

# OpenSource for Open Development

Philip Hewitt  
&  
Don Anderson

Development Resource Centre  
PO Box 12440  
Wellington  
New Zealand  
Email: info@drc.org.nz

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## **Why is Software important?**

Key Enabler - Software is a key enabler for the knowledge society! Software is a dynamic layer of machine instructions. The appropriate software will enable otherwise inert computer hardware perform a vast array of useful functions, for example consider the following diverse range of function provided to common PC hardware:

### Communications:

- Document editing/sharing, fax/modem answerphone.
- Internet, email, web, news, chat, radio, etc.

### Business:

- Accounts, inventory control, contact management, POS, transaction handing, booking/ordering systems.

### Entertainment / Education:

- Games, Internet, Tuition and learning.

### Multimedia / Publishing:

- Graphic design, Audio/video recording/ editing.

### Science / Research

- Data logging, reporting, modelling, statistical analysis.

### Network Infrastructure

- Network protocols and Servers, DNS, web, email, news, etc.
- Router, firewall.

## **Economic Significance**

Software has increasing practical and commercial importance. Many economic efficiencies and productivity gains can be attributed to Information Technology in the knowledge society.

The Statistics New Zealand annual "Information Technology Survey"<sup>1</sup>, shows that New Zealander's spend significant sums on software. New Zealand software license sales in 1999 totalled NZ\$699,100,000. 85% of this total was imported softwares. Software licensing represented 23% of the total (\$3065.8M) spent on computer hardware, peripherals and software in 1999.

In 1998 the figure was NZ\$604,600,000; 87% imported; 21% of computer hardware, peripherals and software sales. With an above 10% annual growth in the value of software license sales and a 20% drop in the NZ dollar, we can expect New Zealand's imported software license sales to exceed NZ\$750 million in year 2000. This is a significant amount for a nation of 3.8 million people.

According to the Sustainable Development Networking Programme of the UNDP: Information and Communication Technologies ("ICTs") are now fundamental to dealing with all development issues in developing countries.<sup>2</sup> With the expansion of information technology internationally, software licensing is an increasingly significant cost. In developing nations working to improve basic infrastructure - water, roads, electricity, housing, health and education - the inaccessibility and costs associated with software frequently deny people access to the key tools of the knowledge society.

### **A Culture of Abundance**

Unlike computer hardware that requires physical manufacture, software is a virtual commodity. Once software exists it can be copied or reproduced at negligible cost. The economic principles of scarcity need not apply. Software is naturally a culture of abundance, unlike physical goods, use of software by one party does not deny another party use of that same software. Likewise, softwares may be refined and extended, adding new features and capabilities, more readily if there is a base of code to work from. The effort in designing software is incremental, there are often significant opportunities for reuse of code and modules.

A culture of scarcity has been artificially invoked in relation to many commercial types of software through the use of legal instruments controlling the use of intellectual property rights, and the practice of distributing only precompiled executable binaries to prevent code reuse and adaptation.

A culture of scarcity is good for the profits of software publishers. While the benefits of an abundance culture are enjoyed internally, they are not passed on to the software users. Once licence sales cover development and operating costs, a critical mass has been reached. Thereafter, product manufacture and distribution costs are minimal compared to the income from each sale. This internal capture of the abundance culture leads to spectacular profits. (Compare Microsoft's profit/turnover ratio with General Electrics'.)

Nevertheless, the culture of abundance survives. In academic computing a culture free/open-source software exists. Perhaps the greatest example of the culture of abundance is the Internet. Most of the essential Internet infrastructure, such as DNS

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<sup>1</sup> The following should be copied as one line into the address of your web browser:  
[http://www.stats.govt.nz/\\_4c2565af000bec19.nsf/173371ce38d7627b4c25680900046f25/4c2567ef00247c6acc2568b3001708f2?OpenDocument](http://www.stats.govt.nz/_4c2565af000bec19.nsf/173371ce38d7627b4c25680900046f25/4c2567ef00247c6acc2568b3001708f2?OpenDocument)

<sup>2</sup> Sustainable Development Networking Programme; <http://www.sdn.undp.org/home.html>

(BIND), email (Sendmail), web (Apache), runs with free/open-source software and non-proprietary open standards. Without open standards and free/open-source software the Internet would not exist.

