



IT Adaptation in Developing Countries

An Ethnographic Study of the Open Source Initiative SchoolNet Namibia

Abstract

The Open Source (OS) movement was started as a reaction to proprietary software by people with strong beliefs in the freedom of information, knowledge and software. OS is in computer circles today known as rapidly developed stable and secure software of high quality. Besides these technical advantages, many OS advocates mean that Open Source Software (OSS) is a competitive alternative to proprietary software in order to bridge the digital divide. Since little research exist about the use of OS in developing countries, we decided to make a one-month field study in Namibia. The organisation SchoolNet Namibia uses refurbished equipment together with Open Source Software to bring computers and Internet to Namibian schools. The purpose with our journey was to find out whether this technology was successfully adapted by its users or not. The question we chose to answer was: *Which factors are critical for a successful IT adaptation in a developing country?* We used theories about IT adaptation in general and combined them with theories about implementation of technology in developing countries. Our study showed that SchoolNet Namibia has considered many of the important factors mentioned in the existing theories and is working towards a successful IT adaptation. By combining our theories and applying them to our results we were able to generalise and come up with conclusions concerning IT adaptation in developing countries. According to us, the critical factors for successful IT adaptation consist of addressing real, experienced problems, making the technology sensible to its users, providing sustainable solutions, controlling that the infrastructure supports the technology, realising the importance of local champions, focusing on the right target group, avoiding technical distanciation and understanding attitudes and structures of the society.

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Preface

We would like to thank the OS project at the Viktoria Institute for making it possible for us to perform our study in Namibia. Special thanks to our tutor Magnus Bergquist for his help and encouragement with this thesis.

We would also like to take the opportunity to thank the people at SchoolNet Namibia for their warm welcome. They took time for our interviews, gave us the information required about the organisation and let us use their computer lab whenever we needed. We are impressed by the friendliness and devotion found with the members of this organisation. They really made an impression on us and made our stay meaningful.

We want to thank all of the organisers of the Africa Source conference, especially the Tactical Technology Collective, for welcoming us to the conference. The experiences and the contacts gained from the conference have been of great importance to our work.



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1 Introduction

1.1 Problem area and purpose

OS¹ is today a rather unknown concept for many people. Although many people are incapable of expressing the term Open Source in concrete words, most of them are using OSS on a daily basis not knowing about it. For example, browsing the Internet involves OSS. Many people come in contact with OSS when using the operating system Linux². However, OS is about more than software, it is a different way of thinking. For many of the members within the OS movement, OS has become a way of living and a culture with an ethic of its own (Feller & Fitzgerald, 2002).

Today we are facing a reality where inequities exist between rich and poor countries, as well as between the citizens within. Disparities are nothing new and the process of globalisation has brought increased and new conflicts concerning intangible assets like information and knowledge. In this context, Information and Communication Technology (ICT) is an important tool that enables effective usage and sharing of those assets. Subsequently there is a gap between people who have access to and can use ICT and those who cannot. This gap is often referred to as the digital divide. The digital divide means that large groups are denied the option to participate in the possibilities of using ICT to improve different fields of society, for example the generating of ICT related jobs, e-government, ICT improved healthcare and ICT enhanced education. The victims of the digital divide are primarily found in developing countries and for them it indicates a lost opportunity. Looking at ICT from this point of view makes it easy to understand how its potential for development is closely related to the field of human rights (www.bridges.org, 24/2-2004). The focus in this thesis is how OS can be a way to overcome the digital divide.

During our work we have noticed an increased interest in the potential of using OSS as part of the solution for successful development in disadvantaged and poor countries. One report that contributed to this notion was published on behalf of the Finnish Ministry for Foreign Affairs (Rajani, 2002-2003). It presents a number of reasons why OSS should be considered a competitive alternative for developing countries in their effort to reach a sustainable development. OSS is believed to have potential in several fields, for example the ones of democratisation, education and research, alleviating poverty, reducing conflicts, enhancing independence and meeting international obligations. The general assumptions about OSS covers issues like cost, quality and stability for both individuals as well as governments all over the world to consider. We felt it was important to study how OSS can be successfully

¹ All abbreviations are collected in Appendix 2.

² www.linux.org



introduced in developing countries. To find a working OS initiative we turned to SIDA³ who recommended the non-governmental organisation called SchoolNet Namibia⁴. We spent one month (March 2004) doing a field study of the organisation SchoolNet. Their vision is to spread the use of ICT in the schools of Namibia. The reason why they caught our attention was the fact that they are advocating and using OSS to achieve their goal. Although SchoolNet was our main focus we used their contact net to reach people from other groups of interest. We felt it was important to talk to people that used SchoolNet's services and also other stakeholders that were connected to the organisation in particular or the OS movement in general. By doing so we wanted to see how the OS technology was adapted in Namibia. We used the theories of Ola Henfridsson (1999) about the process of IT adaptation in Swedish organisations. His results were vital to our work since they point out important factors to consider in order to attain a successful IT adaptation. Since this thesis concerns the adaptation of ICT in the context of a developing country, we had to add further theories to suit our purpose. We found an article about a three-year field study in India (Walsham & Sahay, 1999). The purpose of that study was to understand the implementation of ten projects that aimed at making the work of Indian middle level officials more congruent and efficient by the use of Geographical Information Systems (GIS)⁵. We found their conclusions valuable since they showed us in the right direction for our study. In order to gain a successful implementation of a new technology in a developing country, the GIS study stated it is important to keep in mind that it differs from traditional adaptation processes. There is a need to bring it to a higher level and take differences in structures and attitudes into account. In the report by bridges.org (2001) we found a number of so-called key factors that determines the success of ICT implementation in developing countries. These key factors were combined with the thoughts of Henfridsson (1999) to gain knowledge and an as thorough understanding as possible of the OS adaptation in Namibia.

The purpose with our thesis is to understand IT adaptation in developing countries by studying adaptation of OSS in Namibia.

To achieve this purpose we have chosen the following question:

Which factors are critical for successful IT adaptation in a developing country?

1.2 Motivation of the study

The majority of the writings we have taken part of emphasises the fact that OSS has an immense potential for developing countries. Nevertheless, our literature studies have shown it is not until quite recently that the interest and

³ The Swedish International Development Cooperation Agency, www.sida.se

⁴ There are several different SchoolNets around the world. In the following text we will only refer to SchoolNet Namibia as SchoolNet, www.schoolnet.na.

⁵ A map based integrated system (Walsham & Sahay, 1999).



the debate around OSS and its potential for development actually started. This is the explanation to why there is not much work done within this field. Even though this situation is changing, the area is still fresh and exciting to study. We have found several recommendations that highlight the importance of further research and there is especially a request for field studies of existing local projects in developing countries that use OSS (Rajani, 2002-2003, Walsham & Sahay, 1999).

Another motivating factor was our discovery that there is a lack of research that combines an IT adaptation perspective with the use of OSS for developing countries. By making this field study of a local project we felt we could fill the gap and contribute with valuable insights within this area.

Combined, these thoughts motivated us and made us enthusiastic about writing this thesis. Hereby, we make a modest try to contribute with a greater understanding for the issues concerning the adaptation of ICT in general and OSS in particular in developing countries.

1.3 Commissioners

This thesis aims to serve as a contribution to the research of the OS project under the Knowledge Management Hub at the Viktoria Institute. The project is interested in the OS phenomena as a social movement, its cultural aspects and its influence on new organisational forms (www.viktoria.se, 5/4-2004). We were fortunate as the OS project decided to cover some of our expenses for the field study in Namibia. By supporting our initiative, they have the opportunity to broaden their field of knowledge of OSS and its use in developing countries. This thesis is the result from our work and we hope the OS project will find it valuable for its research.

1.4 Delimitations

In this thesis we have focused on OS adaptation in developing countries. We have studied a project that uses OSS within the educational sector as a tool to empower youth and enhance the ICT situation in Namibia. We have not considered other factors than the use of OSS that can influence development of poor countries in any direction. Even if our subject is strongly connected to the educational system of Namibia, it is not our intention to cover this in our thesis. The educational system will be mentioned briefly but we will not include pedagogical and learning potential connected to ICT.

On several occasions in our thesis we mention different kinds of factors that we have found to be important for a successful IT adaptation. Even if we sometimes refer to them as critical factors, they are not to be mixed up with theories concerning Critical Success Factors (CSF). The concept of CSF is not covered in this thesis.



Although we had the opportunity to meet people from different groups of interest, the majority of our interviews are made with people closely connected to SchoolNet. It was hard for us to find totally objective persons to interview due to the short time we spent in the country. Consequently, we have been forced to exclude certain groups of interest in Namibia, for example representatives from the Industry as well as the municipal level.

1.5 Disposition

From this point and onwards our thesis will have the following disposition. In chapter two we present the research and the background information we have based our thesis on. The most important theories concern Open Source Software, the digital divide, the potential of OSS in developing countries and IT adaptation. In chapter three we present the methods we have used together with our scientific standpoint and a description of how this study was accomplished. We explain how we got in contact with SchoolNet, how we selected the persons to be interviewed and the reliability of our gathered material. In chapter four we demonstrate the results of the observations and interviews that have helped us come up with our conclusion. We discuss the results in the following chapter, number five, and in chapter six we reply to our question by stating our conclusions. The thesis ends in chapter seven with our recommendations as well as suggestions to further research within this field.



2 Theory

2.1 Open Source Software

This section aims to create an understanding of what OS is, its history and how people use OS today.

2.1.1 History

The phenomenon called the OS movement started to grow within the US hacker culture in the 1960's. In 1969 two important inventions contributed significantly to the OS movement. The Arpanet⁶ provided its users with a network that simplified communication. The operating system Unix together with the programming language C made it easier to develop stable and flexible software. Unix was at that time distributed for nominal fees to those who wanted it. The hacker society was then an open society where the members shared information freely with each other (Andersson, 2000). It was a real achievement to develop a working program and if someone managed to do this, the software was shared within the society in order to enhance development. In 1977, the University of California at Berkeley started the Berkeley Software Distribution (BSD) project. Besides improving the Unix system and the Arpanet they also significantly contributed to the development of the Internet in other ways. Under the BSD project, the important Internet tools Sendmail and BIND were developed. Sendmail is a mail agent now used for 80 % of the world's email traffic and BIND is a program that makes it possible to write addresses in the URL field instead of IP numbers (Feller & Fitzgerald, 2002).

In the 1980's, software development became commercialised and many of the hackers moved on to working within big software companies. As an opposition to this, Richard Stallman founded the strongly ideological organisation the Free Software Foundation (FSF) in 1985. He resigned from his job at MIT⁷ and committed his time to creating free software (the GNU project⁸). Stallman had a firm belief that software should be free and to guarantee this he created the GNU Public License (GPL). Before submitting software on the Internet, the creator provides it with a license that describes its basic theory. Generally within the OS movement the licenses state that improvements made by others than the creator shall be made available so the development continues. The licenses have different grades of restrictions and possibilities. These restrictions concerns not only law but also an understanding of a culture, an ideology. Stallman's license, the GPL, means

⁶ Arpanet was used to connect universities and other organisations within the field of computers. People used it to share information and to connect researchers and knowledge all over the US (Feller & Fitzgerald, 2002).

⁷ Massachusetts Institute of Technology

⁸ www.gnu.org. GNU is short for Gnu is Not Unix.



that everyone is allowed to freely run, copy, modify and redistribute programs without adding any restrictions to them (Andersson, 2000).

In the beginning of the 1990's, the Finnish programmer Linus Torvalds started developing a kernel to an operating system. The purpose was to create a Unix-like operating system for PC's. In 1992 his kernel was linked to the operating system GNU and after further development, improvement and debugging made by him and other hackers over the Internet, it became what today is commonly known as the operating system Linux. The development of Linux claims to be the largest collaboration in the history and the system is now widely used and even more popular than its predecessor Unix. In 1995, the development of the web server Apache started as another open collaboration between programmers. This OS product has had immense success and is now running over 60 % of the world's websites. In 1998, the next important part of the OS history took place. Netscape had for a long time lost market shares to Microsoft and to try and change this, they decided to freely distribute the source code of their web browser to the users. The name of the project was Mozilla. As soon as the source code became available on the Internet they got vast amounts of contributions of code. In the end of the year the company started to regain market shares from Microsoft and the project has all in all been very successful (Feller & Fitzgerald, 2002). As a reaction to Netscape's action, a group of developers⁹ within the Free Software movement saw an opportunity to separate themselves from the purely ideological division and address the commercial world with the concept of open software (www.opensource.org, 13/4-2004). Without a split it was impossible to attract a commercial interest and therefore the Open Source Initiative (OSI) was founded in February 1998. The expression Open Source Software was coined as an alternative to Free Software. The word open was chosen to state that free did not mean gratis, since the word gratis is hard to unite with commercial interests. Eric Raymond is one of the leaders of the OS movement, a position he attained partly by being one of the major contributors to the development of Linux but also for being an important spokesperson for the OS society (Feller & Fitzgerald, 2002). Besides Raymond, the other famous persona in the OS movement is Linus Torvalds due to his great skills and, of course, the important work he did in creating Linux (Bergquist & Ljungberg, 2001). In the end of 1998, the OSI received a collection of confidential documents originating from Microsoft, the so-called "Halloween Documents". These documents discussed the threats of OSS in general and of Linux in particular, and increased the interest of OSS enormously in the media (Feller & Fitzgerald, 2002).

2.1.2 Open Source vs. Free Software

Feller and Fitzgerald (2002, p 12) define that "*Open Source Software is software distributed under terms that comply with the Open Source Definition*". The Open Source

⁹ Todd Anderson, Chris Peterson, John Hall, Larry Augustin, Sam Ockman and Eric Raymond.



Definition (OSD) is not a license but a document created by the OSI, which measures a product's terms of distribution. In spite of this, the OSD has mainly been used as a licensing standard. Both the GPL and the LGPL¹⁰, which are the most common used licenses, comply with OSD standards. If software is fully distributed in accordance to the OSD it may be called OSS and can be OSI certified.

Both the FSF and the OS movement strive to obtain liberation of software with the possibility to freely copy, modify and redistribute it. Even though their main purposes are the same, there are differences between the two groups. The FSF are motivated by ethical aspects focusing on freedom associated to software. The OS society has a more pragmatic and commercial approach focusing on the supremacy of software developed in accordance to the OSI (Feller & Fitzgerald, 2002). They allow a bigger mix of proprietary software and OSS since they have this practical view. Such solutions are not accepted by the FSF, where the general opinion is that a commercialisation of OSS is totally against the basic thoughts about free software (Andersson, 2000). Stallman means that within the FSF they speak about freedom, principles and the rights of users. He believes that his group and the OS movement are parted concerning the basic questions but that they still follow the same practical recommendations. Raymond declares the supremacy of the OSS as a better argument for openness and freedom than the principles of the FSF. While the FSF still produces software and articles, the OSI in general does not. They have given up software development in favour of marketing the software. In spite of the differences of the two branches, Feller and Fitzgerald (2002) mean, the FSF and the OSI complement each other well. The FSF continues to stimulate the software development with projects and articles and the OSI complement them in legitimating the OSS within the commercial world. FSF constitutes the kernel and the foundation of the movement while Open Source is still a new concept, which is far away from being accepted of all people (Andersson, 2000).

