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ANNEXES ONLY
Comparison Study of Free/Open Source and Proprietary Software in an African Context

Implementation and Policy-Making to Optimise Public-Access to ICT

bridges.org, in collaboration with SchoolNet Africa, the International Development Research Center and the Open Society Institute

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ANNEXES

Annex 1. Terminology debate: free, open source, proprietary, commercial software

In the debate around free/open source and proprietary software, the arguments are often confused by inconsistent use of terminology. To start with, the term "software" can describe a variety of things, ranging from networking infrastructure programmes that normal users never need to see, to operating systems, to end-user applications like web-browsers and word processors. Because many stakeholders feel so passionately about the correct use and interpretation of the terms, and to provide a basis for discussion in this report, the following comprehensive definitions are provided.

There are many views on which are the "right" definitions of "free software", "open source software" and "proprietary software". Numerous definitions for these terms exist, focusing in varying degrees on different characteristics of software, including development processes, licensing issues or business models. Some definitions include an interpretation of the philosophies behind different types of software. Because nobody can claim to have the single correct definition, the research team attempted to capture the most important and relevant aspects of the different software definitions to form a foundation for the work. The definitions used in this study and report are based on definitions collected from a wide range of respected resources, including TechWeb (www.techweb.com), Wikipedia (www.wikipedia.org), the Open Source Initiative (www.opensource.org), the Free Software Foundation (www.fsf.org), the Business Software Alliance (www.bsa.org), and Microsoft (www.microsoft.com), as well as the feedback received from the advisory group who supported the study.

Free/open source software (FOSS)

Free and open source software is distributed with the underlying source code open for other programmers to look at and use. When everyone is allowed to read, modify, and redistribute the source code for a piece of software, then programmers can improve and adapt it, and fix bugs; and users can share the software with their neighbours, colleagues and friends.

The term "FOSS" can be used to describe a software development and licensing model:

The FOSS development model. A software development model that is based on a "bazaar style" of collaboration (where many individuals in seemingly uncoordinated fashion contribute and share) rather than the traditional "cathedral" style (a few leaders develop the full design and then oversee the structured implementation).[1]

FOSS licensing. A number of different licenses exist for FOSS, but they typically award the following four rights:

1 For more information on the differences between the bazaar style and the cathedral styles, see http://www.catb.org/~esr/writings/cathedral-bazaar/, last accessed December 2004.

1. The right to use the software freely. The user has the right to install and use the software on any and as many computers as he/she likes and use it for professional or private purposes or both.

2. The right to modify the software to suit his/her needs. The user has the right to change how the software works, and can extend its functionality, fix bugs or combine it with other software applications.

3. The right to access to the source code. This is an important prerequisite in order to be able to exercise the right to modify the software.

4. The right to redistribute the original or modified software, either at no cost or for a fee.

But FOSS licenses do not only grant rights, they can also have restrictions. These restrictions are most relevant to software developers and companies, but have no impact on end users, who are the focus of this study. For example, some licenses prevent software developers from distributing their modifications and additions under a non-FOSS license. More specifically, free software licenses require all software that is based on free software to remain free software (and be distributed under a free software license), making it impossible to turn modified free software or a combination of free software with other software into proprietary software. More "permissive" open source licenses -- the "BSD-style" licenses are a popular example -- allow the modification of open source code and integration into proprietary products.[2]

The difference between free and open source software

While the pragmatic realities for end users are very similar, the philosophies behind free software and open source software differ quite substantially and have been the source of endless heated debate. The free software movement believes that all information should be "free", and free software licenses add the requirement that all software based on or including free software becomes free software as well.[3] But the English term "free" is ambiguous and is often understood as "in absence of cost" rather than to signify the "freedom" of free software. To borrow the words from Richard Stallman, the founder of the Free Software Movement, free software is "free as in speech" and not "free as in beer". The business community generally had difficulties with the term "free" and surprisingly also with use of "cost-free products"; the idea being that products which came without licensing costs were considered inferior. To address their concerns and focus on the development model, and the practical, technical and business aspects of free software, a number of developers coined the term "open source".

2 For more information and a list of open source licenses, see http://www.opensource.org/licenses/, last accessed February 2005.

3 For more information on the terminology and the ideas underlying the term "free software", see http://www.gnu.org/philosophy/free-software-for-freedom.html, last accessed December 2004.

For the large part of this report, the differences between free software and open source software are not relevant. Where they are relevant, this is clearly marked. Thus, to avoid confusion, the terms "free software" and "open source software" are combined for the purpose of the report, and the terms "FOSS" or "free/open source software" are used.[4]

Proprietary software

Proprietary software is privately owned and controlled, usually by a company. The owners of proprietary software hold a copyright that awards them the exclusive rights to publish, copy, modify, and distribute the software and they usually keep the source code hidden. Most proprietary software companies sell an "end-user license" to people who use the software programme on their computers.[5] The end-user license agreement limits the way the software can be used -- for example, only allowing non-commercial uses -- and it often restricts sharing.[6]

Proprietary software companies have invested in research and development to write new software applications, and they use licensing fees to recover these costs. Proprietary software companies typically do not allow access to or modification of the underlying programming code for the software, the "source code". Access to the source code would enable a user to analyse and either copy or recreate the knowledge about how the software works, and that would make it easy for a software programmer to create a similar application. Access to the source code would also make it possible to make unlimited copies of the software programme (for example, by enabling circumvention of the built-in copy prevention mechanism). So proprietary software companies keep the source code secret, and they build security mechanisms into the software that prevent users from circumventing the end user agreement. Usually, no one outside the company is supposed to ever have access to see the source code.

However, the copyright holders sometimes choose to make the source code available, such as when they need to address the preferences of an important customer. For example, some government clients have voiced concerns that the software they use to handle confidential government information is controlled by a company in a different country, which raises obvious national security issues. Microsoft has addressed this concern with its Shared Source Initiative, where certain clients are given "read-only" access to the source code of a number of software applications and software development tools, including the Windows XP

4 The following resources provide a few good starting points and arguments for further analysis of the differences between free software and open source software:
http://www.oreilly.com/pub/a/oreilly/ask_tim/1999/free_open.html, last accessed October 2004.
http://c2.com/cgi/wiki?FreeSoftwareVsOpenSource, last accessed October 2004.
http://en.wikipedia.org/wiki/Open_source, last accessed October 2004.

5 Not all proprietary software licenses require payment. For example, freeware (software that can be used without paying for a license), abandonware (software that the copyright holder no longer supports or distributes), or shareware (software that can be used in certain environments or for a trial-period free of charge) are examples of proprietary software that might be free of cost to the user.

6 Both FOSS and PS licenses contain certain restrictions. As mentioned above, the FOSS restrictions apply to the development of software, which are largely not relevant to the user of the software. PS licenses place further restrictions on the end-user, governing where and how the software can be used and shared with others.

operating system. [7] Microsoft argues that through this type of initiative it is able to offer those aspects of the FOSS software development model that are most important to its clients. FOSS supporters answer that being able to see the code is insufficient because it is the right to modify code that is important. They also point out that inspecting the millions of lines of code that make up the Windows XP operating system is a significant effort that few organisations can afford.

Proprietary software vendors sometimes use the term "commercial software" to describe their products. However, the implication that FOSS is non-commercial is not correct. The commercial opportunities open to users and developers of free, open source or proprietary software are different, but examples of successful businesses based on all types of software exist.

7 For a description of the Shared Source Initiative, please see http://www.microsoft.com/resources/sharedsource/default.mspx, last accessed December 2004. For more information on country availability, please see http://www.microsoft.com/resources/sharedsource/Licensing/Availability.mspx, last accessed December 2004.

Annex 2. Research methodology

Development of the methodology

Background research and initial definition of research focus areas

Initial topics for investigation were defined based on desktop research and expertise of the organisations involved -- bridges.org, with respect to different types of software that exist, and SchoolNet Africa with regard to the role of ICT in education.

Initial scoping study

A scoping study was conducted between January and April 2003 with the following two objectives, which constituted first deliverables of the research project:

1. A preliminary report to inform SchoolNet Africa's efforts related to technology use in SchoolNets and educational settings across Africa, specifically for discussion at a SchoolNet Africa workshop. The initial observations were presented to the "ICTs in African Schools" conference in Gaborone, Botswana in May 2003. Because the report was based on impressions from a few labs only, and because the debate around software choices is so heated, it was decided the report would not be published, and a confidential version was released only to project partners, the advisory group and funders.

2. Groundwork in preparation of the subsequent longer-term field study and to shape a comprehensive comparison model based on the findings of the scoping study. As part of the scoping study, contact was established with key organisations and first hypotheses with regard to software choices were tested.

Scoping study sample

Interviews with a non-representative sample of computer lab managers and policy-level decision-makers were conducted in South Africa and Namibia during the scoping study phase. Data and impressions were collected in informal interviews during which questionnaires were filled out by the researchers to collect the respondents' statements.

Namibia

- Policy level: 14 individuals, representing 12 organisations/institutions, were interviewed.
- Computer lab level: six computer labs were visited (all six were in schools).
- Of these labs, three were full proprietary software labs, one was a full free/open source lab, and two were multi-platform labs combining free/open source and proprietary software.

South Africa

- Policy level: 21 individuals, representing 15 organisations/institutions were interviewed.
- Computer lab level: eight computer labs were visited (seven were school computer labs, one was a community information technology training centre).
- Of these labs, five were full proprietary software labs, two were full open source platform labs (one had migrated from proprietary software to FOSS), and one was a multi-platform lab.

Final research methodology

The methodology was developed through the combination of background research, scoping study findings and bridges.org's Real Access/ Real Impact framework. This approach ensured that all issues influencing the choice of software (and being influence by it) could be identified.

The final methodology is captured in the following files:

- **Computer lab questionnaire:** a comprehensive list of questions that were filled out by staff members in the labs visited.
- **List of computer lab open questions:** a list of questions to guide an interview style conversation with the person that filled out the questionnaire.
- **List of policy level questions:** a similar list of questions, but targeted at policy level decision-makers or stakeholders.
- **Questionnaire objectives file:** the list of questions, annotated with the initial hypotheses and objectives for each question -- this document was initially intended as the basis for data analysis.
- **Data:** provided as an annex to this report, the data tables supersede the objectives file and categorise questionnaire and interview data.

All methodology documents are published under a Creative Commons license and can be shared with other researchers.

