



education

Department of Education
REPUBLIC OF SOUTH AFRICA

GUIDELINES FOR THE USE OF OPEN SOURCE SOFTWARE IN SCHOOLS

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Foreword by the Director-General

Information and communication technology (ICT) is increasingly becoming an important resource to support, enhance and transform teaching and learning. Software, that is, the range of digital content, application programmes and operating systems that specify the tasks that computers perform, is also becoming more costly. It is therefore necessary that we understand the capabilities and issues around the use of software in order to maximise the educational value we derive from ICT in education.

An issue currently topical in software usage is open source software. There is a growing awareness of the potential benefits and limitations of this type of software in both the public and private sectors. It is for this reason that guidelines for the use of open source software in education have been compiled.

These guidelines are designed to provide education practitioners with a frame of reference concerning the use of open source and proprietary software in education. They have been compiled in line with current government recommendations regarding open source software. The guidelines aim not to be prescriptive about its use, but to use open source software where it is appropriate.

I trust that these guidelines will clarify some of the issues concerning the use of open source software in education.

Mr Duncan Hindle
Director-General

GUIDELINES FOR THE USE OF OPEN SOURCE SOFTWARE IN SCHOOLS

1. INTRODUCTION

Information and communication technology (ICT) is making rapid inroads into all aspects of life. It affects the way we live, learn, work and play. The National Advisory Council on Innovation and the World Summit on Information Society Action Plan notes that ICT can generate economic growth and contribute toward job creation. ICT has been recognised as a tool that can be used to address developmental challenges of developing countries. Software is key to the functioning of such technologies. Existing software ranges from proprietary software to open and free software.

Open Source Software (OSS) is raising considerable interest worldwide and is emerging as a powerful new way of generating knowledge and economic value. There are numerous arguments for the use of OSS and it has a significant following for some applications. For example, open standards and open software are basic elements in the development of more affordable access to ICT. In addition, use of OSS can contribute greatly to increasing access and enhancing the diversity of choice of software and platforms for consumers.

Developing countries like Brazil and Argentina are developing national policies to promote the use of OSS. The South African Government is exploring the potential for OSS to make a significant contribution within the public sector, as well as to wider social and economic development. The opening of the Meraka Institute OSS Centre by the Minister of Communications is an important step to support this direction.

The purpose of this document is to highlight issues concerning the use of OSS in education, as well as to provide guidelines to education managers, teachers and administrators regarding the use of OSS. The guidelines are aligned with government's proposed policy on the use of OSS in public institutions.

2. DEFINITIONS

2.1 Open Source Software

Open Source Software is software that is developed, tested, or improved through public collaboration and distributed with the idea that it must be shared with others, ensuring open future collaboration. It is available to anyone, usually at little or no cost, it does not attract licence fees and the users have access to the source code revealing the inner workings of the software. It is software that is free of proprietary restrictions.

The OSS development model is based on a "bazaar" style of collaboration, where many individuals contribute and share, rather than the traditional "cathedral" style, where a few individuals design and then oversee the structured development and implementation of the software. The underlying philosophy is that of collaboration and sharing for the common good.

Different licences exist for OSS. The following four rights are typically enshrined in all of the licences:

- a) 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 and/or private purposes.
- b) The right to modify the software to suit his/her needs. The user has the right to change the software and extend its functionality, fix any bugs or combine it with other software applications.
- c) The right of access to the source code. This is an important prerequisite in order to exercise the right to modify the software.
- d) The right to redistribute the original or modified software. This can be done at a cost, normally to cover duplication and distribution costs.

2.2 Proprietary software

Proprietary software is privately owned and controlled, usually by a company. The developers of proprietary software hold copyright that awards them the exclusive rights to publish, copy, modify, and distribute the software and they usually do not publish the

source code. Most proprietary software companies sell an "end-user licence," granting permission to use the software program. The end-user licence agreement sometimes limits the way in which the software can be used, for example, by allowing only non-commercial use and placing restrictions on any form of sharing.

3. THE SOUTH AFRICAN GOVERNMENT'S POSITION ON OPEN SOURCE SOFTWARE

In 2000, the Government Information Technology Officers' Council (GITOC) initiated a discussion on the relevance of OSS to government. These discussions concluded that OSS cannot be ignored and that it must be viewed as a viable and legitimate option. Policy guidelines for government on OSS emerged from these discussions, in which the following is stated:

The spin-offs from OSS in bridging the digital divide, the exposure of ICT to a wider public and the amount of money saved on licensing, are what the country needs. The expectation is that the ICT environment will grow substantially, thus pushing us to the fore to effectively compete with other developed economies, with OSS as the engine of growth.