2.1.3 Understanding Open Source

No matter how you choose to describe the OSS process, the result is reliable, high quality software rapidly developed at low cost, a fact that even Microsoft admitted in the Halloween Documents. There is no cookbook for developing OSS, every organisation and developer are using different methods and tools. There are, though, certain characteristics that can be distinguished for most projects. One of the keywords is parallel development, which is made possible by the modularity of many OS products. Parallel development makes it possible for several developers to work simultaneously with different parts of a system. The parallelism is what makes the OS process fast and time efficient. Another advantage with OS development is the members' worldwide distribution. The expectations and requirements of the OSS are often of an international character and can be compared to proprietary software that is

¹⁰ LGPL – Lesser General Public License. Richard Stallman created both licenses.



mostly developed out of a US perspective. As a result of this, the OSS attracts attention from countries and individuals that are normally sceptical of the US. Feller & Fitzgerald (2000) names developing countries and students as examples of such groups. Within the OS movement there is an independent peer review. Feedback is instant since developers and other members of the community are in different time zones. People strive to find bugs and fix them, and since everyone is aware of the fact that there will be a thorough review and that highly reputable leaders might check their contributions, in general only software of high quality is contributed. The members communicate and cooperate via the Internet, which is the most important tool for a working OS society. The Internet renders possibility for developers to share ideas and software at high speed and low cost even though the developers are situated in different parts of the world. Today most of the communication within the OS society takes place in different websites or via mailing lists (Feller & Fitzgerald, 2002).

The OS society is characterised as a strong gift culture where people share information and software freely with each other. New OS activists are slowly socialised into the gift economy. They enter the society as “newbies”, slowly turn into hackers and the truly skilled people may even gain the status as a “demi-god”. A well-known demi-god within the OS society is for example Linus Torvalds. Status is not achieved by owning or controlling software; it is determined by what you give away. There is no monetary reward for sharing software, what motivates the members are instead factors such as gaining new knowledge, reputation and fame. Giving away software can therefore be understood as a way to create and maintain power relations (Bergquist & Ljungberg, 2001).

Feller & Fitzgerald (2000) name four divisions within the OS community:

- Developer communities. The majority of the developers are men in the age of 20-39, living in the US or in Europe. Many of the developers are professionals, and are paid by their employers for contributing to the OS development. In this category many specialists are found, which is a contributing factor to the stability and robustness of OSS.
- User communities. OSS is most often used within the business sector in English-speaking countries. It is mostly found in backend-systems due to the fact that these products totally outmanoeuvre their proprietary competitors. The use of OSS for Office-services is still not common because these products are not considered to be user-friendly. A general opinion is that it takes specialist skills to use them. This is changing with the society putting a lot of effort in producing user-friendly desktop environments.
- Commercial OSS organisations. IBM is one of the most active companies within this group, building and selling their own Linux distributions. The business model for most of these companies is to



sell hardware with an operating system included at negligible cost. Other activities can be producing drivers, adjusting OSS for different platforms, providing technical support and education. Many of the companies within this group support the OS society, for example by donating revenues to different projects, hosting projects and creating documentation.

- Non-commercial organisations. This group is governed by people with strong beliefs in ideology and a wish to contribute with time and knowledge. They are living and working in a so-called meritocracy. The Internet and other effective ICT tools are of great importance here. Not all OSS projects are big enough to have their own organisations. Many smaller projects take advantage of free project gathering places on the Internet. An example of such a place is SourceForge¹¹ which is the largest site hosting over 20 000 projects. They offer CVS repositories¹², mailing lists and forums and project management software and can be used by any project that are OSI certified. Since contributions and feedback may appear at anytime and from anyone, the core group of a project would be fully occupied with this if these tools were not available.

Thanks to companies like IBM¹³ and Red Hat¹⁴, OS development teams are put together and can cooperate in a more traditional way. Likewise, the amount of OS conferences contributes to an increased worldwide cooperation outside the virtual world. Most of the studies indicate that the majority of OSS development is performed in the developed world so even if one can say that OS is an international phenomenon; it is still not a global issue. This is very interesting when the high expectations related to the possibilities for OSS to reduce the digital divide are considered (Feller & Fitzgerald, 2002).

The motivational factors for contributing in OS projects are according to Feller & Fitzgerald (2002) a subject for much research.

At first there are the pure technical motivation factors. On an individual level it is about “scratching a personal itch”. Almost every well-known project has been created by someone with a special demand for non-existing technology. Examples of this are software as Linux, Sendmail and the programming language Perl. The advantages with peer review and cohesive development motivates people to produce OSS. The possibility to work with “bleeding-edge” technology and the fact that OS products can be superior and easy to work with is another factor. The organisational level addresses the software crisis. In general, it takes too long time and costs too much money to develop proprietary software. OS projects develop at high speed and low cost. High

¹¹ www.sourceforge.net

¹² Concurrent Versions System, www.cvshome.org

¹³ www.ibm.com

¹⁴ www.redhat.com



quality is connected with OS development since the people that create projects often are highly skilled and not affected by the market- or business interests. Testing, documenting and requirements analysis, take a lot of time in traditional software projects but are here handled by the users. Organisations like NASA¹⁵ are using Linux because they cannot allow themselves to be dependent of an operating system that is like a black box with encapsulated code, unavailable for the user to look at and modify. For security reasons they must have the possibility to do thorough testing of a system before taking it into use.

Besides this there are economical motivation factors as well. Participating in an OS project can enhance an individual's chances of getting employed or promoted. The developers get a chance to work with new techniques and thereby increasing their skills and knowledge. Reputable and capable persons within the OS society often get good job offers, and being known in the OS society is a good way of marketing oneself. A big part of the existing OS programming is actually paid for, many employers pay salary for their employees' contribution to the OS movement. The possibility to make money out of OSS is not as unbelievable today that it was in the beginning. The biggest successes within the OS movements have been in commercial products. While people pay nothing or just a nominal fee for software, they spend a lot of money on maintenance and support. The idea is to give away something that creates a need for another thing that must be bought, for example support, books and guarantees. In developing countries, where a license can cost more than a year's salary, people cannot afford using proprietary products. OSS is an immense possibility for these countries not only on an individual level but also concerning governments and businesses. Most governments need to decrease their costs, and changing into using Linux could easily do this.

The last motivating factor is the socio-political one. Working in an OS project is a way to strengthen people's egos. Developers in traditional projects may have to wait a long time to get feedback on their work and do not achieve the kick from seeing ones code being used. The recognition the developers get is given by highly regarded people and is therefore valuable. Belonging to a global group make individuals feel empowered and is a central motivation factor. The common norms, taboos and language are all a part of the culture and outsiders do not get access to this easy (Feller & Fitzgerald, 2002). Every social movement needs an enemy to strengthen the community from the inside. The OS movement has found their biggest one in Microsoft. The above-mentioned Halloween documents became a hot topic in the OS society, characterising Microsoft's evilness and clumsiness and confirmed Microsoft's status as the enemy (Szczepanska, Bergquist, Ljungberg, 2003). Ideology is central in the OS society and it takes its expression in a reluctance to use proprietary products.

¹⁵ www.nasa.gov



Ideology is of importance when it comes to levelling out inequities by providing free software to developing countries.

The OS movement is often pictured as a movement with a strong collective feeling. There are no owners of programs, creators of projects are actively searching for contributions to their code, and every contribution is valuable whether it is code, documentation or bug reports. The fact that the OS movement is said to be of great importance for developing countries is also contributing to the belief that it is a group working for the common best (Feller & Fitzgerald, 2002).

2.2 ICT and the Digital divide

As mentioned, the OS movement is one of many examples of so-called social movements that are part of the new society appearing on the global arena. They are challenging the traditional forms of behaviours and organisations. Today we face a reality where existing power relations concerning economical, political and cultural institutions and forces are changing. The reasons for this are the globalisation together with advances in technology, which increases the levels of mobility, flexibility and complexity. New conflicts arise concerning the control of for example information and knowledge (Szczepanska, Bergquist & Ljungberg, 2003). It is about more than just the right to use a technology in itself; it is a matter of having, or not having, access to information and knowledge. The use of ICT is an important and powerful tool when it comes to spreading and sharing these resources (bridges.org, 2001).

The unequal distribution and the differences in the possibility to use ICT effectively are often referred to by the term of the digital divide (www.digitaldividenetwork.org, 24/2-2004).

“The digital divide is not a single thing, but a complicated patchwork of varying levels of ICT access, basic ICT usage, and ICT applications among countries and peoples.”
(bridges.org, 2001, p 4)

The digital divide is a quite abstract and complex, but yet important, problem in today's society. It can be cumbersome to measure the digital divide. Therefore it is important to consider different factors, including for example affordability, infrastructure and the level of ICT training within a country. One of the most commonly used criteria for measuring IT readiness is the total number of Internet users (bridges.org, 2001). In order to understand some of the disparities we are referring to, consider the following extract:

“In the entire continent of Africa, there are a mere 14 million phone lines – fewer than in either Manhattan or Tokyo. Wealthy nations comprise some 16 per cent of the world's population, but command 90 per cent of Internet host computers. Of all the Internet users worldwide, 60 per cent reside in North America, where a mere five per cent of the world's population reside” (Nkrumah, 2000, cited in bridges.org,



2001, p 13). *"One in two Americans is online, compared with only one in 250 Africans. In Bangladesh a computer costs the equivalent of eight years average pay."* (The Economist, 2000, cited in bridges.org, 2001, p 13)

This picture is quite pessimistic but some claims that a change is taking place since all countries on earth, not just the richest, are actually increasing their ICT usage. The problem is that the developed countries are escalating their access and practice of ICT in a much higher speed, which in fact widens the divide, instead of shrinks it (bridges.org, 2001). Today no country can afford to neglect investments in ICT if they wish to raise their living standards, or to prevent them from being left behind, as other countries exploits the possibilities of ICT (Clarke, 2003).

Why is ICT considered to be an effective tool for bridging the international gap of the digital divide? At the UNDP's¹⁶ website one can read:

"...ICT is an increasingly powerful tool for participating in global markets; promoting political accountability; improving the delivery of basic services; and enhancing local development opportunities." (www.undp.org, 24/2-2004)

Those aspects can be of great importance for developing countries in their effort to gain economic development and improvements. Furthermore, it is also a question about every human's right to have access to information (www.sida.se, 24/2-2004). The majority of the research we have taken part of shows a belief in the benefits for everyone who manages to capture the advantages of ICT in order to improve their lives and society. Countries and people that are not able to effectively use ICT are losing an opportunity to improve the work concerning for example education, businesses and governance. Within schools, the Internet and computers can be used to bring courseware and achieve a more effective education. Throughout the use of ICT, small and local businesses can learn from the experiences of others, gain access to global markets and thereby become more competitive and nurture local markets. Nationally, ICT can increase and simplify the procedure of democratisation because of its ability to enhance efficiency and transparency in the work of governments (www.bridges.org, 24/2-2004).

In spite of all the praises for ICT as a tool for development, it is still not used in an optimal way in many parts of the world. ICT must be carefully integrated into society and supported by policy reforms. One necessity is to spread the awareness of ICT as part of the solution for improved education, healthcare, government administration, and local economic development (bridges.org, 2001). By increasing this awareness, people can understand the potential of using ICT and will more likely embrace it. An existing problem is when local grass root level initiatives neglect factors that affect their success, for example old and insufficient policies and educational systems. In other words, we think

¹⁶ United Nations Development Programme



there is a need for a holistic approach to cover the range of issues with the purpose to create an effective and sustainable ICT usage. Of course it is vital to provide access to the technology itself but in reality it is about more than just physical access. It is a matter of effective and affordable usage (bridges.org, 2001).

2.3 OSS in developing countries

“Open-source software has been called many things: a movement, a fad, a virus, a Communist conspiracy, even the heart and soul of the Internet. But one point is often overlooked: Open-source software is also a highly effective vehicle for the transfer of wealth from the industrial world to developing countries.” (Rajani, 2002-2003, p 13)

Advocates of OSS have lately been noticed in discussions concerning the decrease of the digital divide, since OS solutions offer access to ICT without costly license fees. (Szczepanska, Bergquist, Ljungberg, 2003). Rajani (2002-2003) argues that a big part of today’s research points out the fact that developing countries could benefit a lot from the use of OSS. It is argued that OSS has potential for the development of these countries and in the next section we will present in what way.

2.3.2 Why OSS in developing countries?

“It would not be too extreme to claim that certain forms and applications of so-called intellectual property rights are a way of protecting the ‘firstness’ of the ‘first’ world against the interests of the other worlds.” (Rajani, 2002-2003, p 8)

According to Hesselmark (2002) material poverty and lack of information are strongly connected. It is more difficult for a poor person to achieve information since they often live isolated in rural areas. Rajani (2002-2003) states that if information is made someone’s property it cannot and will not be free. It is apparent that the owning of information will be an obstruction to the development of the economy in developing countries. Therefore it is important to allow freedom of intellect and software. The OSS advocates do not say no to proprietary software, but important is that there must be an alternative for those who cannot afford it. Otherwise, the digital divide will not ever be bridged. Microsoft and other organisations opposed to the OS movement are even more opposed to the GPL because of the fact that every adjustment or improvement must be shared. One cannot use an OS product licensed under the GPL to develop something closed since it is not allowed. If redistribution of GPL’ed software occurs, it must also be under the GPL.

As Rajani (2002-2003) argues, OS is an attractive alternative for the developed parts of the world concerning cost, quality, reliability and security. As mentioned in chapter 2.1.3, Feller & Fitzgerald (2002) also emphasises these



advantages for the developing parts of the world. Besides this, it has an immense potential for communities, democratisation and human rights. His conclusion is that if OS has this many advantages for developed countries; of course there will be great advantages even for those in a developing stage. Even though it is easy to make such assumptions he points at the fact that little research is actually done at place in developing countries. This is something we are trying to change with this thesis. In Africa the most prominent country within the field of OSS is South Africa but many other countries are following, amongst them Kenya, Namibia and Nigeria. Even though the use of OSS is getting higher, the African continent is not contributing very much to the OS society.

There are, according to Rajani (2002-2003), three important reasons to why developing countries should consider using OSS. The most important one is the cost issue. People in developing countries normally do not pay for software; they cannot afford it and because of that pirating is the common way to gain access to necessary programs. Even though OSS does not cost very much, or sometimes even nothing at all, it is still important to look at the bigger picture, to consider the Total Cost of Ownership (TCO). Even if the initial cost of OS is not big, it is not gratis or easy to migrate proprietary systems into OS systems. It will not exceed the cost of buying proprietary software, but there might be a need of making investments within the human resources sector. In developing countries these costs are not as high as in the western world, due to the lower labour costs. And the persons employed are locals who are contributing to the local economy. The other big reason is the pirate copying issue. People in governments and other organisations in developing countries slowly get aware of the fact that copying and pirating cannot continue forever, and that they have to start paying licenses sooner or later. This is a major reason to why OS is gaining popularity. The third issue is covering security and technical independence. The majority of today's software is produced and controlled by the US. Many governments feel uncomfortable relying on software they do not know is safe. It is frightening to know there can be backdoors or spyware included in the software without anyone being able to control it. By using OSS, the users have total control and the possibility to adjust the software to fit their purposes. These issues are not just connected to governments but also to individuals. Microsoft has a good way of controlling and monitoring their users, something not many people feel comfortable about.

Besides these three factors there are further positive side effects with migrating to OSS. OS goes hand in hand with a good educational system. Without educated, skilled people it is hard to succeed with OSS but at the same time OSS can help and boost education providing good tools for learning freely to schools. Again, the meaning of the word open is central, it is as important for the schools to get free software as it is to have the possibility to take part of and learn from other people's skills through the sharing of source code. OS is a major tool for localising and adding content to courseware. Many languages of



developed countries are not supported in software coming from big international companies and here OSS can make a difference. The possibility to translate software into minority languages can have a positive impact on computer illiteracy. When people have a possibility to learn in their own language they are more open to new technology. There are also big expectations on the development of new ICT skills and thereby new job opportunities that follow an increased use of OSS (Rajani, 2002-2003).

