

FREE - OPEN SOURCE SOFTWARE FOR DEVELOPMENT

C. N. Krishnan and Kenneth Gonsalves

National Resource Centre for Free/Open Source Software, (NRCF/OSS), AU-KBC Research Centre, Anna University – M. I. T. Campus, Chennai, India.

Keywords: Free Software, Open Source Software, Internet, ICT, Development.

Contents

1. Introduction
 2. Development, ICT and Software
 - 2.1. Some Specific Areas where ICT can impact
 - 2.2. Software and ICT
 3. The F/OSS Movement-- its moorings, methods and results
 - 3.1. Some Definitions
 - 3.2. Proprietary Software vs. Open Source Software
 - 3.3. Licensing Models in F/OSS
 - 3.4. The F/OSS Software Development Model
 - 3.5. The Status of F/OSS Products
 4. F/OSS for Development
 - 4.1. Some Specific Application Areas.
 - 4.2. Possible Players and their Roles
 5. Discussion and Conclusion
- Acknowledgments
Glossary
Bibliography
Biographical Sketches

Summary

This chapter deals with the possible roles that Free/Open Source Software (F/OSS) can play in the development of a country, especially in the context of developing countries of the third world. It briefly outlines the key issues involved in the development process of these countries, and then examines the role that Information and Communication Technologies (ICT) play in it. The critical importance of Software in ICT is then brought out which is the context in which F/OSS becomes relevant. The precept and practice of F/OSS movement is then examined in some detail and the different ways in which it can impact on the development process in third world countries are identified and described. The paper concludes with some comments on the scope of the analysis presented here, and points out the much larger issues at play that would ultimately decide what contributions F/OSS would be able to make to the development process.

1. Introduction

The F/OSS Movement is a voluntary movement of software developers and programmers from all over the world who believe that the software needed for the use of computers and Internet should be freely available to all. The movement is opposed to the way in which today's mainstream proprietary software are produced and marketed like any other commodity, and considers it a wasteful, inefficient, inferior, unnecessary

and unethical practice. In less than twenty years of its existence, the F/OSS movement has contributed thousands of software products that are freely available to all, including the well known and widely used ones like the Linux Operating System, the Apache Web Server, the PostgreSQL Data Base Management System, the Firefox Browser, the Python Language, etc. The vision of the FOSS Movement has inspired thousands of software developers and programmers from all over the world to collaboratively and on a voluntary basis develop an astoundingly wide range of software products and solutions that any one can download from the Internet free of cost and use as they wish.

While it is a long way before the full dream of the F/OSS Movement can become a reality, there is no doubt that the paradigm of software development and distribution that it has evolved has already begun to have a significant impact on the way the future of software is being perceived. In particular, F/OSS is expected to play a significant role in meeting the software needs of the developing countries, which is the theme that is elaborated in this paper.

Software, F/OSS or otherwise, can not of course do anything by itself; it has to be run on a computer or some other electronic device. In fact, it is the software that decides what the computer or the device will do. The entire Information and Communication Technologies (ICT) System of today are controlled by software, and the development of such software is a substantial part of the cost of today's ICT solutions. When one recalls the critical role that ICT plays in the economic and social development, it also brings out the role and relevance of software as such. F/OSS has a significant role to play here, and it is in this manner that it can impact on the country's development, and this aspect is examined more closely in this paper.

The next section of this paper gives an outline of the impact that ICT can have on the development of the third world countries. It also elaborates on the role and relevance of software in ICT, which is also where F/OSS comes into the picture. Section 3 introduces and discusses F/OSS in greater detail covering various aspects of critical importance. The core theme of this article, viz. the role of F/OSS in development, is covered in section 4. Section 5 concludes the paper and also sketches possible future scenarios.

2. Development, ICT and Software

Today's ICT had its humble beginnings in two technological strands of the mid-twentieth century-- telephony and computers-- which merged together when they both became digital and evolved into what ICT is today. Some of the central components of today's ICT include the Internet, e-mail and World Wide Web, Multimedia Communications and Networking, Wireless and Mobility, Optical and Satellite Communications, Human-Machine Communications, Creation and Analysis of Databases and Repositories, Real-time systems and Automation, MIS(Management Information Systems), ERP (Enterprise Resource Planning) and CRM(Customer Relationship Management) Systems, Virtual Communities, e-Commerce and e-Governance, etc. The human sensory environment is increasingly getting dominated by ICT.

ICT has given us ability to organize and manage massive quantity of data and information in a variety of forms and make the same available to any one anywhere. It includes systems that can process and present such data and information automatically

and at great speeds, and take appropriate actions as desired. Distance and time (delay) are no more barriers to exchange of information and decision making involving both humans and machines. When it is remembered that all processes, natural or human-made, are but different forms of organizing matter, energy and time, and that it is the embedded information that distinguishes one such organization (organism) from another, then it immediately becomes apparent as to what the new found power of ICT can mean to the dynamics and evolution of human society. ICT thus represents a potent force available to human kind today, and like other similar tools developed by it earlier, what the tool can deliver depends largely on who uses it and for what goals and purposes.

