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Open Source Alternatives and Applications for Technical and Vocational Training

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Abstract

With the continuous development of new applications and operating systems incompatible with older versions, schools face the dilemma with the software and hardware upgrade. The authors deal with the question whether it is necessary to upgrade technology and software equipment. They show the potential of open source alternatives. The article discusses the possibility of including the open source software to technical and vocational training.

Keywords:
Open source
Technical training
Technology and software equipment

1 Introduction

Open-source software or "free software" is the software that is distributed using open-source license. License determines the rights and obligations of users in relation to the licensed work. However, in terms of distribution, open-source licenses can be divided into two groups:

- Licenses applying the so-called "copyleft". This kind of license expresses that every other distributed licensed product will have a license as an original work, or in the further distribution of the software, it will be maintained under the same "freedom" as the user received the original. Here we include all licenses compatible with the GNU GPL license;
- Licenses allowing dissemination of the work with any (even proprietary) licence. Such licensed work can thus be taken and distributed without restrictions. Here we include such licenses as the BSD license (Krátky 2012).

Detailed description of the licenses can be found on the website https://gnu.org/licenses/license-list.en.html. In this article, we will focus on software licenses in the first group. According to the Open Source Initiative (OSI), which is recognized as the official authority with the power to approve open-source licenses and which by means of licenses provides legal protection for software, open-source software is the software that meets the basic four freedoms of free software.

- freedom to use the software for any purpose,
- freedom of access to the source code - i.e. to study program functions, to carry out changes and adapt them to the needs,
- freedom to distribute copies of the program,
- freedom to improve the program and publish the improvements - ultimately brings benefits to the whole society, the conditions is an access to the source code..

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2 The use of open-source software

2.1 What do students gain by using open-source software?

In the educational process, students develop some important skills through open-source software. Firstly, it is the **ability of creative thinking**. The advantage of open-source software is that students often achieve the same result by different ways, what ultimately allows applying the acquired knowledge in unknown products of the same orientation. Another skill is the **adaptability**, closely related to creativity. This important factor has been rather neglected and it surfaced mainly at the change of the environment either of the Windows operating system itself by using Metro tile system, or by using the Ribbon panel in MS Office. Especially those students faced some difficulties, who in their practice did not meet other environments and their time of adaptation was disproportionately longer than that of those students who were guided to a comprehensive solution of the problem, which means, not by what to achieve a result, but how to achieve it. Finally yet importantly, it is the **ethical form of the software use**. By using open-source software, students learn such concepts as free license, legal software, proprietary software, intellectual property, as well as theft of intellectual property, etc.

2.2 Why to use open-source software at schools?

Free Software supports education by enabling sharing the knowledge - through the source code, and by sharing the tools - through the programs themselves, as one of the freedoms of free software. Educators have the opportunity to provide students with not only the result of work in the classroom but also the software itself. Basic advantages of the use of free software are: **independence, social responsibility, security, financial savings and quality.** When using open-source software, there is no dependency on a single supplier and its licensing terms. The big advantage is that the GNU GPL license does not expire and guarantees the owner of the product all the freedoms of free software. By obtaining complete independence, the school also avoids proprietary locking (i.e. "vendor lock-in"), which defines what the school can do with this product (GNU 2011). School should not be a tool or a springboard for commercial businesses to obtain future users. By the strict use of proprietary software at schools, the lifetime dependence of students from the software is built. The school should be a tool for education, not for training. Security means the fact that the owner of the software is its "real" owner, not only a user (as it is in the case of Windows 10). Moreover, the user has full access to the source code, which means that the owner can study the code, change and adjust it, that the software is fully under control. It cannot happen that the software sends information without user consent, as it can happen in a closed proprietary code. The big advantage is the freedom of copying at minimal or no cost ensuring in education fairness and equity among students. Then there are the savings in technical support, where the low hardware requirements for the use of open-source software are sufficient. Exactly this factor often leads the company into contemplation regarding the deployment of free software into practice without having to upgrade hardware in dependence on a new version of the software. The quality is conditioned by a broad base of developers interested in the product. For schools, it also has the advantage that in addition to secure and stable solutions, publicly available documentation relating to that software can often be downloaded. For students, it has the advantage that this software can also be used without restrictions also for commercial use, what can be the basis for their business without unnecessary additional costs of acquisition and training.