2.3.3 Why are not more developing countries using OSS today?

Many developing countries are still pirating software and could not ever afford to pay for licenses. It is easy to wonder why not all developing countries have migrated to OS solutions. Rajani (2002-2003) means that there are three main reasons for this. At first there are the purely economic reasons. To achieve success with new ICT a country must invest in the infrastructure of the country and in the education of its population. In some countries this is not possible, there might be bigger issues to look after first. But it is important to keep in mind that ICTs does not just cost money, it can be a way to boost the economy as well as creating new job opportunities and more educated citizens. Another important factor is that a change into the use of OSS demands skilled, IT literate people. This should be looked after already in the schools, giving the learners a chance to widen their knowledge and not be dependent of a single software platform. Strongly connected to this issue is the concept brain drain. There is a tendency for well-educated people to move away from their countries because of the lack of job opportunities and career possibilities. Due to the economic situation of western countries today there is not as much migration within the field of ICT as it was a couple of years ago when the IT revolution was at its peak. The third reason is political and social factors. The bureaucracy is a hindrance, they are often inflexible, slow organisations who have difficulties reacting to a dynamic world and fast changes. Many decision-makers are afraid to believe that the OS movement, built on a voluntary base, is really working and is not just a communist occurrence. In countries where there are little money and few jobs, it is perhaps impossible to believe that people actually have the time and motivation to work on something for free in their own spare time. Besides these factors, significant corruption is an existing problem in many developing countries. The outcome is that big companies can easily bribe people in decision-making positions to use solutions they normally would not have chosen. As a conclusion in his report, Rajani (2002-2003) stakes that further research is needed at place in developing countries. We wanted to understand how a new technology is introduced into a society or an organisation, and why it fails or succeeds. In our search for theories concerning this issue we came across Ola Henfridsson's work (1999) about IT adaptation. In the following section we will discuss IT adaptation as a theoretical standpoint for our analysis.



2.4 IT adaptation

Henfridsson's thesis (1999) is primarily based on two case studies, one of a Swedish social services department and one of a Swedish software firm, in order to show how sensemaking¹⁷ processes affect IT adaptation in organisations.

“Being a human activity, IT-adaptation will always be in the hands of human beings, pursuing visions and intentions, having feelings and desires.” (Henfridsson, 1999, p 51)

What happens when an IT artefact¹⁸ is introduced into a new environment? According to Henfridsson (1999) there are no explicit answers to this question but some common tendencies can be recognised by observing the so-called IT adaptation process. This process consists of two major phases: exploration and exploitation. The initial phase of exploration is characterised by ambiguity. Individuals create their own subjective meaning to the introduced technology by changing their behaviour and activities to cope with the new situation. In order to understand a new IT artefact people select the parts they can relate to and that fit with previous knowledge and experiences. Because of this many temporary and coexisting meanings are created and the features and functions that are not selected are ignored. During this phase the new technology has not yet become a natural part of the everyday routines but this changes when entering the following phase of exploitation. The transition between the two phases occurs when several different meanings merge into a homogenous taken-for-granted-version that becomes part of practises and routines. Individuals are permitted to share and exploit the meaning they see in the IT artefact, which then is given the summarised meaning of the group. Once this collective view of the artefact is created, Henfridsson uses the term double interacts to refer to it. The process of transition is also a question of the construction of identities. The use of the IT artefact and the meaning we subscribe to it is an important part of the individuals' identity. Double interacts are therefore valuable in the sense that they are the elements by which we interact with other people and that generates feedback on our performances. When the IT artefact has reached this final stage of exploitation, its existence can only be threatened by so called external triggers, for example the introduction of an even newer technology, frustration by the users or technology breakdowns (Henfridsson, 1999).

In his conclusion Henfridsson (1999) shares a number of lessons, experienced during his research process. We have chosen the five we find valuable for this thesis. They concern the importance of using IT artefacts that addresses

¹⁷ Sensemaking is the word used by Karl Weik to describe the process where individuals create subjective meaning to relate to their use of IT-artefacts (Henfridsson, 1999, p 2).

¹⁸ A manmade object taken as a whole, for example an information system (www.hyperdictionary.com/dictionary/artefact, 18/5-2004).



problems that are genuine for the individual, the importance of creating double interacts, to avoid and be aware of technological distancing, to trigger the sensemaking process and to understand and pay attention to collective identities.

1. The first lesson is, as mentioned in the description of the exploitation phase, when the parts of the IT artefact that does not fit with the intentions of the individual, are ignored. Meaningfulness is only created when the technology solves already existing problems. In that sense problems are not something that can be initialised by the artefact itself. A good example, which explains this thought is described by Henfridsson (1999, p 52): *“A communication technology does not become meaningful as a communication technology until you experience a communication problem.”*
2. Lesson number two is the importance of enabling the creation of collective meanings, i.e. double interacts. This is when the artefact becomes a meaningful contribution to a unit. If this process does not occur there is a risk that the artefact is not going to be properly used. Creating double interacts brings stability to the meaning that is needed to use the artefact in order to sustain the goals and activities of an organisation. Without this stability, the artefact can only continue as part of the organisation if a dedicated or influential actor supports it.
3. The issue of “technological distancing” is part of lesson number three. Even in those cases where collective meaning has been created around the new IT artefact, technological distancing can interfere with the final adaptation. When this happens it can be hard for individuals to relate the new technology to their everyday work practices. Consequently they do not have an interest in testing different existing functions and possibilities but instead they tend to use only a few of them. Another difficulty with the IT adaptation process is when it is related to high prestige and pride. If this is the case, the technological distancing can at its extreme result in behaviour of defence towards the new technology.
4. The surroundings and the conditions for an IT artefact are constantly changing and therefore it is crucial to evaluate its existence, features and functions on a regular basis. If this is neglected there is a risk that the original purpose of the technology is no longer legitimate. Henfridsson (1999) refers to this activity as triggering the sensemaking processes. The aim is to adjust the artefact to fit with changes in the surrounding that is of importance of its efficiency without interfering too much with the desired stability mentioned as lesson number two. It is not easy to know which meanings will be related to a specific technology but it is not impossible to overcome this issue. By focusing on the underlying processes that actually generates new meanings we



can try to understand what separates successful IT adaptation processes from failed ones.

5. Finally Henfridsson (1999) subscribes to the effects different identities have on the sensemaking process. Every organisation consists of certain groups of individuals that share the same interests and therefore have subscribed their own collective motives and meanings to a new technology. It is important to try to understand these motives in order to gain support from those groups. Otherwise there is a risk to abuse their identities and create a conservative resistance towards the new IT artefact.

2.5 IT adaptation in developing countries

Henfridsson's (1999) findings are primarily valid in Swedish organisations. We have chosen to use his results as a way to discover tendencies for IT adaptation in order to understand similar processes in a different context. What happens when a western technology is implemented and adapted in a developing country? Many different aspects matter according to if a new technology will be embraced and successfully adapted or not. In order to understand differences between IT adaptation in developed and developing countries we have taken part of the experiences from a research project that has studied the implementations of GIS in the Indian society (Walsham & Sahay, 1999). The team who performed the GIS study viewed their findings from the perspectives of the actor-network theory¹⁹. In this thesis we applied the IT adaptation theory, described in section 2.4, to the conclusions of the GIS study. The presentation of the study is followed by a summary of a number of key factors that are important to notice in order to enable an implementation of ICT in developing countries. The factors mentioned will determine the success of the new technology and whether people are going to be able to use it effectively or not (bridges.org, 2001).

2.5.1 Applying the theory of IT adaptation on the GIS study

Between 1993 and 1995 a research team studied a number of GISs that were being implemented in order to simplify the administration of one of the public sector activities in India, i.e. the middle level districts (Walsham & Sahay, 1999). The team followed the starting up processes and the collected experiences concerning ten of those GIS projects. The purpose was to see how the systems could be used to support development of degraded land. In India, as well as in developing countries in general, a lot of expectations are tied to the use of GIS within this particular area. GIS is believed to be able to help in the work concerning for example planning and repairing of roads, and in deciding which districts that are suitable for agricultural development.

¹⁹ "Actor-network theory examines the motivations and actions of actors who form elements, linked by associations, of heterogeneous networks of aligned interests." (Walsham & Sahay, 1999, p 42)



As the field study went on for a long period of time, the research team managed to discover the underlying attitudes and social structures, which represented part of the context for the GIS implementations. In IT adaptation processes in developing countries it is important to consider further issues than in a traditional approach. Participation of the end user is often mentioned as one of the determining factors when it comes to the success of a new IT artefact. Of course this is true even in the context of developing countries but it is also essential to include other areas. The result of the GIS study was that the projects had not been successful. In the majority of the cases there were only a slight technological transfer out to the district levels and there were no working systems actually running. What was the reason for these failures?

If we use the findings of Henfridsson (1999), we can see that the projects failed in addressing problems that were real for the end users. The GIS technology assumed that the users were in need of map-based solutions. This truly differed from the Indian reality and culture where maps are not part of the daily life. The absence of maps had therefore never been seen as a problem. Cultural obstacles like these constructed barriers for the implementation of the new technology. Another issue was the dependency on remotely located data that was not congruent with the local needs or conditions. For example they received data regarding which crop to use, from a remotely located source. As a consequence these data were not always in harmony with local conditions and requirements and thereby did not solve the problems for the local farmers (Walsham & Sahay, 1999).

Henfridsson (1999) emphasises the importance of creating the so-called double interacts. In the GIS projects they did not succeed with this. The organisational form and the length of the projects had the effect that the involved people were relocated on a rather regular basis. This transfer of people resulted in a short-sighted way of looking at the goals, something that had an impact on the level of internal support for the GIS projects. Even in those cases where individuals actually saw the potential and had a personal interest in the projects they simply did not have the possibility to do anything about it. Consequently there were no dedicated people that could have secured the existence of the GIS technology due to the inability to create collective meaning concerning the projects overall goals and visions. Further the driving forces within the projects did not manage to understand the different groups of interest. Thereby they did not avoid technological distancing, mentioned by Henfridsson (1999) as lesson number three. The differences in motives between groups resulted for example in a conflict of interests between the supportive donor agency USAID²⁰ and the many Indian scientists who were part of the projects. USAID considered the Indians to be too focused on the technology itself and that they did not pay enough attention to the problems it was actually there to solve. The projects did not properly address the problem and therefore the Indians

²⁰ United States Aid-organisation for International Development



were not able to integrate the technology as a logical part of their everyday practices.

Another reason for the failure of the projects was that local vendors did not support the implementations as desired. Even though there was an interest in taking part of the new market opportunity, which came with the GIS technology, there was simply not enough available and educated staff. This, in combination with a frequency in delayed payments, made it impossible for the local vendors to survive if they gave the support required. Since it did not make sense for the vendors to support the new technology, the projects failed in what Henfridsson (1999) calls triggering the sensemaking process.

The GIS study came up with the conclusions that when it comes to projects like the one of GIS, it is important of fostering long-sighted thinking and to simplify and adjust the technology from the aspects of the end user. Technology is normally not a natural part of the work practises for the Indian district level officials. Thus, in order to have successful adaptation, structural changes, as well as changes in the actual training, are necessary. The training issue concerns the overall educational sector and is therefore a question that reaches the highest political level and needs support and cooperation between central government agencies in India. Consequently, the research team stated there was a need for a fundamental change in social attitudes and structures. However, it is essential for governments in developing countries to stay critical in the decision-making process for new technologies and try to reach a suitable balance between traditional attitudes and Western ideas. The organisation bridges.org has taken this into account in their report (2001) where they present twelve factors that limit and determine the success of a new technology in a developing country, which can be understood as active parts of an adaptation process.

2.5.2 Key factors

The factors presented by bridges.org (2001) considers physical access, affordability, capacity, trust, relevant content, integration, socio-cultural factors, appropriate technology, local economic environment, legal and regulatory framework, macro-economic environment and political will.

Of course, physical access is fundamental to enable the adaptation of a new technology and limitations of infrastructures are a big obstacle to the distribution of ICT in many developing countries. Even in those cases where there actually exists a physical infrastructure, the quality can be outdated in relation to its purpose. The speed of the Internet connections can be slow and very old-fashioned compared to the ones in richer countries. As a consequence it is time consuming to download emails and web pages especially as the global trend moves towards increased file sizes. Many developing countries use dialup connections to get access to the Internet. The combination of long download



periods and the fact that most phone calls are charged by the minute makes Internet surfing an expensive activity.

“Poverty remains the greatest barrier to Internet growth in Africa. The monthly connection cost for the Internet in Africa exceeds the monthly income of a significant portion of the population” “In the US, Internet access costs a user only 1% of average monthly income, whereas in Uganda it costs more than a month's average (per capita) income.”(bridges.org, 2001, p 20)

Compared to rich countries the wages are low in the developing part of the world and as shown in the quote above, people simply do not have the necessary money to make use of the new technology. Therefore it becomes a question of affordability. It is vital that citizens become aware of the potential and the possibilities that come out of effective usage of ICT. One way to increase the capacity with new technology is to encourage ground level initiatives in every possible area. Examples of these kinds of initiatives are school computer learning programs, HIV/AIDS information propagation and sustainable development programs. It is also important for people to realise the security and privacy aspects of new technology in order to trust it. It is not just about access to information and knowledge but more importantly these must be relevant and adjusted to the surroundings. The English language dominates the Internet. The people who do not understand English are as a consequence automatically excluded from participation. It is not only the language, but also the content that excludes people in developed countries from using the Internet optimally. The majority of the information and knowledge on the Internet is produced in the Western world and it is hard for people outside that world to relate to it and gain meaning from it (bridges.org, 2001). The issue of using relevant content is what matters when it comes to if ICT will be used in an optimal way or not. The countries that are not able to use all the advantages of this tool are not likely going to contribute with information and knowledge. As a consequence ICT will not be of great important to the lives of their citizens. Since the beginning of the computer era we have seen examples of when implementation of a new technology becomes a burden instead of a solution. To get the most out of ICT it must therefore be carefully integrated with the society to become a natural part of the daily lives of its users. Further it must include all different groups in the society and not discriminate people because of socio-cultural factors like age, gender and ethnicity. Not all new things are good and it is up to every policymaker to decide whether or not a new technology is the appropriate one according to the problems it is supposed to solve. The possibilities for sustaining the technology are going to determine its level of efficiency. Technologies that can help in the process of economic growth by nurturing local markets are more likely to be successfully adapted. The legal and regulatory framework for the technology is another key factor. The developed countries control the set of standards and this is something that leaves out the needs of the developing part of the world. Today developing countries are kept out of the decision-making processes and the



setup of internationally accepted ICT standards. As a consequence their problems and needs are given a low priority. Further key factors for a successful implementation are national policies and laws that encourage the use of the technology, issues related to democracy for example transparency of the work of governments and also macro-economic concerns. The final and maybe the main key to adaptation of a new technology is the presence of a political will to actually make a change in the society (bridges.org, 2001).

2.6 Summary of the theoretical framework

In this chapter we have presented the theories we have used for our study. Before we move on to the next chapter we will make a brief summary of the theories that have been the most important for our thesis.

Rajani's (2002-2003) writings gave us a valuable insight in the assumed potential for OSS in the context of developing countries. Furthermore, the conclusions of Henfridsson (1999) became the core of our theories as it gave us five necessary lessons to consider in order to obtain a successful IT adaptation. We used the GIS study from India as a way to share the experiences from a similar study, even though we chose to apply our perspective of IT adaptation on their findings. Finally, we took the twelve key factors from bridges.org (2001) to get an understanding of IT adaptation in developing countries.



3 Method

3.1 Gathering of information

Our tutor Magnus Bergquist made us aware of the organisation SchoolNet Namibia. Since he did not have any knowledge about the organisation besides knowing that it existed and that they were using OSS we tried to get in contact with other stakeholders to find out whether SchoolNet was a good project to study or not. We sent emails to different organisations in the world and the most valuable contact we got was Bengt Oberger at the IT section of SIDA. Given that SchoolNet is one of SIDA's partner organisations, Oberger had a valuable insight in their work and told us that the project was worth taking a look at. Besides this we have gathered background information from different websites and books.

