Open Source Software: Take It or Leave It?

The Status of Open Source Software in Africa
A study towards informed decision-making on ICT-platforms

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Martin Bruggink

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Special thanks also to Arjan de Jager, IICD, for his initiative and support towards this research. Last but not least we thank and congratulate Martin Bruggink for his excellent work in producing this report within such a short time frame. With the enthusiasm, energy and expertise displayed by Martin, we are confident that more and more people will be equipped to make informed decisions in the realm of ICT architecture.

This report showcases a few of the many promising initiatives and illustrates some of the challenges facing OS-implementation in Africa. We hope it contributes a few pebbles towards paving the road towards more equitable decision-making in terms of ICT-architecture. The strong sense of partnership displayed by the respondents during this research project strengthens the case and makes the road an easier one to venture upon.

Julie Ferguson, Editor

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BACKGROUND RESOURCES

WHY RESEARCH OPEN SOURCE SOFTWARE?

Information and communication technologies (ICTs) are widely recognized as tools contributing to the realisation of the Millennium Development Goals. However, in terms of being well equipped to make informed decisions on ICT architecture and choice of platform, countries from the South are lagging behind, and are therefore still unable to harness the full potential of these tools in the eradication of poverty. This knowledge arrear contributes to incompatible information systems, expensive and ineffective maintenance of ICT infrastructures and resource-draining software licenses. By addressing this issue, communities can be better equipped to develop local expertise and markets, based on ICT knowledge, and can develop a stronger domestic ICT-industry, such as we have seen developing in Asia over the past decade.

Open source software (OSS) can provide a solution to some of these problems, but clear indicators of what should be taken into account when implementing or migrating to an open source software environment, are scarce. In this report these indicators are explored, first by presenting the results of research on the status of open source software in three African countries. Second a number of case studies are presented, supported by results from an internet survey. The report particularly focuses on organisational aspects that play an important role in the implementation of open source software.

Research Objectives and Approach

ICT practitioners are increasingly interested in strengthening their capacities to make informed, autonomous decisions when choosing a platform or software. With this research, we aim to achieve the following objectives:

1. Explore the current status and opportunities for open source software for organisations in the South;
2. Study possible migration scenarios (from proprietary towards open source software) and determine what arguments should play a role in decision-making;
3. Identify projects related to the field of open source software and ICTs for development and make recommendations for next steps;
4. Encourage a coherent approach towards open source research, and
5. Disseminate knowledge on open source software.

A definition of open source software is presented, followed by an analysis of the current status of open source software in Africa. This is supported by research results on the use of open source software obtained from organisations operating in various sectors (government, NGO's, private sector, education, etc). A number of case studies (based on interviews) are described, showing amongst others how open source can be used within organisations. A list of questions and answers then illustrates the issues faced by different actors dealing with ICT infrastructure in an organisation, and which support information is available for each of them through the Internet. Research studies conducted by partner organisations lead up to the conclusion, including possible actions to be taken by development agencies and enabling partners. The appendix contains two handy flow charts, helping decision-makers to make informed choices on whether open source is a viable option for their organisation's architecture.

WHAT IS OPEN SOURCE SOFTWARE?

Open source software code can be read and modified and can be distributed without always having to pay for it[1]. "Free" software is the term used by Free Software Foundation (FSF), founded by Richard Stallman, for indicating software that can be freely used and its code freely read, distributed and modified[2] (but not necessarily free of charge). Linux is an example of open source software, and so is OpenOffice.org.

Proprietary software is software of which usage, distribution and/or modification is restricted in some way or the other. Microsoft Windows is an example of proprietary software.

The General Public License model (GPL) is often used for open source software. Software covered by GPL is "copylefted": it can be modified, but any release containing modified software must include an offer for the source code under the same GPL license[3].

In this report four software categories are referred to. Each category is marked by a symbol that will be used later on in the report:

♣ ***Operating systems***: the base software that runs on every computer, of which the most well known is Microsoft Windows (95 / 98 / NT / 2000 / XP / 2003). Many alternatives are available, ranging from proprietary operating systems like SunOS to open source variants like Linux and FreeBSD. Currently, Linux is becoming more popular, especially for servers, though Linux is suitable for desktop computers as well.

♦ ***Server software***: this type of software often is installed on one or just a few computers within a computer network. Email servers are part of this category, as well as web servers and software for sharing files and printers, etc. Open source software is particularly popular in this category. Familiar examples of web servers are the Apache web server (open source) and the Microsoft IIS web server (proprietary).

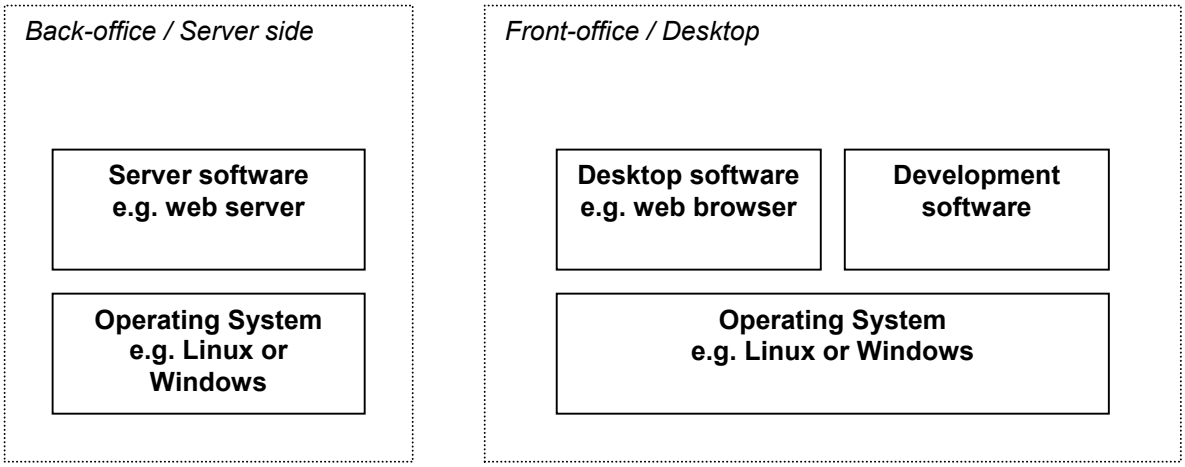


Figure 1 Software categories overview

[1] *See http://www.opensource.org/docs/definition.html for a more elaborate definition*
[2] *See also http://www.gnu.org/philosophy/free-sw.html*
[3] *The FSF website offers an overview of these and other definitions: see http://www.gnu.org/philosophy/categories.html*

♥ ***Desktop software:*** desktop software comprises office suites like Microsoft Office and OpenOffice.org for word processing, web browsers like Microsoft Internet Explorer and Netscape Navigator and email clients like Microsoft Outlook. A whole range of desktop software is available, both proprietary and open source.

♠ ***Software development:*** this contains tools for creating applications, such as operating systems, server software and desktop software. This report will focus on software for developing websites, including programming languages like PHP and ASP as well as content management systems like PHPNuke. This kind of development software is particularly popular in Africa. However, many other kinds of open source development software are available.

For all four categories described above, proprietary and open source software varieties are available. When deciding on what kind of software to use, one does not necessarily have to use *either* open source or proprietary software for all categories. On the contrary, all kinds of combinations are possible.

Though there is at least one clear-cut advantage of using open source software, namely that one generally does not have to pay license fees, many other aspects should play a role in deciding what kind of software infrastructure is best suited for a particular environment. The latter is a recurring theme throughout this report.

There are several ways in which open source software can play a role for people and organisations. First, *open source software can be used* for running on servers and desktops. Second, organisations might (also) want to *develop software using open source products*, for example by using an open source programming language for software development. Third, people and organisations can *contribute to the development of open source software*. There has been quite some research on the reasons driving people and organisations into developing open source software[4].

Linux is one of the most well-known open source products available today. Linux is an operating system, made available via distributions, such as SuSE, Redhat, Knoppix and Debian. All distributions use the same base (the Linux operating system), but differ in aspects like ease of installation, availability of extra software and support[5].

[4] *See http://www.firstmonday.org*
[5] *A comparison of Linux distributions can be found at http://www.asiaosc.org/article_5.html*

STATUS OF OPEN SOURCE SOFTWARE IN AFRICA

Uganda[6]

In Uganda 20 out of the 100 registered ICT-companies use open source software. Most Internet Service Providers (ISPs) use Linux in one way or another. They were the pioneers of commercial open source usage in Uganda. Linux became the de facto standard in most ISPs complementing it with FreeBSD (an open source operating system like Linux).

The government is in the process of formulating an ICT policy. There is currently no law in Uganda protecting intellectual property, so piracy of proprietary software is common practice.

A survey of 34 organisations showed that almost all use open source software in some way.

- Almost all respondents have a local area network in place and 94% are using Linux at a server-level.
- 54% of the respondents have been using open source software for over three years.

Especially the growth of the Internet has played a big role in the spread of open source software in Uganda. The possibility to download open source software from the Internet is one of the reasons for this. More importantly however, pioneers establishing ISPs decided to implement Linux on their servers because they had used it before, not able to afford Microsoft licenses. This led to ISPs coming with more cost effective solutions and thus open source software was the most obvious choice.

Sector	Number of organisations
Government	6
NGO	5
Education	10
Private	13
Total	34

Table 1 Uganda respondent profiles

Open source applications used in Uganda are used predominantly on email servers (illustrating a need for centralised email, allowing organisation to use their own email addresses, for example john@mycompany.co.ug), web servers, proxy servers (allowing information from the web to be cached), file and printer sharing, VPN (Virtual Private Networking) and databases.

Open source databases are used by 34% of the respondents (mostly ISPs and internet cafes), although the majority of the respondents knew nothing about open source databases. Apparently, quite a number of people do not know what kind of open source software alternatives are available. Open source desktop software is hardly used.

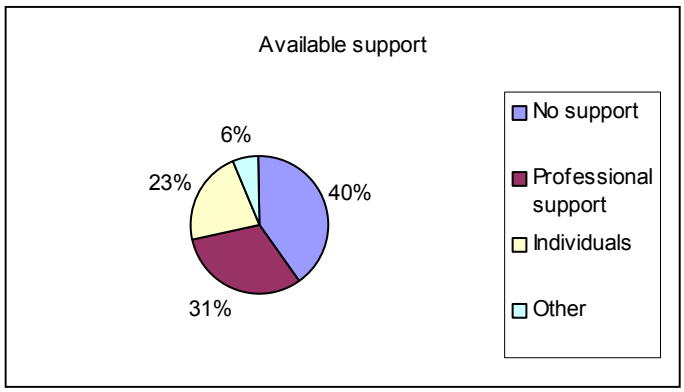
[6] *Summary based on research by James Lunghabo from LinuxSolutions (http://www.linuxsolutions.co.ug). Research consisted of questionnaires and a number of interviews with key players in the field of ICT in Uganda.*

SUSE Linux is the most-used distribution, followed by RedHat. This is mainly due to the fact that the SUSE Linux distribution has had a local reseller in Uganda for the past two years. The majority of OSS users obtain their software, installation and user support from their ICT vendor.

Support

Sources of knowledge and support on open source software are mainly schools and seminars, followed by the Internet and informal networks of friends.

Lack of expertise in open source operating systems is the main concern raised by management when it comes to adoption of this type of software. Besides, Linux is still often perceived as an "unfriendly" piece of software. However, it is becoming quite common to see newspaper adverts for ICT administrator jobs requiring Linux experience. This supports the research results that Linux is becoming more common and is gaining a more important place in the Ugandan ICT-sector.