Main field study

Data collection

The data collection was conducted by 5 researchers in 121 computer labs across the three project countries -- Namibia, South Africa and Uganda.

During each visit the most suitable person (based on their job description) was asked to fill out a questionnaire and engage in an interview-style conversation, that was based on a specific set of open questions. An effort was made to select respondents that have at least some influence on decision-making and involvement in day-to-day operations/support activities. Ideally the individual was the decision-maker and also responsible for lab operations.

As a side note, the data that was collected provides a comprehensive description of the situation in public-access computer labs that were part of this study, and brings out many interesting observations beyond the issues surrounding the choice of software. The data can be made available to other researchers for follow-on work.

Study sample selection

Namibia

A regional focus was placed on two important areas, the capital city Windhoek and the northern area around Oshakati and Ongwediwa. The northern area is both home to the majority of Namibians and partly very rural. An attempt to visit equal numbers of FOSS labs and PS labs proved difficult as many labs were not using entirely one kind or the other. Most labs that participated were in schools.

South Africa

In South Africa the approach was to identify as many FOSS labs as possible and to visit all of them, and then visit an equal number of PS labs, situated as closely as possible to the FOSS labs.[8] This method was chosen as a simple way to reduce the impact of external influences that come with different demographics. For example, a computer lab in a wealthy suburb will face very different problems and find different solutions to them, compared to a lab in a township.

Uganda

The labs were chosen mainly based on a regional approach with respect to Kampala. One focus area was located towards the eastern part of the country from Kampala and the other was towards the western part. These are the areas of Uganda that have the highest incidence of labs with Internet access.

Study sample description

The following statistics describe the characteristics of the 121 labs that comprise the study sample. The sample is not representative, e.g. the percentage of FOSS labs that were in schools is not likely to be the same for a country as a whole. The sample selection is not strictly random and different selection criteria were used in the different countries.

A total of 52 participants/computer labs studied are located in South Africa (RSA), with 28 in Namibia, and 41 in Uganda. In both Namibia and Uganda, multi-platform labs are the most common type. In South Africa, PS labs are the most common type. The final breakdown of labs is summarised in the following table. Lab type was selected based on answers from labs in combination with researcher's assessments of the lab (self-categorisation values are provided in brackets; also see a more detailed description of the analysis process below).

8 At the time of the study a relatively small number of FOSS labs existed. This approach would not be feasible in today's environment, because there are now hundreds of FOSS labs in South Africa.

Type of lab:	**Combined**		**Namibia**		**South Africa**		**Uganda**	
Free and Open Source Software	35 [38]	28.93%	9	32.14%	15	28.85%	11	26.83%
Proprietary Software	39 [25]	32.23%	4	14.29%	29	55.77%	6	14.63%
Multi-platform	47 [46]	38.84%	15	53.57%	8	15.38%	24	58.54%
"Do not know" answers	0 [9]							
Missing answers	0 [3]							
Total	121	100%	28	100%	52	100%	41	100%

Table a: Study sample, type of software used

The majority of labs are located in schools. Participating FOSS labs are exclusively in schools (89%) or commercial Internet cafés (11%); no community labs or other labs (which include libraries, etc.) use FOSS exclusively. The PS labs studied are more diverse: many are in schools (67%), 15% are "community-labs", and 5% are commercial Internet cafés. 13% of PS labs fall in the "other" category.

	Combined		**FOSS**		**PS**		**Multi-platform**	
School -lab	90	74.38%	31	88.57%	26	66.67%	33	70.21%
Commercial Internet café	8	6.61%	4	11.43%	2	5.13%	2	4.26%
Community lab	12	9.92%		0.00%	6	15.38%	6	12.77%
Other	7	5.79%		0.00%	5	12.82%	2	4.26%
Missing	4	3.31%		0.00%		0.00%	4	8.51%

Table b: Study sample, type of lab

While this study focuses on typical public-access computer labs, most labs place certain restrictions on what part of the community can access them. For example, many of the labs in schools are open only to students and teachers. However these school labs are virtually identical in set-up, technology used, and operating environment to labs open to the public, and many are planning to allow public access in the near future.

History of the computer labs

With regard to age and history of the labs a variety of scenarios exist. Some labs have already undergone a number of changes to the computers they are using, others were set up recently. The PS labs studied tended to be in operation for longer than FOSS labs, most of which were created during the last two years. One common model for multi-platform labs is to add a Linux server to an initial Microsoft Windows-based desktop computer lab. For example, SchoolNet Uganda frequently deploys a model that includes a Linux-based Internet gateway/web-server and proprietary software that runs on workstations.

The origins of the labs -- when it was set up and the organisation that led the effort -- are linked with several factors, including location (urban areas are likely to be set up first); access to donations and funding; and (especially in the case of schools) economic background of the school.

Data analysis

For the questionnaire data analysis consisted of three full rounds of analysis and an additional combined analysis for certain questions (for example, in order to assess usefulness of online technical support, computer, labs without Internet access were excluded). The results were combined with the qualitative data from the open question interviews.

First analysis

The first round of analysis was a general look at the answers to all questions regardless of type of software used by the respondent. Some interesting results with regard to general issues in public-access labs were found.

Second analysis

The second round of analysis was based on a split between different lab types as specified by the respondents themselves in their answers to question 23 of the questionnaire. While the first analysis provided a good sense of the lack of awareness that is prevalent in many labs, the second analysis provides more accurate information on the implications of using one kind of software.

Lab Type (based on answers to Q23 / self-categorisation)	
Free and Open Source Software (FOSS) labs	38
Proprietary Software (PS) labs	25
multi-platform labs	46
Do not know	9
Missing answer	3

Table c: Study sample, lab type self-categorisation

Third analysis

After a careful look at the results that were based on this self-categorisation, some of which seemed mistaken compared to the researchers' observations, a different approach to lab-categorisation was taken. Instead of only relying on the answers in the questionnaire, the researchers, who had visited the labs, compared the self-categorisation with their own knowledge of what software was actually used. If an error was found, the lab was then re-categorised. In addition to the errors that were discovered and corrected, this also allowed elimination of all "do not know" and "missing" answers. Incorrect categorisation (self-categorisation in this case) would have an effect on all other results as answers will be attributed to the wrong type of lab.

The final break-down of labs was as follows (previous self-categorisation values in brackets)

Lab Type (verified results)	
Free and Open Source Software (FOSS) labs	35 [38]
Proprietary Software (PS) labs	39 [25]
multi-platform labs	47 [46]
Do not know answers	0 [9]
Missing answer	0 [3]

Table d: Study sample, lab type verified

Whereas the first categorisation (and related analysis) implicitly contained a measurement for the awareness of respondents, this aspect is excluded from the final categorisation and analysis, in favour of a more realistic impression of the issues related to the use of one or the other type of software.

It is striking that the most significant change in the number of labs is shown for the PS labs. However this does not allow the conclusion that most of the "do not know" (or missing) labs were actually PS labs or that PS labs necessarily knew less or more about their lab set-up than other labs. Such an interpretation could only be based on analysis of all changes, because it is possible that a larger number of FOSS labs were re-categorised, with former "do not know" labs or missing answers balancing the change. One possible explanation for the large number of changes for PS labs, could be a misunderstanding of the term "proprietary software".[9]

Additional combined analysis

Some of the questions were then combined to correlate answers. For example, to assess the use and usefulness of online technical support, labs that reported no Internet access were excluded.

Open question analysis

The answers to the open questions were split by country. Usually two types of information were extracted for each question: (1) general and common themes or patterns that were mentioned by multiple labs and (2) snapshot answers, which were not necessarily common to many labs, but either support the general themes or point out unusual opinions and experiences (most of the quotes used in the report were collected this way).It is important to note that sometimes the snapshot answers highlight a misconception or lack of awareness rather than an actual fact.

Cost data

With regard to the cost information that was provided by the computer labs, it was decided not to not draw conclusions based on the numerical data provided (actual amounts for equipment prices and training costs, etc.), but to focus on the question that weighed different cost factors exclusively. Due to some

9 A record of all changes and reasons for changes was kept and can be made available on request.

respondents' lack of awareness, the absence of business plans and processes in some of the labs and the very large amount of labs that received donations, this approach was more viable.

Limitations of the collected data

The following points impact the quality of collected data:

- **Lack of expertise.** Some respondents lacked even the most basic computer skills. These respondents are not able to understand the more technical questions and provide reliable answers. The research team noticed occasional errors in the data, but there was no way to verify each answer without interfering in and influencing the data collection. Questions that have especially surprising results were verified in detail, using the original data and combining the answers with researchers experience and impressions. Some questions were removed from the results.
- **Attempts to provide the correct answer.** There was some indication that choosing the "do not know" option was perceived by some respondents as a bad answer. These respondents might choose to guess rather than admit that they cannot answer a question. In cases where researchers suspected this might be a problem, it was explained that all answers were equally valuable.
- **Length of questionnaire.** This project presented a unique opportunity to collect information on the realities in computer labs across Africa. Some difficult decisions had to be made in terms of limiting the size of the questionnaire. However during the data collection some respondents took significantly longer than others and the level of attention is likely to decrease as respondents tire.
- **Difficulty of collecting cost data.** Reliable cost information was extremely difficult to collect. As reflected in the data, few labs were able to specify numerical values for costs -- few labs are run on the basis of a business plan (this came out in the open questions part) and many respondents were unable to estimate what the most important cost drivers were.
- **Problems understanding the term "proprietary software".** While there is no reliable proof, impressions from lab visits and analysis results for certain questions indicate that respondents had problems with the term "proprietary software" -- this was true across all labs, but probably even more so for respondents whose first language is not English (the vast majority).
- **Rural/ urban breakdown.** No data on rural/urban location of computer labs was collected and included in the analysis. During analysis, this was perceived as a potential limitation, and it was considered to manually assign computer labs to rural/urban categories based on researcher experience and impressions. It was ultimately decided that this approach was too prone to errors and that there were very few questions that would benefit from additional analysis on the basis of this variable.

Advisory group

The original Advisory Group was formed in April 2003 to review documents leading up to the scoping study report. The group remained unchanged until early 2004, when, in order to reflect the emergence of new experts -- and especially a stronger visibility of African experts -- additional members were invited to join.

All of the comments received from Advisory Group members were collected and can be shared -- except where confidentiality was requested (this was very rarely the case). Advisory group comments and suggestions were taken very seriously and informed edits, revisions, and additions of the study and this report. Further it was offered to Advisory Group members to make their input publicly available -- per request -- on the part of the bridges.org web-site that is dedicated to the study. These policies were intended to create an environment for open and frank input to the report.