2.1. Some Specific Areas where ICT can impact

The following are some of the ways in which ICT can contribute to the development of third world countries:

Economy – Compared to many of the other areas, the industrial and business activities in the ICT domain need relatively lower levels of energy and material resources, and hence are easier to organize in the context of the third world countries – trained manpower represents the most important resource, and this is something that the third world countries can potentially organize in large volumes and in a cost-effective manner. Countries like India have done this successfully, and made IT a significant component of their economy especially in terms of export-orientation and delivery to global markets. Countries like China have emphasized the domestic use of ICT to enhance productivity and efficiency of their manufacturing and management processes, contributing substantially to their overall economic growth. Other countries in similar positions too are quickly learning of the various economic benefits that ICT can deliver to them, directly or indirectly.

Governance and Society – ICT can potentially enable a much larger participation and involvement of people in government and administration, improve the quality of governance by incorporating greater transparency and sharing of information, put in place a more effective feed back and grievance redressal mechanism in governance, etc. By making the process of communication and information sharing easier, ICT can help bridge the huge communication gap that exists between the ruler and the ruled in the third world countries. Socially also, these technologies can help bring about greater exchange of information and ideas between the different sections of the population, leading to greater tolerance, cohesion and identity and outlook.

Education and Health care --Vast sections of population of third world countries do not have access to education and health care today, and this represents one of the biggest impediments to their development and progress. Given its ability to quickly and inexpensively store and disseminate huge amounts of information and knowledge, ICT can provide some very useful tools that can help improve this situation.

Resource Conservation and Ecological Protection – Wide awareness and availability of information about the state of resources and ecology of the country is one of the most effective ways of combating their improper or inefficient use. Once the relevant data becomes widely available thanks to ICT, debates and discussions on these issues can be conducted more meaningfully and transparently, making it easier to accommodate

different perspectives and interests, and eventually arriving at decisions that represent the greatest common good.

It is thus seen that there is lot of scope for ICT to contribute to the development of third world countries in a variety of ways. We would now examine where software comes into it, and thence F/OSS.

2.2. Software and ICT

A development of immense practical import in the development of computing has been the separation of computer software from hardware, making software writing an autonomous activity carried out with little reference to the hardware on which it is going to be executed. It is this freeing of software writing activity from the constraints of hardware awareness that has made it possible for hundreds of thousands of people to get engaged in it the world over producing software that does an immense range of activities – the IT revolution is unthinkable without this development. In the IT area, the hardware is becoming pretty much invisible, and originality, innovation, new opportunities, business success etc take place increasingly in the software space. It is as though human thought can now directly get mapped into the machine and get executed without any sort of constraints! With the rapid blurring of distinctions between computing and communication, what is true of IT is also becoming true of ICT, viz. that software is the key.

Software in this context is of two broad types—the ‘system software’ that ensures that computers (devices in general) and their interconnections are got ready to provide the intended service as soon as the ‘application software’ appropriate to that service is supplied to it. The former includes operating systems, device drivers, servers, networking software, etc. and these have to be hardware-aware.

While this type of software is essential to make the computer or network useful for any purpose, the user of the computer or the network per se has no interest in them as such; it is the application software that gives the user the service he/she wants from the computer –such as word processing, games and animation, on line ticket booking, etc. The developer of the application software need not worry anything about the computer or the network; he/she can focus entirely on the application.

And again, while manufacture of computer hardware has been largely automated, and does not employ very many persons, software writing is still almost entirely done by human beings with very little of automation in place yet. The entire IT scene is sure to undergo a revolution if large scale automation of software writing becomes a reality—something that still looks rather well out into the future.

Lastly, a user of computer or network today has to pay for the procurement and maintenance of the hardware, the system software and the application software. With the large scale automation of hardware manufacture and assembly, its share in the total cost of the computer has been steadily dropping, and soon the cost of software is expected to be the dominant factor that would determine the extent to which ICT would be able to spread in the developing world. F/OSS aims to reduce this cost component substantially, which is one of the reasons for its becoming a topic of public interest--and why this article finds a place in this compilation!

The relationship between development, ICT and F/OSS has been a matter of considerable public debate globally, such as in the successive versions of World Summit on Information Society, WSIS [1-3].

3. The F/OSS Movement - Its Moorings, Methods and Results

There is a huge body of literature freely available on the Web that deals with every aspect of F/OSS with varying degrees of clarity, depth and complexity. This article would therefore minimize the use of jargons and keep the explanations as simple as possible, giving necessary references to the literature so that the technically minded readers can increase their understanding from those sources.

To start with certain terms need to be defined or described, as below:

3.1. Some Definitions

Programming languages. Software consists of instructions to the computer written using languages that are more formal and constrained than human languages like English or Tamil. Modern programming languages are of two types - those that create executable code that can be run without the source code, like C or Java, and those that run from the source code itself - so called interpreted or scripting languages like Perl or Python. The difference is significant as with the growth of usage of the scripting languages it is easier for end users to participate in the modification and enhancement of software.