- 60% of the respondents acknowledge they have support available
- 40% indicate that they have no support at all
- Company professional support contributes 31%
- Individuals contribute 23%
- Other (e.g. international consultants) constitute 6%

Figure 2 Available support in Uganda

The answers from the respondents show that there is local support available, although general expertise (compared to for example Microsoft) is still low. There is also a Linux user group in Uganda, which is quite often consulted for advice or support. Seven organisations were identified as offering training in open source software. Most training in Uganda focuses on Windows with the idea that "to know Microsoft Windows is to know the computer".

When asked how to deal with migration from Microsoft to Linux most of the respondents were unable to respond. 14% indicated dual boot up systems (being able to run two operating systems on one computer) as an option, using X-windows or consulting "an expert".

Tanzania[7]

In Tanzania an inventory was made of 37 organisational profiles, focusing on software infrastructure. Almost all of these organisations have a local area network with a back-office, and Internet connectivity.

Sector	Number of organisations
Government / Military	5
Manufacturing	8
Service	10
Education	5
NGO	6
Other	3
Total	**37**

Table 2 Tanzania respondent profiles.

30% of the respondents use Unix and 24% use Linux (some of the organisations use both Unix and Linux). 95% use Windows, thus some of the respondents use several kind of operating systems within the same network.

Support

When asked about open source software, 59% of the respondents indicated to have heard of it. Software products like Linux, PHP and StarOffice are the most well-known open source products. Most organisations use Microsoft Office for their word-processing, whilst 8% of the respondents indicated they use open source products (StarOffice and OpenOffice.org). Advantages were identified as being lower Total Cost of Ownership (TCO) and the ability to adapt the code to specific local needs.

Most respondents indicated that their organisation had in-house troubleshooting staff for hard and software problems. The willingness to get trained and train other people in the use of new software is very high. Outside installation and troubleshooting support is available, and training can be found (although it was not clear whether this includes open source software training). Internet-based informal support is available through a Tanzanian user group on open source software[8].

[7] *The results presented here are based on the survey performed by Duncan O. Oyuke from the Institute of Finance Management.*
[8] *See http://groups.yahoo.com/group/OpenSourceTz/*

Burkina Faso[9]

37 organisations were interviewed in Burkina Faso to profile their use and awareness of open source software.

Sector	Number of organisations
ICT service providers	5
Education	9
Health	3
Banking	2
Private	4
State owned companies	3
Government	4
Other	7
Total	**37**

Table 3 Burkina Faso respondent profiles

Research indicates that in Burkina Faso, government use of open source software is extremely limited, whilst most ICT service providers have adopted it in some way or the other. An interesting indicator was that young organisations adopt new technologies more easily than older, more traditional or hierarchically structured ones.

Organisations in Burkina Faso often have rather strict hierarchies, which can hinder employees in accessing appropriate information or training on new technologies. The head responsible for ICT within an organisation often has great influence on the adoption of new technologies and most of the time people avoid the risk of upsetting the hierarchy and perhaps losing their job, when it comes to innovation. The research results also show that the higher the education of the person responsible for ICT at an organisation, the better its utilisation.

Compared to Uganda and Tanzania, Burkina Faso has a small number of Internet Service Providers and a small amount of computers available in the country. About 100 recognized ICT enterprises are established, with 5 institutes for ICT education and 1 certification centre in all of Burkina Faso.

All ISPs in Burkina Faso use Linux, as well as the University of Ouagadougou, the postal services and RESAFAD (Réseau d'Enseignement à Distance)[10], a development organisation. The university first received a Windows NT server. Later, in cooperation with other organisations, they started to install Linux on their servers.

Most web developers use PHP and MySQL running on a Windows server. Open source web development tools (like SPIP and PHPNuke) are successful, partly because these products run on both Linux and Windows. Within some of the organisations server software like email and web servers are based on open source software. OpenOffice.org is hardly used. In general, those who are responsible for maintaining the servers do not install new operating systems fixes and packages as long as the machine keeps working.

[9] *This research was conducted by Sylvain Zongo from ZCP (http://www.zcp.bf) and based on interviews with people from 37 organisations.*
[10] *http://www.bf.resafad.org/*

In terms of policy, the government has created a taskforce responsible for ICT policy within the country, called DELGI (Délégation Générale à l'Informatique). All projects concerning new technologies have to be approved by DELGI. Going through the list of past decisions, DELGI does not seem to choose for open source software.

In Burkina Faso illegal software is often used. 30% of the respondents had not heard of the term software license, which could be supported by the fact that there are to date no laws in Burkina Faso protecting intellectual property.

Support

50% of all people being interviewed had heard of open source software in general terms or have encountered it in some form. However, most respondents are not convinced by the idea that software produced for free can be a qualitatively viable alternative to Microsoft. Other concerns are:

- Lack of knowledge available concerning open source software options and maintenance;
- Previous investments keep people from changing their software infrastructure;
- Using "free" software puts a lot of pressure on decisions makers, used to the adage "without cost = without value";
- Open source software can be complex, but primarily in terms of development, rather than use; respondents perceive it as being user-unfriendly and only suitable for ICT specialists.

There are a number of organisations in Burkina Faso promoting the use of open source software in Burkina Faso by educating people and organizing seminars, the most well known of which is ABULL[11]

[11] *l'Association Burkinabé des Utilisateurs de Logiciels Libres, http://abull.zcp.bf*

What Drives African Organisations to Using Open Source Software?

Country research shows that a number of factors stimulate the usage of open source software in Africa. In Uganda adoption of open source technology by Internet Service Providers (ISPs) played an important role in the spread of this software variety. Open source software made it possible for these organisations to keeping their software costs low, positively affecting their overhead[12]. Another advantage is that these ISPs are now able to provide technical support to other organisations. Once the example has been set, and the technical expertise is available, other organisations follow.

Company culture influences the readiness to adopt open source software. The case studies show that most initiatives for open source software implementation come from young people with (technical) experience in the ICT field. Organisational structures also play an important role. In Burkina Faso for example, organisations are traditionally structured according to strict hierarchy. These factors combined prevent open source software from being widely used.

Computer Weekly states: "Early adopters (of ICTs) will be more receptive, as will those who want a lower-cost way of developing bespoke systems[13]." Research by QinetiQ[14] shows that the influence of management is also strong during migration. The success of the project is dependent on the commitment of higher management.

Finally, the availability of certified technicians is critical. However, most training institutes focus on skills related to proprietary software, resulting in low availability of certified staff for open source software. For organisations to fully take advantage of open source software certified courses have to be developed for staff to be trained (see chapters "Certification" and "Internet user groups"). Only when sufficient certified and/or experienced technical support staff is available, can an organisation make informed decisions about the most appropriate software infrastructure.

[12] *Whether and to what extent this lower overhead is reflected in the rates charged to ISP-customers was not included in this research.*
[13] *Computer Weekly, http://www.computerweekly.com/articles/article.asp?liArticleID=121037&liFlavourID=1&sp=1*
[14] *http://www.govtalk.gov.uk*

Governments Take Action

What are the potentials of open source software for government?
The motivations for governments to develop a vision on open source software and formulate this in ICT policies include:

- Lower license fees can help reduce ICT costs within government(-supported) institutes
- Open source software can be adapted more easily than proprietary software into local languages
- Stimulus of domestic ICT industry through *active* use and adaptation of software, and through the support of open standards (avoid monopolisation)
- Avoid vendor lock-in: source code is made available to all users who wish to have it and can then be amended by others, without having to depend on a single developer
- Non-obsolescence: source code can readily be amended if new demands arise

Many governments have started formulating ICT-policies. Substantial differences in scope and focus can be found, including how issues pertaining to open standards are dealt with. Let us consider the cases of Burkina Faso and Uganda, and compare these to South Africa and the United Kingdom in more detail; the latter comprise strong examples of ICT policies on open source software.

Burkina Faso, Tanzania, Uganda

Burkina Faso has set up a government ICT division (DELGI), which so far has not favoured any open source projects, primarily because of lack of professional support and expertise. In Tanzania, the first National ICT Policy was approved by Cabinet in March 2003, focusing on modern, locally relevant infrastructure – not specifying whether this should be based on open or proprietary software[15]. Case studies from the Uganda government (Ministry of Water Lands and Environment and the Ugandan Parliament) on the other hand describe how open source software is implemented at certain ministries and other public institutes.

South Africa

The government of South Africa has opened a web portal on open source software including a strategy document describing open source policy framework[16] for the public sector[17].

The document “proposes a strategy to ensure that Government exploits the benefits that OSS can offer more systematically by both using available OSS and contributing to further OSS development. (…) By promoting OSS development the government could make a huge contribution to the OSS community. (…) By acknowledging the potential benefits of OSS and Open Standards, Government can contribute and benefit significantly”[18].

[15] *http://www.moct.go.tz/*
[16] *GITOC (Government Information Officers' Council), 2003*
[17] *http://www.oss.gov.za/*
[18] *http://www.oss.gov.za/docs/OSS_Strategy_v3.pdf, version 3.3, p.10*

The strategy builds on the premises[19] that:

1. Implementation of OSS should produce *value*[20];
2. *Capacity* to implement and maintain OSS has to be adequate, and
3. Sufficient *support* for the initiative must be given by all key players.

Recommendations[21] include:

- Government will implement open source software where analysis shows it to be the appropriate option. When proprietary and open source software are equally strong, opting for open source software will be preferable;
- An environment where open source software can be implemented must include:
  - Knowledge and understanding of and capacity to support the software
  - Fair and impartial procurement processes
  - Opportunities for trial use
- Open source software policies should be embedded in broader e-Government policy and related strategies for the ICT sector in the country, including the promotion of access to information for citizens and seeking more creative procedures to enhance access to Government's electronic service delivery.

A phased approach is suggested, starting with an introductory phase in which knowledge and understanding is created, leading to an enabling and finally a mature phase in which open source software is an equitable alternative to proprietary systems. In this situation knowledge, capacity and support is fully available and open source software will not only be used, but developed as well.

Although the South African government recognises clear advantages and strengths in open standards, this does not imply that it will be the exclusive choice for all ICT infrastructure[22]. The government has however adopted open source products, for example in OpeNet, a network for 40.000 government employees.

United Kingdom

In July 2002 the UK Office of Government Commerce published a strategy document on the use of open source software in the government[23]. The proposal states:

- UK Government will consider, on value for money basis, open source software solutions alongside proprietary ones in ICT procurements and will consider obtaining full rights to software code or customisations of COTS (Commercial Off The Shelf) software it procures;
- UK Government will seek to avoid lock-in to proprietary ICT products and services;

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[19] Moore Mark H; Creating Public Value; Harvard University Press, 1995

[20] Financial value can be enhanced by considering expenditures on licenses for proprietary software: an annual expenditure of 3 billion rand (US$352 million) for South Africa. (source: John Yarney, IDG News Service\West Africa bureau (2003))

[21] http://www.oss.gov.za/docs/OSS_Strategy_v3.pdf, version 3.3, p.24

[22] South Africa's Ministry of Education and Microsoft Corp. agreed to a deal in May 2002 whereby all 32,000 public schools in the country are provided with perpetual free access to the use of selected Microsoft software. (source: John Yarney, IDG News Service\West Africa bureau (2003))

[23] See http://www.ogc.gov.uk/oss/OSS-policy.html

- UK Government will explore further the possibilities of using open source software as the default exploitation route for Government-funded research and development software.

An implementation guidance paper[24] accompanied the policy, providing an overview of open source software strengths and weaknesses, how to deal with Intellectual Property Rights (IPR) and a set of questions that may help software purchasers avoid proprietary lock-in.

