanger Velle
ketil.sandanger@telenor.com
958 13 763

Med Open Source Software mener vi fri programvare. Altså programvareprodukt eller kodekomponenter som er fritt tilgjengelige med kildekode, og som kan endres til å passe til utviklerens spesifikke behov. Vi skiller ikke mellom Free Software (fri programvare) og Open Source Software (åpen kildekode), men ser begge under ett. Eksempler på Open Source Software er Linux, Eclipse, MySQL, Spring, JBoss, Firefox, OpenOffice osv.

Vennligst velg ett eller flere alternativ.

Hvilket forhold/tilknytting (både jobb og privat) har du til Open Source Software? *

- Hørt om (fra kollegaer, venner, kurs/seminar, nettaviser og lignende)
- Brukt skrivebordsapplikasjoner (for eksempel OpenOffice)
- Brukt i utviklingsmiljø(er) i Telenor IS
- Brukt i produksjonsmiljø(er) i Telenor IS
- Brukt i tidligere jobb(er)
- Brukt under utdanning
- Brukt på fritiden
- Deltatt aktivt selv i ett eller flere Open Source Software prosjekt
- Har ingen kjennskap til Open Source Software
- Annet, spesifiser her

Neste >>

14 % completed

FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Med et Open Source Software nettsamfunn (eng: community) mener vi det distribuerte fellesskap av utviklere, testere og brukere til et enkelt Open Source produkt/komponent, i tillegg til de ressursene som finnes i form av hjemmeside, e-postlister, diskusjonsforum og lignende.

Vennligst velg ett eller flere alternativ.

Hvilke av følgende alternativer har du benyttet deg av i et Open Source Software nettsamfunn (eng: community)? *

- Hjemmeside (prosjektside)
- E-postlister
- Diskusjonsforum
- FAQ
- Wiki
- Versjonskontrollsystemer (CVS/SVN)
- Dokumentasjon
- Download
- "Quickstart" / "Getting started" og lignende
- "Bugtracker"
- Ingen av de ovennevnte
- Annet (spesifiser her): _____

Vennligst velg ett eller flere alternativ.

Har du på noen av følgende måter bidratt (jobb eller privat) i et Open Source Software nettsamfunn (eng: community)? *

- Sendt inn feilrapport
- Rettet en feil
- Sendt inn endringsønske
- Lagt til ny eller endret funksjonalitet
- Tilpassing av programvare til norske forhold
- Skrevet dokumentasjon/brukerguide/eller lignende
- Deltatt aktivt på forum eller e-postlister
- Initiativtaker til oppstart av Open Source Software prosjekt
- Nei jeg har ikke bidratt i et nettsamfunn
- Annet (spesifiser her): _____

Neste >>

29 % completed

FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Vennligst velg ett alternativ.

Hvor mange Open Source Software kontorstøttesystemer bruker du regelmessig? *

- 0
 1
 2 - 4
 5 - 10
 > 10

I forhold til spørsmålet over.

Kan du nevne opptil 5 slike Open Source Software kontorstøttesystemer?

I følgende spørsmål vennligst oppgi antall i tallformat. Skriv X i tekstboksen dersom du ikke har grunnlag for å svare.

Vi tenker her ikke på kontorstøttesystemer (som for eksempel OpenOffice).

Anslagsvis hvor mange arbeidsverktøy (for eksempel prosjektstyrings, arbeidsflyt, kodeverktøy, ledelsesstøtteverktøy) benytter du deg av til daglig eller i prosjektsammenheng? *

I følgende spørsmål vennligst oppgi antall i tallformat. Skriv X i tekstboksen dersom du ikke har grunnlag for å svare.

I forhold til forrige spørsmål, anslagsvis hvor mange av disse vet du at er Open Source Software? *

Vennligst velg ett alternativ per rad.

Hvor ofte bruker du følgende Open Source Software verktøy i Telenor IS? *

	Aldri	Månedlig	Ukentlig	Flere ganger i uken	Daglig	Vet ikke
Bruk av utviklingsverktøy (for eksempel Eclipse, JBeans og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av skrivebordsapplikasjoner (for eksempel Mozilla Firefox, StarOffice/OpenOffice og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av testverktøy (for eksempel JUnit og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av byggerverktøy (for eksempel Ant og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitorering- og feilsøkingverktøy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kodeanalyseverktøy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feilregistreringsverktøy (eng: issue tracking)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Neste >>

43 % completed

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FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Vennligst velg ett alternativ per rad.