Copyright. Whenever a creative piece of work is published, the author automatically gets copyright in the work, which he/she is also free to assign to any one else. Whoever owns the copy right can control the distribution, copying and modification of the work. Copyright covers works of art, literature as well as software.

License. This term can be explained taking the example of the driving license. The state owns the roads, and gives a person a license (permission) to drive a vehicle on the roads as long as the person obeys the road rules. Failure to obey the road rules may result in cancellation of the license. A software license is similar. The owner of the copyright in the software can decide to give users only the right to use the software as it is, or can additionally permit the user to copy, modify, distribute the software under certain conditions – what rights are given to the user depends on the terms of the license, and there are a wide variety of licenses available.

Patent. Patent, unlike copyright, is a right granted by the government to a person to exclusively own an invention, for a period of time. The person, who applies for patent, needs to prove that the invention is an original one made by him/her. Currently it is not legally possible to patent software in many countries (like India), but the legal position is also under review and debate.

The differences between two major models of software development and distribution – proprietary and open source-- would be examined in the next paragraph.

-
-
-

TO ACCESS ALL THE 18 PAGES OF THIS CHAPTER,
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

Andrew M. St. Laurent (2004), *Understanding Open Source and Free Software Licensing*, Amazon Books. [A detailed description of all Open Source Licenses and a discussion of the legal, methodological and business aspects of developing software using Open Source Licenses.]

Club of Rome (2003), Statement of the Club of Rome to WSIS, Geneva, 2003. <http://www.worldsummit2003.de/en/web/490.htm>[A brief description of the stand taken by the Club of Rome on WSIS]

David A. Wheeler, Why Open Source Software /Free Software? Look at the Numbers! http://www.dwheeler.com/oss_fs_why.html[A compilation of statistics on the use of Open Source software around 2006]

Eric S Raymond, *The Cathedral and The Bazaar*. <http://catb.org/esr/writings/cathedral-bazaar/cathedral-bazaar> [Eric Raymond's classic work on the open source methodology contrasting it to the proprietary development model. It is because of this work that open source software development is often referred to as the 'bazaar' model.]

Karl Fogel (2005), *Producing Open Source Software*, O'Reilly Publications. [A handbook for developers who want to build a successful Open Source project. This book is a must for any would be Open Source developer]

Laurence Rosen (2004), *Open Source Licensing: Software Freedom and Intellectual Property Law*, Amazon Books. [A discussion of Open Source Licenses and Intellectual Property Law from the legal viewpoint.]

Richard S Stallman (2007), *What is copy-left?* <http://www.gnu.org/copyleft/copyleft.html> [The famous essay by Richard Stallman where he describes the concept of copy-left which is subversive of copyright.]

Steven Weber (2005), *The success of Open Source*, Amazon Books. [A comprehensive analysis of the methodology of production of Open Source software, it's history, organisation and business models.]

Walt Scacchi (2006), Free/Open Source Software Development: Recent Research Results and Methods. www.ics.uci.edu/~wscacchi/Papers/New/Draft_Chapter_Scacchi [The focus of this paper is to review what is known about free and open source software development (FOSSD) work practices, development processes, project and community dynamics, and other socio-technical relationships (taken from the abstract)]

World Summit on the Information Society, WSIS (2003), A report on the discussion of F/OSS in WSIS(2003). <http://www.itworld.com/Man/2685/030115wsis/>[A report on the discussion by delegates from Asian governments, organizations, companies and non-governmental organizations (NGOs) on support for open source software deployment]

World Summit on the Information Society, WSIS (2005), Software for Development: Is Free/Open Source Software the answer? <http://www.apdip.net/news/eventatwsisvdo> and <http://www.mncc.com.my/ossig/lists/general/2005-11/msg00055.html>[email describing the advances in WSIS in a meeting at Tunis]

Biographical Sketches

C.N. Krishnan did his B.Sc.(Maths and Physics) from Kerala University, B. Tech. (Electrical Engineering-Light Current) from I. I. T. Madras, and M. Tech. (Electrical Engineering-Semiconductor

Devices) and Ph. D. (Electrical Engineering) from I. I. T. Kanpur. He holds the position of a Professor in the Electronics Engineering Department of the Anna University, Madras Institute of Technology Campus, Chennai, and specializes in the field of Signal Processing and Communication Engineering. He is also the founder-director of the AU-KBC Research Centre set up in Anna University to pursue interdisciplinary research across the domains of Information Sciences and Life Sciences. He also coordinates the National Resource Centre for F/OSS (NRCFOSS) Project in Anna University set up with support from the Govt. of India to promote F/OSS in India.

Kenneth Gonsalves graduated in Science as well as Law from the University of Madras. He has been an active member of the Indian F/OSS community contributing both technology wise as well as in evangelizing F/OSS. He has expertise in the areas of Python and Perl programming, RDBMS programming and administration, Web programming, Linux System Administration, Xwindows based GUI programming, etc. He has been involved in, as well as contributed to, a number of F/OSS Development Projects. He is currently associated with NRCFOSS, Anna University, and actively contributes to many of its programs and projects.

UNESCO - EOLSS
SAMPLE CHAPTERS