Advisory group members[10]

- **Joseph Alhadeff**, Vice President Global Public Policy/Chief Privacy Officer, Oracle
- **Chose Choeu**, Director Legal and Corporate Affairs, Microsoft South Africa
- **Johan Eksteen**, Director (acting) Information and Communications Technology, Council for Scientific and Industrial Research
- **Laurent Evrard**, Director Computer Services, Polytechnic Namibia
- **Richard Fuchs**, Director ICT4D, International Development Research Center
- **Riff Fullan**, Program Coordinator, bellanet
- **Johan Helsingius**, Board Member and Technical Advisor, bridges.org
- **Shafika Isaacs**, Executive Director, SchoolNet Africa
- **Joris Komen**, Executive Director, SchoolNet Namibia
- **Allen Luyima**, Technical Coordinator, SchoolNet Uganda
- **Simbo Ntiro**, Founder eThinkTank Tanzania
- **Jonathan Peizer**, Chief Technology Officer, Open Society Institute
- **Stormy Peters**, Manager HP Open Source Program, Hewlett Packard
- **Theo Schoemans**, Managing Director, Schoemans IT
- **Guido Sohne**, sohne.net
- **Steve Song**, Managing Director, Connectivity Africa
- **Fred Tipson**, Director International Affairs, Microsoft
- **Bill Vass**, CIO, SUN Microsystems
- **Arno Webb**, CIO Department of Arts and Culture, Government Information Technology Officers Council, South Africa

Advisory group - feedback process

The Advisory Group was asked to provide feedback at key moments in the development of the methodology and the analysis of the collected data, including the draft report outline and final draft report.

10 This list only includes active members. Additional individuals that agreed to join the group, but did not provide input or feedback are excluded.

- **April 2003.** Scoping study documents, including the draft report and presentation for the "ICTs in African Schools" conference.
- **October 2003.** Field study questionnaires were reviewed before data-collection started.
- **March 2004.** First round data analysis for data collected in the computer lab questionnaires and computer lab interviews.
- **April 2004.** Second and third round data analysis. Initially labs were split by self-categorisation. This approach was revised and the labs were then categorised based on the impressions of the researchers who had visited them. See more information on this process above.
- **May 2004.** Report outline file, which contained the structure of the report in terms of chapters, tentative headings, etc. It also contained short descriptions of the contents of each chapter and was intended to detect and avoid omissions.
- **May 2004.** Report notes working draft: a very rough collection of notes and pointers, which was shared for information only.
- **October/November 2004.** Review of first final draft.
- **February 2005.** Review of final report draft.

Annex 3. Thin-client configuration

The following text is copied verbatim from bridges.org's recent report *How to set up and operate a successful computer refurbishment centre in Africa*:[11]

Another option suitable for laboratory installations makes use of diskless thin clients. Under this model, computers use one central server not just to supply an Internet connection, but also to provide an operating system and applications for all the computers in the lab.

The slower processors of refurbished computers, even those available at the lowest-end of the market's price spectrum, are well suited to deployment as thin clients. While all computers are fully functional, the clients do not have any moving parts. The only harddrive required is installed in the server; all the clients share access to it. Since harddrives are among the components most likely to fail in a lab, reducing the total number of harddrives should make the lab cheaper to run. Since the amount of memory and the speed of the processor to run a thin client are each lower than the specifications a traditional, stand-alone computer requires, older computers can be made to run with a degree of performance they would otherwise not achieve.

Thin client implementations may also reduce maintenance requirements. Because clients have few or no moving parts, they do not need to be protected from dust, dirt and other environmental hazards with the same rigour as standalone clients. Since all the work is being done by a server, the clients might also withstand the rougher use -- being turned off abruptly, being rebooted several times -- that novice and casual users can sometimes inflict.

At the same time, thin client solutions also present a moderately higher risk to data availability. Since all the clients depend on the server to function, a failure on the server implies a failure of all the computers in the lab. Consequently, effort and investment should be focussed on the server to increase the lab's overall uptime and performance and to reduce the likelihood of problems on the server. Several distributors of thin client laboratory products choose to use new servers in combination with refurbished clients. The number of clients a server supports determines its specifications. In labs with five or ten clients, a server may require a processor of at least 1GHz. Labs with 20 clients may require 2GHz processors or more. Servers require a baseline amount of about 512 MB of RAM, and about 50-60 MB of RAM for every client it supports.

Thin client implementations may also lower a lab's security risks. As mentioned above, a server need not be in the same room as the clients, so it is possible to dedicate more resources to making sure the server is in a safe place. It is not necessary to fortify the whole room to the same degree as one might if all computers had to be protected to the same degree. Since the clients do not work independently of the server, they also have less value to potential thieves. One supplier of a thin client product urges lab operators to post a sign in the

11 "How to set up and operate a successful computer refurbishment centre in Africa", bridges.org, 1 November 2004. Available from http://www.bridges.org/refurb/, last accessed December 2004.

window of the computer room warning that the computers will not work if they are removed from their environment. That fact alone can be a deterrent to thieves.

Enthusiasm for thin clients

Thin client technology is in use by a number of organisations that supply computers to schools. Kakinda Daniel, Executive Director of SchoolNet Uganda, describes the advantages of the system this way:

> The thin-client model is an alternative to the traditional approach of expensive workstations. Under a traditional (fat-client) model, applications run on the individual workstations[...]Under a thin-client model, the applications run on a network server and the local clients (workstations) are used only to provide a keyboard, mouse and display! What makes a computer obsolete is low memory (RAM), low processor speed and low hard disk space. Thin clients have no hard disks, their processing speed & RAM are irrelevant. One of the biggest problems schools have is that of software maintenance because kids sometimes "mess" up the computers. Most school technology coordinators spend the majority of their time just providing software maintenance support. But with these dumb terminals, there is literally nothing students can do to them!! Only the network server needs to be upgraded to cope with increasing performance demands of both new software and a greater number of users. If you've ever had to deal with the problems and costs of keeping your desktop systems hardware up-to-date so that you can run the latest software, you can see the potential benefits of only needing to update one PC and observe the effects on all the others! [...]
>
> We want to help schools access technology but keep their costs down. Schools can now connect to the Internet using very old machines that would have never have the capacity to access the Internet otherwise. Thin-client technology brings back to life old computers which the schools had labelled obsolete.[12]

12 "A mail from SchoolNet Uganda", Kakinda Daniel, Executive Director SchoolNet Uganda. Available from http://www.tacticaltech.org/africasource, last accessed December 2004.

Annex 4. Definitions and glossary

The majority of definitions are summaries of the information available on www.wikipedia.org, the free encyclopaedia. Full URLs to the resources are provided as footnotes.

Computer lab: A computer lab is a room which contains many computers, printers and other electronic equipment designed for public use. Computer labs can be found in libraries, schools, government buildings, science labs, and research centres. In addition, some companies such as Kinkos or Mail Boxes Etc. provide labs with computers to use for an hourly fee.[13]

Free software: Free software is software which, once obtained, can be used, copied, studied, modified and redistributed. It is often made available online without charge or offline for the cost of distribution; however, this is not required, and software can be "free as in free speech" and sold for profit. Similarly, freeware is sometimes published with source code; however, the software is not free in the same sense as free software unless the rights to modify and redistribute modified versions of the program are guaranteed.[14] See Annex 1.

GNU: GNU is a recursive acronym for "GNU's Not Unix". The GNU project was launched in 1983 by Richard Stallman with the goal of creating a complete operating system -- called the GNU system or simply GNU -- that is free software, meaning that users are allowed to copy, modify and redistribute it. The GNU project is now carried out under the auspices of the Free Software Foundation (FSF).[15]

Linux: Linux is a computer operating system and its kernel. It is among the most famous examples of free software and of open-source development. The term Linux strictly refers to the Linux kernel, but is commonly used to describe entire Unix-like operating systems (also known as GNU/Linux) that are based on the Linux kernel, the libraries and the tools from the GNU project. Linux distributions often bundle large quantities of software with the core system.[16]

Localisation/ Software localisation: Software localization is a process of translating software user interfaces from one language to another. This process is labour-intensive and often requires significant efforts from development teams. There are tools that can simplify the localization process.[17]

Open source software: Open-source software is required to have its source code freely available; end-users have the right to modify and redistribute the software, as well as the right to package and sell the software. Software with source code in the public domain meets these criteria, as does any software

13 http://en.wikipedia.org/wiki/Computer_lab, last accessed February 2005.
14 http://en.wikipedia.org/wiki/Free_software, last accessed February 2005.
15 http://en.wikipedia.org/wiki/GNU, last accessed March 2005.
16 http://en.wikipedia.org/wiki/Linux, last accessed February 2005.
17 http://en.wikipedia.org/wiki/Software_localization, last accessed February 2005.

distributed under the popular GNU General Public License. Despite apparent similarities, 'open-source software' is distinct from free software.[18] For more information, see Annex 1.

Operating system: In computing, an operating system (OS) is the system software responsible for the direct control and management of hardware and basic system operations. Additionally, it provides a foundation upon which to run application software such as word processing programs and web browsers.[19]

Platform: In computing, a platform describes some sort of framework, either in hardware or software, which allows software to run. Typical platforms include a computer's architecture, operating system, or programming languages and their runtime libraries.[20]

Proprietary software: The term "proprietary software" is often used to in contrast to "free software" or "open source software". The Free Software Foundation applies the term to describe software in which the user does not control what it does or cannot study or edit the code. Some proprietary vendors prefer the term "commercial software", but it incorrectly implies that "free software" cannot also be "commercial. See Annex 1 for more information.

Public-access computer lab: A computer lab that is open to the public. Public-access projects are a popular approach to increasing access to computers in developing countries, where personal ownership of information technology is often not possible due to prohibitive costs.

18 http://en.wikipedia.org/wiki/Open_source, last accessed February 2005.
19 http://en.wikipedia.org/wiki/Operating_system, last accessed February 2005.
20 http://en.wikipedia.org/wiki/Platform_%28computing%29, last accessed February 2005.