[24] *See http://www.ogc.gov.uk/embedded_object.asp?docid=2498, based on a research by QinetiQ after open source software implementation projects, see also http://www.ogc.gov.uk/embedded_object.asp?docid=1000435*

FORMAL AND INFORMAL CAPACITY DEVELOPMENT FOR OPEN SOURCE SOFTWARE

Internet User Groups on Open Source Software in Africa

A number of online communities targeting open source software or Linux in particular, are active in Africa, though the number of messages posted here is limited. South Africa has the most (active) user groups; others have been established in Uganda, Tanzania, Zambia, Burkina Faso and Ghana. These user groups are usually set up by "local champions" who take initiative in the field of open source, are part of a (local) network of people in this field and have substantial knowledge of and experience with the subject. Furthermore, there are many international user groups on open source software. All these in many cases fulfil the role of informal support networks[25].

A recently established initiative is the Free and Open Source Foundation for Africa[26]. FOSSFA was initiated to create a coordinated approach to support open source development, distribution and integration in Africa. In 2003 FOSSFA released an action plan[27] aimed at developing activities and partnerships in support of open source awareness and training.

Certification of Open Source Skills and Knowledge

The options for gaining certification on Linux and open source products in Africa are increasing. Just as for proprietary software, some of the training modules and tests are made available through commercial institutes (like Thompson Prometric or VUE), others are made available by non-profit organisations.

Non-Profit Certification

- ICDL (International Computer Drivers Licences): several test centres in Africa (Ghana, Zambia, Uganda, Tanzania, South Africa) are licensed test-centres. These exams focus on general, platform independent computer skills, like word processing, emailing, browsing, how to work with the operating system, etc.
- LPI (Linux Professional Institute) is an independent, vendor-neutral, certification body supported by the key players of the Linux community, e.g. Intel, IBM, Hewlett Packard, Silicon Graphics, SCO, SuSE, Mandrake, Linux International and O'Reilly. Several levels of certification are available, from basic Linux skills to advanced networking skills, in a number of African countries (Uganda, Tanzania, Ghana, Zambia, South Africa).
- Sair Linux and GNU Certification (in cooperation with Thompson and VUE) include installation, configuration, system administration, networking, security, ethics and privacy.

[25] *See "Resources and References" below*
[26] *http://www.fossfa.org/*
[27] *See http://www.fossfa.org/static/resources/FOSSFA_ACTION_PLAN_2003-2005.rtf*

Vendor-Specific Certification

- RedHat and SuSE both offer a range of vendor-specific certification, starting from basic user skills to complex Linux maintenance skills. RedHat and SuSE do not have any certification centres available in Africa at this time.
- UnitedLinux and LPI are preparing two certification programs (Professional and Expert) based on the existing programs from LPI. These should be available soon.
- MySQL certification by MySQL BA, the company founded by the lead developers of the MySQL server, provides two certifications: MySQL Core Certification (focusing on the use of MySQL for creating and updating database content) and MySQL Professional Certification (database management, installation, security, disaster prevention and optimisation). VUE provides the test centres where exams can be taken. These centres are available in several African countries.

Commercial Certification

- Linux+ by Comptia: The Linux+ certification validates technical competency and provides a broad awareness of Linux operating systems (installation, operation, administration and troubleshooting services). Comptia does not have any centres available in Africa.

CASE STUDIES: OPEN SOURCE SOFTWARE

The following five case studies illustrate key-factors encountered in the implementation open source software. Not all case studies reflect organisations in Africa, but illustrate lessons, applicable to organisational decisions, regardless of their locality.

Each of the case studies is marked by a number of symbols, referring to the open source software categories that are used within the organisation (see also chapter “What is open source software”):

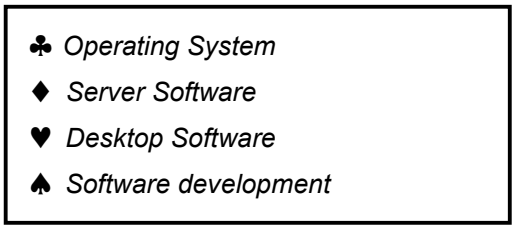

Figure 5: Legend of software types applied in organisations

Case Study: University Migration, Uganda Martyrs University

Categories: ♣ ♦ ♥ ♠

Background

Uganda Martyrs University (UMU) is located 80 km south of Uganda’s capital Kampala. The university has about 50 lecturers and approximately 2000 students, 50% of whom live on campus. An on-campus local area network has been established. All computers within the network have Internet connectivity. In the back-office Linux was already used in combination with Windows NT, and now the university wants to migrate the complete network to Linux and open source software.

Organisations and Key-Players

The university ICT-department is responsible for maintaining and expanding the local area network and all computers on campus, as well as for maintaining installed software. The Technical Assistant of the department (Mr. George Lule) has a technical background, with in-depth knowledge of and experience with Linux. The researcher-head of this department (Dr. John Kiazza) is an innovator, well informed of the potentials of ICT. With a total of eight staff, what the ICT-department lacks in size is made up in efficiency and innovation.

Martyrs University boasts a newly formed postgraduate course for Information Systems under the auspices of Prof. Victor van Reijswoud, who also plays an important role in advising and deciding on the software infrastructure. This researcher, with hands-on experience managing an ICT company in the Netherlands, initiated the process of migrating the campus to a Linux platform. The Vice-Chancellor of the university, Prof. Michel Lejeune, has been closely involved in decisions on the software infrastructure, showing the value of top-management buy-in for any

change process. The operational practicalities of the migration project are managed predominantly by Prof. van Reijswoud and the Technical Assistant.

Applications

Currently, several desktop applications are used at UMU. Table 4 illustrates the current – proprietary – software infrastructure, juxtaposed by the open source environment replacements to be adopted.

Current software	**In open source environment**
Windows 98 / 2000	Linux
Browsers (Internet Explorer)	Netscape Navigator
MS Access databases for the student administration	To be decided
Finance support software (Tally)	Not available for Linux
Web design software (Macromedia)	Bluefish
Microsoft Office suite	OpenOffice.org
Corel Office suite (including WordPerfect)	OpenOffice.org
CAD software for the Department of Architecture	CAD on Linux still to be tested
Software Development Tools like Visual Basic and Visual C++	To be decided, possibly Java
CDS/ISIS Library database and software	To be decided

Table 4 Current and alternative software at UMU

In the summer of 2003 most of the desktop computers will be migrated to Linux. There are still some uncertainties, for example how to deal with the CAD software, which, although available for Linux, has not yet passed a full quality-control. An open source alternative for the Financial support software has not yet been identified, so it is likely that a number of computers running Windows will be kept available for this.

In the back-office, the email and web server have been running stably for quite some time now on Linux (SuSE distribution).

Decision-making

What arguments were decisive in the university's decision to migrate to Linux? Prof. van Reijswoud explains that *cost* was the initial factor. *Piracy,* of the Windows operating system and the Microsoft Office suite, a ubiquitous phenomenon in Uganda up until now, is being quashed with Microsoft changing its licensing policies and the BSA prosecuting perpetrators of piracy. Furthermore, *deepening students' knowledge* and providing them with insight into the mechanics of ICT-infrastructure is an important motivation for changing to open source. By building this kind of ICT-capacity, the university takes in a unique position in Uganda (and in fact in the world), giving it a strong position amongst its competitors.

Implementation

Although the migration has not yet been completed, some preliminary conclusions can be drawn. First of all, although the students have shown enthusiasm and flexibility in the adoption of the new software, some staff members have shown some reluctance, even resistance.

However, by emphasizing the potential capacity building benefits, and the adaptability for the African context in particular of open source software versus the current, Western proprietary system in place, the ICT-department has begun an awareness campaign to reap further support. The question whether additional training for end-users (mainly staff) is necessary or not stays unanswered for the moment. Second, the functioning of some applications on the Linux operating system is uncertain (such as a CAD-alternative), and still needs testing. Some of the software is not available in a Linux-compatible alternative, which will probably result in maintaining one or more Windows computers. In terms of the choice of Linux distributions, a determining factor is that it must be compatible to all computers available at UMU, including some Pentium II computers. Several distributions have been evaluated, and at present it seems most likely that the Knoppix distribution[28] will be selected.

Despite the in-house technical knowledge, the team consults external parties for some of the highly specialised challenges. The creators of OpenOffice.org have committed to helping UMU in their effort, and a commercial company is available for further technical support where necessary.

Success?

As the migration is not yet complete, judging the success of the operation on the whole is premature. However, the project displays a number of key success-factors, such as buy-in from top management (the university Vice-Chancellor) *and* end-users (the students), the availability of strong technical support, and precedents providing experience to build on (successful implementation of open source in the back-office).

Case Study: Web Portal for the Government of Ghana

Categories: ♦ ♠

Background

The ministry of Information in Ghana required a web portal, to be created under the extreme time-constraint of three and half months. A local company won the tender and implemented the portal including a content management system (CMS) on time, using open source software. It is now available at http://www.ghana.gov.gh.

Organisations and Key-Players

The Ghana Ministry of Information decided to develop the portal and asked IICD, who had experience with such portals, for their strategic assistance. Operational management of the project was carried by the Ministerial Information Services Department (ISD), under direct supervision of the Minister of Information and Presidential Affairs, the Honourable J. O. Obetsebi-Lamptey M.P.

The Ghanaian Internet company (Soft Internet Solutions) selected to develop the portal is experienced in building complex websites, mainly using open source software. In terms of support during the implementation process: there is a Linux User Group in Accra, the capital of

[28] *http://www.knopper.net/knoppix/index-en.html*

Ghana. Many of Accra's technology workers are "OSS minded", although this is not yet reflected in the educational institutes providing certification and training: these are all focused on Microsoft and other proprietary software. Reflecting this, knowledge within the company assigned to build the portal has been acquired and kept up to date from books, hands-on experience and through (user groups on) the Internet.

Applications

The Ghana.gov portal was built using MySQL and PHP, both open source software. The content management system was custom-built by the local company for the Information Services Department, using open source technology.

Decision-making

The time restrictions for the implementation process limited the process of specifying the needs and doing research on possible products and technologies. The decision to outsource the implementation of the system was therefore quickly taken, also in light of the fact that the Ministry lacked experience and time to develop the software in-house. The local company selected for the job was considered sufficiently experienced and reliable, worthy of a ministerial tender.

The implementers chose for open source software for a number of reasons:

- Open source software is widely available through the Internet;
- There is a large support community available through the internet where experiences, questions, and answers can be found;
- Products can be customised to the needs of the customer, since the code is available;
- Open source software proved cheaper than other software, especially in view of licensing fees.

A disadvantage of open source software quoted by the implementer is that many products are updated daily, which makes it difficult to keep track of the latest developments. However, as the code can be freely adapted, obsoleteness is less of a problem than in proprietary software.

Implementation

During the implementation stakeholders from the Ministry, from IICD and from the Internet company regularly met to discuss the functionality of the content management system and the portal. Two people from the local company were directly involved with the Ministry in developing the system. The frequent contact and direct communication between the stakeholders was one of the reasons that the tight deadlines could be met.

Success?

The website is now up and running. The government is in the process of expanding the portal to other ministries and expanding the information base. In these terms, the project can be considered a significant success. An important consideration for the longer term is whether an

"off-the-shelf" open source content management system should be used instead of the custom-made application. An off-the-shelf system might prove to be more robust, easier to extend, more flexible and, on the long term, provide more independence from external parties for the Ministry.

Case Study: Development Agency Bellanet, Canada

Categories: ♣ ♦ ♥ ♠

Background

Bellanet's mission is "to help the international community to work together more effectively, especially using information and communication technologies (ICTs)." Bellanet focuses on development partners in the South and in the North.

Bellanet is embracing open source software in three ways:

- By migrating the internal network to open source software
- By using open source products for developing software
- By publishing software under the General Public Licence (GPL)[29]

This case study will focus on the migration of the internal network and on the use of open source software for one of the applications Bellanet has developed (Dgroups, see below).

