The impact of teaching using open source geospatial software

Jens Ingensand and Bertrand Cannelle

School of Business and Engineering Vaud (HEIG-VD), University of Applied Sciences
Western Switzerland (HES-SO), CH-1401 Yverdon-les-Bains, Switzerland

Abstract: This paper explores the impact of using open source geospatial software for education in general. On one hand, educational institutes are a driving force behind open source software development, on the other hand students, once they have completed their education, are likely to use the software that they know from their studies in their future jobs. Several researchers have proven that many courses that use geospatial software can be entirely taught using open source software. In this paper we present the results of a questionnaire that we sent to several educational institutes throughout the world regarding their usage of open source software, their relation to propriety software companies and also what triggered the change from proprietary software towards open source software.

Keywords: Open source geospatial software, user study, teaching

1   Introduction

In recent years the use of open source geospatial software in public administrations and private companies has been increasing. For instance in France the IGN (French National Mapping Agency) uses open source geospatial tools such as PostgreSQL/PostGIS for storing and distributing their data (Fuchs 2006); in Switzerland, several federal and regional agencies use open source API's for the development of their online platforms such as map.geo.admin.ch (Moullet 2013). Also companies, as for instance the Swiss Post, started using open source geospatial software.

However the usage of open source software in companies or administrations is absolutely not equal to no cost as Shaikh and Cornford (2011) pointed out. In order to be able to use open source software, an organization needs experts who know

what they are doing and where to look for support. Furthermore the organization needs to assure a continuity in their services. If an expert leaves the organization, another expert who is familiar with similar open source software knowledge needs to be recruited.

Another important point is that open source software is known to be less "user-friendly" than proprietary software (Iivari et al. 2008, Nichols & Twidale 2003) and often, in order to create new systems or to implement data handling processes, developers and administrators need to assemble several different products that use different input or output formats, or that are utilized through very differently looking interfaces. Software coming from companies selling proprietary software on the other hand has interaction manners, terms, and interfaces and so forth that are standardized for all their products.

2 The impact of using open source software in teaching

We suggest that the fact that open source software is used in courses and projects at educational institutions plays a major role in the increasing usage of open source software in general. On one hand the initiators of open source software projects are often to be found at educational institutions because the need for a specific tool made them develop the software themselves - on the other hand open source software offers the possibility to inspect and to modify the source-code and thereby to understand how for instance an algorithm has been implemented.

Furthermore using open source software in education also allows to shape tools for special needs, for instance within student projects or research projects. Open source software also helps introducing students to programming. In the case of a research project it is easier to continue the development process and allow all partners of the project to use the software and to maintain and upgrade the source code.

However within the limits of a study program it is almost impossible to present all existing software and systems in depth to the students and lecturers need to make choices. Therefore we can ask the question - why teach one or several proprietary systems rather than open source systems?

Several researchers; e.g. Steiniger & Hunter (2013) or Ellul (2012) have shown that it is fully possible to replace proprietary geospatial software products such as GIS, geospatial databases, remote sensing software and so forth with open source alternatives in courses taught at their institutes.

So what reasons prevent educational institutes from exclusively using open source software? Rey (2012) for instance has described concerns of students who wanted to learn the proprietary software tools that they needed for their CV in order to apply for jobs. Moreover colleagues were worried about the relationship to

proprietary software companies, since they also sponsor research; organize meetings, seminars and so forth.

However from the perspective of proprietary software industry, the competition has changed. 20 years ago software development companies were facing competition from other proprietary software companies. Today they are also facing open source software. Software development companies of course are aware of the fact that people, once they have learned a specific tool, tend to prefer the same product at their new jobs and are thus influencing the usage of geospatial software. Educational institutes thereby have a certain power in influencing the usage of open source software: they are often involved in the programming of the software and more importantly shape future users.

3   User study

In order to analyze the impact of teaching open source software, we decided to send questionnaires to colleagues working at other research institutes. In this questionnaire we wanted to know:

- if open source software has been chosen for teaching and why
- if proprietary software had been used before: what has triggered the change and what was the reaction of the students
- if the proprietary software industry has undertaken steps in order to promote their products for teaching (or/and to prevent institutions from using open source software)
- if there has been feedback from former students regarding the fact that open source software has been taught / has not been taught. Did they have problems adapting to a different kind of software.

We sent the questionnaire to 20 lecturers in Switzerland and to 50 lecturers teaching at institutes throughout the world.

4   Results

We received 15 answers from Switzerland, Germany, France, UK, Finland and Canada. Four out of these 15 answered that no or almost no open source software is used.