Annex 5. Background and further reading

"Considering Open Source and Commercial Software," GOH Seow Hiong, BSA, July 2004.
http://www.unescap.org/icstd/events/documents/egm_km/BSA.pdf

"Evaluating TCO for Software Platforms: Comparing Apples, Oranges and Cucumbers," Alan McCormack, 2003.
http://www.aei.brookings.org/publications/abstract.php?pid=329

"First Annual BSA and IDC Global Software Piracy Study", Business Software Alliance (BSA), July 04.
http://www.bsa.org

"Free/Libre and Open Source Software: Survey and Study", International Institute of Infonomics and Berlecon Research GmbH, June 2002,
http://floss.infonomics.nl/report/index.htm

"Government Preferences for Promoting Open-Source Software: A Solution in Search of a Problem", David S. Evans and Bernard J. Reddy, *Michigan Telecommunication Technology Review*, 2003,
http://www.mttlr.org/volnine/evans.pdf

"Is Linux More Secure Than Windows?", Forrester Research, 19 March 2004.
http://www.microsoft.com/windowsserversystem/facts/analyses/vulnerable.mspx.

"Linux Usability Report - English Version 1.01", relevantine AG, 2003.
http://www.linux-usability.de/download/linux_usability_report_en.pdf

"Linux vs. Windows Total Cost of Ownership Comparison", Cybersource, 2004,
http://www.cybersource.com.au/about/linux_vs_windows_tco_comparison.pdf

"Open Software & Open Standards in South Africa -- A Critical Issue for Addressing the Digital Divide", National Advisory Council on Innovation Open Software Working Group, 2002.
http://www.naci.org.za/

"Open Source in Developing Countries", Sanjiva Weerawarana and Jivaka Weeratunge, Published by Sida 2004.
http://www.sida.se/publications

"Open Source Software: Free Provision of Complex Public Goods," James Bessen, 2004.
http://www.researchoninnovation.org/opensrc.pdf

"Security: Linux versus Windows," Nicholas Petreley, 22 October 2004.
http://www.theregister.co.uk/security/security_report_windows_vs_linux/

"Some Simple Economics of Open Source," Lerner and Tirole, *Journal of Industrial Economics*, v52, June 2002.
http://www.nber.org/papers/w7600

"The Cost and Risks of Open Source", Julie Giera, Forrester Research, April 2004
http://download.microsoft.com/download/7/d/0/7d059de9-1557-415c-8332-920db6f89e44/FRSTRossCosts0404.pdf

"Total Cost of Ownership for Linux in the Enterprise," Robert Frances Group, July 2002.
http://www.rfgonline.com

UNCTAD United Nations Conference on Trade and Development, "E-Commerce and Development Report 2003", Chapter 4: Free and open-source software: Implications for ICT policy and development.
http://www.unctad.org/en/docs/ecdr2003ch4_en.pdf

"Realizing The Promise of Open Source in the Non-Profit Sector," Jonathan Peizer, Open Society Institute, 2003.
http://www.soros.org/initiatives/information/articles_publications/articles/realizing_20030903

"Windows 2000 Versus Linux in Enterprise Computing. An Assessment of Business Value for Selected Workloads", IDC White Paper sponsored by Microsoft Corporation, October 2002.
http://www.idc.com

Annex 6. Additional aspects of software use in public-access computer labs

The contents of this Annex are not directly related to the choice of software, but presents some of the lessons learned in public-access computer labs and their use of software in a more general way. It also outlines the need and opportunities for additional research to be undertaken.

Support and enthusiasm for ICT in general

There is a wave of enthusiasm for computers and technology in local communities and at the policy-level. Most expectations and hopes pinned to ICT focus on improving employment opportunities.

> "No matter how good you have learned, without computer skills you will not find a job."
> -- Lab Manager, Namibia --

Successful ICT project are beginning to show the positive impact that computers and technology can have: they can create a sense of empowerment that few other activities award and provide opportunity to overcome some of the obstacles to development.

> "The learners will say: Miss, I will try to find more information about this on the Internet." The moment they experience they can use the computers it builds their self-esteem. In that moment they are more educated than others. Some of my students come from terrible social circumstances. One boy in grade 12 was so interested in computers but told the teacher one day: We don't even have water at home. Sometimes we don't even have food at home."
> -- Teacher, Namibia --

Ensuring local support and buy-in is a key step in setting up a computer lab. In schools teachers and administrators must support the idea of using computers in teaching and learning and understand how it can support their work. Computers can also increase the profile of existing institutions, such as libraries or radio stations and support their position as meeting points for the community.

> "Because of the computers the library has become more popular. People sometimes just come in for computer purposes and then notice the services that the library offered."
> -- Librarian, Namibia --

In schools computers capture the imagination of learners -- even leading to increased attendance levels on the days of computer classes.

> "Trainer A: Each and every class should start including computers in their curriculum. Kids would enjoy the education much more. When kids go to school they get tired. But when it's time to go to computer class, they will run.
>
> Trainer B: That is correct.
>
> Trainer C: Still have a couple kids to stay after hours and show others what to do with the computers. I got kids who do not come to school 4 days of the week, but they only come on the day where they have computer class."
>
> -- Discussion between computer trainers, Namibia --

Unrealistic expectations can lead to frustration

Part of the current enthusiasm is not grounded in African realities however. Some expectations are unrealistic and when they do not come true in due time, this leads to frustration. As a result, interest in computers often declines after a period of initial enthusiasm. For example, users understand that computer literacy is increasingly becoming a prerequisite to qualify even for basic jobs, but there is widespread and incorrect belief that basic computer skills alone will lead to employment.

To blame for unfunded expectations are partly those that have been most active in promoting and implementing ICT. The terminology used by computer lab staff too often resounds with the keywords used by development aid organisations and computer companies; "poverty alleviation", "community upliftment" and "leapfrogging" to a higher level of development are concepts that seem remote in the context of local communities especially as local staff is often not aware of the strategies how computers will help them reach these goals.

The underlying reason is often a flawed approach to planning and implementing community computer projects. To often the focus is exclusively on providing computers and connections and disregards the other factors that make ICT projects succeed or fail in developing countries[21]. These include availability of relevant applications and training, the skills required to conceptualise how computers can be useful tools in the local context and sufficient access to the equipment. Technical problems are also important; non-working equipment quickly dampens enthusiasm.

21 The structure of this report is based on the *Real Access/ Real Impact* methodology that is useful in identifying all aspects influencing the impact of ICT in development projects.

> "[Learners are enthusiastic about computers], but every time they want to get in, the room is locked which leads to disappointment. You will always find learners cleaning outside - asking when the room will be open. The learners want to use the computers, but then who is there to train them, who is there to show them."
> -- Teacher, Namibia -
>
> "Personally I think that computers can be a difficult topic. I used to come here to look for topics that you want to teach and you find a lot of information about them. Right now you cannot print, because the printer is not working, which makes me less enthusiastic."
> -- Lab Manager, Namibia --

Socio-cultural divisions in Africa and the impact on software use

The likelihood of living in poverty is far greater for groups who suffer discrimination. Across Africa, people are prevented from full participation in their societies and economies on the basis of their race, gender, class, age, physical ability, HIV status, geographical location, sexual preference, religion and other socio-cultural factors. Social exclusion leads to unequal participation in economic, political, educational, and digital arenas, and it follows that discrimination limits computer uptake. The infusion of ICT into a country paints the existing landscape of poverty, discrimination, and division onto the new canvas of technology use. Because ICT can reward those who know how to use it with increased income and cultural and political advantages, the resulting digital divide shows up in increasingly stark contrast. The trend is that privileged groups acquire and use technology more effectively, and because the technology benefits them in an exponential way, they become even more privileged. For example, in many countries women are inhibited or prevented from using technology, and ICT professions continue to be male-dominated. There are also growing gaps between younger and older generations in relation to technology use in some communities: older people often believe that they are too old to use computers, while in other communities a pecking order for computer use prevents younger people from using ICT. Public-access computer labs need to be aware of the socio-cultural factors that have an effect on the computer use they offer, and take steps to mitigate discrimination.

Public-access computer labs that fail to involve traditionally excluded groups fall short on the social mission to serve humanity and promote equity. When groups are alienated for social or cultural reasons it not only hinders ICT penetration to the detriment of those excluded, but also limits the benefits of diversity in the information society more broadly. ICT use and the information exchange it engenders can be a powerful driver for social change. This potential must be harnessed by public-access computer labs, to promote understanding of the politics around discrimination and division in society and the economy.

> "When the learners come into 8th grade learners are divided by language. One group grew up in an urban setting and they are more sophisticated and have much better English skills. However the other group is much more enthusiastic -- it does not take as much to impress them. The sophisticated class is looking up newspapers, rap stars etc. on the Internet. The other class goes to (an educational) site and checks out the educational content. They are more interested in things that have some educational value; that are actually going to help them."
> -- Teacher, Namibia--

A whole study could be devoted to this issue alone. Given time and resource constraints, only a few key issues are highlighted here, including a look at the influence of age, gender and poverty on how technology is perceived and used in the labs visited during this study. Changing social structures due to the HIV/AIDS pandemic present additional challenges and at the same time opportunities for the use of computers.

- **Age.** Particularly in the school labs visited, there seems to be a correlation between the age of users and the curiosity and enthusiasm they show for computers. Generally younger users are more interested and motivated to use computers for the sake of the computer itself. On the other hand, some older users tend to be more focused; they understand the value of the technology and use the computers more purposefully.

- **Gender.** The differences in computer use based on the gender of users are also most distinct in school labs. As a broad generalisation, teenage boys are often seen to be more dominant, sometimes monopolising the computers in the lab. Girls, on the other hand, are reported to show more genuine interest in the purpose of the technology -- and often advance more quickly when given a chance. Perceptions of the role of women with regard to technology differ. In some regions, computers are regarded as technology in an engineering sense and therefore the domain of the men. In other computer labs, the similarity of computers and typewriters is noted, which places them in the domain of women, who have traditionally performed secretarial tasks. In one extreme case, only boys were allowed to use the computer lab at one rural, religious school.

- **Poverty.** Anecdotal evidence suggests that users from poor or disadvantaged backgrounds tend to approach computers more carefully, aware of the value and cost of the equipment. But once engaged they then use them to more directly support their work and study (rather than for entertainment). One lab manager suggested that this is related to the lack of access to computers at home: many of the poor students have no hope of ever owning a computer, and the computer lab at school is their only chance of learning about and using the technology. For example, a lab manager at an urban school in South Africa with a mix of children from different background, reported that the learners from previously disadvantaged background were "bubbling over with excitement" when it was time for computer lessons.

