Assessing the Role of Open Source Software in the European Secondary Software Sector: A Voice from Industry

Pär J Ågerfalk, Andrea Deverell, Brian Fitzgerald, Lorraine Morgan
University of Limerick, Limerick, Ireland

{par.agerfalk | andrea.deverell | brian.fitzgerald | lorraine.morgan}@ul.ie

Abstract – **This paper addresses the open source software (OSS) phenomenon from an industry perspective and reveals a number of complexities surrounding the role of OSS in the secondary software sector. It presents the research results of an international workshop which was hosted with the explicit intention of extracting the voice of key industrial stakeholders. The data was gathered and analysed using a qualitative approach which revealed the key strengths and weaknesses of OSS from an industrial perspective. This formed the foundations for developing a framework describing the emerging commercial incarnation of OSS (we refer to this as Open Source Software, Inc.) The paper concludes that the European secondary software sector recognise the benefits of leveraging OSS but are aware of key issues pertinent to such an end.**

I. INTRODUCTION

The open source software (OSS) phenomenon has been around for quite some time now[1]. However, the image of OSS is undergoing a transformation. OSS has emerged as something quite different from its Free Software antecedent, not just ideologically, but also practically. Free Software was originally perceived as largely an ideological phenomenon within the domain of software engineering. However, the open source movement pragmatically shifted the centre of gravity towards a more business-friendly and hybrid concept, and OSS is now rapidly changing into a viable alternative to proprietary software also in commercial settings[2].

The OSS phenomenon is, without doubt, innovative in a number of respects [1]. It has, for example, appeared on the software engineering scene as an apparently revolutionary paradigm shift which addresses the three central problems of software development: projects exceeding budget and schedule and software products being of poor quality. In tackling these issues, often referred to as 'the software crisis', the OSS development model is somewhat at odds with conventional software engineering wisdom. For example, it often does not map to current software development lifecycle models, it encourages redundant tasks and seems to turn 'Brooks Law'[3] on its head [2].

However, since OSS products are freely available for public download and OSS processes encourage extensive collaboration, there is an obvious element of shared cost and risk. The cost issue is thus immediately addressed. From the point of view of development speed, the collaborative, parallel efforts of globally-distributed co-developers have allowed many OSS products to be developed much quicker than conventional software. In terms of quality, many OSS products are recognised for their high standards of reliability, efficiency and robustness, and the OSS phenomenon has produced several 'category killers' (i.e. products that remove any incentive to develop any competing products) in their respective areas, such as the Apache HTTP server and the Sendmail mail routing application. The OSS model harnesses the most scarce resource of all – talented software developers. The resulting peer review model, comprising extremely talented individuals, serves to ensure the quality of the software produced. There is also growing evidence to support the claim that OSS can help to address, or even alleviate, the software crisis. For example, Forrester Research have reported that 56% of the world's 2500 largest organisations use one or more OSS products. These are organisations with considerable internal resources who choose OSS products based on technical quality and the radically different nature of software ownership created by open source terms of distribution.

From a broader business perspective, several innovative business models and new business opportunities have emerged as a result of the OSS phenomenon, and many organisations have begun to capitalise on this. In terms of competitiveness, the OSS phenomenon has created a new service market for commercial enterprises to exploit and there are several examples whereby these companies have innovatively forged competitive advantage. Since purchase price and license fees are not a factor, OSS companies have to compete predominantly in terms of customer service. Since OSS counters the trend towards proprietary monopolies, the OSS model inherently promotes competitiveness and an open market. Also, by having access to source code, traditional barriers to entry which militate against new entrants are lowered.

Although much of the recent OSS debate has focused primarily on desktop applications (Open Office, Mozilla Firefox, etc.), the origins and strengths of OSS have been in the platform-enabling tools and infrastructure components that underpin the Internet and Web services; software like GNU/Linux, Apache, Bind, etc. This suggests that OSS may have a particularly important role to play in the secondary software sector; i.e. in domains where software is used as a component in other products, such as embedded software in the automotive sector, consumer electronics, mobile systems, telecommunications, and utilities (electricity, gas, oil, etc.). With a focus on the

---

[1]One can argue that open source is indeed the original mode of software distribution since the first commercially available computers were shipped bundled with the source code of all their programs, which was usually free [3]. With the contemporary understanding of the concept, open source software has been around at least since the coining of the terms 'Free Software' in 1985 and 'Open Source' in 1998.