## **Free/Open Source Software – What is it?**

Richard Stallman of MIT is generally credited for the first instance of modern, organized Free/Open-Source Software. In late 1983, Stallman created the Free Software Foundation (FSF). The FSF was concerned to counter the impact of the developing culture of proprietary closed softwares.

FSF articulated four freedoms that underpin the Free/Open-Source Software movement<sup>3</sup>.

“Free software' refers to the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it refers to four kinds of freedom, for the users of the software:

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and adapt it to your needs (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbour (freedom 2).
- The freedom to improve the program, and release your improvements to the public, so that the whole community benefits. (freedom 3). Access to the source code is a precondition for this.”

The FSF published some key software development tools under the “GNU General Public License” (GPL) enshrining these freedoms to run, copy, distribute and modify software.<sup>4</sup>

One cannot overstate the tremendous significance of the General Public License! The GPL provided a legal framework to ensure that the natural abundant benefits of software cannot be captured and ransomed to others. Moreover, the GPL defines rules for open collaboration, sharing and incremental building up of a common intellectual resource.

The FSF and GPL gave rise to the free/open-source software movement. Like any grassroots movement there is diversity. Various groups now use, develop and advocate open-source software solutions. Many types of software essential to the running of the Internet are released under the GPL and similar licenses<sup>5</sup>.

The best-known example of open-source software is Linux, a Unix clone operating system that runs more Internet server machines than any other operating system. In the past year or so Linux has achieved acceptance and backing from hardware vendors such as IBM, and Sun Microsystems, Compaq & Dell.

Proprietary closed-source software vendors, such as Microsoft, are aware of the threat free/open-source software poses to their business. In November 1998 an internal

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<sup>3</sup> <http://www.fsf.org/philosophy/free-sw.html>

<sup>4</sup> <http://www.opensource.org/licenses/gpl-license.html> & <http://www.fsf.org/philosophy/pragmatic.html>

<sup>5</sup> <http://www.opensource.org/licenses/>

Microsoft strategic memo analysing the open-source software threat was leaked. The memo, which became known as the “Halloween” document<sup>6</sup>, provides a useful summary of licensing modalities, acknowledges many advantages of free/open-source software and begins to define a combat strategy for Microsoft.

The following table compares features of different types of software licensing. It is extracted with thanks from the first Microsoft Halloween document. You will see that commercial software rates poorly.

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<sup>6</sup> <http://www.opensource.org/halloween/halloween1.html>

## Software Licensing Taxonomy <sup>7</sup>

<u>License Feature</u>	<b>Zero Price Avenue</b> <i>(cost, access)</i>	<b>Redistributable</b> <i>(cost, access, sharing)</i>	<b>Unlimited Usage</b> <i>(cost, access)</i>	<b>Source Code Available</b> <i>(access, tech-transfer)</i>	<b>Source Code Modifiable</b> <i>(access, empowerment)</i>	<b>Public "Check-ins" to core codebase</b> <i>(participation, collaboration)</i>	<b>All derivatives must be free</b> <i>(protected public ownership)</i>
<u>Software Type</u>							
<b>Commercial</b>							
<b>Trial Software</b>	<b>X</b> <i>(Non-full featured)</i>	<b>X</b>					
<b>Non-Commercial Use</b>	<b>X</b> <i>(Usage dependent)</i>	<b>X</b>					
<b>Shareware</b>	<b>X</b> <i>(Unenforced licensing)</i>	<b>X</b>					
<b>Royalty-free binaries</b> <i>("Freeware")</i>	<b>X</b>	<b>X</b>	<b>X</b>				
<b>Royalty-free libraries</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>			
<b>Open Source</b> <i>(BSD-Style)</i>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>		
<b>Open Source</b> <i>(Apache Style)</i>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	
<b>Open Source</b> <i>(Linux/GNU style)</i>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<u>License Feature</u>	<b>Zero Price Avenue</b> <b>(Cost)</b>	<b>Redistributable</b>	<b>Unlimited Usage</b>	<b>Source Code Available</b>	<b>Source Code Modifiable</b>	<b>Public "Check-ins" to core codebase</b>	<b>All derivatives must be free</b>

