

## Open Source Software and Open Source Business Models

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*Open source has a large potential competitive advantage for hardware and software vendors. Linux has contributed greatly to the adoption and success of open source software. Companies such as IBM, HP, Dell, Red Hat, Oracle, and Novell, have invested in, and legitimized the use of Linux for enterprise applications including datacenter operations. Open source business practices have emerged and new business models are being built around commercializing open-source products, by bundling them in other products or services.*

**Keywords:** open source software, business models.

### Introduction

IT organizations are increasingly investigating the use of open source software for its cost-effectiveness and flexibility. Some myths about open source software persist; for example, that it runs only on Linux or that it is not stable enough for demanding production environments. In opposition with those myths, leading companies such as Amazon.com and Google rely on open source software, and many more companies will make the switch in the years ahead.

Open source software is transforming the way companies acquire and manage software at every level, from operating systems to applications. IT managers who don't evaluate open source alternatives to proprietary software are making a big mistake. Novell, its customers, and its partners have been waiting for a quantitative and qualitative way to assess the strength of open source projects to support or build into our products. Open source software addresses many of the needs of IT organizations.

To succeed today, IT must both cut costs and deliver innovation. In three years' time, there will be a new set of critical innovations that need to be addressed immediately; for example, this year it is Web services; next year it is Wi-Fi; the year after that, RFID will be a strategic imperative. Moore, Metcalfe, and Gilder [NetLingo The Internet Dictionary, 2006] have proposed some laws, which, taken together, account for the relentless opportunity and demand for innovation (Moore's Law is the best known: the power of a chip doubles every 18 months and the

cost of a given amount of computing power falls by half in the same period of time - usually a year-). Metcalfe noted that the value of a network of connected devices increases at a geometrical rate even though the number of devices themselves only grows arithmetically. Gilder has been discredited because he posited that available bandwidth for a fixed price would triple each year; this is not really true, but certainly bandwidth is enormously less expensive today than it was in the past.

Because of these laws, technology functions that were expensive a few years ago are now financially viable. Wi-Fi was unaffordable five years ago; today you can buy an access point for \$39 at your local electronics store. The ubiquity and cheapness of Wi-Fi makes the number of new devices (like Wi-Fi-enabled phones) much more valuable. Those phones will soon be connected by Voice over IP (VoIP), communicating across the Internet.

Open source is a relatively new phenomenon that consists in five elements:

- open source means Linux – a part of the largest technology vendors are pushing Linux continuously for market share advantage against their competitors and they are not really admirers of open source. Linux is rapidly becoming an accepted operating system choice for IT servers and even client machines. Linux is just one of more than 70,000 open source software products that are available and IT organizations will move in the near future to a world in which selecting open source products will be a commonplace

task;

- open source only runs on Linux - most open source products run on a variety of operating systems, and anybody can take advantage of open source;

- no one runs open source in production – many IT organizations believe that open source is not ready for demanding environments. There are certainly environments that are best suited to commercial products, but open source is definitely used in production systems. If you have used Amazon or Google, you have experienced production use of open source. Open source will increasingly be used in production environments;

- open source will eliminate the software industry - some vendors affirm that open source is anti-capitalism and should not be available because it will breakdown the software industry, but other developers believe that open source solves all problems and will obliterate commercial vendors. This is not really true; open source developers are very good at developing infrastructure, but have not yet addressed industry-specific applica-

tions. The availability of free software will increase the use of software dramatically and the open source software used in the infrastructure will increase demand for this kind of applications.

- open source is just like commercial software - this is the tendency, but open source software is created, distributed and operated differently. The fact that it is free means that product elements formerly delivered by vendors will now need to be sourced by users.

### Open source software

There are multiple languages used to write open source software. The next table (Table 1) summarizes the number of projects using each of the top ten most-used languages in the SourceForge.net repository. The C language features at the top of the list and is probably insufficiently represented because many very large C open source projects such as FreeBSD and GNU/Linux are independently hosted, and many projects that pretend to use C++ are in fact written in C, making very little use of the C++ features.

**Table 1.** The Ten Most Used Languages in Open Source Projects

Language	Number of Projects	% of Projects
C	8,393	21.2
C++	7,632	19.2
Java	5,970	15.1
PHP	4,433	11.2
Perl	3,618	9.1
Python	1,765	4.5
Visual Basic	916	2.3
Unix Shell	835	2.1
Assembly	745	1.9
JavaScript	738	1.9

### Open source business models

Although the vast majority of open source products are available as free downloadable software, a number of open source products have commercial entities associated with them. To understand how we can take advantage of open source, it's important to understand the relationship between open source products and these entities.

*Open Source is relatively new*

As a significant presence in the software world, open source has really only been available in the last five years. Before open

source became a recognized part of the software industry, there had been users of open source (especially Linux) which typically had used these products in severely limited hardware and connectivity environments. The only solution to connect to Internet was dial-up, which significantly increase download times. In these conditions, it appears the opportunity for the first open source businesses: CD distributions of Linux.