[2]Notwithstanding this, it is certainly the case that Free Software has made a critical contribution to the OSS phenomenon which deserves to be more fully acknowledged, perhaps.

[3]Citing empirical evidence from the development of the IBM 360 operating system, Brooks [4] coined the widely-accepted law that 'adding manpower to a late software product makes it later'. Thus, merely increasing the number of developers should not be a benefit in software development. On the contrary, the OSS community have proposed their own law asserting that 'given enough eyeballs, every bug is shallow' [5].

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87

secondary software sector, different vertical issues, such as embedded software and safety critical applications, are brought to the fore. The differences in how horizontal issues play out across different vertical sectors can be dramatic. For example, the nuances of the software development context in the banking sector are very different from those which apply in the consumer electronics or telecommunications sectors. A vibrant European secondary software sector provides fertile research ground for studying the potential benefits of OSS from a commercial perspective.

With this backdrop, the CALIBRE project[4] has set out to investigate the role of OSS for the European secondary software sector. CALIBRE is conducting a thorough investigation of the role of OSS for European industry the output of which will be an industry-research roadmap. This will enable coordination of industry and academic research interests in this area. A means to achieve this is the establishing of the the European Industry Open Source Software Policy Forum, CALIBRATION. Through a series of workshops and conferences, this forum will investigate and create policy on the role of OSS for European industry, concentrating particularly on the secondary software sector. One of the ideas behind CALIBRATION is for it to serve as an arena where OSS researchers and practitioners can meet to scrutinise research findings as well as generate ideas and empirical data. The forum also represents a crucial step towards assisting the dissemination of open source software to the European secondary software sector.

A first step in organising such an arena would be to create a better understanding of the industry's current views of and expectations from OSS. This paper is the result of such an enquiry: to assessing the role of OSS in the European secondary software sector – by enabling and facilitating an industry voice.

The paper proceeds as follows. Section II describes the research method adopted in this study. Section III develops a number of themes that characterise what the European secondary software sector itself sees as the potential benefits and threats in the adoption of the OSS model. Section IV builds on these insights and articulates a framework of the role of OSS in a commercial environment; a phenomenon we refer to as Open Source Software, Inc.[5] Finally, Section V concludes the work and points at some future research directions.

II. RESEARCH METHOD

The research approach adopted is inspired by Grounded Theory, particularly as it has evolved through the work of Strauss and Corbin [6] and the 'six thinking hats' approach by De Bono [7]. Grounded Theory enables a loosely structured approach and facilitates the establishment of real sentiments and experiences on a particular subject area; in this case the role of open source software in the European secondary software sector. The 'six thinking hats' approach encourages informants to think creatively from different perspectives involving both positive and negative thinking and was used as a way to facilitate and focus data collection.

The data was collected at the launch event of the CALIBRATION forum (see above) in The Hague, The Netherlands, on the 19th of September 2004. In order to enable dynamic discussion and the gathering of relevant feedback from attendees at the conference, an industry workshop was facilitated. The participants in the workshop, forming the source of data, were industrialists from multi-nationals and small and medium enterprises, public sector representatives, and academic researchers from a variety of European academic institutions. Some of the participants were invited, based on a shown commitment to OSS, while other were self-selected[6].

Participants were divided into 7 teams, each with a maximum of 10 members. Each team was given two conceptual 'thinking hats' (a summary of each hat is provided in Table I). Findings were captured on 'Post-it notes' and subsequently organised on flip charts with the assistance of team facilitators. Each team's task was to 'assess the role of open source software for the European secondary software sector' from the perspectives given by the different hats (see Table I).

The data collected at the workshop was subsequently analysed inspired by the Grounded Theory techniques of open and axial coding. This means that raw data were 'grouped' in themes to form topical concepts, which were then abstracted into more generic categories. The analysis was performed in two major phases. The first phase focused on expressed strengths and opportunities vis-a-vis threats and weaknesses.