One of the organisation's activities involves the development of software that supports organisations in sharing knowledge over the Internet. An example is the *Online Project Appraisal* (OPA), a management application supporting several workflow processes[30]. OPA has been published under the General Public License (GPL) and is written with an open source development tool (PHP). Another example is Dgroups[31], which is a web-based system for supporting online development communities through discussion groups and shared calendars. Currently the Dgroups platform is written in a proprietary language (ColdFusion), but a project is underway to investigate the migration of Dgroups into open source.

Bellanet is in the process of migrating their internal network from proprietary to open source software.

Organisations and Key-Players

Currently, Bellanet staff consists of 20 people, most of whom have a technical background and are involved in the internal migration process.

Concerning the development of Dgroups, a number of people from the consortium in- and outside of Bellanet is involved in an ongoing Dgroup discussion investigation the migration of the platform onto open source software.

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[29] *See "Open Approaches to Development - Open Standards, Content and Software", Mark Faul 2003*
[30] *http://sourceforge.net/projects/opa/*
[31] *www.dgroups.org, a consortium of Bellanet, DFID, ICA, IICD, OneWorld, UNAIDS and UNECA*

Applications

Half of the servers at Bellanet are currently running on open source software, which includes Linux, web servers (Apache), email servers (Mailman) and web development tools (PHP). The other half of the servers is still running Windows NT and other proprietary software, like web servers (IIS), email server (Lyros), database systems (MS Access) and web development tools (ColdFusion). Most desktop computers were migrated to Linux, installing open source browsers and email clients. Word processing software (OpenOffice) is installed on both Linux and Microsoft computers.

Decision-making

One of the main reasons why Bellanet started to use open source software within their organisation is to get hands-on experience with it, in order to be able to give their partners well-informed advice on the subject. Another reason is cost reduction pertaining particularly to licensing fees.

Bellanet quotes advantages of developing software using open source as a more collaborative process, reflecting their mission. One does not have to pay for development tools in contributing to the code, so deployment of the system involves lower costs. A negative aspect quoted by Bellanet is that implementation and migration is very time consuming. This will be explained in more detail in the next paragraph.

Implementation

Quality of professional technical support has been an import issue to Bellanet. When using proprietary software, there is always a company backing the product, able to provide this support. When using open source software one is not certain of support and depends to a large extent on informal support structures such as user groups. However, in some cases, these communities have proved to respond faster and better than professional support companies.

Nonetheless, because of this scarcity of professional support, deciding what open source product is best suitable for the organisation, and what user community is able to give the best support, becomes a time-consuming process. For example, the selection of a web development tool is done by following the activities of a user-community and finding out how active the community is in responding and interacting. Therefore, a certain degree of autonomous decision-making and in-house expertise, as well as the time to do the research, appears to be a requisite when making such choices. Deciding on what software to use for each level of ICT-infrastructure involves a lot of testing, and in projects such as the Dgroup consortium, collaborative decision-making.

The internal migration to open source software at Bellanet is executed gradually. In the current situation, most Bellanet desktops have been installed with Linux RedHat, and a number of different systems and applications are being used and tested by various staff members, Bellanet aspires to a situation in which one distribution and compatible set of applications is adopted. This can be a complex process. For example, a Bellanet partner organisation uses WordPerfect, which is incompatible with OpenOffice. However, an auxiliary piece of software called Win4Lin relieves this problem, allowing Microsoft Windows software to run on top of Linux. Such scenarios all need to be considered, before full migration is completed.

Success?

In terms of in-house capacity building, Bellanet has gained experience in the adoption of open source products; ICT-costs have gone down thanks to a reduction of back-end and partial desktop licensing fees, so in this respect, the migration has provided successful results. Bellanet will document and publish the whole migration process for other organisations to learn from.

Case Study: Web Design Company ColdReed, Zambia

Categories: ♦ ♠

Background

ColdReed is a small Zambian web design company that develops web sites using open source software like PHPNuke, PHPB, Plone and MySQL. The company also provides consultancy on Internet server security and network installations.

Organisations and Key-Players

ColdReed uses predominantly, but not exclusively, open source products for their web development projects. The MCSE-certified owner (Mr. Gareth Huntley) is at the same time the company web server administrator. All other skills are self-taught, based on information from the internet and practical experience. The principal web designer (Mr. Michael Zulu) is experienced in using PHP and MySQL for developing web sites; he is also actively involved in modifying existing open source products.

Applications

In addition to proprietary software (like Fireworks and Dreamweaver), ColdReed uses open source software for their web servers and for the development of websites for their customers. This software includes a programming language (PHP), a database management system (MySQL) and content management systems (PHPNuke, PHPBB, Plone).

Decision-making

ColdReed's most important reasons for choosing open source software include:

- The absence of expensive license fees;
- Being able to tailor and improve software so it suits specific needs;
- The availability of support through internet discussion groups;
- Stability.

A disadvantage quoted is that installing open source software is more complex.

Implementation

It is very difficult to find qualified web developers in Zambia, especially with hands-on experience besides theoretical knowledge. However, this does not deter ColdReed from contributing to software modifications. This mostly involves adapting scripts to change the presentation of websites. According to ColdReed, there is a lack of good WYSIWYG (What You See Is What You Get) web development software for Linux, so the code-adaptability is a benefit.

Success?

Despite the challenges of finding qualified developers and scarce support, using open source software has turned out to work well for ColdReed. ColdReed has a competitive advantage in terms of developers' expertise, who are not only able to develop websites, but also understand what goes on "under the hood". ColdReed is also familiar with proprietary systems, maintaining the flexibility to adapt to a client's wishes in any which way, whilst being equipped to provide unbiased advice on *appropriate* technologies for their clients – whether proprietary or open source.

Case Study: Digital Communities: Chaski Global Teenager Project, Oruro, Bolivia

Categories: ♣ ♦ ♥

Background

A number of schools in the Oruro district in Bolivia are set up with computer networks as part of the Chaski Global Teenager Project (GTP)[32]. Computers shipped in from the Netherlands were installed at primary and secondary schools in the Oruro urban as well as rural areas. The computers are installed with open source software.

Ayni Bolivia-Nederland Foundation, an organisation targeting poverty reduction in Bolivia, has initiated the Chaski GTP, aiming to improve education in Bolivia through harnessing the potential of ICTs. The project includes 20 schools, 50% of whom are part of the Global Teenager community.

Organisation and Key-Players

Two local staff (Borys Espada and Sigrid Ortega) installed the computers and networks and are responsible for training the local administrators. With four years of experience of open source, they have advanced knowledge of its implementation at a number of levels. The NGO staff has various degrees of technical and organisational experience, and IICD is closely cooperating in the project by advising the project members on both technical and non-technical matters.

[32] *See www.iicd.org/globalteenager.*

Applications

At all urban schools participating in the programme, a local area network is installed, with access to the Internet through a gateway server. Servers are being installed with the Linux Conectiva distribution, as are all desktop computers

In rural areas a Windows environment was implemented because of the lack of local technical support. Logistic barriers make it impossible for the central support team to give adequate technical assistance, the schools sometimes at 4 or 5 hours travelling distance.

Decision-making

Decisions on ICT implementation are made by Ayni Bolivia-Nederland directors together with stakeholders from the Chaski project. One of the motivations for choosing open source software was the lack of or low licensing costs, with the appropriate technical support being available to the project. Furthermore, it was argued that people able to handle Linux are easily familiarised with Windows, which is generally not the case the other way around, so in this way users are equipped to be more versatile in their use of ICTs. This being a predominantly educational project, this was a decisive factor.

However, in Bolivia on the whole Windows is used almost everywhere. Commercial enterprises always use Windows, thus skills in handling Windows are indispensable.

Implementation

With some technical support from IICD, local technical staff installed the networks and software, though a lack of knowledge concerning the configuration and certain applications made it into somewhat a ‘learning by doing’ exercise.

Training is provided to all network and computer administrators at all schools targeted by the project, providing them with about 80% of necessary primary skills for maintaining the network. Troubleshooting remains problematic and outside support is needed when problems arise. However, all participating schools have a local area network and Internet connection available, allowing the administrators to access Internet resources and help-groups. Nonetheless, according to the project managers more on-the-job training is needed for the project to become a success.

The ad-hoc changes made to the software, without always being able to change it back to the original configuration, are a problem. Furthermore, administrators lack the knowledge or support to install extra hardware like scanners and web cams.

The willingness and ability amongst teachers to adapt to new technologies is critical to the success of the project. To maximise this effect, teachers have been trained and are provided with permanent support for troubleshooting. In addition to that, off- and online working groups allow colleagues with the same interests to exchange experiences and share knowledge.

Success?

Although some hiccups have been encountered, the implementation of the programme has been working out relatively well so far. If the teachers succeed in convincing the community that learning new software is an advantage rather than a difficulty, the project will be successful.

Project managers are exploring the possibilities of setting up a small ISP in the Oruro region in order to lower the costs for Internet connectivity and provide the schools – and the community – with better, more reliable services.

Other Case Studies

Other case studies can be found at:

- http://www.li.org/success/
- http://www.opensource.org/advocacy/case_studies.php
- http://www.itpapers.com/cgi/SubcatIT.pl?scid=262&wc=3
- http://www.redhat.com/solutions/info/casestudies/
- http://www-3.ibm.com/software/success/cssdb.nsf/topstoriesFM?OpenForm&Site=linuxatibm

Q+A ON OPEN SOURCE IN ORGANISATIONS

In this chapter a number of questions about open source software are raised by four characters in a fictive organisation. The questions are related to the use of and possible migration to open source software in the software infrastructure of this organisation. The questions articulate possible concerns a person in each of these positions might have, the answers can support their decisions on software infrastructure, and how the use of open source software would affect their job.

Scenario: all four people profiled have a different responsibility in the organisation, each of them formulating different kind of questions relating to their position. The organisation consists of around 100 employees, though most of the answers are valid for other types of organisations as well. Open source software is being considered as a replacement of the current proprietary software. Let's introduce our characters.

Orson is the director and as such responsible for the whole organisation. In his eyes, software infrastructure is an important factor in the continuity of the organisation and ICTs should facilitate the working process in an effective way. The costs that are involved in implementing and maintaining the software infrastructure are an important factor to him.

Sarah is the Chief Information Officer (CIO); she knows how to work with a computer, but not how to configure an email server or replace the hard disk of a computer like Susan does. Sarah is responsible for managing the ICT-department, and has some contacts outside the organisation that are related to her job.

The third person is ***Susan****,* a systems engineer and responsible for maintaining the computer servers (for email, for file sharing and the intranet) as well as for desktop computers and the software running on it. She has knowledge of computers, of both hard- and software, has a lot of hands-on experience, mainly focused on the Windows operating system and other Microsoft products.

The fourth person is ***Patrick***, an employee of the marketing department. The productivity of his work depends much on the availability of the computer network. Above all, he uses a word processor, a web browser, and an email client. He also wants to be able to share documents with colleagues using the internal network.

Orson, Director

Q: What background resources are available to help me understand the issue at hand?

There are a number of articles available on the web on the use of open source software within an organization aimed at managers and directors, for example "The Practical Manager's Guide to Linux, Can you profitably use Linux in your organisation?"[33] and "Five things every IT manager should know about Linux"[34].

[33] *http://linuxsolutions.hypermart.net/manager.htm*
[34] *http://www.computerworld.com/softwaretopics/os/linux/story/0,10801,78340,00.html?OpenDocument&~f*

Q: How can I calculate how much money I might save by migrating to open source?

The biggest financial advantage of open source software is the savings in software licenses. However, costs for training, acquiring skilled personnel and support will most likely increase. The term *Total Costs of Ownership* (TCO) is often used in this context. TCO was introduced by the consulting group Gartner[35] and refers to the direct and indirect costs related to the use of an ICT-component, such as, in this example, a network infrastructure based on open source software. TCO should include costs for administration, upgrading, licenses, technical support, training, and more. Determining the TCO means calculating the real costs that come with implementing an ICT-component, which can help you decide what option is best.