- **Health and HIV/AIDS.** The HIV/AIDS pandemic is not showing a direct impact on operations of the computer labs in this study at this point in time, but there are signs indicating that it can be expected to aggravate staff and skills shortages in the near future. Rising numbers of deaths in the community are starting to increase the need for staff time off to attend funerals. One lab manager indicated that he is not willing to invest further efforts into training his staff, because he feels these efforts will be lost when the trained staff fall ill. Looking beyond how HIV/AIDS affects the operations and management of computer labs, it also creates focused purposes and applications for the computers that would have a concrete benefit in the community. For example, one school has a study group of HIV-positive students, who use the Internet extensively to access the latest news and information about the disease, and then disseminate this information in the school to increase awareness. In another example, a local NGO organised a website competition and helped learners to compile information on how the disease is directly affecting their neighbourhood.[22] An associated benefit is that computers are also helping to build confidence of the people infected with the virus, and to decrease the social stigma attached to the disease.

The impact of African socio-cultural diversity on software choices

There are fundamental differences between the social and cultural contexts of Africa (in all the diversity seen across the continent) and those of the countries that are now driving ICT development and the framework of the information society and economy. Most information and communications technology is designed outside Africa and the very concept of computers is foreign and new to many users in Africa. This goes far beyond the issues of language and culture touched upon above in the discussion of "localisation", and includes factors related to religion, heritage, age, gender, race and income level. And it is impossible to make generalisations about how different social and cultural contexts impact on the use and usefulness of computers in the public-access environment in Africa.

There is no common approach of African users to computers. For Africans, this statement is absurdly obvious: perhaps the only thing common to all of Africa is its rich diversity, and that can be both a strength and an obstacle. At a practical level, identifying and understanding the socio-cultural factors affecting computer use in the local environment is critical to ensure the long-term success of public-access computer labs. At a higher level, the wide social and cultural variations across regions, countries, religions, cultural groups, language groups, genders, economic groups, age groups are a reality that software developers ignore at their peril if they want their software applications to make a difference in Africa.

22 SchoolNet Namibia has a nationwide website competition supported by a marketing campaign that showcases what individuals are doing to reduce the impact of HIV/AIDS in their communities. Fore more information, see http://www.e-inclusionsite.org/eng/GeM/X.asp, last accessed October 2004.

Annex 7. Field-study data

The tables in this Annex are ordered broadly following the list of key issues in the section "Findings" of the report. A number of tables listed here were not included in the analysis -- because the data was considered not reliable or not relevant -- and interpretation of the data in this Annex is recommended only in combination with other background and familiarity with the situation in the computer labs.

Some of the data tables can be used to highlight more than one issue -- for example, the thin-client data is relevant with regard to lowering cost through use of old hardware, as well as reliability of the chosen system. However, all tables are listed only once in this Annex -- for example, the thin-client data is listed in section "The computer labs studied" and not again under cost or reliability.

All of the tables contain the results of the third analysis (see the Annex "Research methodology") of the raw data collected through questionnaire in 121 computer labs in Namibia, South Africa and Uganda.

Index of Tables

The computer labs studied

Q1: What is your job description?	FOSS N=35	PS N=39	Multi-platform N=46
Computer lab manager	28.57%	33.33%	32.61%
Computer trainer	11.43%	17.95%	26.09%
Technical support staff	8.57%	10.26%	17.39%
Teacher	51.43%	38.46%	36.96%
Other (please specify):	25.71%	25.64%	32.61%

Table 1: Computer labs studied -- job description of respondent

Type of lab:	Total: 121 labs		Namibia: 28 labs		South Africa: 52 labs		Uganda: 41 labs	
Free/Open Source Software (FOSS)[23]	35	29%	9	32%	15	29%	11	27%
Proprietary Software (PS)	39	32%	4	14%	29	56%	6	15%
Multi-platform	47	39%	15	54%	8	15%	24	58%

Table 2: Break-down of sample -- by type of software and country

	Total (N=121)		FOSS (N=35)		PS (N=39)		Multi-platform (N=47)	
School -lab	74%	90	89%	31	67%	26	70%	33
Commercial Internet café	7%	8	11%	4	5%	2	4%	2
Community lab	10%	12	0%		15%	6	13%	6
Other	6%	7	0%		13%	5	4%	2
Missing	3%	4	0%		0%		9%	4

Table 3: Break-down of sample -- by lab type (school, Internet café, ...)

Hardware

Q18: Which of the following best describes the computers in the lab?	FOSS N=35	PS N=39	Multi-platform N=47
Only new computers	25.71%	46.15%	23.40%
Only used/second-hand computer that were not refurbished	8.57%	0.00%	2.13%
Only refurbished computers (refurbished meaning old computers that have been fixed up)	22.86%	7.69%	8.51%
Both new and second-hand computers	14.29%	15.38%	14.89%

23 Awareness of the differences between "free" and "open source" software was limited among the sample group of the research. The term "open source" is more commonly known and was used in the questionnaires when respondents were asked to describe the type of software they use. However, in tables that present the results of data analysis -- and for reasons outlined above -- the term FOSS is used.

Q18: Which of the following best describes the computers in the lab?	FOSS N=35	PS N=39	Multi-platform N=47
New, refurbished and second-hand computers	5.71%	10.26%	12.77%
Both new and refurbished computers	11.43%	12.82%	23.40%
Both refurbished and second-hand computers	2.86%	5.13%	12.77%
Do not know	5.71%	2.56%	2.13%
Missing	2.86%	0.00%	0.00%

Table 4: Hardware -- new, second-hand, refurbished

Q20: What is the processor (CPU) speed of the computers in the lab? (You can Tick more than one) [% of answers / multiple answers possible]	FOSS N=35	PS N=39	Multi-platform N=46
AMD Athlon	16.67%	15.38%	43.48%
Pentium I (PI)	54.17%	38.46%	36.96%
Pentium II (PII)	41.67%	33.33%	52.17%
Pentium III (PIII)	33.33%	12.82%	15.22%
Pentium IV (PIV)	8.33%	10.26%	23.91%
Intel 486	0.00%	2.56%	2.17%
Other (please specify):	0.00%	15.38%	17.39%
Missing answers [% of all respondents]	17.14%	35.90%	8.51%

Table 5: Hardware -- processor speed

Software

Q25: Which Operating System is installed on the desktop computers in the lab? (Tick all that apply)	FOSS N=35	PS N=39	Multi-platform N=47
Microsoft Windows 95 / 98 or ME	2.86%	64.10%	76.60%
Microsoft Windows 2000 or XP	0.00%	58.97%	57.45%
Linux	97.14%	5.13%	63.83%
Mac OS / Mac OSX	0.00%	0.00%	4.26%
Do not know	2.86%	2.56%	0.00%
Other (please specify):	5.71%	2.56%	6.38%

Table 6: Software -- desktop operating systems

Q26: What Operating System is installed on the servers for the lab? (If you have multiple servers, please Tick all that apply)	FOSS N=34	PS N=35	Multi-platform N=47
Microsoft Windows 95 / 98 or ME	0.00%	31.43%	14.89%
Microsoft Windows 2000 or XP	0.00%	51.43%	19.15%
Linux	94.12%	8.57%	78.72%

Q26: What Operating System is installed on the servers for the lab? (If you have multiple servers, please Tick all that apply)	FOSS N=34	PS N=35	Multi-platform N=47
Mac OS / Mac OSX	0.00%	0.00%	0.00%
Do not know	2.94%	5.71%	0.00%
Other (please specify):	8.82%	17.14%	6.38%

Table 7: Software -- server operating systems

Q27: Which Word Processing software is used in the computer lab? (Tick all that apply)	FOSS N=34	PS N=38	Multi-platform N=47
Microsoft Office / Word	0.00%	89.47%	95.74%
Microsoft Wordpad	0.00%	31.58%	44.68%
OpenOffice / Writer	58.82%	2.63%	23.40%
Abiword	11.76%	0.00%	6.38%
Koffice	11.76%	0.00%	4.26%
StarOffice	32.35%	0.00%	25.53%
WordPerfect	2.94%	10.53%	14.89%
NOTE: "other", "do not know" and "none" answers were removed from the table			

Table 8: Software -- word processors

Q28: Which Spreadsheet software is used in the lab? (Tick all that apply)	FOSS N=33	PS N=39	Multi-platform N=47
Microsoft Office / Excel	0.00%	94.87%	95.74%
Corel	0.00%	5.13%	10.64%
OpenOffice / Calc	48.48%	2.56%	17.02%
StarOffice	21.21%	0.00%	19.15%
Gnumeric	21.21%	0.00%	2.13%
Koffice	9.09%	0.00%	2.13%
NOTE: "other", "do not know" and "none" answers were removed from the table			

Table 9: Software - spreadsheet applications

Q29: Which Email software is installed on the computers in the lab? (Tick all that apply)	FOSS N=31	PS N=38	Multi-platform N=46
Pegasus	0.00%	18.42%	6.52%
Outlook / Outlook Express	3.23%	47.37%	60.87%
Eudora	0.00%	0.00%	17.39%
Netscape Email client	3.23%	7.89%	17.39%
Mozilla Email client	9.68%	0.00%	23.91%

Q29: Which Email software is installed on the computers in the lab? (Tick all that apply)	**FOSS N=31**	**PS N=38**	**Multi-platform N=46**
Evolution	16.13%	0.00%	4.35%
Kmail	16.13%	0.00%	21.74%
Other (please specify):	12.90%	0.00%	19.57%
None (we do not use email programs)[24]	29.03%	26.32%	4.35%
Do not know	19.35%	10.53%	4.35%

Table 10: Software - -email clients

Q30: Which Web Browser software is installed on the computers in the lab? (Tick all that apply)	**FOSS N=32**	**PS N=38**	**Multi-platform N=47**
Microsoft Internet Explorer	0.00%	81.58%	93.62%
Netscape Email client	18.75%	7.89%	38.30%
Mozilla Email client	25.00%	0.00%	34.04%
Opera	28.13%	0.00%	12.77%
KDE Konqueror	56.25%	0.00%	38.30%
NOTE: "other", "do not know" and "none" answers were removed from the table			

Table 11: Software -- web-browser applications

Local network / lab configuration

Q21: Which of the following best describes the computer lab?	**FOSS N=35**	**PS N=39**	**Multi-platform N=47**
Thin-client / terminal server network	45.71%	10.26%	14.89%
Individual workstations that are not networked / no server	8.57%	30.77%	4.26%
Individual workstations connected to a server (such as a file server, print server, or Internet gateway)	40.00%	56.41%	72.34%
Other (please specify):	0.00%	2.56%	4.26%
Do not know	2.86%	0.00%	0.00%
Missing	2.86%	0.00%	2.13%