TABLE I

DESCRIPTION OF CONCEPTUAL 'THINKING HATS' USED IN THE DATA COLLECTION

Hat Colour	Description
Yellow	This hat finds reasons why something will work and why it will offer benefits. It can be used in looking forward to the results of some proposed action. It can also be used to find something of value in what has already happened.
Black	This is the hat of judgement and caution. The black hat is used to point out why a suggestion does not fit the facts. The black hat must always be logical.
Red	This hat covers intuition, feelings and emotions. The red hat allows the thinker to put forward and intuition without any need to justify.
Green	This is the hat of creativity, alternatives, proposals, what is interesting, provocations and changes.

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87

This first phase was driven by the way the thinking hats structured the data collection. Hence, the thinking hats also served partly as a descriptive analytic framework. The yellow hat is biased towards strengths and opportunities, while the black hat is biased towards threats and weaknesses. The red and green hats, on the contrary, are not biased in the same ways but provided emotionally based and creative suggestions in both directions.

In the second phase, this initial understanding was used as a basis for identifying higher level categories. These categories together form a framework that describes the potential role of OSS in a commercial environment – Open Source Software, Inc. being the top-level category.

In order to validate the results and to ensure that they adequately represents the experiences and sentiments of the participants, a follow up phase was undertaken (i.e. member checking). This follow up involved the presentation of key findings to the CALIBRATION industry group, who reviewed and approved the findings.

III. THEMES IN THE ROLE OF OPEN SOURCE SOFTWARE

This section summarizes key findings within three overall themes: opportunities, basic premises, and threats. The themes, and their main categories, are generated from the data but are likely also to be influenced by the focus imposed by the different hats (see above).

A. Strengths and Opportunities

One of the most pressing topics was, perhaps not surprisingly, that of *intellectual property and patents*. This issue was mostly discussed in terms of a threat and a fundamental premise for the success of OSS (see below). However, some participants felt less reason to worry believing that a solution was on the way. There was also wide debate on the use of the GPL with some feeling that licensing issues are not such a problem after all. Politically speaking it was felt that the current resentment towards proprietary software will speed up the adoption process of OSS. Its basic premise challenges deep rooted intellectual property rights.

Another key issue was *development costs and time to market*, and it was suggested that the reduction of time to market for new products and the overall cost to develop or buy is much less than those solutions offered by proprietary organisations. It was also put forth that wasteful duplication can be avoided.

An interesting issue that emerged is the tension between *increased collaboration* and *increased independence*. It was generally acknowledged that OSS allows for greater collaboration, between individual organisations, but also between industry and government. OSS, as a development model, enables the sharing of costs and benefits from a collective pool of knowledge. OSS was also viewed as a means for increasing innovation, and enabling the development of collaborative group wisdom. It offers far-reaching global and social benefits which are not always self-evident or fully understood. It also facilitates geographically-distributed software development. However, in the midst of this spirit of collectivism, it was suggested that OSS enables businesses to pursue their own strategies without being tied to suppliers or vendors,

enabling a greater level of flexibility. Interestingly, this collaborative mode of operation seems to blur the separation between competitors and clients, which was regarded as something positive.

A topic related to the community-spirit of OSS and the belief that shared knowledge enables greater innovation is that of potentially *increased job satisfaction*, by many participants suggested as a key advantage of OSS. It was, furthermore, suggested that OSS will encourage the development of new jobs and opportunities for professionals. One team questioned if OSS was really that different, while others stated that the opportunity for cross-pollination between software developers was a fundamental advantage often emulating in software mutations which lead to innovative breakthrough. The aspect of innovation and breakthrough was put to the fore in a vision of OSS as enabler of *increased research and development (R&D) in SMEs*.

From a *security and quality* perspective attendees felt that OSS was a safe option, which is highly transparent and open to scrutiny. Participants also felt that OSS is both sustainable and reusable enabling better long term stability for software code.

B. Threats and Weaknesses

As indicated above, sorting out the issues surrounding *intellectual property and patents* was regarded key to the successful adoption of OSS; 'who do I sue and who's going to sue me', as one workshop participant put it. Another related obstacle is that some companies suggested that their legal teams do not understand OSS licences.

The lack of clear *business models* which appeal to industry at large are still not widely known or appreciated.

Key issues also related to the *standardisation* in relation to OSS which many participants felt was urgently needed but perhaps a little premature.

Furthermore, the lack of relevant *skills*, and a means to support OSS projects and the need for improved collaborative research tools to assist in the dissemination of OSS was reported to be a key issue.