Hvor ofte benytter du deg av Open Source Software plattformer/infrastruktur i utviklingsmiljøer i Telenor IS? *

	Aldri	Månedlig	Ukentlig	Flere ganger i uken	Daglig	Vet ikke
Bruk av operativsystem (for eksempel Linux, FreeBSD)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av webserver(Apache HTTP-server og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av database (for eksempel MySQL, SAP-DB, Postgres og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruk av applikasjonsserver(for eksempel JBoss, Zope og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Vennligst velg ett alternativ.

Hvor ofte bruker du Open Source Software kodekomponenter/rammeverk (for eksempel Ruby on Rails, Django, Spring, Enterprise JavaBean (EJB), Java Persistence API (JPA) og lignende) i utviklingsmiljøer? *

Aldri Månedlig Ukentlig Flere ganger i uken Daglig Vet ikke

Annet (spesifiser her):

Med ett Telenor-system mener vil systemer som er utviklet av eller for Telenor IS.

Kan du nevne med navn opptil 5 Telenor-systemer som inneholder Open Source Software?

I forhold til spørsmålet over.

Med Open Source Software produkter tenker vi i denne sammenheng på infrastruktur (for eksempel databaser og webservere) og kodekomponenter/rammeverk (for eksempel Ruby on Rails, Django, Spring, Enterprise JavaBean (EJB), Java Persistence API (JPA) og lignende).

Kan du nevne med navn opptil 5 Open Source Software produkter som er i disse systemene?

Neste >>

57 % completed

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FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Med tilbyder mener vi her en fellesbetegnelse for en kommersiell leverandør og en utgiver/leverandør av systemstøtte (eng: support) av Open Source Software.

Vennligst velg ett alternativ per rad.

Hvilke grunner mener du er viktige for at Telenor IS velge Open Source Software fremfor og kommersielle produkter visa versa? *

	Best med kommersiell	Tilstrekkelig med Open Source Software, men bedre med kommersiell	Like bra	Tilstrekkelig med kommersiell, men bedre med Open Source Software	Best med Open Source Software	Vet ikke
Påvirkningskraft ovenfor tilbyder (ny eller endret funksjonalitet)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilgang til ekstern kompetanse og erfaring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilgang på støtte (eng: support) under utvikling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilgang på støtte (eng: support) under produksjon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilgjengelig informasjon(dokumentasjon, håndbøker og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utviklingstid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utviklingskostnader	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vedlikeholdskostnader	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ikke-funksjonelle egenskaper (kvalitet: pålitelighet, sikkerhet, skalerbarhet, ytelse, brukervennlighet og lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funksjonelle egenskaper (tilstrekkelig funksjonalitet)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Styrke Telenors omdømme (merkenavn og rykte)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilpassningsevne i forhold til eksisterende systemer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mulighet til å kjøre pilottester (alfa/betatesting) før release	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Med tilbyder mener vi her en fellesbetegnelse for en kommersiell leverandør og en utgiver/leverandør av systemstøtte (eng: support) av Open Source Software.

Vennligst velg ett alternativ per rad.

Hvilke fordeler/ulemper ser du med bruk av Open Source Software i Telenor IS? *

	Stor ulempe	Ulempe	Verken ulempe eller fordel	Fordel	Stor fordel	Vet ikke
Tilgang til å lese og endre kildekoden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eksisterende avtaler med tilbyder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lisenskostnader	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pressmiddel ovenfor kommersielle leverandører	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tillitt til og erfaringer med tilbyder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leverandøruavhengighet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivasjonsfaktor for de ansatte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Vennligst velg ett alternativ.

Synes du at Telenor IS bør satse på mer bruk av Open Source Software? *

Ja Nei Usikker Vet ikke

Hvilke risikomomenter ser du med økt bruk av Open Source Software?**Hvorfor bør Telenor IS satse på økt bruk av Open Source Software?****På hvilke områder kan økt bruk av Open Source Software være passende?**

Neste >>

71 % completed

FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Vennligst velg ett alternativ per rad.