A number of studies are available in which a comparison is made between the costs of implementing and maintaining a network based on proprietary products (such as Microsoft) and one based on open source software (including Linux).

> Cybersource published a study showing that savings of 25% - 35% can be achieved by migrating to open source software, *depending on whether hardware was already purchased*. These results are based on a calculation of the TCO for an imaginary organisation with 250 computer-using staff, an according number of workstations and network servers with Internet connectivity. Furthermore the infrastructure includes an e-business system, network cabling and hardware, standard software, costs for training for end-users and salaries for ICT professionals to establish and support this infrastructure and technology.
>
> *http://www.cyber.com.au/cyber/about/linux_vs_windows_tco_comparison.pdf*

Such figures are debatable, as in some cases costs will actually increase because support and skilled personnel are more expensive. Most studies are based on a period of three years, but especially in the long run open source seems to be an appropriate money saver. Expectations are that with open source software becoming more popular, the costs for support and skilled personnel will probably drop.

As each organisation is different, so are their ICT-needs, and the possible savings which can be achieved by choosing a certain type of software infrastructure. Therefore, each organisation needs to calculate their own TCO to get a reliable picture; however, the *factors* to be considered in calculating the TCO (training, licence costs, etc.) are fairly constant. A number of articles are available on the Internet dealing with TCO of software infrastructure which can be a help in calculating the TCO. Two good examples are “A comparison of TCO for Windows and Linux environment”[36] or “The Great Linux-Windows NT Debate”[37]. (See also “Sarah”, “How do I determine which software is the best alternative?”)

> **TCO for software infrastructure**
>
> TCO should be calculated based on expenditures like license fees, support and courses for personnel. A number of studies are available on the Internet, reasoning that TCO is lower for open source software infrastructures, other studies show that they are higher. Most studies show that the larger the ICT infrastructure, the more feasible open source becomes.
>
> Open source software is cheaper in terms of license fees. On the other hand, formal technical support is often more expensive and more difficult to find. Informal support networks are an active and inexpensive way of dealing with this.
>
> Most important is that organisations should calculate their own TCO in order to get a realistic overview of the costs involved in implementing or migrating a software infrastructure.

[35] *http://www.gartner.com*
[36] *http://www.cyber.com.au/cyber/about/linux_vs_windows_tco_comparison.pdf*
[37] *http://www.linux-tutorial.info/Linux-NT_Debate/*

Q: Can I find skilled personnel who know how to deal with open source software? Are they more expensive?

The availability of skilled personnel depends on what region you are in. The research presented in this report shows that in Uganda, Tanzania and Burkina Faso there is a lack of experienced people, who know how to deal with open source software. The number of institutes that offer training in applying open source software is low, certified personnel is hard to find. So far, most people have been trained in-house or in institutes outside the country. People also educate themselves through books and the Internet. Because of their scarcity, trained, skilled and certified personnel or support staff is likely to be more expensive. However, making use of the informal support networks through the Internet is a fairly common and inexpensive way of dealing with this.

Q: What if open source is just a hype and is not viable in the long run?

QinetiQ states in a 2001 UK government research report: "Our first key conclusion is that OSS is indeed the start of a fundamental change in the software infrastructure marketplace, and is not a hype bubble that will burst"[38]. Well-known research institutes like Giga, The Meta Group and Gartner foresee a growth in Linux and other open source products, especially on the back-end of networks[39]. Also, corporate support by companies like IBM, Sun, Oracle and Veritas for Linux and open source technology is increasing.

For other less common open source software, such as web development tools, it is more difficult to decide what will be the viability in the long run. In such cases, the advantage of an open source product is that when commercial support is no longer available, one can still decide to support or adapt it oneself: the source is available.

Q: Can you show me some examples of organisations that *migrated* to OSS?

It is difficult to find examples on the Internet that describe how large companies have migrated to open source software possibly for protection of their competitive advantage attained in their infrastructure[40]. However, a number of examples include:

- Schwäbisch Hall, a town in Germany is in the process of deploying open source software for government employees[41]
- Uganda Martyrs University (see case study above)
- Yahoo.com[42]
- Google.com search engine[43]
- The city of Largo, Florida[44]

Research by Open Forum Europe[45], shows that according to CIOs there is a need for more examples and case studies in order for open source software to become more accepted. In support of this need, July 2003 saw the launch of the FOSSFA Community Database[46] as a resource for African open source practitioners. As this decentralised database grows, such cases should become easier to identify and follow.

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[38] *QinetiQ 2001, http://www.govtalk.gov.uk/documents/QinetiQ_OSS_rep.pdf*
[39] *See http://www.veritas.com/news/press/FeatureArticleDetail.jhtml?NewsId=9570 and http://news.bbc.co.uk/2/hi/technology/2680955.stm*
[40] *http://www.ogc.gov.uk/embedded_object.asp?docid=1000435*
[41] *http://www.suse.de/en/company/press/press_releases/archive02/german_city.html*
[42] *http://www-1.ibm.com/linux/casestudies/index.shtml*
[43] *http://www.redhat.com/solutions/info/casestudies/google.html*
[44] *http://techupdate.zdnet.com/techupdate/stories/main/0,14179,2860180,00.html*
[45] *http://www.openforumeurope.org/research/oss_market_perception_followup.pdf*
[46] *http://fossfa.org/database/*

Sarah, CIO

Q: What are the pros and cons of open source software?

A guide produced by the British Office of Government Commerce (OGC) on implementing open source software[47] provides an overview of benefits and weaknesses of open source software. These include:

PROS	CONS
• OSS tends to have strong support for open standards for interoperability • OSS is supplier independent • OSS has lower or no licensing costs (significant license cost reduction) • OSS tends to be portable to a wide range of platforms • Patches or updates tend to be produced very rapidly • Avoidance of proprietary lock-in	• Uncertainty as to what exactly constitutes OSS • Fear that support can be fragmented or difficult to obtain • Misunderstanding of the licensing and IPR implications of using or purchasing OSS • Difficulties in identifying appropriate OSS applications for particular business problems • Documentation can be informal or sometimes non-existent • Lack of real world experience and support for migration from closed proprietary software installations to OSS • OSS software often lags behind proprietary software in support for new hardware

A *Microsoft* comparison argues[48] that their small business server is preferable over open source technology because:

- The number of applications running on Windows is much higher
- Open source technology often lacks complete programmer toolkits
- Ease of installation
- Linux is an open-source operating system with limited company-based support
- Greater availability of certified consultants
- Linux is typically much slower than Microsoft in staying current with new hardware requirements and new technologies

Although the objectivity of their comparison is debatable, a number of important considerations are raised.

Obviously, there are strong arguments supporting both technologies. It is up to the decision-maker to make up a cost-benefit analysis for his or her particular case.

Q: How do I determine which software is the best alternative?

A number of factors play an important role:

- Total Costs of Ownership (TCO): what are the differences in TCO when migrating to a different software infrastructure?
- Organisational needs: what software infrastructure is needed by the organisation and which alternatives are available?

[47] *http://www.ogc.gov.uk/embedded_object.asp?docid=2498*
[48] *http://www.microsoft.com/SBSERVER/evaluation/compare/linux.asp*

- The availability of support
- Availability of skilled people: are there people within or outside the organisation who are skilled in using open source (or able and willing to learn it quickly)?
- The commitment of management to migrate to open source
- The willingness of users to learn new skills
- Aspects like openness, dependence on vendor, flexibility

In the appendix to this report two decision models are included, based on these factors, which can support CIOs from small and larger organisations by providing a *preliminary* guideline to determine whether open source software is a viable alternative for their organisation. The first model is suitable for small organisations without back-office and without server software, where staff uses computers mostly for browsing the Internet, emailing and word processing. The second decision model is intended for larger organisations that do have a back-office and who run software like web and email servers. In addition to these standard applications, the organisation might also run less common software to support the specific needs of the organisation.

Q: What configurations for our software infrastructure are possible?

A common misconception is that software infrastructure consists of *either* proprietary *or* open source software. The opposite is true: all kinds of configurations are possible. For example, a fairly common configuration is using open source software in the back-office (Linux, Apache web server, Sendmail email server, SAMBA for file sharing), while using proprietary software in the front-office (Windows, Microsoft Office, Internet Explorer). It is also possible to run proprietary software in a Linux environment, or open source software in a Windows environment. This provides a major advantage, namely that migration can be established gradually, for example by starting with the back-office, and if successful, only then continuing with the front-office.

Q: Is there such a thing as a "roadmap" to guide me through a migration trajectory?

Ithaca Solutions describes a set of 20 initial steps as part of a migration roadmap for managing the process[49]. The same article provides a guideline for migrating a number of specific applications including file sharing, Outlook email server, IIS web server and databases.

Many configurations are possible, and migration from proprietary software to open source software can be executed gradually. For example, a common scenario is to start by deploying Linux servers for file and printer sharing, web hosting or other services: applications where open source software has proven to be successful. This way an organisation is able to incrementally build experience and knowledge in applying open source software.

A QinetiQ survey[50], profiling organisations that migrated to open source, shows that in most cases an external consultant is contracted. Such expertise on open source and migration scenarios can add to the success of the project but of course this has cost implications, which should be included in calculating the TCO. QinetiQ: "*The most successful of the reviewed implementations applied the most formal approach*." Applying proven project management tools are an important key to success.

[49] *http://www.ithaca-solutions.com/pdf/29.pdf*
[50] *http://www.ogc.gov.uk/embedded_object.asp?docid=1000435*

Q: What problems can I expect when implementing open source software?

Most problems encountered are not caused by the fact that open source software is implemented but by factors that can occur during *any* implementation project[51], and have to do with such factors as project management, organisational change, etc. In that sense, implementing open source software is just like implementing any other kind of system or network. Again, sound project management is a critical success factor for the implementation process.

Q: Where can I get certified personnel?

Though still scarce, there are a number of certifying institutes available in Africa. More on this is explained above in the chapters on "Internet user groups" and "Certification".

Q: Where can I get support?

"*Support is the major concern for corporate users of OSS and associated costs are currently higher than for commercial software. This is a typical supply and demand factor which should decrease over time*", says Ithaca Solutions[52].

The research presented in this report indicates that local support is not always available, which is a big concern to CIO's in Africa. However, following increasing demand, the number of training centres that focus on open source is increasing, and with the rising number of open source users, support centres will probably also become more available.

To compensate this scarcity of formal support is the availability of a large and active online community that can be consulted through user groups and mailing lists (see chapter "Internet user groups on open source in Africa"). Response time depends on the software you are using: more commonly used software like Linux or the Apache web server, have a very lively online community, while other communities might be less active. Unless an organisation has expertise in-house, this might be a consideration when making a software choice.

The availability of documentation depends on the software, for example "The Linux Documentation Project" provides an abundance of support documents including HOWTOs, FAQs, Guides, etc., that explain the usage of Linux[53].

Q: Is open source software compatible with proprietary software, for example OpenOffice.org and Microsoft Word?

Not all open source software is compliant to proprietary standards. OpenOffice.org can generally be used to open and save Microsoft Word files. Other cases can be more problematic. For example, using Outlook clients, sharing address books and schedules might be tricky when using open source server software[54]. For most problems, numerous software solutions are available depending on the organisation's preferences and choices.

When common proprietary vendors (such as Microsoft) release a new version of their software, it takes some time before open source products can be adapted to the new format. The time for OpenOffice.org to be updated after a new version of Microsoft Office has been released is estimated at 6 months.

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[51] *http://www.ogc.gov.uk/embedded_object.asp?docid=1000435*
[52] *http://www.govtalk.gov.uk/documents/QinetiQ_OSS_rep.pdf*
[53] *http://www.tldp.org/*
[54] *SuSe offers a product to deal with this, see http://www.suse.com/us/business/products/suse_business/openexchange/*

Susan, ICT-specialist

Q: What open source software is available?