While some participants felt that there was a clear future for OSS, others were somewhat more apprehensive. Comments such as 'Love the idea, hate the consequence', 'Grass roots never grow trees', and 'OSS the white Unicorn will be crucified' were collected and clearly exemplify the divide and strong feeling that are part of the OSS paradigm. It was generally felt that there is a strong need for real *success stories* to assist in the dissemination of OSS to general business. Questions such as when will OSS end and where will the next OSS *leaders* come from were also considered. Others believed that patents will kill software and that OSS is not converging but diverging into chaos.

IV. OPEN SOURCE SOFTWARE, INC.

The emerging commercial incarnation of OSS – Open Source Software, Inc. – naturally retains many of the characteristics of the 'traditional' OSS model. However, the commercial setting introduces a number of new complications. For example, the community-based development model may not be completely compatible with a *corporate environment. Business strategy* becomes a

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87

central concern, and the very *acceptance* of OSS as a serious contester becomes a critical issue. Fig 1 shows these high-level factors that appear central to the success of Open Source Software, Inc., together with the required *social*, *technical* and *legal infrastructural foundation* on which to build it.

In the remainder of this section, we will briefly discuss each of these factors and look at how the Open Source Software, Inc. stakeholders choose to characterise them during the workshop, as reflected in Section III.
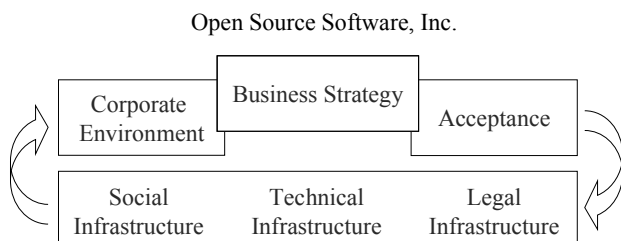
Open Source Software, Inc.

Fig. 1. Major factors in the successful construction of Open Source Software, Inc.

A. Technical Infrastructure

Since it constitutes the software technology as such, the technical infrastructure is a natural key foundation for OSS success. It is believed that the OSS model leads to the creation and adoption of open standards and increased software reuse, which are important factors in adoption of OSS. Other factors that were seen as OSS success-drivers are the perceived proven quality and increased control over the technical infrastructure.

However, there are issues related mainly to reliability that needs to be addressed. Especially since the secondary software sector brings OSS to previously unproven domains, such as safety-critical systems. There were also concerns raised about a perceived lack of support and, generally, about the issue of ensuring the longevity of OSS products. Proprietary software companies have tried to undermine OSS by claiming that long-term support of OSS products is uncertain due to the voluntary and self-selected nature of the community. Obviously, Open Source Software, Inc. need to prove them wrong.

Perhaps due to the general interest in and success of the OSS model, there are a multitude of projects and products to select from. This raises the question of how best to find a technical solution that is right for the current problem or project.

B. Social Infrastructure

The emphasis on social infrastructure is one of the main tenets of OSS. Leveraging the community-based model that underpins OSS development is thus key to a successful Open Source Software, Inc. Positive aspects of this is the potential of increased collaboration, and specifically joint R&D efforts. This is particularly important from an SME perspective since it may enable smaller companies, with limited resources to participate in cutting-edge research. Increased collaboration is also likely to lead to knowledge sharing and, in the end, shared costs regarding software development.

However, a basic foundation for such collaboration and

sharing to happen is that companies find ways of building and sustaining OSS communities, and learn how to build trust within those communities. The relationship between commercial organisations and already established OSS communities will be a challenge for Open Source Software Inc. A model based on sharing obviously assumes that as a user of the community's results, you are also supposed to give something back. How and what to give back to 'the community' is often unclear.

A further concern regarding the social infrastructure has to do with whether or not it is at all meaningful to discuss Open Source Software, Inc. as a European venture. In many ways, OSS is an international phenomenon, and it seems to be important not to overlook possible global collaboration, especially with Asia and USA.