<sup>7</sup> See Appendix 1 for Description of Broad Categories of Software Licensing.

## **Benefits of Free/Open-Source Software**

Numerous authors have described the various advantages and benefits of using Free/Open-source software. This paper is concerned with the application of Free/Open-source software in the context of International Development. There is not time to cover the broader issues in any detail. However, if you are interested to explore the wider issues further then we recommend the reading resources listed in Appendix 2.

## **The Role of Free/Open-source software in Development?**

The Sustainable Development Networking Programme of the UNDP regards ICTs as fundamental to dealing with all development issues in developing countries. This view is shared among significant number of actors in international development<sup>8</sup>. There are an increasing number of international conferences convened around ICT and development themes.

Asia-Pacific countries rely increasingly on the Internet and ICTs for their social and economic development. The growing adoption of ICTs, with the increased abilities to communicate and manage information, implies major structural change. Few, even in developed countries, comprehend the profound nature of upcoming societal change.

The challenges facing developing countries are diverse and profound, even without the implications of a knowledge society revolution. Our ability to comprehend the issues involved and the technologies used is a limiting factor in using ICT capacities to catalyse the sustainable development of a country.<sup>9</sup>

Information and Communication Technologies are not only a significant factor in the performance and growth of economies - the importance of which is continuously growing - but they also represent a novel and effective tool to help advance sustainable human development (SHD).<sup>10</sup>

The Digital Divide is now commonly referred to between and within countries. The Digital Divide is a term that describes the gulf between those who are able to access and make use of information technology and those who are not. New Zealand is no exception and while around 50% of the population has access to the Internet, the percentage drops dramatically for low-income groups and those with fewer educational qualifications<sup>11</sup>

There are a wide range of factors affecting access to and use of ICTs. One of these is appropriate software.

## **Is Free/Open-source software appropriate for use in development?**

Danny Yee in his paper Development, Ethical Trading, and Free Software<sup>12</sup> makes the political and ethical case for the adoption of Free/Open-source software by

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<sup>8</sup> <http://www.globalknowledge.org/gkpartners.html>

<sup>9</sup> Capacity Building; APDIP; <http://seminar.apdip.net/>

<sup>10</sup> Information and Communications Technologies for Development; <http://www.undp.org/info21/index5.htm>

<sup>11</sup> The Digital Divide: Poverty and Wealth in The Information Age; Caritas Aotearoa New Zealand; 2000

<sup>12</sup> Development, Ethical Trading, and Free Software; Danny Yee; 1999; <http://danny.oz.au/freedom/ip/aidfs.html>

Community Aid Abroad and other members of Oxfam International. He also notes that the ideological foundations and social/organisational structure of the Free/Open-source software movement are also consistent with community development at a theoretical level.<sup>13</sup>

The Second Global Knowledge Conference in March 2000 in Malaysia looked at the special challenges facing communities and nations in the rapidly changing information and communications environment. The Global Knowledge Partnership (GKP) – Action Plan developed at the conference aims “to encourage diversity and innovation in software tools specifically adapted to local needs, particularly through support for innovation in, and dissemination of, Open Source software tools.” The interested GK Partners include: Association for Progressive Communications, Bellanet, Education Development Center, FAO, Free Software Foundation, Harvard Center for International Development, IICD, SDNP/UNDP, UNESCO, W3 Internet Services, and the World Bank.