Several websites are available that list open source software[55]. Software ranges from operating systems like Linux to server-software, databases, web development tools, application servers, and desktop applications, like word processors and email clients. Open source software is available for all kinds of platforms (including Windows, Linux, MacOS, etc).

Open source software is not Linux

A common misconception is that Linux is the only or one of just a few open source software products available. In fact, for most types of software open source variants are available. A brief overview:

Word processing	OpenOffice.org, Star Office
Mail clients	Mozilla, KMail
Browsers	Mozilla, Konqueror
Graphical and video editors	The Gimp, VirtualDub
Mediaplayer	Coolplayer
Web servers	Apache
Database	MySQL, PostgreSQL
Filesharing server	Samba
Scripting language	Perl, PHP, Python

More resources that list available open source software can be found in the chapter "Resources and References".

Q: What software runs on Linux?

A number of big companies have put efforts into supporting Linux. Oracle database management systems run on Linux, IBM's Websphere does as well. More and more companies are porting their software to platforms like Linux.

Q: What are the pros and cons of Linux?

In terms of support, http://www.suncoastlug.org/proscons.html provides a clear overview of the pros and cons of Linux. These include:

PROS	CONS
• More flexibility • Use of open standards • Distributed development and collaboration • Price/performance • Lack of license fees • Lack of vendor lock-in • Better security • Better stability	• Lack of ownership • Uncertainty of future development roadmap • Less hardware support

[55] *For example http://www.sourceforge.org or http://www.asiaosc.org/enwiki/page/Major_OSS_packages.html*

Q: When migrating to a complete open source environment, what to do with software that runs on?

Several options are available:

1. Software like RealVNC[56], Citrix[57] or Windows Terminal Service[58] allows users to access a Windows machine from within a Linux environment. Users can run Linux, but also have access to Windows software this way, though it is necessary to keep a Windows computer available on the network.
2. A second option is replacing the software with another (open source or proprietary) product that is more versatile. (As shown in the UMU case study, Microsoft Office can be replaced by OpenOffice.org.)
3. A hybrid network can be implemented, keeping one or more Windows computers directly accessible for users. These computers can be dual bootable, which allows the user to choose which operating system to use at start-up.
4. An increasing number of software vendors produce their software not only for Windows platforms, but for other operating systems like Linux as well. Migrating those products from a Windows to a Linux environment is then not problematic. As an example, the Uganda Martyrs University (UMU) case study (see above) describes that CAD software is available for both Windows and Linux, allowing the university to keep using the same product in a different environment.
5. The Bellanet case study (see above) illustrates another possibility: tools like Win4Lin[59], Wine[60] or VMWare[61] allow you to run a Windows environment *on top* of Linux. Software suitable only for Windows can then be run from a Linux environment, without keeping a Windows computer available.

Q: What Linux distribution should we use?

Giga[62] lists a number of criteria when selecting a distribution. The most important ones according to Giga are:

- Available service and support for implementation
- Application support
- Vendor's financial situation
- Original Equipment Manufacturer (OEM) relationships (agreements of vendor with other suppliers)

Other criteria are user friendliness (installation, interface, etc), hardware requirements and support. Organisations should decide what criteria are most important, based on the organisational configuration as well as whether it concerns desktops or servers.

The availability of support in the region is often quoted as one of the most important criteria. In Uganda for example, SuSE has been used most, which results in better support for this particular distribution. This in turn motivates other organisations to also select SuSE. Each distribution has its own characteristics; a good overview is provided on http://www.asiaosc.org/article_5.html

[56] *http://www.realvnc.com*
[57] *http://www.citrix.com*
[58] *See http://members.home.nl/stoelie/citrix.htm for more information on Terminal Servers and Citrix*
[59] *http://www.netraverse.com/*
[60] *http://www.winehq.com*
[61] *http://www.vmware.com/*
[62] *"Linux has gone mainstream: are you up to it?", June 2002*

Linux distributions

Linux is available through a variety of distributions, including commercial distributions such as SuSE and Redhat, or non-commercial alternatives including Knoppix and Debian. All distributions use the same base (the Linux operating system), but differ in aspects such as:

- Ease of use and installation
- Availability of extra software
- Upgrade frequency
- Licensing

An interesting comparison of Linux distributions can be found at http://www.asiaosc.org/article_5.html. Besides important technical considerations, the availability of local support is perhaps the most critical, especially for organisations in Africa, where expertise is scattered and scarce. Often just one or two distributions are supported by companies within a certain country.

Q: Does Linux support all available hardware?

A disadvantage of Linux compared to Windows is that Linux supports less hardware. Many hardware producers focus on writing drivers for Windows first and Linux comes in second place (or not at all). This results in new hardware not always being supported by Linux. Companies like SuSE and RedHat have published lists of supported hardware on their websites[63].

Q: How about security of open source software?

The level of network security in an organisation is determined by many factors, including choice of software, their network configuration, personnel awareness, security policies, etc. Thus the level of security reached within an organisation involves far more than the choice of software. Having said that, security breaches in proprietary products are encountered more frequently than in open source products. One of the reasons might be that these proprietary products are more widely used than others, another might be that it is more of a challenge to break into code which is not openly available. With open source software becoming more popular, the number of attacks will probably also increase.

Q: How do I get the proper knowledge to support our open source infrastructure?

Besides the option to follow courses locally or through the Internet, one can join user groups on the Internet in order to share experience and gain access to a network of people with knowledge and skills. Formal courses focusing on open source software and Linux in particular are still scarce, though they are available (see chapter on “Certification”). The case studies show that most skills and knowledge are acquired through experience and by accessing resources on the Internet (websites, user groups, etc).

Patrick, Marketing Assistant

Q: I have never worked with open source software before; will I need to put a lot of effort into building up my skills again?

Concerning open source operating systems, Linux and other Unix flavours have the prejudice of being user-unfriendly and only suitable for ICT experts. Today a number of Linux distributions and desktop environments are available that can be easily used by inexperienced computer users. Most Linux distributions are delivered with a graphical interface. Desktops are available that resemble Windows XP in almost every way.

[63] *http://www.suse.com/en/business/certifications/certified_hardware/index.html and http://hardware.redhat.com/hcl/?pagename=hcl*

As far as applications like word processors and email clients are concerned, user interfaces of these kinds of products are often very similar in either flavour. Thus, user interfaces of open source software can resemble proprietary software, allowing users to easily adopt the new software. The Bellanet case study (see above) shows that sometimes no training is needed at all, depending on the degree of general computer literacy within the organisation.

Q: Will I still be able to use and update my existing material if we migrate to open source software?

This depends on the kind of software used before migration. If documents have been produced in open standard formats, chances are high open source software can deal with these documents. Microsoft Word documents can be opened using OpenOffice.org, other kind of documents like spreadsheets and presentations might be more difficult to access, although auxiliary software is available to overcome this obstacle. CIOs should decide how to deal with these issues before migrating desktop computers.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The research conducted in Uganda, Tanzania and Burkina Faso shows that open source software is not uncommon in Africa. The many open source initiatives, user groups, research projects, applications, discussions and conferences increasingly popping up around the world, indicate that increasingly open source software needs to be considered as part of making informed decisions about ICT-infrastructure.

Open source software is not the best alternative for every organisation, in terms of cost, support, willingness to change, expertise, organisational dependency on ICTs, size of the organisation, etc. In the appendix a decision model is presented, as a support tool for decision-makers, offering a preliminary indication which type of software is a viable alternative for an organisation. Each organisation has to calculate for itself, weighing each factor in terms of their unique situation, the total cost of ownership of sticking with proprietary software, versus implementing or migrating to open source software.

Nevertheless, a number of general conclusions can be drawn:

- ***Open source software can be a worthy alternative***

  In some sectors open source software has proven to be a true alternative to proprietary software, both in terms of technological reliability as well as financial value. Most applications are available in proprietary and open source varieties.

  Country research indicates that most Internet Service Providers have had their servers run on open source software since they started. The private sector is generally familiar with open source software but is hesitant to implement it at a user level (as opposed to network level). Some universities and governments have acknowledged the opportunities of open source software and reflect this in policies.

  One can conclude that open source software can be a viable alternative to proprietary software, if carefully implemented. Total Cost of Ownership (TCO) can be lower, open source software avoids vendor dependency and is compliant to open standards, thus offering the possibility to alter the software. Generally, the larger the organisation and the longer the term, the more attractive it becomes to migrate (part of) the infrastructure to open source alternatives.

- ***(Top) management buy-in is a critical success factor for an implementation or a migration to succeed.***

  Without thorough project and change management and adequate thought given to the implications for each computer-user in an organisation, sweeping changes to ICT-infrastructure are less likely to succeed.

- ***Most open source software is used for back-office applications***

  Linux operating systems and open source web and email servers are the most commonly used open source applications. Web development tools and content management systems are also often based on open source software. Desktop use of open source software is still limited but is incrementally gaining popularity as user groups gain momentum and value, as professional support improves, and as licensing regulation becomes more severe. This is reflected in Africa as well as in Europe and the United States.

- ***Awareness and image-building is necessary***

  Open source software tends to be perceived as complex and user-unfriendly, and only useful for ICT specialists. Furthermore, open source products other than Linux are not very well known, despite the fact that all kinds of open source products are available. For open source models to be considered as a true and viable alternative to proprietary software, awareness needs to be enhanced.

- ***Professional support for Linux is available, though still scarce***

  This is reflected in the limited number of certified personnel with demonstrable knowledge and skills of open source software, and augmented by the fact that most training institutes focus on proprietary software like Microsoft Windows and Office. Without adequate professional, certified technical support, open source software can not be adopted by professional organisations whose income depends on the reliability of their technical infrastructure. *This is the major obstacle indicated by decision-makers as barring their choice for open source software*.

- ***Software piracy is common practice***

  Few African countries have laws protecting intellectual property, but many are in the process of developing these. Microsoft's new licensing model and the activities of the Business Software Alliance (BSA) will make use of illegal software less easy and less attractive.

- ***"Champions" influence government choice of software flavour***

  The Uganda case studies describe the implementation of open source software by the Ministry of Water, Lands and Environment and the Uganda Parliament. Similarly, in Namibia, open source is the software type of choice in the education sector, largely due to one strong advocate. Burkina Faso has a strong tendency to favour proprietary software, reflecting the preference of government IT-agency DELGI.

- ***Familiarity outdoes innovation***

  In terms of ICT-infrastructure, people rather conform to what is popular in the mainstream, and are reluctant to introduce new technologies, despite potential financial gains. 'Young', un-hierarchical organisations are most likely to adopt new technologies or new business models, and the higher the education of the ICT-decision-makers, the more effective the ICT-policies and utilisation within the organisation.

- ***Tools for informed decision-making are insufficient***

  Adequate information on different kinds of software infrastructures, possible migration paths and relevant case studies is under-documented. Formal support for migration scenarios is practically non-existent. Therefore decision-makers are poorly equipped to make well-informed choices for proprietary or open source ICT-infrastructure.

- ***ISPs have played an important role in the introduction of and business sector familiarisation with open source software***

  Linux in particular is a popular option for ISPs because of the lower costs involved; for example Uganda shows high permeation of this open source alternative in the ISP-industry. This might be supported by the fact that ISPs generally have a large number of highly-skilled technical staff.

- ***The choice for a Linux distribution is limited by the availability of resellers.***

  The distributor determines which support is available. For example, in Uganda a particular Linux distribution (SuSE) is the most popular, because the distributor provides at the same time the technical and installation support.

- ***Multi-supplier policies enhance competition***

  By encouraging diversity of choices in software infrastructure, organisations and governments are better equipped to negotiate with vendors both of open as well as of proprietary software. For example, South Africa was in a strong position to negotiate a deal with a proprietary vendor for the education sector, when it had developed an ICT policy for the country, specifying that open source would be considered in procurement processes.

