Open source software: an example in use

Anthony Greenwood
ASS and Business Studies, St Martin's College, Carlisle

Abstract

"Open Source" software (OSS) is distinctive because of its licensing arrangements. In contrast to commercial software, OSS is freely distributed. Once in possession of the software, users may copy, modify, redistribute the software, or incorporate it into another product. The author used OSS to develop and write-up his MPhil thesis.

This paper explores the OSS concept, finding that the 'gift economy' is a widely used metaphor in the practitioner literature, though the academic literature exhibits some scepticism about the depth of its applicability. It confirms that experience with the MPhil project supports the findings from the literature, and concludes by recommending that a fuller literature review and a series of formal case studies be undertaken.

Introduction

Software is made from 'source code' which is created by computer programmers. The source code for conventionally licensed software, such as Microsoft Windows, is owned by its creator and is normally regarded as a commercial secret, though specific rights to the source code may be released under license to partner organisations. Similarly, ownership of the software itself is generally commercially retained whilst customers are granted licenses to use the software under specified conditions. In contrast, OSS source code is made available to the public.

This paper begins with an overview of a convenience sample of the OSS literature. A decision was taken to confine the literature search to recent academic sources, though there is a substantial volume of practitioner literature available. Where the latter refers to sources, it normally uses Raymond (1999a) which is a collection of essays originally presented online. Raymond uses a series of metaphors to explore the OSS movement, especially "vaguely referring to the classic work by Mausse [on gift cultures]" (Bergquist and Ljungberg, 2001:305). The review draws attention to the distinctive nature of OSS and briefly explores some of these and other frameworks.

The paper then recounts the author's experiences in using OSS to prepare an MPhil thesis (Greenwood, 2001) and relates this back to the literature. Finally, it draws attention to two areas of potential further work.

Distinctive nature of Open Source software

Outside of the OSS movement, the ownership of software is tightly managed and its use is controlled by issuing limited licenses. Edwards (2005) and van Wendel de Joode and Egyedi (2004) describe OSS in terms of lack of such restrictions. Edwards (2005:112) specifically asserts that "open source software *is defined by* the restrictions or rather lack thereof in the licenses" (my emphasis) whilst van Wendel de Joode and Egyedi (2004:1) open their paper by stating that the source code is "widely accessible, freely available, reusable". Goode (2005:670) adds that such software can be free of charge, but acknowledges that this depends on the license (Välimäki and Oksanen, 2005). One corollary is that the development of OSS takes place within a community that often has no common employer (O'Mahony, 2003:1180) or can (more pejoratively) have "ambiguous leadership" (Goode, 2005:670).

From an economics perspective, Grand et al. (2004:591) pick out the OSS development process as an example of a particular form of technological innovation. They categorise 'innovation' as an activity that takes place either within organisations or in the public arena. OSS is distinctive in that it crosses this divide – "privately funded efforts contribute to the creation of a public good" (Grand et al., 2004:591). The notion of "OSS as a privately funded public good" (O'Mahony, 2003:1180) is also deployed to examine

the management of OSS projects. O'Mahony argues that these are distinctive in that they are initiated and managed outside of any formal organisational context (also Bergquist and Ljungberg, 2001:310). Dahlander and Magnusson (2005) broaden this scope to include OSS that is developed within organisations, including those for which this is their primary activity. Nonetheless, the possibility of community development makes OSS different from conventional commercially licensed software.

It is clear, therefore, that OSS is not a synonym for 'free of charge', and certainly not for "Warez" (Reyn, 2004). Nor does the term strictly encompass 'public domain' software that is not Open Source. It is not uncommon for commercial software companies to give away licenses to use some versions or aspects of their products. Motivations for doing this are beyond the scope of the present paper but are likely to involve wider marketing considerations. In parallel, not all OSS is free of charge to all users. Edwards (2005:112) uses the term 'free' but points out in a footnote that this means: "free in the sense of freedom and not necessarily free from cost". The development processes and licensing arrangements for OSS are, though, clearly different from those used in conventional settings.