### **Free/Open-source Software Complements Current Development Thinking**

#### Participation

Free/Open-source software is based on the concept of participation that has been well documented and discussed in development. Those who wish to be involved in the development of the software are able to contribute. Access to code enables programmers from anywhere to add to or modify the software. Programmers are encouraged to provide their contributions to others who are then able to make improvements as well. Most free software has been produced through decentralised, community-based development processes that are usually open to anyone with the right technical skills (or a willingness to learn) who is prepared to do the work.<sup>14</sup>

#### Access to and control of resources

Free/Open-source software is all about access to and control of resources. This is a key component of development. Being able to access key code resources and then make decisions on how they are best to be used complements current development thinking. There is no one solution for every situation and Free/Open-source software allows adaptation to a particular situation or need.

Free/Open-source software does not create dependencies on multinational corporations. Support commonly comes from user groups and online communities, which often provide better support than commercial alternatives. Commercial support is available for free software systems, but users of Free/Open-source software cannot be tied to single suppliers or vendors.<sup>15</sup>

Currently there is little discussion around gender issues in the access to and control of Free/Open-source software. This is an area that requires further research, particularly in relation to developing countries where women are less likely to have access to education and information technology resources.

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<sup>13</sup> Development, Ethical Trading, and Free Software; Danny Yee; 1999; <http://danny.oz.au/freedom/ip/aidfs.html>

<sup>14</sup> *ibid*

<sup>15</sup> *ibid*

### Prevents Duplication of Effort

“A public benefit of Free/Open-source software is that it eliminates the economic loss which results from duplicated work.”<sup>16</sup> Free/Open-source software allows programmers to share code and enable them to move forward from a previous effort. By sharing the resources programmers are able to develop solutions more quickly and effectively. Duplication of effort is a growing concern with in development. The development community may alleviate this by further sharing and coordinating resources and planning.

### Education and Technology Transfer

Free/Open-source software both encourages learning and experimentation and in turn benefits from it. Free/Open-source software is widespread in educational institutions, since access to the source code makes Free/Open-source software an ideal tool for teaching<sup>17</sup>: indeed much Free/Open-source software began as learning exercises.<sup>18</sup> Dr V. Vinay, assistant professor of computer science and automation at the prestigious Bangalore-based Indian Institute of Science notes that Free/Open-source software allows teachers and students to look into the software and not just treat it as a mystical black box.<sup>19</sup>

### Appropriate technology

Free/Open-source software should be viewed as appropriate technology. There may be cases where v software is not viable. In the case of the Development Resource Centre we have a mixture of proprietary and Free/Open-source software operating in a complementary fashion. This is due to a number of factors, not least was the donation of software from Microsoft! However the recurring need to purchase expensive software upgrades continues to pressure our organisation. This is one of the reasons the DRC continually evaluates the use of Free/Open-source software. Some Free/Open-source software (especially Linux) also is able to run effectively on older hardware enabling use of available resources.

### Unlimited Replicability

You can replicate Free/Open-source software on all the computers in your organization free of charge. You can take a CD Rom home and install the same software on your personal PC if required. This allows consistency amongst any shared computer resources.

### Cost

This is a key component for many when considering the use of Free/Open-source software. There are extra costs associated with Free/Open-source software. Not last of these is the knowledge required to make effective use. With the Microsoft dominated market there are often many people around who can help with training and support. There are more limited numbers with expertise in Free/Open-source software applications.