Recommendations

- To clear the path for open source software, some of the hurdles presented above have to be overcome. Governments can play an important role, by developing a clear vision on the use of open source software and formulating this vision in an ICT policy. Several countries are currently involved in such a process (see chapter ”Governments take action”).

- Governments can lead the way by implementing open source software within the public sector. Countries like South Africa have already made commitments to stimulating the use of open source software for certain sectors and through this are in a strong position to negotiate with proprietary vendors who fear losing deals to their open source competitors.

- ICT decision-makers are often sceptical about the possibilities offered by open source software, and insufficiently aware of the possibilities to make informed decisions in terms of their software infrastructure. Seminars on this subject could increase awareness on what the possibilities are. These seminars might focus on at least the following:
  - Providing information on which and what types of open source applications are available
  - Demonstrating Linux and open source software use to dispel misconceptions concerning user friendliness and ease of installation
  - Providing tools and models for informed decision-making on software infrastructures
  - Informing about open source software implementation and migration processes
  - Providing examples and case studies of organisations using open source software
  - Providing information about compatibility of open source software and proprietary products (e.g. OpenOffice.org – Microsoft Office, etc.)

- Research conducted by Open Forum Europe[64] concludes that according to ICT decision-makers the most important action to be taken in order to increase the possibilities for open source is to provide examples and case studies, which they can relate to, but which are currently insufficiently available.

- Lack of reliable and sufficient bandwidth is often a deterrent to download software. Knowledge products such as CD-roms containing open source software can be instrumental in order for ICT-practitioners to familiarise themselves with open source applications. (One is included in this report.)

- Standard formats for publishing reports on the web, such as Adobe Acrobat (PDF) and Microsoft Word (DOC), should be supplemented by open standard formats like HTML, rich text format and OpenOffice.org.

- Various development agencies (see chapter “Other research on open source software”) are involved in open source initiatives. All these organisations appear to acknowledge the importance of increasing awareness of technology alternatives, to better equip ICT-decision makers for making informed choices pertaining to technology infrastructure. More coherence between these initiatives might increase their visibility, help pool resources and spread dissemination of knowledge products. The FOSSFA database is a good model in support of such an effort.

- Aspects like the availability of support, total cost of ownership and organisational needs determine what option is best. In the appendix, decision-models are presented that can support ICT-managers in their decisions.

[64] *http://www.openforumeurope.org/research/oss_market_perception_followup.pdf*

OTHER RESEARCH ON OPEN SOURCE SOFTWARE

Currently, a number of research projects on the possibilities of open source software and development are being executed or explored[65].

Bellanet

Bellanet[66] is currently in the process of migrating their internal network to open source software (see also the case study above). The experience acquired in the process will be useful when formulating advice for their partner organisations in the south.

Hivos

Hivos[67] has started a research project on the use of open source software by their partner organisations in East Africa. The research focuses on the possibilities for organisations of up to 30 employees to be able to adopt new technologies, in this case open source software. It includes determining the current status of open source software with partner organisations. Furthermore, it considers opportunities for partner organisations brought by open source software. As part of its open source mandate, HIVOS released a manifesto on the use of open source software in July 2003[68].

Bridges.org / Schoolnet Africa

In February 2003 Bridges.org[69] and Schoolnet Africa[70] started a two-year research project on the implications of the choice between open source and proprietary software in an African context, by investigating the practical issues facing existing computer laboratories in South Africa and Namibia. In addition it will provide a detailed study of the policy environment and the factors that influence related policy-making processes, again focusing on the policy-level debate and choices made and compare them to similar policies in other countries, as appropriate.

The study will produce unbiased and substantive materials on the software environments in the form of background information, analysis of the key factors that affect choices, and practical guidance for decision-makers.

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[65] These research descriptions are based on interviews with profiled research managers, and/or on research outlines received from them. We acknowledge the kind co-operation of these partner organisations in providing us this information.
[66] http://www.bellanet.org
[67] http://www.hivos.org
[68] See http://www.hivos.nl/downloads/oss.pdf
[69] http://www.bridges.org
[70] http://www.schoolnetafrica.net

FOSSFA / APC

FOSSFA[71] with support from the Association for Progressive Communications[72] (APC) have been working on a research paper aimed at elaborating the current status of open source in Africa. The paper will include open source best practices in Africa, as well as 6 projects showcased in the study[73].

Aitec

Aitec[74] is organising the African Open Source Forum in Nigeria 26 to 29 August 2003. The theme of the conference is "Open Source for Economic Growth".

Two of the key streams will be

- Open Source in training IT professionals, and its implications for competition, job creation and the local software industry
- Business Cases: The economics of using Open Source Software and total cost of ownership; comparisons with proprietary software

OASIS / TALEEM / IMFUNDO/ IICD

A consortium including OASIS[75], TALEEM, IICD and Imfundo are currently exploring a three-year project with the following objectives:

- To empower local communities in deprived areas to participate in the utilization and development of open source solutions
- To provide the development community with best practices and tools for the adoption of open source software in less developed communities

The project will focus on the UK, India and two African countries, targeting local communities where open source opportunities for employment or business are emerging, mainly due to the existence of large employers using open source software. It begins by analysing the current conditions of open source users, in terms of their needs for services and skilled human resources. Based on that information, relevant resources (specific training materials, installation and maintenance skills, etc) will be developed and provided to the local communities. Students, employees or those looking for employment will be trained in these issues and it is expected that the new skills will help them secure jobs or initiate new ventures in open source-related activities.

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[71] *http://www.fossfa.org/*
[72] *http://www.apc.org*
[73] *African Linux User Group, May 6th 2003, http://globalcn.tc.ca/mailman/listinfo/aflug*
[74] *http://www.aitecafrica.com*
[75] *http://www.oasistrust.org/*

RESOURCES & REFERENCES

References are arranged according to the following categories:

- General open source software references
- References for ICT decision-makers
- References for ICT administrators
- References for policy makers
- References specifically related to this report

General Open Source Software References

Open Source Definitions and Licenses

"The Open Source Definition", open source definitions according to the Open Source Initiative
Open Source Initiative, http://www.opensource.org/docs/definition.html

"The Free Software Definition", the definition of free software from GNU
GNU, http://www.gnu.org/philosophy/free-sw.html

"Categories of Free and Non-Free Software", an overview of software categories (free, open source, freeware, shareware, etc)
GNU, http://www.gnu.org/philosophy/categories.html

"GNU General Public License", the GPL text
GNU, http://www.gnu.org/copyleft/gpl.html

"OPENCODE - House of Licenses", a list of available license formats
Berkman Center for Internet & Society, http://h2oproject.law.harvard.edu/opencode/licenses/

"Microsoft Licensing", information about Microsoft's licensing models
Microsoft, http://www.microsoft.com/licensing/Default.asp

African User Groups

African Linux User Group (Mailing list), http://globalcn.tc.ca/mailman/listinfo/aflug

LinuxInAfrica, an informal, unmoderated discussion group for Linux Users in Africa to allow for sharing and combined learning about Linux and other Open Source operating systems, http://groups.yahoo.com/group/LinuxInAfrica/

Tanzania Open Source User Group, http://groups.yahoo.com/group/OpenSourceTz/

Ghana Linux User Group, http://www.linuxinghana.net/

Uganda Linux User Group, mailing list for those working in the ICT field in Uganda interested in or using open source software, mailto: majordomo@kym.net with the following command in the body of the email message: *subscribe lug*

Zambia Linux User Group, http://www.dgroups.org/groups/zlug/

l'Association Burkinabé des Utilisateurs de Logiciels Libres, Burkina Faso User Group, http://abull.zcp.bf

Overview of worldwide Linux User Groups, http://www.linux.org/groups/

African Open Source Portals and Initiatives

South African Linux Portal, http://www.linux.org.za

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FOSSFA, the Free/ Open Source Software Foundation Africa, http://www.fossfa.org/

WOUGNET (Women of Uganda Network) on open source software, http://www.wougnet.org/ICTpolicy/opensource.html

Other Open Source Software Portals

Asian open source center, http://www.asiaosc.org/article_9.html

OSS / Linux News

Newsforge, The Online Newspaper of Records for Linux and Open Source, http://www.newsforge.com

UNDP Networking and Information Technology Observatory on open source software, UNDP, http://www.sdnp.undp.org/perl/news/articles.pl?do=browse&categories=10

Linux Today, Linux portal and news site, http://www.linuxtoday.org

LinuxMedNews, Linux for medical education and practice, http://www.linuxmednews.org/

Schoolforge News-Journal, news and web portal on open source software in schools, http://opensourceschools.org/

Tectonic, "The Source for Open Source", South Africa, http://www.tectonic.co.za/

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"The Practical Manager's Guide to Linux, Can you profitably use Linux in your organisation?", Ganesh C. Prasad, http://linuxsolutions.hypermart.net/manager.htm

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"MS to Linux Migration Blueprint", recommendations and practical information about migrating to OSS, including an interesting migration roadmap. Ithaca Solutions, UK, 2002, http://www.ithaca-solutions.com/pdf/29.pdf

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"Analysis of the Impact of Open Source Software", elaboration on open source phenomenon, history and competitiveness with proprietary software, QinetiQ, UK, 2002, http://www.govtalk.gov.uk/documents/QinetiQ_OSS_rep.pdf

"LSP: migrate from Windows NT to Linux", an article in ZDNet containing practical information about a proprietary product for automatic migration of file sharing, ZDNet, 2001, http://techupdate.zdnet.com/techupdate/stories/main/0%2C14179%2C2809945%2C00.html

"Migrate With Confidence From Microsoft Windows Servers to UNIX/Linux", reasons for migrating to Unix/Linux, Jon C. LeBlanc, 2002, http://www.cuug.ab.ca/~leblancj/nt_to_unix.html

Certification

ECDL (European Computer Driving Licence Foundation) homepage, including information about International Computer Drivers Licences (ICDL), http://www.ecdl.com/

"Microsoft training and certification", information about Microsoft certification, including Microsoft Certified Systems Engineer/ Administrator (MCSE/MCSA), http://www.microsoft.com/traincert/default.asp

SAIR Linux and GNU Certification homepage, www.linuxcertification.com/

LPI (Linux Professional Institute) homepage, "Professional Certification for the Linux Community", http://www.lpi.org

Thompson Prometric, Testing and Assessment centres, http://www.prometric.com/

Pearson VUE, licensing and certification programs, http://www.vue.com/

RedHat Training and Certification Programs, http://www.redhat.com/training/

SuSE Training, http://www.suse.com/en/business/services/training/index.html

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Comptia Linux+ certification, Comptia, http://www.comptia.org/certification/linux/

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United Linux, http://www.unitedlinux.com

Knoppix distribution, http://www.knopper.net/knoppix/index-en.html

Morphix distribution, http://morphix.sourceforge.net/

Mandrake distribution, http://www.mandrakelinux.com/en/

RedHat distribution, http://www.redhat.com

SuSE distribution, http://www.suse.com

Lycoris distribution, http://www.lycoris.com/

Debian distribution, http://www.debian.org/index.en.html

SCO Linux / Caldera distribution, http://www.sco.com/products/linux/

Available Open Source Software

SourceForge: Open Source software development website, http://sourceforge.net/

Jairlie.com: open source software in a Windows environment, http://www.jairlie.com/oss/suggestedapplications.html

Key open source successes, by category, http://www.delanoscientific.com/oss_success.html

AsiaOSC Major OSS Packages, http://www.asiaosc.org/enwiki/page/Major_OSS_packages.html

Windows under Linux Products

Netraverse, producer of Win4Lin, http://www.netraverse.com/

RealVNC (Virtual Network Computing), remote control software that allows you to view and interact with one computer using a simple program on another computer, http://www.realvnc.com