Studying the OSS phenomenon

OSS, itself described as a "phenomenon" (Fitzgerald and Feller, 2001:273) or "model" (Goode, 2005:670), is developed and supported within what is variously referred to as a "movement" (Dahlander and Magnusson, 2005:2; Grand et al., 2004:592; Zeitlyn, 2003:1287) or a "community" (O'Mahony, 2003:1180; van Wendel de Joode and Egyedi, 2004:1). The concept of an OSS community is explored in Bergquist and Ljungberg (2001), Edwards (2005) and Schofield and Mitra (2005).

Recently, the OSS movement has attracted considerable academic attention. For example, it has been the theme of a double issue of the Information Systems Journal (Fitzgerald and Feller, 2001, 2002), is the raison d'être of at least one research group (MIT, 2005), and was the subject of a keynote address at the 2005 Conference of the UK Academy for Information Systems (Fitzgerald, 2005).

OSS features in the Economics literature (Dahlander and Magnusson, 2005; Edwards, 2005; Grand et al., 2004; O'Mahony, 2003; Välimäki and Oksanen, 2005). It has been studied as an example of a 'gift' economy (Bergquist and Ljungberg, 2001; Grand et al., 2004; Zeitlyn, 2003), as a model for project management (Gallivan, 2001; Koch and Schneider, 2002; van Wendel de Joode and Egyedi, 2004), and as a market force (Dahlander and Magnusson, 2005; Grand et al., 2004; Välimäki and Oksanen, 2005). Economics has also supplied the concepts of network effects (Gallaugher and Wang, 1999; Katz and Shapiro, 1985; Välimäki and Oksanen, 2005) and public goods (Samuelson, 1954; Grand et al., 2004; O'Mahony, 2003).

The association between OSS communities and gift economies Mausse (1924/2001) is generally attributed to Raymond (1999b). Bergquist and Ljungberg (2001) offer some critique of Raymond's use of the term, but confirm through a more detailed review that the association is appropriate. Similarly, Zeitlyn (2003) confirms that the gift economy is one of a number of useful metaphors. From Bergquist and Ljungberg (2001) and Zeitlyn (2003) it can be seen that gift economies are distinctive in that:

- repayment is not direct or immediate
- gifts increase the power of the giver
- there is no explicit bargaining involved, of the form seen in exchange economies.

In addition, digital gifts are distinctive in that:

- giving a digital gift does not detract from its value
- transaction costs are small and independent of distance.

These points are open to criticism in an OSS setting. For example, frequent anecdotal evidence suggests that, unlike physical gifts, there is an expectation in electronic communication that responses to messages are immediate. Although bargaining of the form 'I'll send you this correction if you tell me how to do x' does not take place, the rapid nature of online communication could lead to near-explicit bargaining for status. Although digital information does not become worn out, there are risks involved in giving it away. One source of difficulties within OSS communities is the process of 'forking', in which one piece of software is evolved into a number of mutually incompatible versions by competeing groups of developers. Through (economic) network effects, this can effectively reduce the value of each tine.

The gift ecomony metaphor is one of a number that have been proposed (Bergquist and Ljungberg, 2001; Raymond, 1999b; Zeitlyn, 2003). One common reference point is the academic peer review process. Bergquist and Ljungberg (2001:317-319) discuss this comparison in some detail.

Example: use of OSS to prepare an MPhil thesis

To illustrate the foregoing points, an account is offered of the role of OSS in documenting an MPhil thesis (Greenwood, 2001). The documentation process took place between 1999 and 2001 using the Lyx word processor alongside a range of other OSS. The sequence of events in selecting this software was as follows:

1. The thesis would potentially include a large number of matrices and equations. A freely distributed typesetting system called TEX is specifically designed for this and, especially in its LATEX dialect, is widely used in the scientific community. In addition, through experimenting with LATEX, it became apparent that it has a highly developed set of tools for handling bibliographies.