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<sup>16</sup> The Case for Government Promotion of Open Source Software <http://www.netaction.org/opensrc/oss-report.html>

<sup>17</sup> Human Development Report 1999; UNDP; pp 73

<sup>18</sup> Development, Ethical Trading, and Free Software; Danny Yee; 1999; <http://danny.oz.au/freedom/ip/aidfs.html>

<sup>19</sup> Open source software lures talent-rich, resource poor South Asians; [http://www.iicd.org/base/show\\_story?id=3818](http://www.iicd.org/base/show_story?id=3818)

## Intellectual Property Rights and Software Piracy

Illegal copies of proprietary software abound in many countries. The use of Free/Open-source software can enable users to legitimise the software on their computers more cheaply than if they undertook to purchase legal copies of pirated software they might be using. This allows countries to better meet any obligations they may have towards intellectual property rights.

## Training and Support

There is a certain level of training and knowledge required to be able to utilise Free/Open-source software. This applies to any computer software. Familiarity with Microsoft applications is sometimes a drawback to those learning in a non-windows environment.

Some argue that the support for free software is not available. However as free software continues to grow there is more and more support particularly from organisations that are providing the Free/Open-source software applications. This includes Red Hat, Mandrake, Debian, Caldera, etc. who all produce different versions of Linux. Commercial support for Linux is becoming available from companies IBM and Corel. The increasing number of business users worldwide will also see commercial support options expand.

## Indigenous/Local knowledge and Language

Developing countries such as India, Malaysia and China are evaluating Free/Open-source software for use in promoting indigenous knowledge and language.

## Transparency and Security

"Many government agencies will not use a piece of software in a security-critical application unless the agency itself can examine the source code for flaws; in the case of proprietary software, this often means difficult and costly negotiations allowing the agency access to the source code. If open source software is available to fill such a need, source code is available at no extra cost to the government, and in many cases the software is already more secure."<sup>20</sup>

## Current Uses in Development Community

### 1. Bellanet

Bellanet is an international initiative working with the development community to increase collaboration. They support partnerships by providing advice and assistance on more effective use of information and communication technologies (ICTs).

"Bellanet actively promotes the "Open Source"<sup>21</sup> and "Open Content"<sup>22</sup> trends in the production of software and content. We believe this is fundamentally consistent with our mission and program goals, as well as our operating principles of transparency and collaboration."<sup>23</sup> Bellanet states "what is important on the technical side is the use of applications and techniques that cater to the needs of those with the most difficult or slow connections. This helps to ensure that the principal of equity in

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<sup>20</sup> The Case for Government Promotion of Open Source Software <http://www.netaction.org/opensrc/oss-report.html>

<sup>21</sup> <http://www.opensource.org/>

<sup>22</sup> <http://www.opencontent.org/>

<sup>23</sup> Open Source Software Policy Bellanet International Secretariat;  
<http://www.bellanet.org/downloads/index.cfm?Fuseaction=policy>

participation will not be undermined by the use of highly sophisticated or otherwise inappropriate technology.”<sup>24</sup>

## 2. Global Development Gateway

“The Global Development Gateway is envisioned as a portal website on development issues, from which users will be able to access information, resources, and tools, and into which they will be able to contribute their own knowledge and experience, the Gateway will create a common platform for shared material, dialogue, and problem-solving that is easy to access and navigate through. This will enable those in the development field to share information, easily communicate, and build communities of practice around significant development challenges from the grassroots up.”<sup>25</sup> The GDG is a World Bank sponsored project and is built on open source software developed by Ars Digita and freely available.

## 3. Case of Success: Red Escolar Linux Project in Mexico<sup>26</sup>

RED ESCOLAR proposes to bring a flexible technological model to the primary and normal education schools, a model that is able to easily adapt itself to the every federative state's particular necessities in Mexico.<sup>27</sup> Red Escolar Linux is the technological option that gives the schools the capacity to offer its students and professors an e-mail account and personal web page per user. Additionally, it provides a main web page for the school, enables Internet connections to all the laboratory machines, optimises the information traffic and eases up the administration of the laboratory's local net.<sup>28</sup> All this is done using the Free/Open-source software.