Dersom bruken av Open Source Software skal økes i Telenor IS, hva må Telenor legge til rette for å oppdatere kompetansen blant de ansatte? *

	Helt uenig	Uenig	Verken enig eller uenig	Enig	Helt enig	Vet ikke
Tilby deltakelse på relevante kurs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilby mulighet til å delta i Open Source Software nettsamfunn (eng: communities)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilby deltakelse på relevante konferanser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tilrettelegge for selvstudium i Open Source Software begreper og generell tankegang	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Vennligst velg ett alternativ per rad.

Dersom bruken av Open Source Software skal økes i Telenor IS, hvilke organisatoriske skritt bør da gjennomføres? *

	Helt uenig	Uenig	Verken enig eller uenig	Enig	Helt enig	Vet ikke
Sette i gang ett eller flere pilotprosjekter for å synliggjøre mulige effekter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Synliggjøre satsingen ovenfor alle ansatte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Synliggjøre at det allerede er tatt i bruk en del Open Source Software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Topplederforankring til satsingen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bedre kunnskapsforvaltning/kunnskapsdeling både internt og eksternt (for eksempel ved hjelp av Wiki, diskusjonsforum, e-postlister, blogger eller lignende)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gi enkeltpersoner/grupper ansvar for å følge med på utvalgte Open Source Software produktomener.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ansettelse av nye medarbeidere med kompetanse innen Open Source Software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leie inn eksterne konsulenter med oppdatert kompetanse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omstrukturere Telenor IS's foretningsmodell	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Annet (spesifiser her):

Har du ellers noen innspill på hva som bør legges til rette for økt bruk av Open Source Software?

Prosjektet vil sette pris på eventuelle kommentarer du har til Open Source 2010, og disse vil gi prosjektet verdifull input. Kommentarer vil bli behandlet anonymt og er en glimrende anledning til å gi tilbakemeldinger på godt og vondt til prosjektet.

Kommentarer til Telenors pågående satsing på Open Source Software:

Neste >>

86 % completed

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FORHÅNDSVISNING**Open Source Software i Telenor IS-24.02.2009**

Du valgte "Har ingen kjennskap til Open Source Software", spørsmålene i denne undersøkelsen er derfor ikke så relevante for deg. Dersom du likevel tror du kan ha noe å komme med, trykk tilbake nederst på denne siden og velg ett annet alternativ

Vennligst velg ett alternativ.

Alder *

- <20 20-30 31-40 41-50 51-60 >60
-

Vennligst velg ett alternativ.

Kjønn *

- Mann Kvinne
-

Vennligst velg ett alternativ.

Hva er din høyeste utdanning? *

- Bachelor
 Master/Sivilingeniør
 Ph.D.
 Annet, spesifiser her
-

Vennligst velg ett alternativ.

Innenfor hvilken studieretning/fagområde har du denne graden? *

- Datateknikk, informatikk eller tilsvarende
 Telematikk eller tilsvarende
 Elektronikk, kybernetikk eller tilsvarende
 Økonomi
 Ledelse
 Annet, spesifiser her
-

Vennligst velg ett eller flere alternativ.

Hvilken type stilling har du? *

- Leder
 Prosjektleder
 Utvikler
 Tester
 ITarkitekt
 Systemforvalter
 Brukerstøtte
 Annet, spesifiser her
-

Vennligst velg ett eller flere alternativ.

I hvilken avdeling av Telenor IS arbeider du? *

- DWH & BI – Datawarehouse and Business Intelligence
 CRM & Channels - Customer Relationship Management & Channels

- OSS - Operation Support Systems
- IT Operations
- Strategy & Architecture
- Sourcing & Programs
- Process & Compliance
- Fixed VC
- Mobile VC
- Annet, spesifiser her

Vennligst velg ett eller flere alternativ.

I hvilken "verdikjede" innenfor Telenor IS jobber du? *

- Fixed
- Mobile
- Annet, spesifiser her

Vennligst velg ett eller flere alternativ.

I hvilket markedssegment jobber du? *

- Privat
- Bedrift
- Wholesale
- Annet, spesifiser her

I følgende spørsmål vennligst oppgi antall i tallformat.

Hvor mange år har du jobbet i Telenor IS til sammen? *

I følgende spørsmål vennligst oppgi antall i tallformat.