Through GITOC, government recognises that OSS has potential social and economic benefits and its use should be promoted within the following parameters:

- a) The criterion for selecting any software solution is to improve the efficiency, effectiveness and economy of service delivery.
- b) Where the direct advantages and disadvantages of OSS and propriety software are equally strong, and where circumstances in the specific situation do not render it inappropriate, opting for OSS would be preferable. OSS is thus to be implemented where analysis shows it to be the most appropriate option.
- c) Steps are to be taken to create an environment where OSS can be implemented. This can be done by:
 - creating knowledge, understanding and capacity to implement OSS;
 - creating sufficient support mechanisms to support the use of OSS;
 - promoting fair and impartial treatment of OSS in procurement processes; and
 - creating opportunities for trial use.

- d) OSS policies are to be integrated into broader e-Government policy and related strategies for the ICT sector in the country.
- e) OSS is to be utilised to promote access to information by citizens, particularly in creating procedures to enhance government's electronic service delivery.

In July 2004, The National Advisory Council on Innovation recommended that strong advocacy for OSS is required from decision-makers and stakeholders so that it becomes an essential component of all ICT for development initiatives in South Africa.

4. ISSUES RELATING TO THE USE OF OSS IN SOUTH AFRICAN PUBLIC SCHOOLS

It is possible to use OSS and proprietary software programs concurrently in schools. Each type of software does, however, have particular strengths, weaknesses and incompatibilities that need to be understood and factored into usage and ICT decision-making. The following list is a mix of anticipated and prevailing issues that have emerged from research and discussions.

4.1 ICT in Education

The *White Paper on e-Education* promotes the use of ICT to accelerate the achievement of national education goals. Ways in which this will be done include learning *about* ICT, learning *with* ICT and learning *through* the use of ICT. The emphasis is placed, however, on using ICT for curriculum support with lesser emphasis on learning *about* ICT.

4.2 Costs of software

A key reason often cited in favour of using OSS in public institutions is that the institutions do not pay software licence fees. Expenditure on licences by public schools in South Africa is however, limited. This is because software developers and vendors have made donations and some programs are purchased and distributed from a central level. Agreements also currently exist between major proprietary software providers and the Department of Education. These agreements provide immediate educational support and benefit during the crucial period of establishing an educational ICT infrastructure.

However, there may be long-term economic and social costs associated with these arrangements.

Software costs are not the only issue in the provision of ICT to schools. At a macro level, significant infrastructure investments are needed to bring ICT to schools that lack electricity, access to telephone networks and computer equipment. At the micro level, expensive hardware and support, as well as the high costs of telecommunications and Internet connectivity, especially in remote areas, are significant cost factors. If programs are pre-loaded or provided on CD-ROM, downloading costs can be reduced.

4.3 Vendor lock-in

The use of proprietary software can lead to *vendor lock-in*. This can effectively tie users and applications to particular brands for the long term.

4.4 Ease-of-use in software installation and configuration

Some proprietary software programs are easier to use than OSS. OSS solutions were not originally designed for non-skilled users, but usability has recently improved. Users need to assess the ease of use of different kinds of software in order to make informed decisions.

4.5 Technical capacity and support

Technical support is a key factor to determine the success or failure of ICT in schools. Two types of support are generally required. One is technical support to ensure that the networks and computers are operational. The other is end-user support to operate equipment and use software applications.

Although extensive support is available for OSS by way of mailing lists, potential users need to ensure that localised and accessible support is available.

4.6 Ability to modify source code and applications

A feature and attraction of OSS is the user's right to modify the source code. This allows the user to learn how the software works, build high-level skills and modify the software to suit specific needs. OSS is particularly relevant to developing countries, where the expected market size might not provide sufficient incentive for proprietary software companies to address all local needs. It also offers opportunities for learners to examine and change the way OSS programs are written, which is relevant to learners who have selected Information Technology as a subject.

4.7 Lower-end computers

Some OSS programs are well suited for use on older lower-end computers. Older hardware may not always run the most recent versions of many proprietary software programs because of requirements for processing speed, memory, hard-drive capacity and complex functionality.

4.8 Viruses

It is debatable whether proprietary software is generally more vulnerable to virus attacks than OSS, particularly with the anti-virus software that is available. It is argued, however, that because the source code of OSS is open for review by a wide variety of software developers, OSS weaknesses are more quickly identified and removed and therefore, less susceptible to virus attack.