3 Examples of the use of open-source software at schools

Open-source applications that should not be overlooked when teaching informatics are: **operating systems, office suites, CMS systems and graphics systems.**

3.1 Operating systems

This article does not discuss comparisons between free and unfree operating systems. In brief, we summarize only the basic advantages of using Linux OS in schools. These include: **license, distribution, development**

support and documentation, packaging system, security, application support, language support and documentation, hardware requirements. Fundamental freedom is a free software license. Linux comes in different platforms with different requirements for different target groups of users. It is up to each user to choose the most suitable one. The new versions are issued at regular intervals, some versions have the designation LTS (Long Term Support) what means support for five years from the issuance of version, in addition, this support is free (Ubuntu, Linux Mint and others). Packaging system operates on the basis of repository for adding, removing and updating applications. You do not need to download special apps and manually install them. You only need to select a specific application, and all system requirements are done automatically. The OS is fully under control. It is resistant to many known security threats (viruses, malware, spyware) and, moreover, does not send any sensitive information without user consent. Each distribution contains pre-loaded applications (office suite, graphical system, audio and video browsers...). Therefore, this system is ready for the use without additional packages. Most distributions have language locator and appropriate documentation to the study. Linux can be put into operation also on computers with low hardware requirements.

3.2 Office suites

The best-known open-source software is an office suite LibreOffice, which follows its predecessor OpenOffice and appearance is close to Microsoft Office 2003. It has all the necessities as proprietary MS Office with the fact that in its package additionally includes a vector editor Draw. It is applicable to all operating systems; its greatest advantage is just its license that allows installation without unnecessary problems with licenses on any number of workstations.

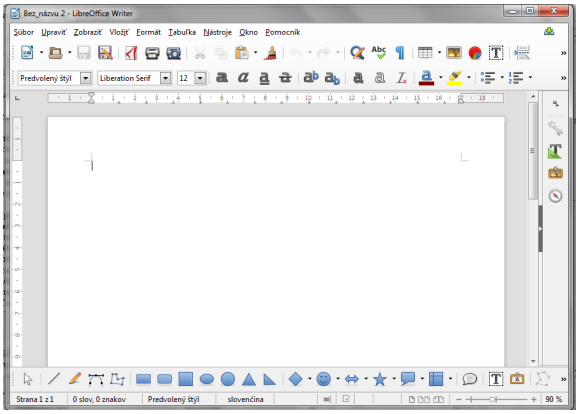

Figure 1. Preview of LibreOffice 5 environment

Along with Linux, we can see the great advantages of free software deployment in practice. The study (Liberix 2014) shows that already the mere deployment of Libre Office in companies will save 10% of the total annual cost of acquisition. When using Linux and LibreOffice, it is already incredible 20-30%. The Munich Town Hall is a good example. In 2004, it started using free software - operating system LiMux (own distribution of Linux), along with Open Office package. As stated in article (Heath 2014), the city operates more than 14,000 computers with free software on the basis of GNU GPL license, and from the start of migration of documents and work from proprietary to the free one, total savings were more than € 10 million. The author also states that the city saved more than 6.8 million Euros on licensing of OS and office suite.

3.3 CMS systémy

As shown in the graph on <https://trends.builtwith.com>, the websites creation by using open-source content management systems (CMS) represents more than 65% of all website in the market. CMS systems allow the creation through the custom interface, often without the knowledge of a single line of code. Management of articles, but also of the database is adapted to intuitive operation, usually in the Internet browser environment. As is clear from research of High-Tech Bridge Security Research Lab (High-Tech Bridge 2014), website security depends on the issued security patches. As shown in the graph, the degree of risk of the most common critical vulnerabilities of larger open-source CMS systems in case of cross-site scripting vulnerability (XSS) and SQL injection were at a low level compared to in-house web applications.