C. Legal Infrastructure

One of the most contentious legal banana-skin for Open Source Software, Inc. relates to software patents. Patents can make a good deal of sense in theory – as initiatives which stimulate publication of non-trivial ideas. Clearly, they can play a role in improving innovation and creativity, giving small players a chance, and consequently benefiting society as a whole. However, one can certainly disagree with their implementation in practice (even if it is difficult to separate theory and practice). Interestingly, some of the largest commercial OSS players are also supporters of patents. For example, IBM, HP and Sun are high-profile examples of companies who support software patenting but who have also provided significant benefit and support to OSS. The basic argument from these companies is that patents are necessary and important, and the real problem is that too many spurious patents have been granted which have actually served to stifle innovation. The guarantee of exclusively-held monopoly rights over a long period of time is clearly not suited to the spirit of the current IT era. Interestingly, it is not too much of a stretch to define OSS as publication of non-trivial ideas, with an explicit guarantee of continued availability, which seeks to protect the interest of the small players, for the overall betterment of society, as others learn from and improve on the original ideas. This shows how close OSS and intellectual property protection are at heart. However, the stimulation of innovation and creativity, which should be the fundamental rationale behind intellectual property protection, has failed miserably in the software area [8].

Hence, a solid legal infrastructure is undoubtedly an absolute key to the success of Open Source Software, Inc. On the positive side, there seems to be a strong motivation to solve the legal, licensing, and intellectual property rights problems. Emerging open standards are important in this respect and the general feeling is that legislation is eminent. There are still uncertainties about copyright legislation and EU policy regarding software patents.

Another problem is the 'ownership mindset' that prevails in many companies. People are simply used to think in terms of owning tangible assets, and there is a required conceptual move before sharing can become as strong a metaphor. Another potential problem is the lack of understanding of the OSS legal infrastructure within many organisations.

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87

D. Corporate Environment

Leveraging the potential of OSS within a commercial setting means that it will have to adapt to and exist within a corporate environment, which could be quite different from the 'traditional' hacking culture often associated with the OSS movement. However, it is envisaged that this cultural cross-breed will lead to increased cooperation at the personal level, increased job satisfaction and more flexible forms of employment. The latter also relates to companies believing that the OSS model will help them recruit the best developers available.

Then again, there are a few corporate environment factors that seem to mitigate against the successful construction of Open Source Software, Inc. First of all, there is currently a lack of OSS expertise. Such expertise would thus be required in order to enable the recruitment of the best OSS developers. There is also a perceived resistance to change in organisations, where often a few enthusiasts advocate OSS and feel that they are not listen to by management.

The OSS movement is often portrayed as an extreme collectivist approach. For example, Bob Young, the founder of Red Hat, adapted the communist manifesto to characterise it as 'from the programmers according to their skills, to the users according to their needs' [9]. Although this purported collectivism has been questioned [2, 10] it still permeates the mainstream OSS discourse and indeed complicates the integration of the OSS model and the commercial environment.

This is also related to the meritocratic structure of OSS communities, which may not go well with traditional power and promotion hierarchies in commercial organisations. This makes one wonder where the next OSS leaders will come from? To date, a strong charismatic leader has often proved to be key to the success of OSS (such as Linus Torvalds in the case of Linux).

E. Business Strategy

For apparent reasons, the business strategy of Open Source Software, Inc. will be quite different from organisations built around a proprietary software model. Besides the potential benefits mentioned above, a basic incentive for adopting a OSS approach is to cut costs. The social infrastructure and the sharing mindset of OSS helps to lower barriers (not only in terms of R&D participation) and to reduce the risk involved in product development. Increased software reuse is also likely to lead to shorter time to market.

However, to some, the actual value of going open source is questionable, and there is an element of risk associated with a blind faith in OSS as finally providing us with the long awaited silver bullet[7]. There is also a perceived lack of coordination of Open Source Software, Inc. and a need for concrete and proven business models.

Again, the success of Open Source Software, Inc. depends on the ability to create sustainable OSS communities, which also affects business strategy. Due to the inherent risks involved in changing the business strategy towards OSS, there may be a need for maintaining a fall-back position, and perhaps adopt OSS incrementally.

F. Acceptance

In order for Open Source Software, Inc. to become reality, it must gain acceptance. Acceptance, in this case, is twofold. First, any company going open source run the risk of being rejected by the existing OSS community. Second, Open Source Software, Inc. must be able to win customers over to the OSS camp and be able to convincingly explain the many benefits and potential shortcomings.

Large commercial organisations are not always well perceived within the OSS community. However, OSS offers organisations the ability to appear progressive and 'open', thereby avoiding potential bad press and negative public opinion. However, it is increasingly important that the current enthusiasm surrounding OSS is harnessed and promoted through well documented success stories. That is if Open Source Software, Inc. is to be widely accepted as a realistic opportunity.