Hvor mange år har du til sammen jobbet innenfor IKT (inkludert studie)? *

I følgende spørsmål vennligst oppgi antall i tallformat.

Hvor mange års erfaring (både på jobb og fritid) har du med Open Source Software (ekskludert ferdigvareprodukter som Firefox og OpenOffice)? *

Dersom du har noen kommentarer til selve undersøkelsen, kan du skrive det her

Kommentarer til undersøkelsen

Send

100 % completed

APPENDIX C

WORKSHOP #1 SUMMARY

This appendix contains the summary notes taken through the first workshop conducted at Telenor's campus, Fornebu. The notes are written in Norwegian, since the workshop was performed in Norwegian.

TOPIC 1: Possible benefits from an increased use of OSS

1.1. Kvalitet

- Redusere IS kompleksitet gjennom å standardisere (for eksempel Linux skal velges om mulig)
- Ha stabile driftsmiljøer med høy performance med OSS
- Velge modne nok OSS produkter
- Standardisere(deler av) applikasjon/infrastruktur med OSS
- Mer vedlikeholdbare systemer gjennom at man kan endre systemet der hvor det er hensiktsmessig, ikke bygge rundt
- Bedre da flere bidrar
- Alle har innsyn
- Lett å prøve ut

1.2. Utviklingsstøtte

- Bedre utviklingsverktøy i OSS (Eclipse)? I tillegg til tilsvarende prosesser
- Raskere tilgang til teknologi – noen leverandører er trege
- Større grad av valgfrihet hvis man setter sammen en OSS løsning
- Enklere og prototype og evaluere SW

1.3. Kompetanse

- Hype
- Ser bra ut på CV
- Etterspurt
- Høy interesse i fagmiljøer/konferanser etc.
- Øke leveranseevne fordi IS kompleksitet er lavere
- OSS er fremtidsrettet → gir tilgang på kompetanse
- Ha Norges største OSS-miljø (et mål?)
- Tiltrekke seg ny arbeidskraft gjennom deltagelse i OSS communities
- Ha nye ansatte med arbeidsoppgave OSS-Support

1.4. Support

- Bedre dokumentasjon:
 - Tilgang på dokumentasjon
 - Tilgang på hjelp
- OSS: dårlig støtte/fiks ved problemstilling? ...eller?
- Bedre kvalitet av ny SW, men problem med integrasjon og test
- Ha førsteklasses support på SW
- Bedre support
- Ha rask feilretting med OSS communities

1.5. Lisenskost

- Redusert kost
 - Lisens
 - Opplæring
 - Flexibilitet
 - Synergi

- Kutte kost til Oracle
 - Mellomvare
 - DB
 - CRM
 - SOA/ESB
- Migrere alle DB2 DB til OSS
- Billigere(gratis) lisenser:
 - Websphere
 - DB
 - NQ (???) (*MQ er IBMs industristandard meldingskøteknologi.*)
- Redusere innkjøpskostnad for kjøp av nye lisenser

1.6. Påvirke prosesser

- Påvirke produkt "roadmap" gjennom mer aktiv deltagelse enn det som er mulig med bruk av kommersiell programvare
- Deltagelse i communities - i tillegg til fremtidige "spin-offs"

1.7. Driftkost

- Enklere administrasjon av eksisterende lisenser
- Redusere hardware kost → gå til Linux
- Billigere å drifte "åpne systemer" (kan for eksempel flyttes på "cluster"(???) (*clustering tipper jeg henspiller på at kommersielle clusterløsninger tradisjonelt er kostbare mens det med friprog kan gjøres langt rimeligere.*)
- Kostnadsbesparelser gjennom å si opp supportavtaler som sjelden/aldri benyttes
- Økt produktivitet gjennom standardisering vha. OSS
- Kostnadsbesparelser gjennom å redusere arbeidet med oppfølging av kommersielle lisenser
- GRATIS!

1.8. Innovasjon

- Bedre grunnlag for innovasjon
- Øke innovasjon → Virtualiserte miljøer og adgang for utviklere til å prøve ut noe

1.9. Mer OSS import/eksport

- Trenger gode demoer – prøve mer OSS
- Migrere alle Sybase DB til OSS
- Prøv "go-open" på strategiske, egne komponenter

1.10. Gøy

- Kult med OSS
- Tiltrekke idealister
- Allmenngjøre OSS
- Mindre frustrasjon ved "Bedre løsning" → Arbeidsmiljø!! Ha det gøy!