3.2 Scientific standpoint

Since we agree with the opinion that the world is an individual, social and cultural construction, we have in this study chosen a hermeneutical approach (Backman, 1998). The hermeneutics are not interested in explaining different phenomena; instead they are interested in creating an understanding of other people through studies of their speech and writing (Patel & Davidson, 1994). Within the hermeneutical field interpretation is one of the key elements with the purpose to gain understanding and meaningfulness. Our focus has not been to present measurable, general knowledge but rather to interpret our empiric material and put existing assumptions in relation to the result of our study. Consequently, we have not looked for an absolute truth but rather an increase of our understanding to be able to spread the awareness of how OSS in a developing context in practise is related to the western research. The use of a hermeneutic approach seemed to be the most appropriate choice for us regarding our purpose, field of interest and scientific heritage from our education in Informatics. Because of this choice we were able to gain a deeper understanding of the organisation SchoolNet and the OS debate in Namibia.

The qualitative perspective lies within the hermeneutic field. The focus in a qualitative study is not about measurement, the focus is instead on people and how they interpret and understand their surroundings. It is in other words a subjective way of looking at the reality. Meaning is a keyword, and it is of great importance for the researcher to create an understanding of how individuals experience and interpret their reality in relation to their previous experiences and knowledge (Backman, 1998). Besides meaning and interpretation, another important part of the qualitative study is to conduct the study in the right context, to do it in a real life situation and not under artificial circumstances. It is the human that is the central thing and the purpose of the observer is to bring himself close to the subject of the study (Backman, 1998).



We have been using ethnography as a qualitative research method. With ethnography the meaning is to create an “inside perspective”. According to Magnus Bergquist (2003), this means that the researcher’s goal should be to see the world in the same way as the objects for the study do. The focus is on flexibility and subjectivity rather than the opposite. The use of ethnographic methods gives a clear picture of the surrounding you are trying to understand, a good insight in what people are really doing, how they look at their own situation and how they interact with other people in their surroundings. To achieve this, the researcher needs closeness to the source of information. This is something we feel that we have achieved since we actually spent one month within the organisation SchoolNet doing our ethnographic study. The fact that the method is flexible and changeable is vital for this kind of study. Since we did not know what to expect when we came to Namibia, it was of absolute importance that we were able to change our focus as we progressed in the work to increase our understanding.

3.3 Conception of problem area

We got in contact with the organisation SchoolNet already in the beginning of the fall 2003 and continued our email correspondence with them until we finally went there in March 2004. During that time we achieved quite a good understanding of the main purposes and goals of the organisation, even though we got aware of the fact that there were still questions that needed to be answered. Our question, though, was not to investigate how their organisation worked. It was about finding out whether the assumptions concerning OS in developing countries were applicable in an actual, working project. Although our literature studies were of help, the conception of the problem area mostly developed during our time in Namibia, where we through deep interviews and participating observations received a very good understanding of the experiences and thoughts about the use of OS.

3.4 The ethnographic methods

The most frequently used ethnographic methods are interviews, observations, document analysis and recording and transcribing. These methods are often used in combination (Silverman, 2001). In this study we chose to use three of these methods: interviews, observations and recording and transcribing, which were complemented with literature studies.

3.4.1 Literature studies

Literature studies are carried out to give the researcher a view about what has been written and what is lacking in the known literature. It also aims to get a picture of how important a certain problem is. Some believe that the observer should not gather any pre-knowledge about the problem but just enter the reality to be observed and continue from that. Others advocate that it can be useful to have some orientation within the field before getting started (Backman, 1998). We chose to follow the later recommendation since we only had one month to conduct our field study and therefore had to have at least



some idea of what we should focus on when we got there. With pre-knowledge Backman (1998) means the conception of something that is received through experiences or education. During our schooling we have gathered a certain level of pre-knowledge concerning OS, ICT and computers in general. This was our base in the beginning and during our study we continuously added knowledge in order to create an as complete understanding as possible of what we intended to observe.

3.4.2 Literature studies in practice

In the beginning of our work we focused on literature studies to gather information and to require a further understanding about the problem area. There is a lot of material to be found about developing countries, ICT and development, the digital divide, and OS. In some of these books, the potential of using OS in developing countries is briefly mentioned but most of our theories come from articles, reports or websites. SIDA provided us with a vast number of reports about the use of OS in developing countries. After reading these reports we were even more convinced of the need of our study. The conclusions were often that more local research was needed, research of projects which worked with OS solutions in a developing country. The literature studies helped us narrowing our problem area and allowed us to formulate a first problem definition. Since most of the reading took place before doing the field study we were aware that this definition would, most probably, change during the study.

3.4.3 Observations

Observation is a technique that focuses on practical situations; you study what people in an organisation actually do. To do proper observations the researcher should be able to spend a shorter or longer period of time with the unit to be investigated in order to have a chance to capture the total working situation (Holme & Solvang, 1997). When doing the observation you follow the members of the organisation, documenting how they react, interact and behave. One of the strengths of observational research is its ability to shift focus as interesting new data becomes available (Silverman, p 68, 2001).

As we spent more than a month in Namibia we decided it would be sufficient enough for us to use this method. According to Hammersley and Atkinson (1983) there are different ways of doing observations. The researcher can take different roles and has to decide whether he is going to act as a member of the organisation or as an external observer. Our study classifies as a participating observation with no intentions of trying to influence the people in the organisation in any way.

3.4.4 Observations in practice

Together with our tutor we decided that a one-month stay in Namibia would be sufficient for our study. Most of this time was spent at SchoolNet, but to get a broader picture of the subject we visited a secondary school, and the Polytechnic of Namibia, “a learning institution that provides post secondary



career education in applied technology at internationally recognized standards” (www.polytechnic.edu.na, 6/4-2004). We also got the opportunity to visit an open source conference, The Africa Source conference, for a couple of days during our stay.

In the beginning our work at SchoolNet was mostly dedicated at doing observations. We did not want to start interviewing people before we got an idea of what everybody was doing, where everybody’s place was, and before they got an idea of who we were and what we were doing. The first day we presented ourselves to the people in the workshop and they in their turn told us about themselves. Already here our observation turned to be of the participating nature, when we were split up and assigned to work with two different teams of technicians. Even if this was not what we had expected from the beginning, this was the best that could have happened. They took us in as full members of their teams and while we got to know each other, they got a quite good understanding about what we were doing in an informal way. Since we were occupied with doing installations of Linux, plugging in cables and packing computers for shipping to schools, we did not have the possibility to take notes during the observations. Instead we took a while every day after work to discuss and write down our experiences. After the first week we decreased our participation in the workshop because we had to start doing interviews, although we still remained present at SchoolNet most of the days.

What followed in the middle of March was our participation at the Africa Source conference, the first pan-African meeting of Free and Open Source Software developers. The meeting was organised by Tactical Technology Collective²¹, the AllAfrica Foundation²² and SchoolNet Namibia, in cooperation with FOSSFA²³ (the Free and Open Source Software Foundation for Africa). The meeting gathered a wide range of people from nearly 25 countries. The participants came from the commercial, academic and non-profit sectors, all with different skill-levels and purposes. Even though the majority of them were African, there were also people from Europe, the US, Asia and Latin America. The purpose of the meeting was skill sharing, the exchange of experiences from different projects and the breaking of the isolation many programmers in Africa experience. The arrangers of the meeting were very generous and let us take part in the conference as observers for two days. Even this observation was of the participating kind since we, as far as we could, contributed to the discussions and shared the skills and experiences we had. There are several reasons to why we chose to participate in this meeting. First of all, SchoolNet is a partner organisation to Tactical Technology and was therefore one of the organisers of the meeting. The director of SchoolNet was one of the keynote speakers on the agenda and was going to speak about the SchoolNet story from a strategic point of view. The

²¹ www.tacticaltech.org

²² www.allafrica.com

²³ www.fossfa.net



meeting was also a true opportunity for us to find out more about the OS movement in Namibia and to see whether we could find any OSS programmers to broaden our understanding about the developers' reality in Namibia.

To get an understanding about SchoolNet's work we felt it was important to visit one of the schools that used their services. Together with the other participants of the conference we visited a secondary school that was one of the first schools to be equipped with computers from SchoolNet. The school had developed a lot since then and had now commenced to give computer classes and they also had a working Internet café where the learners could use the computers after school. This first visit to this school was informative but rather short and we felt the need to come back for a longer visit when we could interview one of the teachers and some of the learners that were using the computer labs. After agreement with one of the computer teachers we returned to the school the next week and participated in her computer classes. We were also allowed to interview her and two of her learners.

Besides these observations we took notes from several other situations. Since Namibia's IT sector is rather small, almost everyone we met within the IT field had some connections with or knowing about SchoolNet. As a consequence of this many of our observations took place in informal gatherings in our spare time. Mostly at these observations we were not able to take notes but, as with the SchoolNet observations, we took some time afterwards and wrote down our experiences.

With these observations we covered most of the interest groups we felt necessary to study. What would have been valuable is an observation of how the children at the secondary school worked with the computers instead of just participating in a theory lesson. Also lacking is an observation of the trainers and the technicians work out at the schools, but unfortunately we were not able to make such an observation since there were no volunteers out at schools during the month we spent in Namibia.

3.4.5 Interviews

Interviews are a way to understand how people perceive their situation and what they think about it. In open, conversation-like situations the researcher lets people describe what they are doing and then let them reflect about it. When doing interviews one should aim at genuineness rather than complete reliability.

"The aim is usually to gather an authentic understanding of peoples experiences and it is believed that open-ended questions are the most effective route towards this end."
(Silverman, 2001, p 13)

We tried to think in those terms when we constructed the semi-structured interviews by making questions that investigated the interviewees' background



within different fields, for example computer skills. By interviewing people in different positions within the field to study we tried to cover as many diverse angles of the subject as possible. To secure the reliability of our interviews we choose to tape-record as many as possible and then transcribe them carefully (Silverman, 2001).

3.4.6 Interviews in practice

As a preparation for our study in Namibia we tried to get SchoolNet to give us some suggestions of people we could book up for interviews. The wish was to have at least the first week's interviews scheduled from home. This turned out to be impossible, mostly due to the workload at SchoolNet at that time. So instead we had to imagine what kinds of people we would meet and what we wanted to know from them and the group of interest they represented. Since we were going to do semi-structured deep interviews we wrote down broad topics that we wanted to discuss with the people we were going to meet (See section 6.1). After that the questions were adjusted and approved by our tutor.

In total we managed to do 18 deep interviews during our stay in Namibia. Out of these, eight were held with the staff at SchoolNet. The ones we chose to interview first were the director, the network administrator and the person responsible for the education of the trainers. After those interviews we were recommended two from each group of volunteers, that is the technicians and the trainers. The last person we chose by ourselves because he had a totally different background than the other volunteers and was therefore of interest for us. This person had a bachelor degree from a university in the US and now worked as a technician at SchoolNet.

The rest of the persons came from different user groups. We chose to interview two teachers and two students from the Polytechnic of Namibia, one teacher and two learners from A. Shipena secondary school, one of the organisers of the Africa Source conference, one of the developers from DireqLearn²⁴, an OS programmer from Ghana and also one of the persons from the IT section of SIDA. To get in touch with these people we used the wide contact net of SchoolNet and from there on, we followed the recommendations we got from people we already interviewed. With this selection we feel that we achieved to find people out of most of the desired groups. What we are lacking is an interview with someone at municipal level and one with someone from the industry. Although the person from DireqLearn comes from the business world, we think he is still too involved with SchoolNet to have an objective opinion.

During all of the interviews we were both present and active. In general we started with basic questions about personal information and background to get a greater understanding about whom the person was and also to get the interviewed person feel more relaxed. After that was done, we pointed out the

²⁴ www.direqlearn.org



direction of the interviews with help from our question list, but tried to make the interviewees talk as freely and undisturbed as possible. Since we interviewed people in very varying ages and in very different positions we had to adjust our participation in the interviews. The younger persons and those with less strategic positions needed more help with questions than others and talked less freely. Our intention was to document all the interviews on tape to guarantee a high reliability. Unfortunately though, due to loss of luggage, our first two are not. During these interviews we both took notes, making a big effort to be as thorough as possible not to taint the material with our thoughts and assumptions.

The amount of interviews can seem a bit high regarding the level of this thesis, but since the Viktoria Institute in Gothenburg²⁵ commissioned our study and our contribution to their research was to gather as much material as possible we wanted to be thorough. We were also, as mentioned above, aware that our problem definition would most certainly change during the stay. Therefore it felt better to have too much material rather than the opposite when we came home and started writing. The problem with this now is to know what material to use and what to let go.

3.5 Strengths and weaknesses

The strength with methods like interviews and observations are that, if used correctly, they give the researcher a good picture of a situation and thereby a more thorough understanding. Their flexible nature makes it possible to change and reconsider the different parts as the work continues. During the previous sections we motivated our choices of methods, however there are weaknesses with the qualitative perspective that needs special attention. For example you must be careful not to apply subjective perceptions and ethics from your own mindset. If doing so there is a risk to interpret the results in a favourable or desired way to fit the objectives of the study. This possibility is something that you as a researcher must be aware of and pay attention to. Even if interviews are recorded, it is easy to misinterpret them and neglect important aspects like body movements and gestures (Silverman, 2001). Another criticism towards qualitative methods is the problem of anecdotalism. Anecdotalism is the fact that “*research reports sometimes appeal to a few, telling ‘examples’ of some apparent phenomenon, without any attempt to analyse less clear (or even contradictory) data*” (Silverman, 2001, p 34). In other words one should avoid taken-for-granted versions. We have tried to keep these issues in mind when we conducted the study.

Before we went to Namibia, we did not know much about the country and its culture. As it turned out, we met a warm, friendly people that welcomed us and gave us a lot of help. Even if our countries are far apart in distance, there are not that big differences in culture that it was a hindrance for us to perform our

²⁵ www.viktoria.se



study. During our time in Namibia we worked closely with the volunteers at SchoolNet. We feel that they welcomed us as friends and equals in their work, and of course that may have affected our objectivity.

English is the official language in Namibia so mostly there were no difficulties with communicating. The fact that the English language is not the native tongue for neither the Namibians nor us, is important to keep in mind. Sometimes we did not have the same interpretations of word and phrases. An example is the use of negations, one way of using the language that we were doing differently.

As we were young females, informally dressed and not afraid of helping out where we were needed, this might have influenced our study. Before we arrived in Namibia we were afraid that people would not take us serious. Looking back, we now believe it was a bit of an advantage for us to stand out from the stereotype academic representative. We found we came close to the organisation and the people connected to it. As we see it, they treated us very well and were not suspicious or afraid of our work.

3.6 Validity and reliability

Validity and reliability are of great importance when it comes to research. The first concerns if you measure the things intended and the second if the study has been performed in the correct way. Since we have used ethnographical methods like observation and interviews, we have tried to connect these with the concepts of validity and reliability.

“The credibility of qualitative research studies rests not just on the reliability of their data and methods but also on the validity of their findings.” (Silverman, 2001, p 231)

The problems of anecdotalism, mentioned in section 2.2.4, have often made the truth, i.e. validity, of qualitative research to be questioned (Silverman, 2001). Reliability can be described as *“the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions”* (Silverman, 2001, p 33). By using both observations and interviews and then comparing and questioning the results, we have tried to increase the validity of our study.