2. LATEX is essentially character-based, but under Windows, a commercial package called Scientific Word offers one means of providing it with a conventional word-processing face. However, the author was also experimenting with Linux at the time. It offered improved speed and reliability, and includes the (somewhat equivalent) OSS Lyx package.

3. Whilst learning to use Lyx it was found to be extremely well supported by an active and helpful online community. As the document developed and experiences in creating it grew, it became possible to participate more fully in the community.

4. When requirements for new types of diagram arose, it was always possible to find OSS products which could not only produce the diagrams but also export them in formats that integrated well with LATEX. In the particular case of data analysis and statistical charts, the production and export facilities of the OSS package were found to considerably outweigh those to be found in readily available commercial packages.

5. Similarly, as bibliographic requirements (including supervisors' tastes regarding punctuation) grew, the OSS packages were found to directly support the full range of emerging requirements. Related packages supported the production of an author index, and managed lists of hypotheses and findings.

The success of the documentation project could be attributed to the closeness of fit between the selected packages and the project. This closeness of fit is not necessarily related to the use of OSS. However, the community aspect of the open source movement meant that constant advice was provided on what packages were available and how to use them. The anticipated problems with compatibility between systems and versions did not occur.

Two practical risks did have the potential to cause inefficiencies in the project but these did not in fact occur. The first problem was that the institution's instructions for preparing theses and dissertations were written in an age of manual typewriters and specialist typists. They had been somewhat adapted to suit Microsoft Word, but there was a concern that LATEX would not be able to create the document in the required format. In fact this fear proved groundless. The second problem was the inevitable limitation on being able to email parts of the document to referees and supervisors for annotation. In fact, all such colleagues were happy to work with Acrobat PDF files so the problem was not significant. Greater difficulties occurred when wanting to use parts of the work in conference paper submissions. In practice these did require some reworking of the text but still the perceived benefits of OSS to the whole project outweighed the perceived additional costs involved in publication.

The example in relation to the literature

Four of the matters arising from the foregoing are

- The existence of a community of users
- The gift economy
- Network effects
- Immediacy of feedback

Bergquist and Ljungberg (2001) studied the idea of an OSS community through observing the socialisation of new recruits to such a group. Experience gained during the thesis documentation project supports Bergquist and Ljungberg's findings. Parallels for their various observations can be found in the discussion groups concerned. The gift economy was also seen at work. In one episode, one of the principal developers of the open source PostgreSQL database management system, who was writing a book about it, had a specific word processing requirement that Lyx did not meet. He pointed out the problem but also supplied a prototype solution to the problem. Other members of the community immediately contributed to the discussion by helping to clarify the exact nature of the problem. One of the Lyx developers used this information to propose an improved solution which was then adopted by common consent expressed through an absence of objections. Despite the OSS leadership concerns outlined in Goode (2005) and O'Mahony (2003), Lyx appears to be ultimately controlled by a small core development group (though the project did fork briefly in the past.) The whole update process was completed in a few days – the investigation of the problem, the development of the solution, and the obtaining of consent to implement it, all depended on the willingness and ability of participants to respond in a timely manner.

The original motivation to use LaTeX had been the need to typeset equations. It turned out that its status as a de-facto standard in the scientific community meant that ample documentation and advice was available on the entire thesis documentation process. The network effects that are commonly used to analyse Microsoft's market dominance were in fact fully present in the OSS community within this specific application area.

Future work

This paper is based on a convenience sample of the literature and on some narrowly based empirical reflections. It has done little to move beyond the "anecdotal … ambassadorial … ideological" work cited in Fitzgerald and Feller (2001). In future work it would be necessary to undertake a formal literature review and to use reproducable documented techniques to develop a series of more widely applicable case studies (Gallivan, 2001).

The gift economy is a common point of reference throughout the OSS literature but this is only one application of that concept. It would be instructive to explore other applications of the gift economy metaphor in order to find resonances between these and the OSS field.

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