1.11. Pressmiddel

- Leverandør pressmiddel:
 - Fokus
 - Hjelp
- Presse eksisterende leverandør av kommersiell programvare på pris ved å vise til konkrete piloter ved bruk av OSS

- "Presser" lisensbaserte SW-leverandører til bedre løsninger
- Vise ovenfor store kommersielle aktører at det finnes andre alternativer

TOPIC 2: Possible risks and pitfalls

2.1. Levedyktighet og valg

- Valg av "umodne" / Ikke levedyktige OSS produkter
- OSS produktet / Community kan dø
- Umodne/ Valg av "døde" prosjekter
- Usikkerhet rundt om man velger riktig produkt (levedyktighet)

2.2. Support

- Få/Ingen internasjonale supportorganisasjoner (for eksempel ved behov for 24/7 arbeid)
- For små support-organisasjoner for OSS produkter
- Ofte dårlig dokumentert
- For liten og uforutsigbar "støtte" ved problemer
- Ingen support
- Stole for mye på "andre" – ikke kontroll med utvikling
- Trenger menneskelig Orakel/"OSS-onkel"

2.3. Nye partnere

- Inngå support avtale med OSS Support organisasjon
- Må skaffe og forholde seg til nye samarbeidspartnere

2.4. Kompetanse

- Tilgang til kompetanse (for eksempel DB gå for Postgres SQL)
- Større krav til intern kompetanse
- Manglende kompetanse
 - Teknisk
 - Juridisk
 - Lisensiering
- Vanskelig med kompetanse hos driftsleverandør
- EDB mangler driftskompetanse

2.5. Anarki

- Økt kompleksitet – fritt valg → kaos?
- Religion – man velger produkt fordi det er OSS ikke fordi det løser våre krav
- Fare for "anarki" i forhold til å ta i bruk for mye ny teknologi (Og endre denne)
- For stor "jungel" av produkter å velge blant
- SW-miljøene vil hele tiden bytte til det "hotteste"
- Over-hyper slik at resultat ikke svarer til forventning
- OSS produkter er personavhengige (en utvikler)

2.6. Kvalitet

- Ikke tilstrekkelig funksjonalitet (på enkelte områder)
- Dårlige produkter
- Lavere stabilitet dersom man velger feil OSS produkter
- Mindre funksjonalitet i database → øker kost

2.7. Ny salgsprosess

- Slutt på "Vining and dining" (salgsmøte med kommersiell leverandør(???)
- Ingen vinflaske til jul
- Dårlige selgere i OSS verdenen, få "smøreturer"

2.8. Ledelsesforankring

- Manglende forankring hos ledelse
- Vanskelig å få mandat til å bruke (frykt)

2.9. Ny prosess

- "Best practices"
- Katalog/retningslinjer over anbefalt OSS programvare
- Retningslinjer for bruk av OSS
- Testmiljø og tilgjengeliggjøring av testresultater
- Tung innføring i konservative miljøer
- "Center of excellence"
 - OSS DB
 - OSS App.server
 - Etc.
- Trenger endrede utviklingsprosesser
- Piloter
- Prosessendringer og organisasjonsendringer
- Erfaringsdatabase

2.10. Ikke gruppert

- Manglende oversikt over "roadmap" / fremdrift
- Lite salgskorps
- Våre eksisterende AD/AM-leverandører klarer ikke følge opp OSS
- Vi må begynne å jobbe, kan ikke lenger bare "peke"
- Ingen har totalansvar → Problem på kritiske systemer (eks PKS(???) (*MKS er et versjonskontrollsystem fra en komersiell leverandør*) i COS der de kom fra England)
- Ingen standarder
- Uryddig lisenssituasjon
- Utbytte av kjent teknologi
- OSS markedet blir konsolidert og kommersialisert

TOPIC 3: Arrangements for increased use of OSS

3.1. Spre budskapet (motivere)

- 5 gode "heishistorier" om OSS i Telenor / Vise til Positive resultater med OSS
- Informere om OSS!
- Analysere hvorfor ikke OSS har blitt valgt i tidligere prosjekter
- Dør Åpner: Få til tiltak som i utgangspunktet var "røde"
- Positiv feedback på alle OSS tiltak/prosesser
- Holde innlegg på "GO Open"
- Synliggjøre konkrete fordeler
- Klart uttrykk hvorfor og hvordan Telenor IS skal satse på OSS. Formidle det til alle (inkludert samarbeidspartnere)
- Motivere til å gjøre SW OSS
- Slutte å snakke om penger/innsparinger som motivasjon