When it comes to the reliability of our observations, we have as much as possible tried to follow the recommendations of Spradley concerning to take different kinds of notes (Silverman, 2001). Whenever something of interest occurred we took short notes at place with the intention to develop and expand them at the first given opportunity. Continuously during our study we kept notes about problems and ideas that came up in our minds as a result of new observations. Another part of our work was to write down short analyses and interpretations that we automatically did throughout the work and which



were related to our discoveries. The reliability in interviews can be increased by the use of a tape-recorder. This was the reason why we recorded our interviews and put a lot of time and effort in doing as accurate transcriptions as possible. We also thought it was important that both of us were present during the interviews. We were then able to compare notes and impressions and discuss the outcome, which further secured the reliability of our empiric result. Standardisation is a good way to gain reliability but in a qualitative study it can be difficult to achieve. To obtain as standardised results as possible we constructed interview guides to guarantee that all persons from the same groups of interest discussed the same topics. In that way we managed to maintain the flexibility and openness of the questions without jeopardising the reliability. By including long extracts of the collected data in a report you can also improve the degree of reliability (Silverman, 2001).

OS has a major role in this thesis. We have chosen to look at OS as one of many ICTs. We are aware of the fact that OS has many unique features that need to be taken into account and that makes it differ from other ICTs. We consider ICT as a tool to spread information and knowledge as well as a tool that enables the creation of new communication channels. Therefore we think it is possible to generalise OS as an ICT. For that reason we have been able to use theories concerning ICT (as well as Information Technology) and adaptation.



4 Introduction to Namibia and SchoolNet

4.1 The Namibian context

Namibia formally became a German colony in 1890 and remained as one until the Union of South Africa attacked the territory in 1915. During the wars South Africa administered the area named South West Africa as a mandate and after World War II they annexed it. In 1966 the Marxist South West Africa People's Organization (SWAPO) guerrilla group launched a war of independence for the area that was soon named Namibia, but it was not until 1988 that South Africa agreed to end its administration in accordance with the UN peace plan for the entire region. Elections took place in November 1989 and the country finally gained independence the 21 of March 1990. President Sam Nujoma is currently serving his third term as president (Government of Namibia Network²⁶).

Namibia is a vast and sparsely populated country. About 1.8 million people live in an area that is a bit less than twice the size of Sweden. The economy is market-driven and the government encourages private businesses and foreign investors. It is one of the richest countries in the southern parts of Africa, but the gaps between the poor and the rich population are enormous. Since the independence, a lot of efforts have been made to improve the situation for the lesser-advantaged part of the population concerning schools, infrastructure, water, health care and public utilities. The government are actively supporting formerly disadvantaged groups to enter the business market. Still 30-40 % of the population is unemployed²⁷. According to Hesselmark (2002), the corruption is rather low in Namibia compared to other African countries.

4.2 ICT in Namibia

Namibia has been engaged in creating ICT policies since the 1990's but in general, they have not been made practice of yet. This is a reason why the ICT infrastructure is in fact not where it should be. Nevertheless, since the early 1990's, there has been an explosive growth within the ICT field, especially in the use of telephones. There are many different Internet Service Providers (ISPs) in Namibia, which increase the number of lines and Internet users. Internet cafés are becoming more and more common and Windhoek actually has the biggest one in Africa. Still, large parts of the rural population have not ever used the Internet or even heard about it. For those who are using the Internet today, it is slow and cumbersome and too many users have to share the same lines (Hesselmark, 2002). Dialup via modems are low-cost compared to other African countries but the users still have to pay per minute instead of having fixed monthly costs. Cost remains an inhibitor to the spread of Internet usage (Hesselmark, 2002).

²⁶ www.grnnet.gov.na/index.htm, 6/4-2004.

²⁷ www.afrikagrupperna.se, 25/5-2004.



4.3 SchoolNet

SchoolNet Namibia was founded in November 1999 by a group of enthusiasts driven by the desire to improve the situation for Namibia's youth. The following quotes, found at SchoolNet's website²⁸, reflect the thoughts and purposes behind the organisation:

"SchoolNet's main objective is to introduce computer technology and Internet access to ALL schools in Namibia."

"SchoolNet Namibia plays a critical role in increasing awareness and understanding of ICTs in education and promoting social development objectives, highlighting the critical role of ICT champions and mechanisms to ensure sustainability."

SchoolNet is a non-governmental organisation (NGO) with a few employees and about 20 volunteers. SchoolNet is today depending on donor partners and welcomes people and organisations with an interest in ICT connected to education (Hesselmark, 2002). One of the organisations connected to SchoolNet is the Swedish donor agency SIDA. Through the computerisation of schools they are trying to make youth informed and part of the online world. An example of an attempt to make youth active was SchoolNet's globally rewarded website project "The Impact of HIV/AIDS on Katutura". The project was launched in 2002 as an attempt to inform and spread awareness of this epidemic. The information was based on gathered knowledge and experiences from local people in the poor community Katutura, situated in Windhoek, and the website was dedicated to Namibia's youth (www.schoolnet.na, 20/5-2004).

SchoolNet offers an ICT training programme to young, uneducated "kids off the street". The kids get technical or teaching training and thereby a chance to enhance their situation. After the programme, some of them become working volunteers at SchoolNet. By doing this, SchoolNet both increases the overall ICT skill level in the country and also gets help with their work in the schools (Ballantyne, 2003).

²⁸ www.schoolnet.na, 10/5-2004.



5 Result

5.1 ICT status of Namibia

One of our interviewees explains his reality:

“It’s a nightmare in Namibia to download. The entire country hasn’t got as much as you has as DSL²⁹-link in your room, so the entire country has approximately 1,5 DSL-connections bandwidth. This is a nightmare.” (Higher education representative)

According to Komen (2004a), the number of computers in Namibia is today 30 000 and the number of private Internet subscribers 13 000. The reason why the figures are this low is the high cost of hardware. One way of increasing these statistics is to attain more interest from private users.

Today’s figures show that only a small percentage of the learners are taking computer related classes. NIED³⁰ is trying to implement an ICT policy for schools and they have encouraged the use of ICT in schools. At Komen’s (2004a) session at the Africa Source conference he explained the reality of Namibia: there are 1 585 schools, 700 000 learners, 18 000 teachers but only 103 computer teachers. Most of the computer literate teachers are working in private schools. This, in combination with the fact that there is only one computer for every 280 learners clearly indicates that the situation needs improvement. He further drew the conclusion that it is the incapacity of the educational situation that has put Namibia behind in the ICT development. The teachers are reluctant to new technology and this is a problem that needs to be solved. Sohne (2004) meant that the educational system needs improvement and that the knowledge of mathematics and English are insufficient at the moment. This, in combination with too few computers in the schools, inhibits the creating of a new ICT pool.

“The typical Namibian problem, there’s just not any education here, the people are not educated.” (Higher education representative)

The same person stated that there is a true problem within the computer education department. The teaching material is written by a few teachers that are lacking necessary knowledge about what they are writing. Due to this, many of the computer schoolbooks are full of errors, just plain wrong facts. It is hard to fight with people in the administration and get them to change their minds. The work with schoolbooks is rigid and changes are not taken into practice until three years after they are made. The representative of higher education

²⁹ Digital Subscriber Line. DSL is a high-speed connection that uses the same wires as a regular telephone line.

³⁰ The National Institute for Educational Development in Namibia.



says it is forbidden update the books on a more regular basis. He gave an example:

“...in 2007 they will not get rid of their floppies [in the books] but at least they will know something about a CD writer or a USB-stick or something like this.”
(Higher education representative)

He also thought that the computer education department focuses on the wrong subjects as they for example teach the young learners about programming. The important part should be to introduce the learners to systems administration and how to handle a computer.

The person was very positive to SchoolNet and their work and believes they can make a difference for the educational level of Namibia. Youth are open-minded and quick learners and he thought this was the right group to address to make a change of the ICT skill level in the country.

As we have already mentioned, we did not have the possibility to investigate the market for OSS developers or companies. There seems to be, though, no actual or future market for OS developers in Namibia. Many companies use OSS for their backend solutions, but most of the software and a lot of the support is bought from South Africa. The representative for higher education thought the use of OSS will grow stronger in Namibia, but that Namibia probably not is going to be a country contributing to the pool of software. He tried to give us a reason to why OSS development is unusual in Namibia:

“...because what you need for developing OSS is truly a job where you don't have much to do. And you need the knowledge. The industry is not that far here that they will employ somebody for developing OSS, like as is somewhat possible in Europe. Even in Europe it's not easy to find a paid position where you're allowed to do that. You have to do it all in your spare time.” (Higher education representative)

“The industry is not in a position that they can afford employing people for doing something general, something for the use of all. They don't see the value and many of them have very tight budgets so they just don't have the means to do it.” (Higher education representative)

Another respondent addresses the problem in the following way:

“The problem with software development is that the industry thinks it's better to buy off-the-shelf products, they don't have confidence in their own people and their development. Many middle-sized companies would be much better off with locally developed software. But the companies, the managers, think that our own people can't do what any American or German have been producing. It's a shame!” (Higher education representative)



“The answer is easy. They don’t know what it is, they don’t know what Open Source is because nobody has informed them yet. These kids [the volunteers at SchoolNet] know about Open Source but do the other kids know what Open Source is – probably no but they know what Windows is.” (African developer)

A different problem is that people might not want to use OSS. It is easy to assume that people in developing countries want to use the cheapest alternative but it is also a question about standards. In the western parts of the world it is most common to use Windows. It is hard to convince people in developing countries to go against such standards. Instead, most often they want to be a part of that world and that includes using the same operating system as they do.

“I remember when we [Poland] got independence from the communist system, it was kind of a prestige thing to have American stuff. I can remember the first McDonalds in Warsaw; people were queuing for half a day just to get a shit meal. It is like this here with Microsoft, it is the symbol of the American wealth, of the American commercial system. Because it’s the symbol of wealth, if you get it, you could sit down and think that ‘YES, right now I’m the same like that guy in America, because I have this logo on my screen, and I subscribe to this community’” ... “It’s really interesting, because the commercial world substitutes in many ways the religious and the mystical needs of human beings.” (NGO representative)

One of the representatives of higher education integrates Linux in his courses. He said that his students most often get jobs, not in software development, but in systems administrations. In those positions they have good use of what they learned about Linux in school, as it is a commonly used server solution in many companies. He said that there is a shortage of skilled people and that the companies want his students before they even graduate. He gave us an example:

“In Namibia it’s still crazy that the relation of what qualification you need and what job you get is really incredible. So for instance, in Windhoek, you can become head of IBM Namibia with an industry certification called CCNP³¹. Okay, in Namibia nobody got that thing but I mean there must be 40 000 CCNPs around in America and I can guarantee that 10 000 of them are unemployed. They could have an entire country division for IBM. Here companies don’t find anybody.” (Higher education representative)

We asked a developer what he thought was the reason to why so little software development is performed in Namibia. He started with saying that there are classes in computer science at university level but that it is hard to teach these subjects in Namibia because they are lacking traditions of knowledge in mathematics and logics. He did not think that Namibia will be an eminent

³¹ Cisco Certified Network Professional



nation in software development, but admitted that there are of course exceptions.

Generally, Hesselmark (2002) remarks, there is a change towards a more developed information society. Compared to other developing countries, Namibia has a relatively good ICT capacity. Still, an effective use of ICT on governmental level is lacking. This causes low efficiency and high transaction costs since no information is digital and online. The government in Namibia is aware of the problem and has realised the importance of ICT for a successful development of the country. Another problem is that the majority of the population live outside the cities and are not affected by the ICT revolution. SchoolNet may change this if the schools turn into communication centres, available for entire communities.

5.2 The work of SchoolNet

“From the beginning we said that if we’re going to do this we’re going to deal with the notion that every single school in Namibia must be given Internet access by 2005, which is next year. So we’re nowhere near there yet but conceptually, intellectually and philosophically, ideologically we’ve moved the mindsets of most of our partners and stakeholders to thinking everyone, not just one or two schools. That was a very important breakthrough three or four years ago when most would say that you are crazy, you can’t do all the schools and I said yes we can.” (SchoolNet management representative)

At the moment, about 200 out of the 1585 Namibian schools are connected to SchoolNet (Komen, 2004b). SchoolNet buys refurbished computers from a non-profit organisation called netDay³². They are working with a thin client-solution with the Linux distribution OpenLab3, which they buy from a South African company named DireqLearn³³. DireqLearn exclusively develops free software under the GPL. They add proprietary educational software named LearnThings³⁴ to the operating system (Winter, 2004). LearnThings is an educational support program up to A levels, produced in the UK. At the moment, though, no adaptation has been made to make it suitable for Namibian schools.

“No, that’s the problem for all of us and it’s the only stuff [educational software] we’ve got in one bundle, commercially unfortunately, that gives us at least the beginnings of that [software with content].” (SchoolNet management representative)

SchoolNet has given DireqLearn a three-year window to develop educational material with proper content. In the meantime, they are going to continue

³² www.netday.org

³³ www.direqlearn.org

³⁴ www.learn.co.uk



using LearnThings. The representative we talked to presses the importance of sensible educational content for the schools and said that this is something that needs to be changed in order to convince teachers of the necessity of computers in their teaching.

Normally the ICT skills are low in Namibian schools and therefore SchoolNet can provide them with a voluntary trainer to support them during the first months after the installation of a new computer lab. The schools also have the possibility to get support from SchoolNet either from their helpdesk or at place. SchoolNet also see to that schools in rural areas get electricity and wireless solutions in order to equip them with computers and Internet connections. After some negotiating, SchoolNet has, with help from the government, now closed a deal with Telecom Namibia called the Xnet Trust. The trust means that SchoolNet can leave the connectivity issues to those with the right knowledge and capacity, and instead focus on getting computers and support to schools (Ballantyne, 2003). The deal guarantees that every connected school has a fixed, monthly connection cost of US\$30 independent of connection media. Many of the schools are poor and cannot even afford this amount since they do not get any financial support from the government. In cases like this, SchoolNet sometimes cover the cost for the Internet connection (Komen, 2004c). SchoolNet has grown very fast and the need for support and maintenance is massive. Due to this, the work with connecting new schools has decreased and more resources will be needed to manage the work (Hesselmark, 2002). Concerning the future of SchoolNet, one of our respondents said:

“Today I feel very confident that what I’ve got in there [within the walls of SchoolNet], and the kind of people that are in there and some of the peripheral people involved, that SchoolNet will grow and grow.” (SchoolNet management representative)

This person was not worried about the fact that they are today depending on donor partners. For the next three to five years he felt they had the support needed. In order to gain independence he has been working on a business model to secure the future of SchoolNet. He thought that in a near future a refurbished computer equipped with Linux would cost less than a cell phone.

“If that comes true, then I believe that we could actually create an income generating market place where I can afford, teachers can afford, children can afford to buy a computer and have the same facilities as the schools and the kids are presently getting from us.” (SchoolNet management representative)

He will see to that an industry is created around the reselling of previously owned computers in order to equip disadvantaged people with technology.

“It will make money; it must make money, as I say the model presently is that for every computer put in to a school we want to be able to sell a computer to somebody in



the teaching community, to the parents of children or whatever to make that model sustainable. And if I can get to that ratio then the business is sorted out.”
(SchoolNet management representative)

5.3 Africa Source

As mentioned in section 3.4.4, we attended the Africa Source conference in Namibia. The arrangers managed to create a relaxed atmosphere that encouraged active participation and contributions during the different sessions at the conference. By focusing on constructing a base for understanding and cooperation between individuals engaged in F/OSS³⁵, one of the aims of the Africa Source was to encourage long-sighted relations. During the first day's sessions, the general situation of the F/OSS reality in Africa was presented. Keynote speakers held sessions concerning F/OSS in Africa in general and Namibia in particular. The sessions further addressed vital issues of how F/OSS can be used within the educational system and its correlation to gender and HIV/AIDS issues. During the sessions the importance of understanding the perspective of the end users were stated. One essential part of this debate was the one of localising software concerning content and language. During the sessions, hackers and representatives from civil societies and NGOs had the opportunity to meet and gain understanding for each other's needs. As we later were told and also could read from the agenda, the meeting gradually took on a more practical skill-sharing nature, such as setting up wireless networks. The meeting continued with further discussions on how to strengthen the African community and make it grow. We saw an intention from the organisers' side to enforce the value of being part of a community. Throughout the conference there were movie sessions with hacker themes, a call for attention on the importance of not just gaining knowledge and experience, but also to share it with others. This effort was an attempt to strengthen the way the participants identified themselves with the F/OS community.