Table 12: LAN / Lab configuration -- thin-client, desktops, networks

24 The large number of "none" answers is likely caused by the fact that these labs do not have Internet access.

Internet

Q22: What type of Internet connection does the lab have?	All labs combined	FOSS N=35	PS N=39	Multi-platform N=47
Total with connection	78.51%	74.29%	64.10%	93.62%
Dial-up modem connection	31.40%	31.43%	35.90%	27.66%
Dedicated leased-line connection	12.40%	2.86%	17.95%	14.89%
Wireless antenna	16.53%	25.71%	2.56%	21.28%
Satellite connection	14.05%	11.43%	2.56%	25.53%
Other (please specify):	4.13%	2.86%	5.13%	4.26%
No connection	19.01%	22.86%	33.33%	4.26%
Do not know	0.83%	0.00%	2.56%	0.00%
Missing	1.65%	2.86%	0.00%	2.13%

Table 13: Internet connectivity

Main factors influencing software choices

Q24: Why did you choose the software you are using? Tick any number of reasons that may have influenced the decision from the following list.	FOSS N=33	PS N=37	Multi-platform N=44
Recommendation by the vendor of the software	6.06%	2.70%	4.55%
Recommendation by peer/friend/colleague	12.12%	5.41%	29.55%
Availability of the applications that were needed	6.06%	16.22%	43.18%
The software came pre-installed on the computers that were bought	18.18%	37.84%	61.36%
Availability of technical support for the software	9.09%	8.11%	29.55%
The software was part of a package for the computer lab	21.21%	37.84%	25.00%
Prior experience in using the software	6.06%	16.22%	25.00%
Desire to support the open source philosophy	12.12%	0.00%	13.64%
Desire to purchase products from a particular company	0.00%	2.70%	2.27%
I was not aware of the choice	39.39%	21.62%	6.82%

Table 14: Main factors influencing software choices

Lab use

Q12: How many users (average person to use the lab) are in the lab per day on average?	FOSS N=35	PS N=39	Multi-platform N=47
Less than 20	28.57%	30.77%	10.64%
20 - 50	17.14%	28.21%	38.30%
More than 50	48.57%	41.03%	51.06%
Missing	5.71%	0.00%	0.00%

Table 15: Number of users per day

Appropriateness of software

Usability / Ease-of-use

Q69: Software applications are easy for the user to use. The statement is most appropriate for:	FOSS N=38	PS N=25	Multi-platform N=46
Applies to open source software	13.16%	0.00%	6.52%
Applies to proprietary software	21.05%	44.00%	34.78%
Applies to both	36.84%	20.00%	39.13%
Applies to none	0.00%	0.00%	4.35%
Do not know	23.68%	24.00%	6.52%
Missing	5.26%	12.00%	8.70%

Table 16: Usability -- "software is easy to use"

Q70: Software applications are easy to set up (configure) for non-technical users as well. The statement is most appropriate for:	FOSS N=38	PS N=25	Multi-platform N=46
Applies to open source software	13.16%	0.00%	2.17%
Applies to proprietary software	34.21%	40.00%	47.83%
Applies to both	15.79%	20.00%	23.91%
Applies to none	7.89%	8.00%	4.35%
Do not know	26.32%	20.00%	13.04%
Missing	2.63%	12.00%	8.70%

Table 17: Usability -- "software is easy to configure"

Compatibility / data and document exchange

Q37: Have computer users had problems opening and/or exchanging documents created by a software application different from the one used in the lab? (such as compatibility between documents created in OpenOffice and Microsoft Word)	FOSS N=35	PS N=39	Multi-platform N=47
Yes	37.14%	25.64%	25.53%
No	20.00%	46.15%	59.57%
Do not know	40.00%	23.08%	14.89%
Missing	2.86%	5.13%	0.00%

Table 18: Compatibility -- data and document exchange

Ability to modify source code and applications

Q61: The software offers great flexibility and can be modified to suit my local needs. The statement is most appropriate for:	FOSS N=35	PS N=39	Multi-platform N=47
Applies to open source software	45.71%	30.77%	48.94%
Applies to proprietary software	5.71%	5.13%	12.77%
Applies to both	8.57%	12.82%	21.28%
Applies to none	0.00%	5.13%	0.00%
Do not know	40.00%	28.21%	10.64%
Missing	0.00%	17.95%	6.38%

Table 19: Ability to modify source code -- relevance to local needs

Computer viruses and other malicious code

Q35: How often does the lab get infected by software viruses?	FOSS N=35	PS N=39	Multi-platform N=47
Daily	2.86%	0.00%	2.13%
Once a week	2.86%	10.26%	10.64%
Once a month	0.00%	25.64%	40.43%

Q35: How often does the lab get infected by software viruses?	FOSS N=35	PS N=39	Multi-platform N=47
Never	94.29%	58.97%	42.55%
Other	0.00%	2.56%	2.13%
Missing	0.00%	2.56%	2.13%

Table 20: Computer viruses

Reliability and stability

Q17: How many computers are (generally) fully operational? If some computers are not working, please provide a number.	FOSS N=38	PS N=25	Multi-platform N=46
% of labs with all working computers	60.00%	43.59%	44.68%
% of labs with some not working computers	34.29%	53.85%	53.19%
% of non working computers	14.89%	14.65%	14.54%
Missing	5.71%	2.56%	2.13%

Table 21: Reliability -- working and non-working computers

Q36: How often does the operating system or applications stop working or "crash"?	FOSS N=35	PS N=39	Multi-platform N=47
Daily	14.29%	2.56%	4.26%

Q36: How often does the operating system or applications stop working or "crash"?	FOSS N=35	PS N=39	Multi-platform N=47
Once a week	20.00%	17.95%	14.89%
Once a month	11.43%	25.64%	34.04%
Never	48.57%	48.72%	36.17%
Other	0.00%	2.56%	8.51%
Missing	5.71%	2.56%	2.13%

Table 22: Reliability -- frequency of software "crashes"

Q66: Please choose the most appropriate answer for the following statement: The software is reliable (does not crash). The statement is most appropriate for:	FOSS N=35	PS N=39	Multi-platform N=47
Applies to open source software	37.14%	12.82%	46.81%
Applies to proprietary software	8.57%	15.38%	8.51%
Applies to both	14.29%	12.82%	21.28%
Applies to none	2.86%	7.69%	6.38%
Do not know	37.14%	38.46%	10.64%
Missing	0.00%	12.82%	6.38%

Table 23: Reliability -- perception of reliability

	All computers working N=49	Some computers not working N=45
FOSS (total 35 labs)		
Thin-client / terminal server network	10	6
Individual workstations connected to a server (such as a file server, print server, or Internet gateway)	8	4
PS (total 39 labs)		
Individual workstations connected to a server (such as a file server, print server, or Internet gateway)	10	11
Individual workstations that are not networked / no server	6	6
Multi-platform (total 47 labs)		
Individual workstations connected to a server (such as a file server, print server, or Internet gateway)	15	18

Table 24: Reliability -- combined analysis with local network type

Software cost and affordability

Q74: In terms of initial set-up costs, please rate the following in terms of how much they contribute to total cost using numbers from 1 (least) to 5 (most) N=121	FOSS labs	PS labs	Multi-platform labs
Hardware	3.57 (40%)	3.58 (49%)	3.62 (79%)
Software Licenses	0.79 (40%)	2.56 (46%)	1.49 (79%)
Training for staff	1.88 (46%)	2.00 (46%)	1.51 (79%)
Technical Support	2.47 (43%)	2.29 (44%)	2.22 (79%)
Values in brackets indicate % of labs that answered the question			

Table 25: Cost -- ranking of set-up cost factors

Q60: The software is cheap. Statement is most appropriate for:	FOSS N=35	PS N=39	Multi-platform N=47
Applies to open source software	68.57%	33.33%	46.81%
Applies to proprietary software	0.00%	5.13%	17.02%
Applies to both	2.86%	5.13%	12.77%
Applies to none	2.86%	12.82%	10.64%
Do not know[25]	25.71%	33.33%	6.38%
Missing	0.00%	10.26%	6.38%

Table 26: Cost -- type of software that is considered "cheap"

Thin-client systems to reduce hardware cost

Q20/Q21: Combined analysis of age of computers (Q20) and type of lab set-up (Q21):	thin-client N=9	workstations and server, N=16
Pentium I	6	5
Pentium II	2	6
Pentium III	1	5

Table 27: Thin-client -- combined analysis with age of hardware

25 A large number of multi-platform labs answered that PS or both types of software are "cheap". The two main reasons that could be identified are use of unlicensed software and erroneous answers. Some of the same labs stated the cost advantages of FOSS in answers to other questions.

Locally relevant and useful applications, content and services

Q13: Was a needs assessment (to find out what computer services people will want) conducted prior to establishing the computer lab?	FOSS N=35	PS N=39	Multi-platform N=47
Yes	28.57%	38.46%	38.30%
No	37.14%	30.77%	31.91%
Do not know	31.43%	28.21%	23.40%
Missing	2.86%	2.56%	6.38%

Table 28: Locally relevant applications -- needs assessment

Q68: This software provides a number of sophisticated applications, which is one of its strengths. The statement is most appropriate for:	FOSS N=38	PS N=25	Multi-platform N=46
Applies to open source software	15.79%	12.00%	28.26%
Applies to proprietary software	10.53%	28.00%	13.04%
Applies to both	26.32%	16.00%	23.91%
Applies to none	5.26%	4.00%	4.35%
Do not know	31.58%	28.00%	23.91%
Missing	10.53%	12.00%	6.52%

Table 29: Locally relevant applications -- availability of "sophisticated applications"

Educational software in African schools

Q89: Are you using software specifically created for school education? (Analysis excludes non-school labs)	FOSS N=31	PS N=26	Multi-platform N=33
Yes	32.26%	34.62%	54.55%
No	51.61%	50.00%	33.33%
Do not know	3.23%	0.00%	0.00%
Missing answers	12.90%	15.38%	12.12%

Table 30: Educational software - use of educational software

Q91: What operating systems does this educational software run on? (Analysis excludes non-school labs)	FOSS N=31	PS N=26	Multi-platform N=33
Linux	64.50%	3.85%	15.15%
MS Windows	6.45%	69.23%	42.42%
Other	3.23%	0.00%	12.12%
Both	0.00%	0.00%	3.03%
Missing	25.81%	26.92%	27.27%