4.9 Language and localisation

Localisation of software is an agreed upon goal of the ICT-for-development community and particularly amongst OSS proponents. Until recently, most software in Africa was available only in English, French and, to a lesser degree, other European languages.

Many user interfaces of the most common OSS and proprietary software applications are now becoming available in local languages.

The markets for the eleven official languages in South Africa are not large enough for proprietary software service providers to invest in local language versions of their software, at least not without financial support or incentives. OSS readily allows for the development of programs in African languages. Although it also requires financial support, OSS has a strong volunteer-based software development model that is making good progress in developing local language user interfaces. The OSS approach will enable communities to take ownership of such a process.

4.10 Software activation

Proprietary software vendors use a range of technical mechanisms to curtail the unauthorised use of their applications. One of these mechanisms is "registration", which usually requires the user to enter a licence key to "unlock" the software.

This can cause problems when hardware parts are replaced, particularly as hardware ages. As each software installation is matched with a specific computer, these hardware changes can sometimes cause the installed software to stop functioning. This happens because the software interprets changes made to the computer on which it is installed as being a different computer.

OSS does not have these activation problems and can be freely distributed.

4.11 Compatibility

The ability to exchange electronic data and documents with others is a basic requirement in current computing environments. However, when files are shared between different software applications, and even between different versions of the same applications, problems can be encountered. Incompatibility of file formats means that some software cannot read files created in other applications. This can be a problem if OSS and proprietary software programs are both used in a school environment, particularly when complex files like spreadsheets that use formulas or macros are used interactively.

5. LIMITATIONS TO THE USE OF OSS IN EDUCATION

5.1 Incompatibility of programs with operating systems

A limitation to using only OSS in education is that certain education programs operate only on the Microsoft Windows platform. This problem is further compounded when some applications run only on a particular version of Windows, for example certain applications written for Windows XP do not run on Windows 98.

5.2 Quality Assurance

OSS programs are at differing stages of development and, although the community of users refines the available product, no specific quality assurance processes are applied to OSS. Proprietary software is released only when it has achieved what the software developers term an acceptable level of being “bug-free”, implying measures of quality control. This factor needs to be considered and should users want OSS programs that are stable, packaged OSS programs such as Red Hat Linux, SUSE Linux, Open Office etc., are available.

5.3 Workplace readiness

An argument that has been raised against the exclusive use of OSS application programs in schools is that the commercial sector predominantly uses proprietary application programs and that learners will be disadvantaged in job applications by not being familiar with programs in common use.

6. RECOMMENDATIONS FOR THE USE OF OSS IN PUBLIC EDUCATION INSTITUTIONS

The approach to OSS by provincial education departments and public education institutions is that decision-makers should be adequately informed and therefore enabled to make informed decisions concerning when to use OSS and when to use other software applications, particularly in terms of functionality and cost. Consideration should be given to the following:

- a) In order to make informed decisions that are in the best interests of education, schools and provinces should be aware of the benefits, conditions and potential pitfalls of using software offered through various licensing agreements.
- b) Utilise OSS where analysis shows it to be an appropriate option. If the necessary knowledge and technical expertise are available and if the direct advantages and disadvantages of OSS and proprietary software are equally strong, and where circumstances in the specific situation do not render it inappropriate, OSS should be considered.
- c) Provincial education departments should take steps to create an environment where OSS can be implemented. This can be done by:
 - providing facilities and opportunities to develop the necessary knowledge, understanding, capacity and technical support to assist others;
 - promoting fair and impartial treatment of OSS;
 - promoting an environment of collaboration and sharing; and
 - creating opportunities for piloting and trial usage.
- d) Integrate OSS into e-Education implementation strategies.

6. CONCLUSION

The non-proprietary status of OSS is seen as having significant educational benefits and huge implications for affordable IT solutions in both the public and private sectors. OSS is also considered by many as a useful tool to support developing countries to enter the information age and empower people in ways that proprietary software does not allow.

The issue of OSS is important for both government and education because it has social development and economic implications. Promoting the use of ICT in schools requires that educationists (teachers, managers, administrators) and learners have access to ICT, technical skills to use the technology and the understanding to use ICT for curriculum delivery and support purposes. A smaller group will, however, delve deeper to understand programming, investigate source codes of software and even develop custom-made applications for education.

OSS is becoming a key feature in future ICT usage and its use in education could be significant. Issues concerning the use of OSS in education need to be understood in order to maximise potential benefits and assist in making informed decisions about software use.