5.4 Groups of Interest

Before we went to Namibia, we discerned certain groups of people to interview in order to get an as broad and covering picture of the situation as possible. The groups that have been of importance for us is the management and the volunteers at SchoolNet, a teacher and learners at a secondary school connected to SchoolNet, and teachers and students at the Polytechnic of Namibia. Besides these obvious groups we also met people at the Africa Source conference who could fill in the gaps we needed outside SchoolNet's boundaries. In this chapter we will describe these different stakeholders and explain what is motivating them. What may be interesting to know as background information is that the majority of the persons met have none, or very little, formal computer education.

³⁵Free or Open Source Software. In this section we will use this abbreviation since the meeting consisted of members of both groups. See section 2.1.2.



5.4.1 The management of SchoolNet

As we see it, the organisation SchoolNet has three devoted champions, occupied in different areas: strategic, technical and educational. These three persons are of utmost importance to the organisation since they all share the strong belief in the importance of ICT as a way to improve the situation for people in Namibia today. To achieve their goal they have chosen to use open source, which for them has the same comprehensive purpose but also addresses very specific problems that differs between them.

At a strategic level, the most important thing is to equip schools with computers at as low cost as possible. As the interviewed person said:

“Microsoft versus OSS, for me are non-issues. We are doing this purely on a cost of support basis.”

“Today I can give you as good an open source package as Microsoft can give in their cost-based proprietary solutions.”

“The point is that we can’t say one or the other [OSS vs. proprietary software] and stick with it.”

“My dogma, if there is any dogma, is that we will remain as flexible and dynamic and resourceful in that dynamism to move with the flow.”

“Because the beauty of the model here is that we’ve got kids doing most of that [the work] and they’re like blotting paper and will move with the flow. That’s why SchoolNet must remain what it is, a very dynamic, young, people organisation, preferably more women than men, that’s how I see it.” (SchoolNet management representative)

Even if this person is a strong OS advocate personally, when it comes to work, he can set this aside and avoid prestige concerning what solution to chose. SchoolNet is today working with OS solutions but only because it is the most affordable and sustainable choice. The interviewed person meant that ICT is a tool and what matters is to get it out to the people who need it, not which media that is going to bring it to them. If Microsoft wants to be involved with Namibia’s ICT development they cannot replace SchoolNet, but they are welcome to join them as equitable partners.

“A lot of people see SchoolNet as an anti-Microsoft brigade, and we’re not. We’re just challenging them to meet our standards, that’s all.” (SchoolNet management representative)

He said that his lobby with the government is about informing them about what the cost of ownership actually is. He has been working hard to influence several important stakeholders in Namibia of the advantages with OSS. Due to



this, the government is now hearing his arguments from people in official positions.

At the technical level we find different motivational factors. Besides being SchoolNet's network administrator, this person is also in charge of the volunteers' technical training. For him, the advantages with OS solutions are stability and, as a result of this, also lower costs for maintenance. This person is a true hacker and is sometimes characterised as the guru of Africa within the OS field. He thought that OS systems are superior and more secure and was very critical to proprietary software in general, and Microsoft products in particular. He specifically remarked that he did not find any advantages that are special for developing countries. The positive sides of OSS, i.e. the cost- and security aspects, are the same in both worlds.

The person concerned with educational matters had a third view of the use of OS. He is the person that trains the volunteers to go out to schools and learn teachers and learners about the new computers. The meaning of the work of him and his volunteers is to make the teachers see the computers usefulness in the education. Like the other persons in the management, he was of course aware of the cost advantages with OS, but he further pressed the point of the possibility of localisation and translation of the software. Since he was the one that faced the difficulties to make teachers use ICT, he thought this was the most important factor. If they do not manage to get sensible and understandable content into the computers, the teachers will not ever start using them.

5.4.2 The volunteers at SchoolNet

SchoolNet has two groups of volunteers, technicians and trainers. We interviewed a couple from each group about their thoughts about work and ICT and OS in general. The most important motivational factor for both these groups was found on the individual level. They all joined SchoolNet to improve their lives. They were young and uneducated and saw this opportunity as a chance to learn about computers and get work experience, which they need to get employment. The technicians thought it was necessary to know Linux since that is what is running most servers in the companies. As one of them said:

"Linux needs your knowledge. If you want to be a network administrator, you SHALL know Linux." (Technician)

Besides these comprehensive goals that are common for both groups, the two branches of volunteers saw different aspects as important for their work. The technicians were driven by the fact that Linux is superior to Windows concerning stability.



“Linux is a more stable operating system, especially on the server side. It is harder to ‘crack’ Linux than Windows, i.e. it is more secure. Another good thing with Linux is that you can find everything you need on the Internet, for example patches and common help.” (Technician)

For them it was important that a system is stable since the schools are widely distributed and it would disturb their job with the new computer labs if they had to spend a lot of time on maintenance.

The trainers were not very well informed about the meaning of OSS as we see it. For example, one of them said that translating Linux into the minority languages would facilitate their work, but that it was impossible. Obviously this person did not know the possibilities of OSS. They were aware of the fact that computers are important and for them it was important to see to that schools got equipped with computers and also proper training.

5.4.3 The secondary school

Unfortunately we only had the time to visit one of the schools connected to SchoolNet. The school we visited was one of the first schools to get a computer lab and had now developed a lot since then. We met one teacher and two learners at this school. In general, none of the groups interviewed were aware of the fact that they were using something called OSS. They knew that the operating system was called Linux but they did not know what it meant.

The teacher we talked to was not very motivated about her work. She had no teaching training and the reason she became one, was to finance her studies at the university. The vision was to get a job in an office environment. The teacher was from the beginning a typewriting teacher. Her first contact with computers was when the school switched the typewriters to computers. The principal told her to continue with her courses, that the computers were just the same as a typewriter. She found out on her own that there was a bit more inside the computer than in a typewriter and tried to learn more about it. Now she held computer classes but, as we found out, she did not know very much about computers herself.

The learners often used the computers in order to find information on the Internet. The learners we talked did not use computers in their classes but often got assignments where they had to look for answers on the Internet. Mostly, though, the computer labs were used for browsing and emailing. They were eager to learn more and they saw the increasing importance of knowing how to use computers in the future. The learners we met were active and had participated in a contest held by SchoolNet under the project “The Impact of HIV/AIDS on Katutura”. After learning some basic HTML from trainers at SchoolNet, they developed a website for their school about HIV/AIDS. They thought that the learners needed to know more about the computers since



some of them hardly knew how to use them. They also emphasised the need for more computer teachers.

5.4.4 The Polytechnic of Namibia

At this school we talked to two of the teachers and two of their students. The teachers differed very much since one of them was a real OS spokesman and the other one was not into OS as much. When the last teacher talked about the negative sides with OS, mostly this was about the operating system Linux, which she placed on the same level as Unix. This person thought these systems were hard to use, not user-friendly, and sometimes not compatible with other systems. The interviewed mentioned, though, that it was a long time since the last use of Linux took place and admitted that a lot may have changed since then.

The other person was advocating a change into Linux for every one of the school's computer labs because of the cost and stability factors. He also thought it would be a good experience for the students, since:

“...it's much closer to servers and all this environment that the students will have after they leave. They won't have colourful surface and mouses and so to click on, they will rather have monochrome screen and commands to be put in and they learn that better on Linux I think.” (Higher education representative)

The students had positive thoughts about OSS and they had been using it in their programming courses. Often they found modules and other things they could reuse in project sites like for example SourceForge. One of them talked about his last project:

“...that module did most of the things we needed so we didn't have to reinvent the wheel as they say. That's why we used it, that module. Also we could modify it if something was not meeting our requirements.” (Student at higher education)

5.4.5 Participants of the Africa Source conference

At the Africa Source Meeting we met a wide range of people, from hackers to non-programming NGO representatives. They seemed to share the same overall vision, namely the desire to level out the differences of access to ICT in the world. All these people saw OSS as a way of obtaining this goal, even if they had slightly different motivational factors.

The NGO representatives came from different kinds of backgrounds, spanning from teachers to people working in organisations for human rights. They had the same purpose of participating at the conference; to learn more about OS in general but also to make developers realise the importance of creating software that correlates with the needs of the end users. Teachers and SchoolNet representatives from various African countries clearly saw a need for customised and localised educational software. They wanted the developers



to consider the needs for each and every country that where going to use their software.

The group of developers were driven by other motivational factors. One was the possibility to share knowledge, to learn from each other's experiences over the Internet as well as from the openness of the source code. The OS movement with its communities is a good way to spread knowledge even if people are widely distributed. We realised that African developers are facing a hard reality. As we mentioned above, isolation from likeminded is a big problem in this part of the world. The situation gets more cumbersome if you put the problem of isolation in relation to the fact that there are actually not many active, skilled OSS developers available in Africa, this we were told by one of the developers:

"We can consider that the number of engaged developers in OSS in Africa is below hundred continent wide. If you look at any major OSS project, there are almost no contributors from Africa. If there are, they are from Northern or Southern Africa. If you even look at mirrors of source code archives, you will only find South Africa. Mirrors are an indicator of local demand for source code." (African developer)

"There are some of us who can compete with the best worldwide...but the problem is we are vastly outnumbered by those who are much less abled, and worse, not aware that there is such a distance between them and where they should be aiming at." (African developer)

Maybe more importantly than the lack of skills, there is also an absence of a market that encourages and supports OSS developers.

"OSS has the unfortunate side effect that it tends to leave you poor as compared with the commercial developers." (African developer)

"After about five years of trying to get my country [Ghana] to see the value of OSS, I have given up (just as they signed a deal with Microsoft) and will make some money now." (African developer)

Nevertheless, many of the developers at the Africa Source conference emphasised the role of the OS communities since they offer people to ask for help, if not in Africa, at least in other parts of the world.

5.5 Open Source in Namibia

In this section we further examine our results concerning some of the motivational factors mentioned above. We have chosen to present our findings divided in positive and negative aspects of OS in Namibia.



5.5.1 Positive aspects of OSS

We have noticed four major reasons to why OSS is seen as a better alternative for Namibia than proprietary software; lower TCO, stability and security, sharing of intellectual property and finally, localisation of software.

The majority of our respondents emphasised the lower cost aspect of using OSS.

“In the context of current licensing prices, software is unaffordable for those in the Third World.” (African developer)

Talking about the cost issue, many persons at strategic levels referred to the ongoing debate in Namibia about controversial Microsoft donations to some schools in the country. According to them, the current nature of those donations is not optimal in the sense that they are not creating a sustainable and healthy ICT adaptation environment in the educational sector of Namibia.

“Microsoft is trying to do a lot of undercover things. They have ulterior motives for everything. They are giving software away for schools with a straight face saying ‘Here, have Windows and Office for free with computers’ and the schools will say thank you without reading the contract that comes with it. And the contract says, ‘You have to grade everything up within two years on your cost’”. (African developer)

Another of the persons interviewed used the following simile to describe her view of the actions of Microsoft:

“It’s like giving a car to somebody who don’t have money to pay for the petrol.”
(Representative of higher education)

Schools that are on a tight budget are not able to pay for the fees of proprietary software. Lowered TCO is therefore the main reason why OSS is assumed to be a competitive alternative to proprietary software. The main opinion during our interviews was that you do not lose the quality of the software just because it is free.

It did not take long for us to realise that the absence of high license fees were only one part of the cost issue. According to all technicians and developers, OSS in general and Linux in particular, offers a stable, efficient and secure server environment. Consequently it is claimed that the need for maintenance are not as high as it can be with proprietary software. Based on assumptions like these, the outcome is lower costs of maintenance, which results in a lower TCO.

Another important reason to why OSS is positive for Namibia is the stability and security aspects. As mentioned in section 4.1.1, Namibia is a quite unique country in the sense that it has a very small population spread over a large area



of land. The problem with isolation obviously makes stability a necessary feature of the technology. The technicians said that by using OSS there is a lower risk of being infected with viruses. If a virus is found in Linux it takes the programmers within the community about one or two days to find the solution.

“Obviously you have a bigger network of support if you use OS distributions because fixes and security things get into the open easier.” (Network administrator)

A third reason to use OSS is the possibility to share knowledge and information.

“OSS accelerate the transfer of technology in the form of source code and working knowledge gained from use of such source code and inspection of pre-existing code bases. Intellectual property transfer/ non-exclusion.” (African developer)

Further arguments of the programmers were that the use of OSS allowed them to increase the level of efficiency in their work. They did not have to write everything from scratch but could take parts they liked from the work of others and add code for features and functions they needed themselves. The openness of OSS enables a thorough insight in how programs actually work and thereby the possibility to understand the logics behind. From a programmers point of view the fact that there are OS communities is also positive. In the community there are other programmers to share knowledge with and ask for help and advice.

Many of our respondents highlighted the advantages of independence and the possibility to localise software. In Namibia, as well as in many other African countries, there are one official language and several minority languages. Big proprietary companies do not see the value in developing software in minority languages, since these groups are not normally seen as a strong market. By using OSS it is relatively easy to translate the software into whichever language desired, as one of the NGO representatives from the Africa Source conference put it:

“We could have quite easily !xhosa³⁶ Linux, !xhosa OpenOffice and that’s one of the reasons that if you have capacity and an idea of developing the stuff then you can do it. It’s allowed, legally allowed. It’s not that extremely difficult, of course you have to have some geek, one person who understands. But then it’s more about the community than the technical knowledge within the translation of the software. And it’s more about sustainability of the translation than the actual technical abilities because new versions are coming and they have to be altered with translation. If you have a committee who can maintain the translation, for whom the translations is important then this could survive. So this is one of the reasons.” (NGO representative)

³⁶ An African minority language.



During our interviews we have noticed two different opinions of whether or not educational software in Namibia should be translated into other languages than English. From the people who work closely with end users there was a request for translations into local languages. They believed this would be beneficial since differences in languages are a source of frustration. On the Africa Source conference some of the teachers subscribed to the importance of learning in ones native tongue in order to gain as much understanding and knowledge as possible. In translating the software you reach people on the countryside that are not fluent in the English language. Even though Namibia is better off than its neighbour South Africa, with only one official language instead of eleven, it would make sense to put an effort in doing translations. On the other hand the majority of technicians and developers did not see any reasons that motivated such work. They argued that all activities in the public sector in Namibia were in English and meant that people must learn in English since they have to use it in the formal practises of their society.

The question of translating the software into one language or another is one thing but there is another, and maybe more important part that concerns the actual content of the software. One of the champions at SchoolNet said:

“We are at the infancy of content development and I mean all we really do here is to make stuff available, offline and online, to make people say, hey, wow I can do this with this stuff but if I had this it would be better.” (SchoolNet management representative)

Fundamental cultural differences become apparent when software that is created for America or Europe is implemented in the schools of Namibia. At this moment almost all of the educational content from DireqLearn is foreign. The person who is responsible for the volunteer training at SchoolNet gave us some examples to illuminate this problem. Many of the Namibian learners never eat bread and might not ever have heard about something called a sandwich. Still they have to learn words like “peanut butter and jelly sandwich” because they are using software that is created for children in other parts of the world. Furthermore, problems arise when learners during computer based geographical lessons, for example get the task to estimate the distance between two American cities. Considering the fact that a majority of the Namibians never leave the country or even their home villages, it would definitely make more sense to use localised content in practices like this.