Major reasons for both the usage of open source software and the switch from proprietary software were the absence of license costs and the possibility to modify the code. Three times we received the answer that lecturers already had acquired the experience during their research and were therefore also using it in their courses. Other reasons for using open source software were performance, scalability, flexibility, major support for interoperability, good online documentation and easiness to install (no complicated licensing software) and also

the fact that for some specific subjects there is no proprietary alternative to open source software.

We also received the answer that the lecturers wanted to open the student's minds to alternatives to proprietary software. One lecturer answered that their faculty also encourages the usage of open source software. Three of the four people who answered that no open source software was used were from the same university.

The answers received did not confirm Rey's (2013) observation that students wanted to learn to use specific proprietary software and thus had a negative attitude to learning open source software. We did not receive any answer about negative student feedback on the usage of open source software except one person mentioning that students were annoyed when the software wasn't stable. Overall students were either indifferent or positive.

Concerning the question if proprietary software industry has undertaken steps in order to increase the usage of their products we received very different answers. Three out of the 10 people who use open source software for teaching answered that proprietary software industry neither puts them under pressure nor are doing an aggressive promotion of their products. Seven people replied they do feel a pressure from the software industry. Methods used to promote software products included aggressive promotion campaigns, discounts, access to resources, agreements with the institution or even the ministry of education, the requirement to book a vendor once a year or the requirement to report software usage.

There was little feedback of former students who had to adapt to different software than the software they learned to use in courses. One answer was that some students might have had problems due to a different GUI; three people answered that students did not have any problems; also due to the fact that conceptual know-how and skills are more important than the knowledge of how to use specific tools.

5 Conclusions

Our survey showed that open source software is used in most of the educational institutes who completed the survey. One interesting finding is that three out of the four people who answered that they were not using open source software at all were from the same research institute. At the same time one person answered that using open source software was encouraged by the faculty. These facts suggest that the influence of the department, the educational institute or even the ministry of education has a significant influence on the choice of software for teaching. Moreover, as Rey (2012) describes, relationships with proprietary software industry are sometimes cultivated over a long period of time and thus not so easy to change or to break.

The change from proprietary software towards open source software appears to be frequently triggered by people who used open source software for their

www.ogrs-community.org

research projects. Once they had learned to use a particular software, they felt that they also wanted to use it for teaching.

The measures proprietary software industry has taken in order to increase the usage of their software in courses appears to be varying; some people answered that local vendors did not care very much, while others reported aggressive campaigns and contracts with their institutes or the ministry of education in order to force the usage of their projects.

None of the people who answered the survey were using open source software at 100%. Most people answered the usage was around 50%.

We argue that the main role of an educational institution is to prepare students for the life after their studies. Most importantly the goal is to make students understand the use of specific techniques within geodesy, photogrammetry, GIS, cartography etc- and to use specific software in order to apply these techniques. However, both open-source and proprietary software is changing constantly. Open source software changes sometimes even every week and it is not always as stable as proprietary software which changes roughly every other year. Lecturers and professors must be aware of this evolution and therefore need to constantly adapt their courses and exercises.

We argue that the choice of software for teaching geospatial concepts has an impact on the usage of geospatial software in general. Choosing open source software has several advantages, but it also has consequences. Professors and lecturers need to be aware of these consequences and need to make students aware of the choices they have made. Our own choices reflect the demand of our student's future employers, but also the necessity to make students understand the theoretical concepts that are taught.

References

Ellul, C. (2012), Can Free (and Open Source) Software and Data be Used to Underpin a Self-Paced Tutorial on Spatial Databases? In: Transactions in GIS, 16(4): 435-454.

Fuchs, F. (2006), Institut Géographique National (IGN) PostGIS Case study, URL: http://postgis.refractions.net/documentation/casestudies/ign/ [accessed 2014-02-03].

Iivari, N., Hedberg, H. & Kirves, T. (2008), Usability in Company Open Source Software Context - Initial Findings from an Empirical Case Study. OSS 275, p 359-365 Springer.

Moullet, C. (2013), User centred design for map.geo.admin.ch. Presentation held at FOSS4G2013 conference 2013. Nottingham, England, 17th-21st September 2013.

Nichols, D. & Twidale, M. (2003), The Usability of Open Source Software. First Monday 8(1).

Rey, S. (2012), Open source spatial analysis: lessons for research and education from PySAL. Proceedings of the OGRS 2012 conference, Yverdon les Bains, Switzerland, 24th-26th October 2012.

Shaikh, M. & Cornford, T. (2011), Total cost of ownership of open source software: a report for the UK Cabinet Office supported by OpenForum Europe. UK Cabinet Office, London.

Steiniger, S. & Hunter, A.J.S. (2013), Teaching GIScience with Free and Open Source Software? – A first Assessment. GIScience 2010: 6th Int'l conference Zurich, September 14-17.