3.2. Standardisering

- Bytt teknologi til det som er kompatibelt med flere app. Servere eller DB-er (unngå Proprietære løsninger)
- Velge Linux-varianter fremfor Windows der leverandører tilbyr begge deler (Server app.)
- Etablere Linux som standard OS
- Standardisere produktportefølje
- Etablere JBoss som standard app. server

3.3. Kompetanse/ressursbruk

- Gi de ansatte (grupper) tid til å sette seg inn i OSS produkter
- Gi ansatte muligheten til å "komme inn i"/delta i OSS communities
- Oppfordre til aktiv deltagelse i OSS nettsamfunn
- Konferanser
- Kurs
- Profilere seg som OSS vennlig → tiltrekke seg dyktige folk

3.4. Produktvalg

- Påvis konkret nytte/utnytte over hele spekteret
- Finn et fåtall OSS produkter og fokuser kun på de
- Gjøre noen valg av OSS produkter som man skal satse på
- Produktene må kunne supporteres av driftleverandør
- Engasjere seg tyngre i et fåtall OSS produkter
- Evaluere OSS produkter (Og vedlikeholde) "listen"
- Velge åpne løsninger som kan lett flyttes til en annen leverandør (dvs. linux/vmware og ikke IBM/SUN/Oracle)
- Holde "OSS-temp" oppe – informere om faktiske erfaringer på prosjektledersamlinger og lignende

3.5. Ansvar

- Holde oversikt over hva som tas i bruk
- Gi enkeltpersoner ansvar for gitte OSS områder
- Koordinere med utvikling. Intern driftsansvarlig og eksterne leverandører
- Ha en ansvarlig person/gruppe for OSS satsing

- "Center of excellence"
 - OSS DB
 - OSS App. Serv
 - Etc.
- 3.6. Pilot**
 - Inkrementell innføring (vurdere nye/revidere tiltak ut fra egne erfaringer)
 - Demonstrer at OSS er enklere. Finn eksempler på dette (MySQL vs. Oracle eller JBoss vs. Websphere)
 - Finne prosjekter som gjør at ansatte sparer tid på utvikling
 - Demoer (2-3 anvendelser av OSS i egne produkt + 1-2 egne del-systemer med ny OSS)
- 3.7. Strategi/forankring**
 - Ikke la systemet eller prosjekter stå fritt til å velge → strategi på teknologivalg
 - Retningslinjer/Policy/Målbilder (*"Vi har etablert noen arkitekturmålbilder som viser et målilde på hvilken IT systemarkitektur vi ser for oss gå mot innenfor gitte områder."*) fulgt opp av 3PI i forhold til prosjektenes valg
 - Godkjent OSS strategi
 - Ha en OSS strategi
 - Få topplederstøtte + mellomlederene
 - Få Rolv-Erik Spilling (*Produktdirektør Telenor Norway*) til å fortelle om fordelere og strategien
 - Valg av best mulig AD/AM leverandør i forhold til kompetanse på OSS (Faktisk reelt eksempel der OSS ikke ble valgt fordi AD/AM ikke hadde kompetanse)

Kommentarer etter undersøkelsen

- Viktig med center of excellency
- Kommunisere på tvers
 - Kompetansen på deles på tvers i Telenor
 - Fjerne "skylappene" → dvs. at avdelingene jobber separat
- Ha en OSS champion som kan drive det videre etter prosjektslutt
 - Drivkraft til å driver prosjektet videre → passe på at det ikke faller i fisk
- OpenSource 2010 → pilot ut innen 2010
- "OSS skal velges på samme måte som kommersiell SW"
- Noe å lære fra andre? Netcom? Utlandet?
- Drift er viktig. Valg av leverandør. For eksempel velge Linux. Mye å spare i drift også
 - "Open Drift" → Driften glemmes ofte?!
- Overgangsfase der økt bruk av OSS muligens innføres → kan føre til et økt tidsforbruk i en "kortere" periode