“...there are different cultural habits here, different needs, the economy and society is working differently here than in the West. So obviously they are going to need some different programs, different tools to fulfil their normal life behaviours, habits etc.” (NGO representative)

“...it would be good to have, lets say localisation communities developing but not in the sense that you [the Western world] throw them money and let them translate everything and then think that you did a good job. It's not the way to do the



translation stuff. It's about more than just translating. There are different ways people do things. The most obvious is reading from left to right and from right to left and like different space on the desktop. There are more and more of those things so it's not only translating it's also to do it in an understandable way for people in local communities.” (NGO representative)

To put it in other words ICT would be a more effective tool if the content of the software were related and adjusted to the surroundings of its end users. All different stakeholders around SchoolNet commonly shared this opinion and considered OSS to be a powerful tool to solve this problem. Hence, one of the strengths with OS is the ability to develop customised software.

Besides these four reasons for using OS in developing countries, there is a close relation between the technology and its impact on the society as a whole. When we interviewed people engaged in NGO's at the Africa Source conference, they mentioned this as one further reason for using OSS:

“I don't think if this is the reason but it's a big point for me, that with the proprietary software you don't develop the community, you develop the user community, but you don't develop the rest of the community.” (NGO representative)

Suppose that Microsoft would offer their software for free to the schools of Namibia. It would still not contribute as much as OSS has the potential to do since the source code of the proprietary software is closed. Even if this would lead to a small group of skilled commercial programmers evolved in the country it would not solve the overall problems. As one of our respondents said:

“If you invest in OS you can have your own developers and in a way you invest in your own market, in your own people. You can rise the skills and learn and get more educated and productive.” (NGO representative)

The same person emphasised that the vision of OS quoted above is obviously quite abstract and that is probably why many countries in Africa do not realise the potential and that this could actually happen.

5.5.2 Negative aspects of OSS

In order to deepen the understanding about OSS in Namibia, we will here give a brief presentation of some of the disadvantages that were mentioned by the respondents.

During our time in Namibia we noticed that SchoolNet's clients were often sceptical to Linux when they first came in contact with it. Those who had used computers before had mostly used Windows and did not know what Linux was. It was then easy to think that Linux was different and hard to learn. The



people we interviewed admitted, though, that it was not very different to use Linux compared to Windows. When it came to the ones that were going to maintain the systems the opinions became more negative. Many of them thought that Linux was too complicated and they called it an operating system for programmers. There is still a lot of work to do, something that is not an unknown problem for SchoolNet. As it is now, it takes two CDs to install OpenLab3 and a lot of server configurations have to be made before it is possible to use. This is too difficult for teachers that might not ever have used a computer before. It became clear at the Africa Source conference that a lot of efforts in making Linux more user friendly were needed. A problem that was discussed at the conference was that programmers tend to develop software to meet their own needs. Representatives from different NGOs and civil societies said that the focus must be on the users and they demanded more cooperation between themselves and the developers.

There is an absence of skilled people for support and maintenance of OSS. Many of the persons interviewed return to this fact, which seems to be a big issue in Namibia.

“It’s also the problem of the support. Because you need skilled people to actually maintain open source and you should actually look at – are there people in the country that can? If you buy the software that would all be included so you have the price against maintenance. The question is, what is more in the country, money or skills. If there is more money and no people, obviously you should go for proprietary software.” (Higher education representative)

“The problems in general are lower computer literacy. Linux does take a little bit more work before it starts and you can use it. It’s a little bit harder to work with. People are struggling like crazy to get their secretary to type a letter and to print it out. Now you will need someone to at least install the printer, that’s something they cannot do. That would be too much, with Windows it could work but not with Linux.” (Higher education representative)

One of our respondents said that it was cumbersome to handle Linux when there were problems. He felt that he had to upgrade the software too often and that it took too much of his time at work.

“That’s half a weeks work if I need to make backup. I need to get the CDs and then I need to reinstall everything and I mean I’m busy. I have something else to do here. So it’s not as easy as they want you to believe. They always say that oh it’s so easy that you can’t do it wrong, but only if you know what you’re doing. With windows you can operate even though you don’t know what you’re doing, that’s the difference. Technically the operating system is superior to Windows but from my point of view, the human interface design and this kind of stuff, you look forever for a button and you move over it but you don’t see any help in the status line about what will happen if I click there. That is the trouble sometimes.” (Higher education representative)



Many of the respondents agree that some tools and products are missing in Linux, for example software developed for specific business needs and network gaming.



6 Discussion

In this chapter we will connect our theories with the result of our study and discuss it in order to answer our question:

Which factors are critical for a successful IT adaptation in a developing country?

6.1 Introduction

According to the majority of the research we took part of before our departure to Namibia, OSS ought to be an optimal solution for bringing ICT to poor, or developing countries. After reading this unanimous information we started to wonder why the use of OSS is not more widespread in the developing countries today. Listening to the recommendations in the literature read, we decided to actually make a study in the relevant environment, i.e. a developing country, to get a thorough and deepened understanding of the problem. We found the organisation SchoolNet, which we thought fitted our purposes. SchoolNet is a working, running organisation that uses OSS. According to our findings, SchoolNet is an organisation that has the right prerequisites to succeed with their goal, which is to empower youth and equip all of Namibia's schools with computers and Internet. Even if they have not reached their wished target yet, they are nevertheless struggling to make it happen.

In preparing for our study we read Henfridsson's (1999) thesis about the IT adaptation process. We decided to use it to find out whether SchoolNet had fulfilled the parts of what constitutes a well-performed adaptation or not. After taking part of the GIS study (Walsham & Sahay, 1999) from India we noticed that moving that far away from the Swedish context as we were going to do would bring further issues than the ones of Henfridsson (1999). In a report written by bridges.org (2001) we found some key factors to keep in mind when implementing ICT in developing countries. This thesis aims at creating an understanding of which factors are important to consider when implementing OSS in a developing country. By combining these theories and applying them on our experiences from Namibia we have managed to draw conclusions that are of importance for the level of success a project will have.

6.2 Relating theories to results

6.2.1 Address real problems

The first lesson we learned from Henfridsson (1999) was the importance of addressing existing problems that are experienced by the future users of the technology. To obtain acceptance of and commitment to a new technology it is important that it will not become an additional burden for the users, but that it addresses true problems that the users experience and can relate to. In bridges.org (2001), one vital factor is to use the appropriate technology regarding its purpose and surroundings. This is the reason why we have chosen



to take a closer look at SchoolNet's work and thereby see if the choice of using OSS is a good choice considering their context.

Like many other developing countries, Namibia is affected by poverty related problems. There are consequently few monetary resources to invest in education, health or development of the inhabitants, and even less in the introduction of ICT. Our result has shown that OSS has potential for lowering the TCO of ICT. The factor of affordability, mentioned by bridges.org (2001), is therefore addressed and more likely obtained with OSS than proprietary software. In close relation to the problem of poverty in Namibia, is the one of high unemployment. The voluntary model that SchoolNet uses allows unemployed youth without education or experience to improve their situation and chances of getting a job. In other words it is a sensible solution since it addresses a true problem in the Namibian reality of today.

Furthermore, OSS is a more sustainable alternative compared to proprietary software solutions. The degree of sustainability will determine how efficiently a technology will be used in relation to its purpose (bridges.org, 2001). During our stay in Namibia we noticed an awareness about the fact that technology has to be sustainable. Solutions that were not considered to be sustainable were not considered as competitive alternatives. This was one of the reasons to the resistance towards donations like the ones of Microsoft. At first they might look generous but in the longer run they are not economically sustainable for the normally poor schools. The difficult part seems to be to convince decision-makers in the schools as well as in the government to realise this.

Isolation is another obstacle in Namibia. The majority of the population is spread over a large area of desolated land. Considering the present status of the infrastructure, they do not have sufficient possibilities to communicate with each other. This communication problem is not unique for Namibia but a reality that faces many of the African countries. ICT is an effective way to connect people and spread information. OSS offers a stable server environment, an advantage that is important in a country like Namibia where there might not be support nearby in rural areas.

One thing that has been apparent during our interviews is the incapacity of the country's educational system. We have not been able to get an insight in the organisation behind and its practises, but through our results we have managed to create a quite good understanding of some of the problems within. We have realised it is a bureaucratic and rigid system that at this moment have no possibilities to respond to changes in its surroundings. When a dynamic technology is introduced in an environment like this, there will obviously be problems. If we consider the example of how the courseware for computer classes was generated this is not hard to understand. Today computers and ICT is not integrated in the teachers' schooling. Another negative side of the educational system is that it does not encourage or facilitate the creation of a pool of knowledge and skills in the country. Namibia does not have any



traditions within mathematics and logics and therefore there is today simply not a sufficient level of knowledge. If we compare our findings to those of the GIS study (Walsham & Sahay, 1999), India has a higher level of knowledge and skills. This has enabled them to use the advantages with ICT more effectively. The cause of this lack of traditions in Namibia is nothing we have had the ambition to investigate but what makes it interesting for us is its relation to ICT and OSS.

By addressing experienced problems as they do in Namibia, the technology is more likely to be trusted and embraced. In India, the GIS technology did not manage to solve problems that were important for the end users (Walsham & Sahay, 1999). We feel this contrasts with the work of SchoolNet since they have actually managed to address true problems in the Namibian context.

6.2.2 Create collective meaning

Adaptation relies on the importance of creating double interacts, in other words a collective understanding for the purpose of new technology Henfridsson (1999). This process he relates to the transition of technology, i.e. when leaving the phase of exploration to enter the one of exploitation.

According to the theory of IT adaptation, the Africa Source conference can be seen as an initiative to create a homogenous mindset around the use of OSS in Africa. All the participants shared an interest and a belief in the potential of using OSS even if they came from different backgrounds and subscribed different motives to the technology. When it comes to technologies like ICT it can be cumbersome to concretise its advantages, especially the ones that are related to costs. This we realised after talking to one of the African developers. It is easier to make people realise cost advantages if they are concrete and possible to relate to something well-known. For example, gold mines are more tangible than ICT. By focusing on existing African problems at the conference, for example the absence of localised content, the advantages with the technology became concrete. The importance of creating and encouraging communities was also obvious at the Africa Source. Communities increase the feeling of belonging to a group where members have the same purpose for technology. If slowly socialised into a group, new members take on the ethics and behaviour of the others. The strength of communities is that it is an effective way to create collective meaning within the OS movement.

Within the organisation SchoolNet, the different stakeholders had to some extent managed to move from the phase of exploration to the one of exploitation. Nevertheless, we found one group that was left behind. The group consisting of trainers did not understand the concept of OSS and were still in the exploration phase of this technique. Even though they had realised the benefits with computers and ICT, they had not realised the specific advantages with OSS.



6.2.3 Avoid technological distancing

SchoolNet has not yet been able to make the teachers embrace the new technology and the attitude towards it is full of ambiguity. The teachers have not managed to create a proper collective meaning of the technology and can therefore not see the value of it. The construction of the educational system results in a lack of interest from the teachers since technology is not included in their education. Due to this, they face the same situation as the middle level officials in the GIS study (Walsham & Sahay, 1999). Neither the officials nor the teachers had seen the need for new technology before the implementation and could therefore not find an easy way to integrate it with their daily routines. The result of such situations is often an ineffective use of technology. If we consider the teacher we interviewed, it is easy to realise what we are referring to. In her mindset, and in the one of her principal, computers were something abstract and different from everything they were used to. The solution to this uncomfortable situation was to relate to previous experiences and knowledge. The obvious answer for her, given the background she had from working as a typewriting teacher, was to compare the computer to a typewriter. It might seem comic but it is not strange since computers were beyond her world of known concepts. She and the principal created their own meaning of the technology and thereby excluded vital features of a computer. When we attended some of her computer classes we were surprised of her relatively low level of computer related skills. Parts of the information passed on to the learners were not even correct. The lessons had a mechanical nature and the learners were not allowed to experiment with the computers. It was in other words obvious that the technology had not found a natural place within the working environment of this teacher.

An important thing to observe is that the ones that arrive at schools to train teachers and learners how to use the new technology are young volunteers. We have no experience in how the Namibian educational system works but we have noticed it is relatively hierarchical and authoritarian in its nature. A conflict arises when teachers that consider themselves in possession of knowledge faces a new technology they do not understand. The teachers' authority is further endangered when the person to train them in the functions of the computers, is a young, uneducated volunteer from SchoolNet. All in all, this has led to behaviour of defence among many of the teachers in the Namibian schools. According to Henfridsson (1999) the solution to this can be the existence of dedicated and devoted persons that are connected to the technology. In literature such persons are often referred to as champions. Unlike the organisers of the GIS projects (Walsham & Sahay, 1999), SchoolNet is aware of the meaning of champions and encourages and supports the ones they find.

According to bridges.org (2001) technology must include all groups in the society in order to secure a successful implementation. We believe the choice of spreading ICT in schools is reasonable since all youth that attend school can



then exploit its advantages. By doing the implementations in the schools, people are not excluded because of sex or ethnicity. Nevertheless, not all ages are included. We have understood that in the vision of SchoolNet, this is taken into account. In their vision schools should be open for the rest of the community when the school day has ended. By doing so, more people could participate and share the new technology. The idea is to have the schools as communication centres for entire communities. In reality though, this was seldom the case because many of the principals did not allow this kind of activities. They were afraid that the computers would break and often the computer labs were locked big parts of the day. SchoolNet and their connected schools need to ask themselves in what way it would be possible to include other groups except from youth in the schools. If they would succeed with this, the technology would more likely become fruitfully adapted and a sustainable part of the society.

Even in cases when teachers accept the computers, the software from DireqLearn is too “geeky” and not enough end user oriented. As the teachers have none or very little previous experience from computers it is too much to think that they will be able to install and update a new version of OpenLab from two different CD’s and then do server configurations. Simplicity is a vital feature if the teachers are going to embrace the technology. If the teachers have to do these kinds of activities the technology becomes related to additional work besides their main task. The purpose of the technology is to facilitate their work, not the other way around. All in all, it is important that the teacher who becomes responsible for the computers are willing to do this, and feels they have sufficient knowledge to do it.

6.2.4 Trigger the sensemaking process

SchoolNet has realised the importance of offering localised software in order to create a collective understanding for the purpose of the new technology. Henfridsson (1999) talks about triggering the sensemaking process by continuous adjustments of the technology to make it congruent with its surroundings. As we have seen in our result the educational software used today is not relevant for Namibian schools. In order to make it legitimate it must be localised, an important part of the sensemaking process of ICT both for teachers and learners. The GIS projects (Walsham & Sahay, 1999) did not use localised content in their technology and this contributed to their failure. At the Africa Source conference, localisation was one of the main topics, indicating that engaged people within the movement were aware of this issue. The question of proper content is also a key factor in the report by bridges.org (2001), because if the content is irrelevant it is not possible to understand the benefits of technology.

The importance of sensible content is easy to understand, but when it comes to pure translations of software people are ambiguous. We believe that by translating software the technology will more likely be accepted by a wider



range of people. It will probably attain more interest of people in rural areas if they could use the computers in their native tongue. During our stay in Namibia, we only had time to visit the capital where we lived, and a small city where the conference took place. As a consequence, we mostly met people that were quite fluent in the English language. We cannot tell how the situation is in the rest of the country but from what we were told, the different minority languages have a stronger position in the rural areas. The majority of the Namibians live outside Windhoek and in order to get their acceptance it would probably be a good idea to translate software. It might be true, as the technicians said, that Namibians anyway must use English in their formal connections with the Namibian system. Even so, we believe a translation initiative would enhance the computer literacy and increase the awareness of the potential of using ICT. As things are done today, the technology is not truly legitimate for many of the Namibians.