Wine, an Open Source implementation of the Windows API on top of X and Unix, http://www.winehq.com

VMWare, allows you to run a Windows environment on top of Linux, http://www.vmware.com/

Portal on Terminal Server and Citrix information, http://members.home.nl/stoelie/citrix.htm

Citrix homepage, http://www.citrix.com/

Microsoft Terminal Server Edition, http://www.microsoft.com/ntserver/ProductInfo/terminal/default.asp

Linux

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Bellanet, http://www.bellanet.org

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Case Studies: Organisations and References

A list of organisations and references that were mentioned in the case studies:

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Government webportal, Ghana, http://www.ghana.gov.gh

Soft Internet Solutions (SIS), Ghana, http://www.sis.gh

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Microlink, Zambia, http://www.microlink.zm

Coldreed Communications, Zambia, http://www.coldreed.com

CopperNET Solutions, http://www.coppernet.zm

D-Groups, discussion boards, http://www.dgroups.org

OPA (Online Proposal Appraisal), http://www.sourceforge.net/projects/opa

Other case studies can be found at:

http://www.li.org/success/

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http://www.itpapers.com/cgi/SubcatIT.pl?scid=262&wc=3

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http://www-3.ibm.com/software/success/cssdb.nsf/topstoriesFM?OpenForm&Site=linuxatibm

GLOSSARY

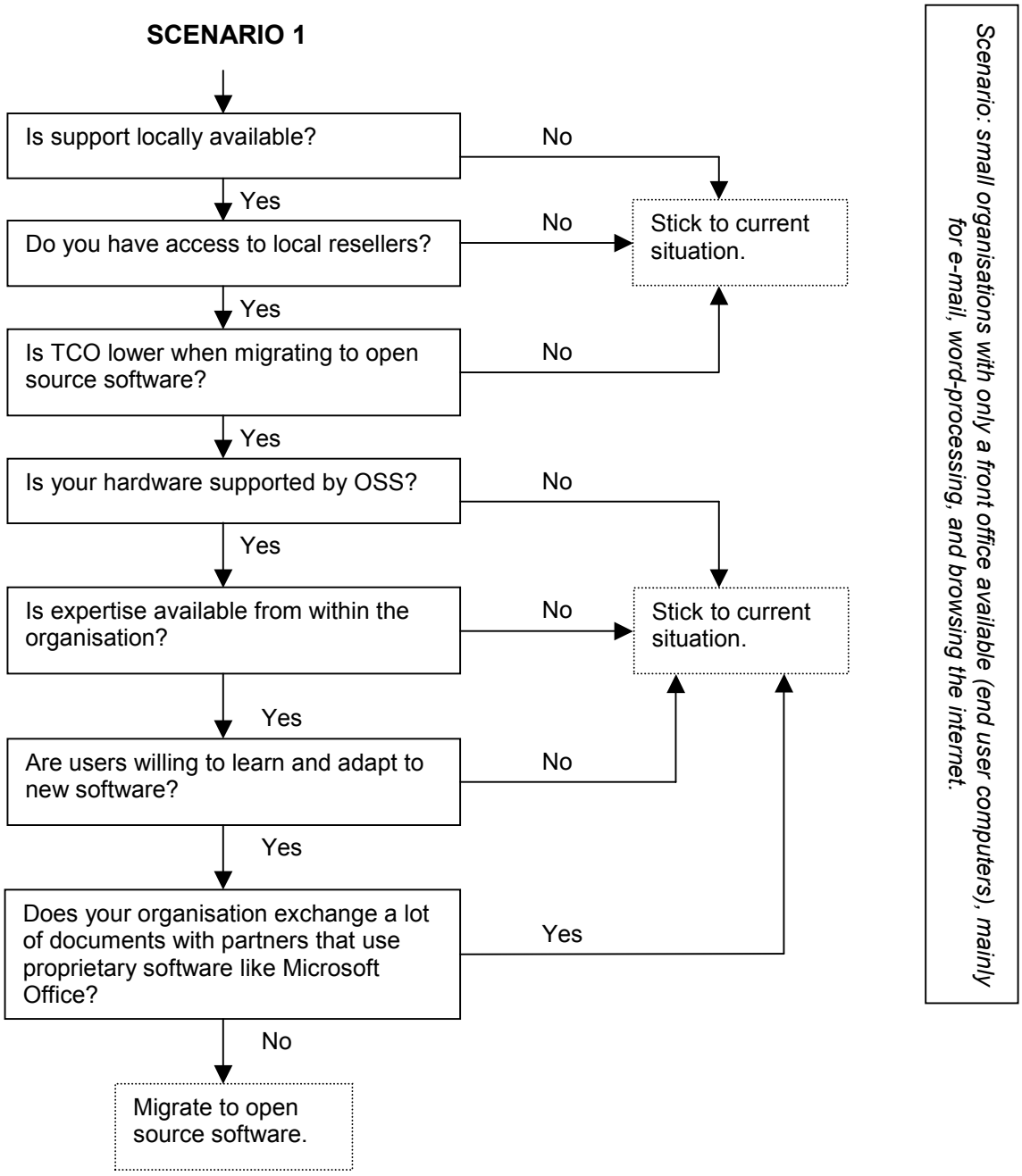
Apache	Open source web server
BSA	Business Software Alliance, a cooperation of several software vendors in an effort to discourage the use of illegal software
CIO	Chief Information Officer, person responsible for computer infrastructure within an organisation
CMS	Content Management System for managing websites (content, users, logging, etc)
FOSSFA	Free / Open Source Software Foundation Africa
FreeBSD	An open source variant of the BSD (Berkeley Software Development) operating system
Free Software	Free software is the term used by Free Software Foundation for indicating software that can be freely used and its code can be freely read, distributed and modified (see also http://www.gnu.org/philosophy/free-sw.html)
GPL	General Public License, Software covered by GPL is copylefted: it can be modified, but any release containing the modified software must include an offer for the source code under the same GPL license
GNU	GNU is Not Unix
GTP	Global Teenager Project
ICT	Information and Communication Technology
IICD	International Institute for Communication and Development
IIS	Internet Information Server, proprietary web server produced by Microsoft
IPR	Intellectual Property Rights
ISP	Internet Service Provider
LAN	Local Area Network
Linux	An open source operating system
Linux Distribution	Linux is made available via distributions. Example distributions are SuSE, Redhat, Knoppix and Debian. All distributions use the same base (the Linux operating system), but differ in aspects like ease of installation, availability of extra software and support
LUG	Linux User Group, user group on the internet for discussing Linux matters, often focusing on a specific region or country
MS Office	Microsoft Office Suite: includes a word processor, spread sheet programme, email and presentation software
MS Windows	Microsoft Windows, a proprietary operating system
MySQL	An open source database management system
NGO	Non-Governmental Organisation
OpenOffice.org	Open Source Word Processor
OSS	Open Source Software: source code can be read, modified and distributed without having to pay for it (see http://www.opensource.org/docs/definition.html for a more elaborate definition)
PHP	Personal Home Page, an open source programming language used for building websites.

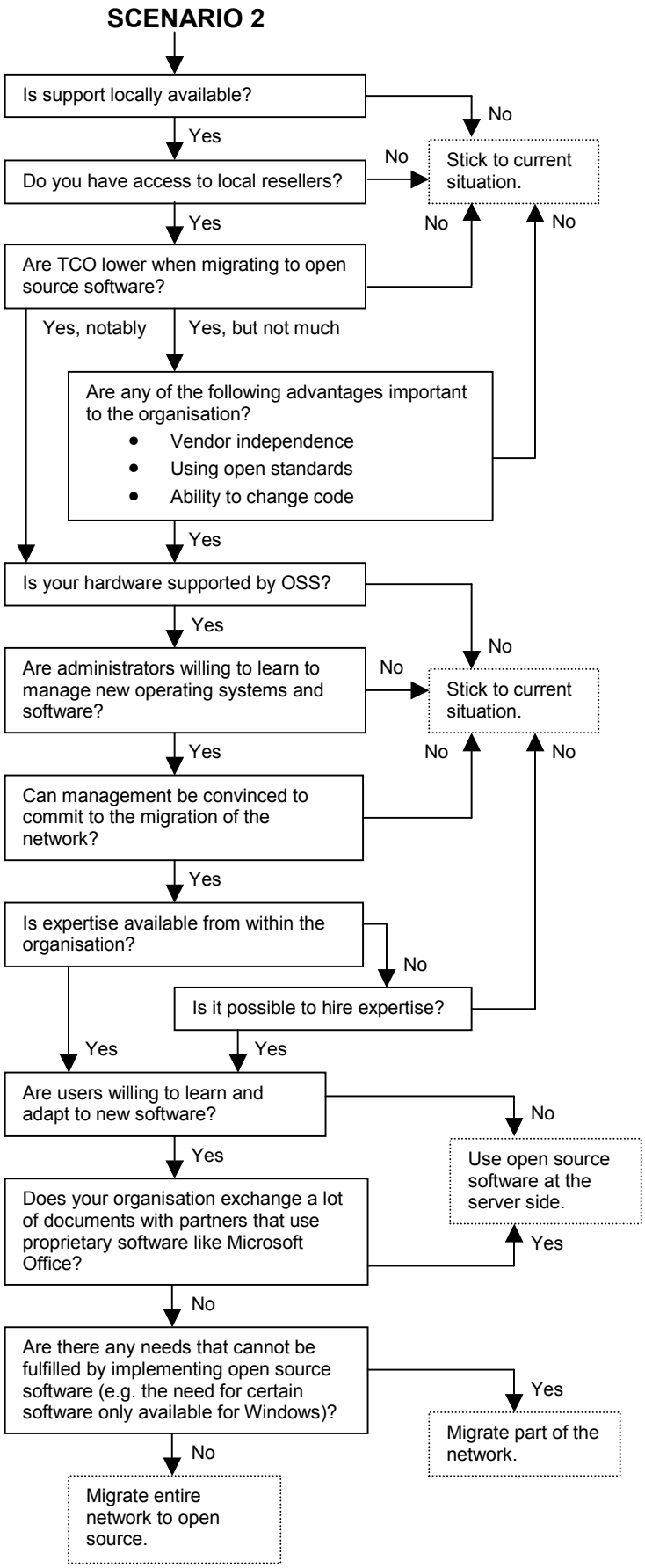
PS	Proprietary Software: software of which usage, distribution and/or modification is restricted in some way or the other by intellectual property rights
StarOffice	An open source office suite that includes a word processor, a spreadsheet program, presentation, database and graphical design software
TCO	Total Costs of Ownership, refers to direct and indirect costs related to the use of an ICT-component
VPN	Virtual Private Networking, technology allowing users to access the internal network from outside
WYSIWYG	“What you see is what you get” software, content management system with highly visual interface

APPENDIX

Decision Models

The following two decision models illustrate which factors might play a role in decisions on software infrastructure and possible migration to open source software.





Scenario: larger organisations (30+ staff) with front- and back-office available (both server and desktop computers are installed on the network).

IICD PROFILE

The International Institute for Communication and Development (IICD) assists developing countries to realise locally owned sustainable development by harnessing the potential of information and communication technologies (ICTs).

IICD realises its mission through two strategic approaches. First, Country Programmes bring local organisations together and help them to formulate and execute ICT-supported development policies and projects. The approach aims to strengthen local institutional capacities to develop and manage Country Programmes, which are currently being implemented in Bolivia, Burkina Faso, Ecuador, Ghana, Jamaica, Mali, Tanzania, Uganda and Zambia.

Second, Thematic Networks link local and international partners working in similar areas, connecting local knowledge with global knowledge and promoting South-South and South-North exchanges. Thematic Networks focus on sectors and themes like education, health, governance, the environment, livelihood opportunities – especially agriculture – and training.

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