

Editorial

Open Source Software Engineering

The term Open Source Software (OSS) first appeared in 1998 [Open Source Initiative (2002) History of the OSI. *OpenSource.org*, <http://www.opensource.org/docs/history.html>. Last accessed on 17th January 2002] in an effort to change the popular understanding of what had to that point been called ‘free software’ – products like GNU/Linux, Apache, Perl and BIND. In the periods both immediately before and after the coining of the term, many insightful essays appeared both online and in print, attempting to better explain this novel approach to the problems of software development. However, as Eric S. Raymond, President of the Open Source Initiative, puts it, “all the attempts at a really comprehensive description of the phenomenon had come from open-source hackers like myself, theorists operating from within the culture we were describing. We had the advantage of knowing our ground, but the disadvantage of knowing it perhaps too well – there are undoubtedly good questions we would never have thought to ask. That’s why I’ve hoped from the beginning that an analytical literature about open source, independent of the open-source community itself, would evolve” [Raymond, E.S. (2002) Foreword. In Feller, J., and Fitzgerald, B. (2002) *Understanding Open Source Software Development*. London: Addison-Wesley].

Since 1998, an independent analytical literature has in fact evolved, and continues to evolve. Scientific research on OSS has appeared in a wide range of academic conferences and journals, produced by researchers and practitioners in a number of disciplines, but primarily from those involved in the study of software engineering and information systems development [Feller, J. (2002) Bibliography of Research and Analysis. *Open Source Resources*. <http://opensource.ucc.ie/biblio.htm>. Last accessed on 17th January 2002]. It is hoped that this special issue of *IEE Proceedings – Software* will be seen as a useful and provocative contribution to this growing body of literature.

The call for papers for this special issue was first issued following *Making Sense of the Bazaar: 1st Workshop on Open Source Software Engineering*, a one-day workshop held at the *23rd International Conference on Software Engineering (ICSE 2001)* [Feller, J., Fitzgerald, B., and van der Hoek, A. (2001) *Making Sense of the Bazaar: 1st Workshop on Open Source Software Engineering*. *Open Source Resources*. <http://opensource.ucc.ie/icse2001>. Last accessed on 17th January 2002] (the full workshop report for *Making Sense of the Bazaar* appears at the end of this issue). In the call for papers, we solicited research examining any aspect of Open Source Software Engineering, but particularly research focused on:

- OSS development life-cycles, methods and tools (including configuration management, requirements engineering, systems analysis and design, evaluation and testing, maintenance and evolution, and OSS software architectures).
- Comparisons of OSS development with traditional Software Engineering paradigms, and applications of OSS development concepts within traditional software companies.

- Knowledge management and community dynamics in OSS development, and OSS development and software engineering education.

The call for papers was distributed on several IS, software engineering, and OSS mailing lists and web sites in late-summer, 2001. There was a great deal of interest, and we had queries and requests for further information from all over the world. In the end, a total of 12 papers were submitted from authors in Australia, Denmark, Italy, Netherlands, Sweden, the UK and the US. Each paper was subjected to a double blind review process involving three reviewers, who were all researchers or practitioners from Australia, Canada, Denmark, Germany, Greece, Japan, Sweden, the UK and the US. We would like to express our gratitude to them for their thoughtful and thorough reviews, which have contributed enormously to the success and quality of these papers. All of the papers were quite strong, and we wish to thank all of the authors for sharing their work with us. In the end, we selected five papers for publication, as follows.

The first paper, ‘Open source software projects as virtual organisations: competency rallying for software development’, by Kevin Crowston (Syracuse University, USA) and Barbara Scozzi (Politecnico di Bari, Italy), seeks to identify critical factors important for the success of OSS projects. To do so, they analyse OSS communities as virtual organisations, applying Katzy and Crowston’s competency rallying (CR) theory to the case of OSS development projects. The authors make use of a substantial collection of data, namely over 7,000 OSS projects hosted by SourceForge.net. Their research has several implications for those involved in organising OSS projects, and highlights the importance of a carefully selected development platform, a clearly articulated understanding of user needs, and the personal reputation of project administrators.

For our second paper, ‘Maintainability of the Linux kernel’, Stephen R. Schach, Bo Jin, and David R. Wright (Vanderbilt University, USA), Gillian Z. Heller (Macquarie University, Australia) and A. Jefferson Offutt (George Mason University, USA) examined 365 versions of Linux and counted the number of instances of common (global) coupling between each of the 17 kernel modules and all the other modules in that distribution. They uncovered the significant fact that the number of instances of common coupling grows exponentially with version number, while the number of lines of code in each kernel module grows only linearly. They offer the provocative conclusion that unless Linux is restructured to reduce common coupling, it will become exceedingly hard to maintain.

The third paper, ‘Understanding the requirements for developing open source software systems’, by Walt Scacchi (Institute for Software Research, USA) reports findings from an empirical study of the processes, architectures, contexts, and offers a solid complement to Crowston and Scozzi’s work on SourceForge. Scacchi investigated four OSS development communities, and describes eight kinds of software ‘informalisms’ which

play a critical role in the elicitation, analysis, specification, validation, and management of requirements for developing OSS systems. Scacchi argues that OSS development practices provide us with new insights into how complex software systems can be constructed, deployed, and evolved.

‘A study of configuration management in open source software projects’, our fourth paper, was written by Ulf Asklund (Lund Institute of Technology, Sweden) and Lars Bendix (Aalborg University, Denmark). Asklund and Bendix address a common axiom in software engineering, namely that geographically distributed projects with a high personnel turnover are generally considered difficult to manage. They argue that many OSS projects demonstrate an exception to this rule, and closely examine OSS configuration management practices in an effort to show how the processes, tools, and social dynamics of OSS configuration management contribute to OSS’s success. Their paper concludes with some useful speculation on how lessons learned from OSS configuration management practices can be applied to closed software projects.

Finally, our fifth paper, ‘Trust and vulnerability in open source software’, was written by Scott A. Hissam, Daniel Plakosh and Charles Weinstock (Software Engineering Institute, USA). The authors argue that OSS constitutes a viable source for software components in the construction of systems, but that the widespread claims that OSS is more reliable and more secure than closed software must be critically assessed. The paper is written from a novel perspective, namely that of a cyber-criminal, and offers a challenging discussion of what both developers and users can do to increase their trust – not only in OSS, but in closed software as well.

As noted above, the special issue concludes with the workshop report for *Making Sense of the Bazaar*. The workshop brought together 30 researchers and practitioners from 8 countries to discuss OSS as an emerging software engineering paradigm – the workshop report highlights their day long conversation, and supplements the 17 position papers which are available online at <http://opensource.ucc.ie/icse2001>.

We hope that the contents of this special issue will help to answer many questions and to raise many more.

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