In Namibia there is a demand of simple and stable technological solutions that are compatible with many different platforms. Even if not every Namibian buys refurbished computers like SchoolNet does, hardware is expensive and therefore not exchanged as often as people in the western parts of the world might be used to. Companies like DireqLearn need to pay attention to this when they develop new software.

Besides addressing the creation of double interacts, the Africa Source conference was also an attempt to trigger the sensemaking process around OSS. By gaining people's acceptance and making them see and understand what ICT can do to improve their situation, the organisers of the conference applied a more long-sighted thinking than in the GIS projects (Walsham & Sahay, 1999).

6.2.5 Pay attention to collective identities

The participants at the Africa Source conference seemed to share the same goals, i.e. to level out the ICT differences in the world. The subjective motives on the other hand differed between the groups of interest. Henfridsson (1999) advocates the importance of paying attention to collective identities, i.e. what kind of motives that are tied to the technology by different groups existing in the community. If we once again compare our study to the GIS projects (Walsham & Sahay, 1999), the people involved did not understand each other's motives. The cultural differences built immense barriers and the USAID did not realise that the Indians could not relate the technology to their everyday routines.

In Namibia we tried to understand the situation of the teachers. It is of utmost importance to realise that computers and technology is not something natural for them and that their conservativeness is in fact nothing else than ignorance and fear and a result of an insufficient educational system. The behaviour of defence is their way of coping with a complex situation.



SchoolNet's target group is the youth of Namibia. Our interviews showed that it did not seem to be any problem to make this group feel comfortable about the new technology. They were satisfied by the fact that they got a chance to learn something new and they seemed aware of the importance of being computer literate in today's society. The school we visited had been equipped with computers for a long time and now ran three computer labs. One of them served as an Internet café where the students could use the computers after school hours. We have not been able to do any interviews in schools on the countryside and therefore it is hard to imagine how the situation there might be. Nevertheless, the SchoolNet trainers we talked to had all been to schools in rural areas and they could tell us about the same experiences as we found in the school we visited. Those experiences consisted of kids, eager to learn about and use computers in contrast to teachers, who were more sceptical of the new technology. As mentioned, the trainers did see the advantages of learning about computers and Internet but on the other hand they were not aware of the meaning and potential of OSS. One example is the one of the trainer who requested translated software to facilitate the learning process but then told us it was impossible because computers were in English. We feel that this group ought to be better informed about OS in order to transfer this knowledge to hesitant teachers in the schools. If SchoolNet wants to convince the teachers of the importance of ICT it is important that the ones training them are familiar with its advantages and possibilities.

One of our groups of interest that were in focus at the Africa Source conference was the group of African developers. They were facing a reality that is hard to understand for a European. The African OSS developers we met were all aware of the importance of free information and software for their people. Their problems consisted of rigid, bureaucratic governments that did not see the importance of ICT. In addition to this, Microsoft representatives are diligently parading the governments to convince them to use their products. In Africa where corruption is common, it is not easy for a single OSS developer to make a difference. At the conference the subject of economic rewards for developing OSS software was discussed. Not many African developers felt that they could do free software development in their spare time; this was seen as a luxury not available to them. All in all, there were many obstacles and difficulties that made it cumbersome for them to exploit the advantages of OSS. Since developers are the core of any OS community, this problem must be taken into account if Africa is ever going to create a strong pool of OSS developers.

6.2.6 Factors specific to developing countries

So far in this discussion we have tried to relate the key factors from bridges.org (2001) with Henfridsson's (1999) theories about IT adaptation and combine them to analyse our result. In order to have a complete picture one must take some additional factors into account.



Physical access is a key factor for a successful implementation and it is therefore important to control that the existing infrastructure meets the demands. SchoolNet's work with wireless solutions to schools without telephones is one way to improve the situation of the infrastructure but it is not enough. As mentioned in section 2.1.3, the Internet is the most important tool for enabling a working OS society. SchoolNet's work with connecting schools to the Internet is therefore of utmost importance. Nevertheless, the existing infrastructure needs further improvements. As shown, Namibia is better off than many other African countries but is still not comparable to international standards concerning speed and quality.

Rajani (2002-2003) gives us three reasons to why ICT is not widely accepted in developing countries. First, as we have mentioned, maybe the most obvious reason is the lack of money to invest in ICT and infrastructure. Furthermore, a technology like OSS demands skilled and ICT literate people. OSS goes hand in hand with a good educational sector. Rajani (2002-2003) writes that without educated, skilled people it is hard to succeed with OSS. At the same time OSS can help boost education. This relationship is somewhat complicated and makes the picture complex. On one hand it is important to spread the awareness of ICT as part of the solution for an enhanced education. On the other hand it is hard to make people understand the positive effects of ICT if there is not sufficient knowledge in the country to make use of the advantages connected to it. Something that immediately comes in mind when discussing developing countries is the issue of poverty. It is therefore easy to argue that an adaptation of OSS would be a good alternative to level out the inequities concerning access to software and ICT. In our result we have seen an importance of putting the monetary resources in relation to the existing skill level in the country. Before advocating a migration into OSS one should answer the question what there is more of in the country, money or skills. To succeed with the implementation of OSS, a certain level of knowledge is required. Without this, it will be hard to exploit all the advantages of OSS and people will merely use it because it is a cost effective alternative. Even if Namibia is better off than many other African countries, the lack of skills is obvious. As the situation is today they are not able to take advantage of all the possibilities with OSS.

When we first chose which groups of interest we were going to focus on in Namibia, we excluded the commercial sector. We have noticed in literature read that this sector is often neglected. During the Africa Source conference, we did not meet any Namibian representatives from the industry nor from institutes of higher education. It is quite interesting to make this reflection since the industry, the educational sector and the government are three important stakeholders that represent structures that, as they are constructed today, build barriers to the adaptation of OSS in the Namibia. In order to gain their support it is in the future vital to include these groups. The people connected to the GIS study (Walsham & Sahay, 1999) did not succeed in



obtaining the support needed from local vendors. In Namibia, the industry does not seem to see the benefits with OSS software but rather focus on its believed negative sides. The key factor tied to this discussion is local economic environment and to make the implementation of OSS successful it is critical to show that it may generate something valuable for the industry and other strategic groups (bridges.org, 2001).

OSS developers need back up from an industry that supports them and pay for their work. That support did, according to our interviews, not exist in Namibia or most of the other African countries today. If the developers did not get a job that allowed OSS development they had to do the development in their spare time. This is not likely to happen in a country with high unemployment rates and low salaries.

Rajani's (2002-2003) third and final reason emphasises the politically and socially related obstacles concerning bureaucracy. We have realised that the educational system in Namibia is in its nature outdated and inflexible in its relation to its dynamic surroundings. A conflict occurs when a technology like ICT, that is flexible in its nature, is integrated in such an environment.

The attitudes related to ICT in general and OSS in particular complicate its adaptation. There is a scepticism concerning the quality of OSS since it is distributed freely, but this also concerns the developers. The industry has no confidence in their own people and do not think they are capable of developing software competitive to what is produced in the western world. Windows is seen as the status of wealth since it is the present standard in the western world. It is understandable that advocating OSS for developing countries makes the people feel excluded from the rest of the world.

bridges.org (2001) emphasises the importance of the presence of a political will of using the new technology and also the importance of the existence of a legal and regulatory framework that supports it. In the extension, it is about creating the right attitudes for OSS. The GIS study (Walsham & Sahay, 1999) shows that it is not only important to change structures but also to pay attention to people's attitudes.

Namibia, as many other countries on the African continent, is poor and the computerisation of the schools is performed without any monetary support from the government. As we see it, there is actually no freedom of choice concerning what software to use. Since schools do not have the possibility to pay for licensed software, there is presently no other alternative than using OSS. The cost issue is in other words determinative for the choice of software. It might not be surprising that the issue of lowered cost of ownership will decide which software solution a developing country is going to choose. However, we were somewhat fascinated by the big interest in other advantages with the OS technology. We saw that the African OSS advocates put more abstract advantages covering the development of the whole society in the



centre of attention. Examples of those factors were the possibility to localise software and share intellectual property. By addressing advantages like these, the Africans showed that OSS is considered as a way to take control of their own development and to invest in their own people. What we mean is that the western people might not understand how important it actually is for developing countries to have this possibility. For people in the western part of the world it is probably hard to completely understand a reality with several coexisting minority languages and a media full of foreign content that differs a lot from the attitudes and cultures of the local community. The same thought can be applied on the transfer of intellectual property. In the western world, knowledge and education is often taken for granted and consequently this makes it hard to understand the difficulties that face developing countries that are lacking such fundamental recourses. These conditions make it somewhat easier to understand how OSS might be used in the developing part of the world. Even if they might not have the required level of knowledge and skills to contribute to the global community and are not able to exploit all the advantages with OSS, they might still be able to use the technology to fit with their own reality and solve problems within it.

We have been able to create an understanding of SchoolNet Namibia, as well as their use of OSS as a tool for spreading computers and Internet to the country's youth. We believe they fulfil the required conditions in order to succeed with their vision. In the next section, conclusions, we will try to elaborate this example related to IT adaptation in developing countries in more general terms.



7 Conclusions

The purpose of this chapter is to briefly summarise our conclusions and in a few sentences answer our question:

Which factors are critical for a successful IT adaptation in a developing country?

To answer this, we studied the implantation of OSS in schools in Namibia. We believe that the following topics are of utmost importance for a successful adaptation of IT in developing countries in general:

- The technology must address real, **experienced problems** in the country. If it fails to do so, the technology will most likely not be accepted.
- The technology must **make sense** for the people that are going to use it. Software have to be localised to fit into the society where it is going to be used or else the adaptation will probably not be successful.
- The technology must provide **sustainable solutions**. Developing countries in general do not have much monetary resources for technology. They must therefore be able to use the technology for a longer period of time, it cannot be outdated and in need of upgrades every year.
- It is important to investigate the **level of infrastructure** in the country. The use of a new technology might depend on questions like Internet connections, electricity and bandwidth, and there might not be any money in the country to improve that situation. Even if necessary Internet connections exist it is also important to control that the users can afford using it.
- It is important to realise the **importance of local champions**. Normally when implementing a new technique there is an initial resistance to it. The existence of a champion who strongly believes in the possibilities and advantages of the new technique may convince hesitant persons to use it, and make them see the benefits with it.
- It is important to **focus on the right target group**. Youth are open-minded and do normally not have problems with adjusting to new technique. Most often, though, it is not possible to address that particular group. Nevertheless, it is important to consider the factor of age and gender when implementing a new technology.
- **Technical distanciation** must be avoided. The technology is implemented to solve people's problems, not to increase them. It must be user friendly and easy to learn in order to make the people embrace it. If the technology means additional work it will not be embraced by the society.
- It is important to see to the bigger picture and try to understand **attitudes and structures** where the technique is going to be



implemented. Try to include the government, the industry and other official institutions and make them see the advantages with the new technique. People will likely follow their lead.



8 Recommendations and further research

Based on the result of our field study, we want to pass on the following thoughts to the organisation SchoolNet.

In order to make the end users embrace and understand the new technology it is important to make them realise its potential. SchoolNet must spread the awareness of OSS to all groups of interest within their organisation. The volunteer trainers are in a key position since they are the ones in close contact with the end users and must be included in this effort.

We want to put the issue of localised content in the centre of attention. Even though SchoolNet is aware of this fact, they need to put pressure on the African developers and make them realise the importance of this problem and how they can contribute by developing localised software.

Furthermore, SchoolNet should consider alternative ways and approaches to fulfil their vision and open up their services for entire communities after school hours. By addressing a wider range of social groups the technology will more likely be adapted and accepted.

Namibia is considered to be quite a developed nation in relation to many other developing countries in the world. In order to properly evaluate the results of our study it would be interesting to compare our findings with a similar field study in a developing country but in another part of the world, for example in Latin America or Asia.

Another interesting approach would be to conduct a related study but in a different environment than ours, the one of the educational system, and look at OSS adaptation within other fields of the society.



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Appendix I

Abbreviations

BSD = the Berkeley Software Distribution
CCNP = Cisco Certified Network Professional
DSL = Digital Subscriber Line
FSF = the Free Software Foundation
F/OSS = Free or Open Source Software
GIS = Geographical Information Systems
GNU = Gnu is Not Unix
GPL = GNU Public License
ICT = Information and Communication Technology
IT = Information Technology
KM = Knowledge Management
LGPL = Lesser General Public License
NGO = Non-Governmental Organisation
NIED = the National Institute for Educational Development
OS = Open Source
OSD = the Open Source Definition
OSI = the Open Source Initiative
OSS = Open Source Software
SWAPO = the South West Africa People's Organization
TCO = Total Cost of Ownership
USB = Universal Serial Bus



Appendix II

Interview guides

Since we did not know which people we were going to interview when we arrived in Namibia we constructed a separate interview guide for each interest group we wanted to meet.

As we did not know much about the Africa Source conference and who was going to be there before we arrived, we did not have many topics to discuss before we came there.

SchoolNet Namibia

Managerial level

- Personal information concerning background, education, present work position and information about main assignments or tasks.
- Experience of computers in general, as well as Linux and other operating systems in particular.
- Thoughts and opinions concerning advantages and disadvantages with the above question.
- Awareness and thoughts about the Microsoft/Linux debate that has been going on in Namibia.
- Thoughts about the future and visions for SchoolNet but also for Namibia in general.
- Discussion about the OSS movement in Namibia. If there is one, do they know if the Namibians contribute to the development of OSS? How is the reality with proprietary development in Namibia?

Network administrators and volunteers

- Personal information concerning background, education, present work position and information about assignments or tasks.
- Experience of computers in general, as well as Linux and other operating systems in particular. (Think in terms of an eventual OS movement in Namibia.)
- Thoughts and opinions concerning advantages and disadvantages with the above question.
- Questions concerning the response they get on SchoolNet's services out at the schools.
- Difficulties or positive things they experience with the work of SchoolNet in general as well as in their own daily work.
- Proposals for changes they believe would improve the work of the organisation.
- Discussion about the OSS movement in Namibia concerning contributions and participation.



End users

Teachers

- Personal information concerning background, education, present work position and information about assignments or tasks.
- Experiences of computers in general and Linux and other operating systems in particular.
- Thoughts and opinions concerning advantages and disadvantages with the above question.
- Differences in awareness and interests of the learners after Internet has been made available.
- Usage areas concerning computers, the computers integration in the teaching.
- Thoughts about how the new technology has affected the teachers work.
- Thoughts about the work and organisation of SchoolNet.
- Proposals for changes they think would make their work more efficient.

Learners

- Personal information concerning background and previous education.
- Earlier experience of computers and operating systems.
- Usage areas of the computers.
- Thoughts about whether the computers have affected the teaching in their school.
- Thoughts about their interests and further education. The possibility of a future foundation for an OSS movement in Namibia.
- Access and cost of using the computers.
- Discussion about the use of computers in their spare time.
- Proposals for changes they would think make their situation better.

Other groups of interest

Teachers at the Polytechnic of Namibia

- Personal information concerning background, education, present work position and information about assignments or tasks.
- Experiences of computers in general and Linux and other operating systems in particular.
- Thoughts and opinions concerning advantages and disadvantages with the above question.
- Existence of computer related courses.
- Existing use of operating system in the schools. Thoughts about importance of choice.
- Their attitude towards OSS and Linux.



- Some thoughts about the connection to the commercial world concerning job opportunities for the students. Visions concerning the ICT development for Namibia.

Participants at the Africa Source conference

- Personal information concerning background, education, present work position and information about assignments or tasks.
- Experiences of computers in general and Linux and other operating systems in particular.
- Thoughts and opinions concerning advantages and disadvantages with the above question.
- Thoughts about the OSS movement in Namibia or the country they come from.
- Thoughts about visions concerning the ICT development in Namibia/Africa.