Table 31: Educational software - required operating systems

Language and the localisation of the user interface

Q32: Is the lab using local language versions (menus and text on buttons is in local languages, non-English) of any software applications?	FOSS N=35	PS N=39	Multi-platform N=47
Yes	5.71%	20.51%	12.77%
No	91.43%	74.36%	85.11%
Do not know	2.86%	2.56%	2.13%
Missing	0.00%	2.56%	0.00%

Table 32: Localisation -- use of local language software

Q33: If you do not use applications that use local languages, is it a problem for the lab users or managers?	FOSS N=35	PS N=39	Multi-platform N=47
It is a significant problem	5.71%	10.26%	6.38%
It is a small problem	25.71%	10.26%	27.66%
Not a problem	54.29%	61.54%	59.57%
Do not know	14.29%	12.82%	4.26%
Missing	0.00%	5.13%	2.13%

Table 33: Localisation -- relevance of local language software

Capacity-building for end users

Q46: How much help does the typical user need in order to use the software on his/her own?	FOSS N=35	PS N=39	Multi-platform N=47
Ongoing assistance	68.57%	66.67%	68.09%
Very little or only initial help	22.86%	23.08%	29.79%
None	0.00%	2.56%	0.00%
Do not know	8.57%	5.13%	0.00%
Missing	0.00%	2.56%	2.13%

Table 34: Capacity-building -- support requirements of typical users

Technical capacity of computer lab staff

	FOSS N=35	PS N=39	Multi-platform N=47
Q5: Have any of the computer lab staff (including you) used Microsoft Windows before starting to work at the lab?			
Combined "Yes, all" and "Some" answers	91.43%	92.31%	95.74%
Q6: Have any of the computer lab staff (including you) used Microsoft Office applications before starting to work at the lab?			
Combined "Yes, all" and "Some" answers	91.42%	87.18%	91.48%
Q7: Have any of the computer lab staff (including you) used open source operating systems, e.g., Linux before starting to work at the lab?			
Combined "Yes, all" and "Some" answers	40.00%	33.33%	44.69%
Q8: Have any of the computer lab staff (including you) used open source office applications before starting to work at the lab?			
Combined "Yes, all" and "Some" answers	31.43%	35.90%	38.30%

Table 35: Technical capacity -- summary, staff experience with different software applications

Q5: Have any of the computer lab staff (including you) used Microsoft Windows before starting to work at the lab?	FOSS N=35	PS N=39	Multi-platform N=47
Yes, all staff members	42.86%	48.72%	34.04%
Some staff members	48.57%	43.59%	61.70%
No staff members	5.71%	7.69%	4.26%
Missing answers	2.86%	0.00%	0.00%

Table 36: Technical capacity -- experience using Microsoft Windows

Q6: Have any of the computer lab staff (including you) used Microsoft Office applications before starting to work at the lab?	FOSS N=35	PS N=39	Multi-platform N=47
Yes, all staff members	45.71%	46.15%	31.91%
Some staff members	45.71%	41.03%	59.57%
No staff members	5.71%	10.26%	4.26%
Don't know	0.00%	2.56%	4.26%
Missing answers	2.86%	0.00%	0.00%

Table 37: Technical capacity -- experience using Microsoft Office

Q7: Have any of the computer lab staff (including you) used open source operating systems, e.g., Linux before starting to work at the lab?	FOSS N=35	PS N=39	Multi-platform N=47
Yes, all staff members	8.57%	2.56%	4.26%
Some staff members	31.43%	30.77%	40.43%
No staff members	51.43%	51.28%	46.81%
Don't know	8.57%	15.38%	8.51%
Missing answers	0.00%	0.00%	0.00%

Table 38: Technical capacity -- experience using a FOSS operating system

Q8: Have any of the computer lab staff (including you) used open source office applications before starting to work at the lab?	FOSS N=35	PS N=39	Multi-platform N=47
Yes, all staff members	2.86%	5.13%	2.13%
Some staff members	28.57%	30.77%	36.17%
No staff members	51.43%	48.72%	51.06%
Don't know	14.29%	15.38%	10.64%
Missing answers	2.86%	0.00%	0.00%

Table 39: Technical capacity -- experience using FOSS office applications

Q3: How long have you been working in a computer environment?	FOSS N=35	PS N=39	Multi-platform N=47
Less than 1 year	31.43%	5.13%	6.38%
1 to 3 years	37.14%	33.33%	31.91%
More than 3 years	31.43%	58.97%	61.70%
Missing answers	0.00%	2.56%	0.00%

Table 40: Technical capacity -- working in computer environment

Q4: How long have you been working in this computer lab?	FOSS N=35	PS N=39	Multi-platform N=47
Less than 1 year	71.43%	15.38%	21.28%
1 to 3 years	22.86%	35.90%	57.45%
More than 3 years	2.86%	46.15%	21.28%
Missing answers	2.86%	2.56%	0.00%

Table 41: Technical capacity -- working in current lab

When staff training is needed

Q43: If you or other computer lab staff did not have the skills to support the computers initially,did you receive sufficient training to fill this role by now?	FOSS N=35	PS N=39	Multi-platform N=47
Yes	37.14%	38.46%	55.32%
No	57.14%	41.03%	38.30%
Missing	5.71%	20.51%	6.38%

Table 42: Technical capacity -- training received to develop necessary skills

Q39: Which of the following describes the availability of training for the software used in the lab? (Tick all that apply)	FOSS N=34	PS N=39	Multi-platform N=44
Training is available locally	14.71%	48.72%	70.45%
Training is not available locally	41.18%	15.38%	11.36%
Training is available, but not appropriate to technical needs	14.71%	12.82%	4.55%
Training is available, but costs are too high	17.65%	23.08%	27.27%
Training is available, but not in an appropriate language	2.94%	2.56%	6.82%
Other (please specify):	14.71%	5.13%	6.82%

Table 43: Training -- availability of training

Q40: What type of courses are they?	FOSS N=31	PS N=36	Multi-platform N=45
Internationally recognized certification	3.23%	19.44%	28.89%
Nationally recognized certification	6.45%	30.56%	33.33%
No certification	41.94%	33.33%	46.67%
Do not know	48.39%	16.67%	6.67%

Table 44: Training -- availability of certifications

Support

Q47: Which of the following options for support are used in the lab? (Tick all that apply)	FOSS N=33	PS N=37	Multi-platform N=46
Internal support (provided by you or other employees)	60.61%	64.86%	80.43%
External support (provided by outside individuals/organisations/companies -can be free or paid for)	51.52%	56.76%	50.00%
Online support (manuals, discussion groups, email lists, etc.)	18.18%	8.11%	34.78%
Support cluster (support provided by similar labs that you share information with)	12.12%	5.41%	13.04%
Lab users helping each other	42.42%	32.43%	36.96%
Other (please specify):	0.00%	0.00%	2.17%

Table 45: Support -- types of support used in the lab

Internal support

How many staff members provide technical and end-user support Q45: What are their positions? (Tick all that apply)	FOSS N=31	PS N=32	Multi-platform N=45
Lab manager	29.03%	31.25%	46.67%
Administrator	41.94%	43.75%	31.11%
Technical support staff	25.81%	43.75%	55.56%
Trainer	9.68%	31.25%	44.44%
Unpaid volunteers	35.48%	12.50%	33.33%
Other (please specify):	25.81%	15.63%	11.11%

Table 46: Internal support -- positions of staff providing support

Q41: How long has the staff member responsible for technical support been using computers?	FOSS N=35	PS N=39	Multi-platform N=47
Less than 1 year	34.29%	2.56%	12.77%
1 to 3 years	31.43%	30.77%	38.30%
More than 3 years	28.57%	48.72%	40.43%
Missing answers	5.71%	7.00%	8.51%

Table 47: Internal support -- experience of technical support staff

Q49: If a technical problem occurs, are you or other staff members able to resolve the problems?	FOSS N=35	PS N=39	Multi-platform N=47
Always	25.71%	7.69%	10.64%
Usually	17.14%	30.77%	42.55%
Sometimes	42.86%	43.59%	42.55%
Never	14.29%	10.26%	2.13%
Missing	0.00%	7.69%	2.13%

Table 48: Internal support -- ability to resolve technical problems

Q10: Which of the following statements best describes your position?	FOSS N=35	PS N=39	Multi-platform N=47
I have no other jobs besides running the computer lab	20.00%	12.82%	21.28%
I have other jobs besides running the computer lab, but they leave me enough time for the lab	22.86%	48.72%	48.94%
I have other jobs besides running the computer lab, which do not leave enough time for the lab	51.43%	33.33%	27.66%
Other (please specify):	2.86%	5.13%	2.13%
Missing	2.86%	0.00%	0.00%

Table 49: Internal support -- other responsibilities of support staff

External support

Q50: On average, how often do you need to resort to outside commercial technical support?	FOSS N=35	PS N=39	Multi-platform N=47
At least once daily	8.57%	0.00%	0.00%
At least once a week	8.57%	2.56%	10.64%
At least once a month	40.00%	66.67%	55.32%
Never	28.57%	25.64%	23.40%
Other	11.43%	0.00%	6.38%
Missing	2.86%	5.13%	4.26%

Table 50: External support -- need for external technical support

Q51: Does the lab have access to outside technical support when needed?	FOSS N=35	PS N=39	Multi-platform N=47
Yes	77.14%	82.05%	91.49%
No	22.86%	12.82%	6.38%
Missing	0.00%	5.13%	2.13%

Table 51: External support -- access to external technical support

Q53: Is this outside technical support able to resolve the problems?	FOSS N=35	PS N=39	Multi-platform N=47
Always	40.00%	35.90%	40.43%
Usually	28.57%	17.95%	25.53%
Sometimes	17.14%	25.64%	25.53%
Never	5.71%	5.13%	0.00%
Missing	8.57%	15.38%	8.51%

Table 52: External support -- ability to solve problems

Economics of commercial and non-commercial support

Q52: If the lab uses outside technical support, where is it sourced from?	FOSS N=31	PS N=35	Multi-platform N=42
Local computer company	32.26%	62.86%	59.52%
Local NGO (non-government organisation)	9.68%	5.71%	11.90%
Local volunteers	12.90%	8.58%	14.29%
Non-local computer company (has to travel to the lab)	12.90%	20.00%	14.29%
Non-local NGO (has to travel to the lab)	16.13%	0.00%	7.14%
Non-local volunteers (has to travel to the lab)	19.35%	5.71%	11.90%
Other (please specify):	9.68%	5.71%	7.14%