V. CONCLUSION

This paper has presented a study of the role of open source software (OSS) in the European secondary software sector. Data for the study was gathered in a workshop session during an industry research conference with key organisations.

From our analysis we can conclude that the European secondary software sector recognise the benefits of leveraging OSS, but are aware of key issues pertinent to its success. There are numerous pressing issues, such as intellectual property rights and patents. Other such issues include standardisation, the development of proven business models and the acquisition of skills required to successfully engage in OSS projects. These issues must be addressed before OSS can reach widespread adoption.

One of the most interesting potential benefits of OSS seems to be the possibility for SMEs with limited budgets to engage seriously in research and development. There are also benefits at both individual and organisational level from a strengthened identity and autonomy. At the same time, OSS facilitates contributing to a shared pool of knowledge and expertise in increased collaboration with both customers and competitors.

An integral part of this research was the development of a conceptual framework which reflects the basic factors that this research suggests will facilitate the successful emergence of OSS in a commercial setting (i.e. the success of Open Source Software, Inc.) Fundamentally, the social, technical and legal infrastructure must be in place in order to ensure the success of Open Source Software, Inc. Building on this foundation, companies will need to align their business strategies with a supportive corporate environment and ensure internal and external acceptance of the OSS model.

This research will continue to be a key element in the development of the European Industry Open Source Software Policy Forum, CALIBRATION. The continued academia-industry collaboration in this forum will serve as a basis for furthering our understanding of the industry's OSS related needs and expectations and will help to refine and further develop the results presented in this paper. Further workshops, like the one from which the data for this paper is derived, are planned over the course of the next two years and will enable a detailed picture to be

---

[7]As suggested by Brooks, there are no silver bullets [4].

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87

developed on the real challenges and advantages pertinent to the OSS phenomenon.

As a concluding remark we would like to draw attention to one workshop participant's suggestion that OSS needs a moon-project really to take off. Perhaps that is the case, and perhaps Open Source Software, Inc. can find inspiration in former US president John F Kennedy's famous Rice Stadium 'moon speech', 12 September 1962, which, in the context of OSS might have looked something like this: We choose open source software. We choose open source software, not only because it is free, but because it is hard, because that goal will serve to organise and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win.

VI. ACKNOWLEDGMENTS

VII. REFERENCES

[1] J. Feller and B. Fitzgerald, *Understanding Open Source Software Development*, London, UK: Addison-Wesley, 2002.

[2] B. Fitzgerald and P.J. Ågerfalk, "The Mysteries of Open Source Software: Black and White and Red All Over?" in *Proceedings of the Thirty-Eighth Hawaii International Conference on System Sciences (HICSS-38)*, Computer Society Press.

[3] R.L. Glass, "A Look at the Economics of Open Source: Is Open Source the Future of the Software Field or a Passing Fad?" *Communications of the ACM*, vol. 47, no. 2, 2004, pp. 25–27.

[4] F. Brooks, *The Mythical Man-Month*, Reading, MA: Addison-Wesley, 1975.

[5] E.S. Raymond, *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*, Sebastopol, CA: O'Reilly, 1999.

[6] A.L. Strauss and J.M. Corbin, *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd ed., Thousand Oaks, CA: SAGE, 1998.

[7] E. de Bono *Six Thinking Hats*, Boston, MA: Little,Brown and Company, 1985.

[8] J. Bessen and R. Hunt, *An empirical look at software patents*, Research on Innovation Working Paper 03-17/R, 2003, http://www.researchoninnovation.org/swpat.pdf, accessed 4 April 2005.

[9] R. Young, "Giving it Away: How Red Hat Stumbled Across a New Economic Model and Helped Improve an Industry" in *Open Sources: Voices from the Open Source Revolution*, USA: O'Reilly & Associates, 1999.

[10] M. Bergquist and J. Ljungberg "The Power of Gifts: Organizing Social Relationships in Open Source Communities", *Information Systems Journal*, vol. 11, 2001, pp. 305–320.

Proceedings of the First International Conference on Open Source Systems
Genova, 11th-15th July 2005
Marco Scotto and Giancarlo Succi (Eds.), pp. 82-87