There are many other instances of organisations both formal and informal using Free/Open-source software throughout Africa, Latin America, Asia and the Pacific.

## Conclusion

Software is an integral part of Information and Communication Technologies and is naturally a culture of abundance. Free/Open-source software allows users to run, copy, distribute, study, change and improve software. The Free/Open-source software movement reflects similar values regarding the concepts of participation, access and control of resources, appropriateness, conservation of resources, transparency, education, and low cost that are considered important in current development thinking. The complementarity of the thinking suggests that Free/Open-source software should be considered for use in the development sector. This is not only in developing countries, but also where it is appropriate for donors, NGOs, and multilaterals involved in development.

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<sup>24</sup> Bellanet Approach; [http://www.bellanet.org/B\\_index.cfm?fuseaction=ShowItem&menu\\_id=2&item\\_id=82](http://www.bellanet.org/B_index.cfm?fuseaction=ShowItem&menu_id=2&item_id=82)

<sup>25</sup> Global Development Gateway; <http://www.worldbank.org/gateway/index.htm>

<sup>26</sup> Case of Success: Red Escolar Linux Project in Mexico; [http://www.iicd.org/base/show\\_story?id=4306](http://www.iicd.org/base/show_story?id=4306)

<sup>27</sup> Red Escolar; <http://redesc.linux.org.mx/en/>

<sup>28</sup> *ibid*

## **Appendix 1. Description of Broad Categories of Software Licensing.**

From Microsoft "Halloween" document: <http://www.opensource.org/halloween/halloween1.html>

- **Commercial software**

Commercial software is classic Microsoft bread-and-butter. It must be purchased, may NOT be redistributed, and is typically only available as binaries to end users.

- **Limited trial software**

Limited trial software are usually functionally limited versions of commercial software which are freely distributed and intend to drive purchase of the commercial code. Examples include 60-day time bombed evaluation products.

- **Shareware**

Shareware products are fully functional and freely redistributable but have a license that mandates eventual purchase by both individuals and corporations. Many Internet utilities (like "WinZip") take advantage of shareware as a distribution method.

- **Non-commercial use**

Non-commercial use software is freely available and redistributable by non-profit making entities. Corporations, etc. must purchase the product. An example of this would be Netscape Navigator.

- **Royalty free binaries**

Royalty-free binaries consist of software which may be freely used and distributed in binary form only. Internet Explorer and NetMeeting binaries fit this model.

- **Royalty free libraries**

Royalty-free libraries are software products whose binaries and source code are freely used and distributed but may NOT be modified by the end customer without violating the license. Examples of this include class libraries, header files, etc.

- **Open Source (BSD-style)**

A small, closed team of developers develops BSD-style open source products & allows free use and redistribution of binaries and code. **While users are allowed to modify the code, the development team does NOT typically take "check-ins" from the public.**

- **Open Source (Apache-style)**

Apache takes the BSD-style open source model and extends it by **allowing check-ins to the core codebase by external parties.**

- **Open Source (Copyleft, Linux-style)**

Copyleft or GPL (General Public License) based software takes the Open Source license one critical step farther. Whereas BSD and Apache style software permits users to "fork" the codebase and apply their own license terms to their modified code (e.g. make it commercial), the GPL license requires that all derivative works in turn must also be GPL code. "You are free to hack this code as long as your derivative is also hackable"

## **Appendix 2. Links to Further Reading about Free/Open-source Software**

- Development, Ethical Trading, and Free Software by Danny Yee.  
<http://danny.oz.au/freedom/ip/aidfs.html>
- Core Competencies: Why Open Source Is The Optimum Economic Paradigm for Software by Dan Kaminsky. <http://doxpara.netpedia.net/core.html>
- OpenSource.org <http://www.opensource.org/>  
<http://www.opensource.org/links.html>
- Free Software Foundation Links <http://www.fsf.org/philosophy/philosophy.html>