Table 53: External support --sources of external support

The impact of perceptions about technical support

Q65.Good commercial support is available for this kind of software. The statement is most appropriate for:	FOSS N=35	PS N=39	Multi-platform N=47
Applies to open source software	14.29%	2.56%	19.15%
Applies to proprietary software	22.86%	23.08%	40.43%
Applies to both	28.57%	17.95%	14.89%
Applies to none	8.57%	5.13%	4.26%
Do not know	22.86%	38.46%	17.02%
Missing	2.86%	12.82%	4.26%

Table 54: External support -- perception of commercial support quality

Support clusters

Q54: Does the lab share information, experiences, and/or technical support with other labs or staff from other labs?	FOSS N=35	PS N=38	Multi-platform N=46
Yes, via online discussion groups	14.29%	5.26%	17.39%
Yes, in face-to face meetings	25.71%	39.47%	50.00%
Yes, by email	22.86%	13.16%	32.61%
No	48.57%	44.74%	28.26%

Table 55: Support clusters -- types and use of support clusters

Q55: Is this sharing of information with other labs helpful for resolving your technical problems?	**FOSS N=35**	**PS N=39**	**Multi-platform N=47**
Always	5.71%	10.26%	12.77%
Usually	11.43%	28.21%	21.28%
Sometimes	31.43%	17.95%	34.04%
Never	17.14%	12.82%	10.64%
Other	0.00%	2.56%	0.00%
Missing	34.29%	28.21%	21.28%

Table 56: Support clusters -- ability to solve problems

Online resources for technical support

Q56: On average, how often do you, or other support staff in the lab use online technical support (such as web site resources, discussion groups, email lists) to try to solve a technical problem?	FOSS N=27	PS N=26	Multi-platform N=45
At least once daily	11.11%	3.85%	17.78%
At least once a week	11.11%	15.38%	15.56%
At least once a month	37.04%	34.62%	24.44%
Never	33.33%	34.62%	26.67%
Other	0.00%	0.00%	11.11%
Missing	7.41%	11.54%	4.44%

Table 57: Online support -- use of online support resources

Q57: Have you, or other support staff in the lab ever been able to resolve problems through such online technical support? (Analysis excludes labs without Internet access)	FOSS N=27	PS N=26	Multi-platform N=45
Always	14.81%	0.00%	11.11%
Usually	14.81%	19.23%	17.78%
Sometimes	25.93%	30.77%	35.56%
Never	29.63%	38.46%	28.89%
Missing	14.81%	11.54%	6.67%

Table 58: Online support -- ability to solve problems

Q64: Good online support is available for this kind of software. The statement is most appropriate for:	FOSS N=35	PS N=39	Multi-platform N=47
Applies to open source software	37.14%	5.13%	23.40%
Applies to proprietary software	2.86%	17.95%	14.89%
Applies to both	22.86%	20.51%	40.43%
Applies to none	14.29%	5.13%	0.00%
Do not know	17.14%	38.46%	17.02%
Missing	5.71%	12.82%	4.26%

Table 59: Online support -- perception of quality

Q58: Which of the following limit the value and use of online technical support?	FOSS N=32	PS N=32	Multi-platform N=44
Cost of Internet connection	34.38%	43.75%	18.18%
Speed of Internet connection	25.00%	9.38%	38.64%
Do not know	34.38%	40.63%	22.73%
Other (please specify):	15.63%	18.76%	29.55%

Table 60: Online support -- obstacles that limit value of online support

The impact of awareness on software choices

Q77: Where do you see or hear adverts?	FOSS N=16	PS N=29	Multi-platform N=43
Television	31.25%	31.03%	27.91%
Magazines or papers	37.50%	51.72%	62.79%
Direct mail	31.25%	10.34%	39.53%
Other, please specify:	18.75%	20.69%	41.86%

Table 61: Advertising -- advertising media

Q78: Which vendors do you see advertising?	FOSS N=16	PS N=26	Multi-platform N=40
Microsoft	68.75%	84.62%	72.50%
RedHat[26]	6.25%	11.54%	12.50%
Other, please specify:	31.25%	11.54%	35.00%

Table 62: Advertising -- brand awareness

Self-sustainability: a critical factor for computer labs

Q14: How were the initial set-up costs (those incurred getting the lab up and running) covered?	FOSS N=34	PS N=38	Multi-platform N=45
Donations	64.71%	47.37%	51.11%
Subsidies	5.88%	2.63%	4.44%
Government grant	2.94%	7.89%	4.44%
Paid full price/ own budget	11.76%	34.22%	37.78%
Do not know	14.71%	15.79%	11.11%

Table 63: Sustainability -- set-up costs

26 Microsoft was selected as the most appropriate representative for PS companies because the company's software is widely used and Microsoft is commercially active in all three countries of the research. RedHat was selected as the FOSS representative, because it is the best known Linux brand globally. However in retrospect it was found that RedHat's commercial activities in Africa are too limited to allow a useful comparison.

Q15: How are the ongoing costs (day to day costs) for the computer lab covered?	FOSS N=35	PS N=38	Multi-platform N=47
Donations	25.71%	23.68%	17.02%
Subsidies	8.57%	2.63%	2.13%
Government grant	2.86%	5.26%	4.26%
Paying the costs out of own budget	71.43%	65.79%	82.98%
Do not know	2.86%	7.89%	2.13%

Table 64: Sustainability -- ongoing costs

Q71: Does the lab charge for services?	FOSS N=38	PS N=25	Multi-platform N=46
Yes	34.21%	52.00%	41.30%
No	60.53%	44.00%	54.35%
Missing	5.26%	4.00%	4.35%

Table 65: Sustainability -- labs that offer services for a fee

Q73: Which of the following services does the lab offer? (Tick all that apply)	FOSS N=29	PS N=36	Multi-platform N=45
Free training	44.83%	41.67%	66.67%
Training for a fee	27.59%	30.56%	26.67%
Printing	37.93%	44.44%	68.89%
Email access	55.17%	30.56%	80.00%
Web browsing	51.72%	27.78%	77.78%
Help with CV writing	27.59%	50.00%	51.11%
Fax	0.00%	13.89%	11.11%
Telephone services	0.00%	11.11%	6.67%
Other (please specify):	10.34%	19.44%	11.11%

Table 66: Sustainability -- typical services offered by public-access labs

Lack of ground-level involvement in software choices

Q2: Which of the following best describes your role with regard to the software used in the lab?	FOSS N=35	PS N=39	Multi-platform N=47
I decided what software should be used in the lab	17.14%	38.46%	42.55%
I advised the person, who made the decision on what software should be used in the lab	17.14%	10.26%	31.91%
I had no influence on what software is used in the lab	65.71%	46.15%	25.53%
Missing	0.00%	5.13%	0.00%

Table 67: Lab staff's role with regard to software choice

Annex 8. List of key local stakeholders and initiatives

The following organisations and initiatives are directly related to this report, they were either interviewed, their decisions had significant impact on software choices or they implemented public-access projects. Full contact details can be provided on request.

Council for Scientific and Industrial Research (CSIR), South Africa
http://www.csir.co.za

Department of Public Service and Administration, South Africa
http://www.dpsa.gov.za

Direqlearn, South Africa (offices in other African countries)
http://www.direqlearn.org

East African Centre of Open Source Software (EACOSS), Uganda
http://www.eacoss.org

FOSSFA, Free and Open Source Software Foundation for Africa
http://www.fossfa.net, council@fossfa.net

Go Open Source (Initiative by HP, Meraka, The Shuttleworth Foundation), South Africa
http://www.go-opensource.org

Government Communication and Information System (GCIS), South Africa
http://gcis.gov.za

Government of Namibia, Ministry of Higher Education, Training and Employment Creation
http://www.op.gov.na/Decade_peace/h_edu.htm

Government of Namibia, Ministry of Basic Education, Sports and Culture
http://www.op.gov.na/Decade_peace/b_edu.htm

Government of Namibia, Ministry of Local/Regional Government and Housing
http://209.88.21.39/

Government of South Africa/ Open Source home page
http://www.oss.gov.za/

Government IT Officer (GITO) Council, South Africa
http://www.oss.gov.za

HP South Africa, South Africa
http://welcome.hp.com/country/za/en/welcome.html

HP iCommunities, South Africa
http://h40058.www4.hp.com/icommunity2/index.asp

Khanya Project (Western Cape Department of Education), South Africa
http://www.khanya.co.za

Linux Solutions, Uganda
http://www.linuxsolutions.co.ug

Meraka (CSIR Open Source Center), hosted at CSIR
http://www.meraka.org.za

Microsoft South Africa, South Africa
(Microsoft Digital Villages, South Africa)
http://www.microsoft.com/southafrica

National Advisory Council on Innovation, South Africa
http://www.naci.org.za

National Institute for Educational Development (NIED), Namibia
http://www.nied.edu.na

NetDay, South Africa
http://www.netday.org.za

Obsidian Systems, South Africa
http://www.obsidian.co.za

Office of the Prime Minister, Namibia
http://www.opm.gov.na

Schoemans IT, Namibia
http://www.schoemans.com.na

SchoolNet Africa, South Africa
http://www.schoolnetafrica.net

SchoolNet Namibia, Namibia
http://www.schoolnet.na

SchoolNet South Africa, South Africa
http://www.school.za

SchoolNet Uganda, Uganda
http://www.schoolnetuganda.sc.ug/homepage.php

SevenC, South Africa
http://www.sevenc.co.za

The Shuttleworth Foundation, South Africa
http://www.tsf.org.za

SOS Villages, South Africa
http://sosvillages.org.za

State IT Agency (SITA), South Africa
http://www.sita.co.za

Sun Microsystems South Africa, South Africa
http://za.sun.com

Tectonic, South Africa
http://www.tectonic.co.za

Telkom Super Centres Project (SchoolNet South Africa)
http://www.school.za/projects/telkom_supercentre_partnerships.htm

Thintana i-Learn Project (SchoolNet South Africa)
http://www.school.za/projects/thintana.htm

Uconnect, Uganda
http://www.uconnect.org

Uganda Martyrs University, Uganda
http://www.fiuc.org/umu/

Universal Service Agency (USA), South Africa
http://www.usa.org.za

Wizzy Digital Courier, South Africa
http://www.wizzy.com