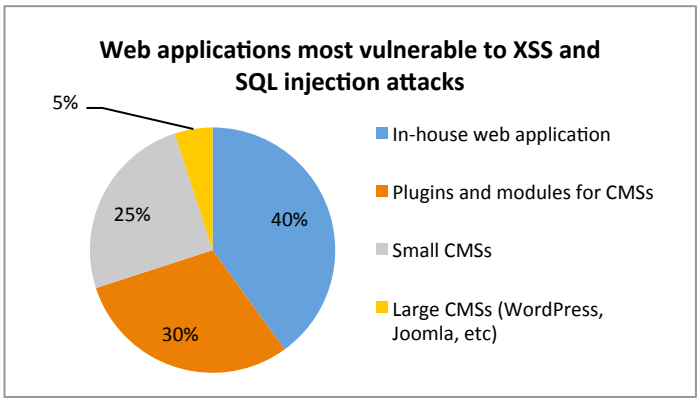

Figure 2. The most common security vulnerabilities on websites in 2013
(source <https://www.htbridge.com/news/web_application_security_trends_in_2013.html>)

3.4 Graphics systems

Graphics is divided into two large parts - 3D and 2D. In 3D graphics, Blender is among the best-known open-source software. It was originally released as a closed system. At the turn of the millennium, this software has become revolutionary by being the first 3D graphics software enabling users its free delivery, and by its low price compared to its competitors on the market. The transition to a new investor in 2001 caused the company stagnation and gradual halting of Blender development. A year later, the idea to disclose Blender as open-source software and thus enable its further development and support arose. To carry out this idea, a non-profit Blender Foundation was established. Enthusiasts collected € 100,000 for the purchase of rights, code and intellectual property and from the former owner for incredible seven weeks, and since 13 October 2002, the software is free (Gumster 2009, pp. 10-11). Not necessarily, software begins as an open format. If it has a broad base of enthusiasts, it also has its future and by adding new functionalities demonstrates its viability. In 2D graphics, it is raster graphics and open source software Gimp. Originally, this software was only designed for Linux operating system, but over time, its scalability got almost on all operating systems. In vector graphics, we can mention the full featured tool Inkscape. Do they cope with their properties to its competitors? Are their functions and their environment sufficiently competitive? On the Internet, we can find many discussions taking on this issue changes. From our personal experience based on teachings the course of computer graphics at our workplace, as well as courses of informatics at private Grammar School, we can proof the results of the discussions in the following areas: The user interface not necessarily appears as "user-friendly" (although is dynamic and completely user customizable). If students are forced to pay attention and time to first lessons associated with becoming familiar with software environment and functions, there is a change in their view to this software. It can be argued that if students did not undergo those first initial lessons, their opinion on graphical open-source software is slightly distorted, often even unfriendly.

4 Conclusion

Does open-source have relation with also other characteristics besides the already mentioned adaptability, critical thinking and financial aspect? From a personal point of view, we can affirm that if a student is forced to work parallel in open-source software, ultimately we push him to think about the things themselves, not only manually use the product or procedure. For a significant positive aspect of open-source applications, we consider in particular the development of creative thinking of students and improving their adaptability to the new environment. Moreover, the development of ethical nature use open-source software forms healthy relationships to intellectual property and its use. However, we disagree with the vast majority of authors that digital media are generally suitable for all subjects, because according to the research of Professor Manfred Spitzer (Spitzer 2014), once you stop developing mental activity, memory weakens and loses the neural connections. From the long term point of view, in children and adolescents due to increased use of digital media significantly decreases their learning ability, distractibility increases, and the reliance on digital information without training their own brain becomes standard.

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