*CD distributions of Linux*

The availability of Linux on CDs for purchase allowed users to avoid the small band-

width that affected their download times and facilitated Linux enthusiasts to support themselves through the sale of these CDs. These businesses were insignificant (usually no more than a few individuals) but they were a start.

*These businesses were founded by enthusiasts for enthusiasts*

These businesses were insignificant, but were a beginning for open source businesses. Linux, at this time, was the territory of enthusiasts: individuals willing to experiment new software, and to share their experiences. The enthusiasts formed these businesses to make it easier for new users to get started. As people began to use the CD-based products, they would send questions about them back to the company; a free interchange of advice and knowledge went on constantly.

*Open source spread to less-technical users*

These businesses were not impressive, but they did help new users to understand the concepts of open source. The programmers who wrote early open source products assumed a highly technical user base. IT organizations are not populated with only highly technical employees, many of these had less-experienced technical personnel implementing and managing open source applications, which created a problem: the products were too difficult to install and use.

*Open source businesses extended the base products with better installation and management mechanisms*

To solve these problems, the CD distribution extended the base open source product with better installation and management mechanisms. With this, these companies moved from being pure packagers to being development organizations in their own right. The additional functionality they created enabled them to generate additional revenues.

*Technical support began to be offered as well*

IT early adopters not only needed installation help, but also technical support. IT personnel cannot treat product issues with a leisurely attitude toward problems and a curiosity about how they happened. IT organizations are used to paying for technical support.

*Technical support also lowered risk*

As open source software migrated into production systems, the potential cost of downtime became an issue. Open source businesses added personnel who could fix bugs as well as offer technical support.

*Support services led to training and consulting*

The distributors began to offer their expertise to customers. The addition of training and consulting allowed these companies to offer some professional services and allowed users to lower the risks associated with open source.

*Enthusiasm leading to paid services*

These businesses have continued to evolve. Several of them have become large companies that do far more than sell standard distributions and they create customized versions of Linux, selecting which fractions of the standard Linux modules to include.

*Professional services will be a viable business model*

The professional services business model continues to be viable. The increasing use of open source in IT software infrastructures will raise the demand for technical support and consulting. Entrepreneurs will find many opportunities in open source services. Open source developers will offer in the future a great support for a product because they built it.

*Open Source business models grew from user/distributor interactions*

Open source businesses evolved in an unplanned manner from the interactions of users and distributors. As open source began to penetrate IT organizations, previous open source businesses extended their services to better support this new type of user.

*New business models based on open source are being developed*

Today, new businesses are using open source as an explicit part of their business strategy. These businesses are run by technology business veterans who believe significant advantage is possible by incorporating open source into a business plan.

*Open source will be a key of many new technology businesses*

These business strategies are a relatively new development and are the result of entrepreneurs calculating that open source can significantly cut their time to market or reduce the investment needed to create a product.

*These businesses take advantage of the unique characteristics of open source*

The new business models take advantage of the unique characteristics of open source. Companies can release their product under an open source license to build a large user base very quickly. Distributing their product without licensing restrictions enables them to realize the revenue opportunities possible from a large user base.

*Open source's low cost enables less-expensive technology offerings*

The new IT firms can create products that incorporate or integrate with open source products. These firms sell a solution consisting of its product along with one or more open source products, and the resulting product, incorporating open source software, can be dramatically cheaper than the existing alternatives that require expensive commercial components. Products that were not viable due to price issues are now possible because of free open source software.

*Open source shortens product time to market*

Including existing open source software in a product can dramatically shorten development time and get it to market much faster, which is critical in today's global economy.

The recent open source business models can be seen in three variants. Each of them differs in how it uses open source as part of its business, but each of them depends on open source.

#### a) Open Source Add-On Products

Some companies have adopted this model that seeds a user base with one part of a product distributed at no charge, and then sells additional products that integrate with the free product. For a software product, this might mean to distribute a server product at no charge and selling a management console that makes it much easier to administer.

#### b) Extended Open Source Products

Some companies have extended an existing open source product, improving it in some

way. Then, they offer their open source-based product for sale, even though it is also available as source to their customers. The primary examples of this model are companies extending Linux, several vendors have created embedded versions of Linux optimized for use in hardware devices. In that model these companies have invested intellectual capital into the baseline product and offer the resulting product for sale.

MontaVista Software provides a Linux operating system targeted at embedded uses. For example, Motorola uses MontaVista Linux as the basis for its Smartphone, which provides e-mail and document viewing capabilities along with voice, text messaging, and Internet access. MontaVista modified a number of aspects of the Linux kernel to make it more applicable for real-time embedded uses (power management, POSIX threads, and changing the scheduler) and offer a strong product maintenance and support. MontaVista does not keep its modifications proprietary and donates them back to the main Linux code base, if possible.

#### c) Commercial/Open Source Products

Some companies offer their products under two licenses: a traditional proprietary license and an open source license. Products distributed under the first license are offered for sale, whereas the open source version is distributed for free. The third variant of business model is offering a dual-license scheme.

Depending on the type of open source license the product carries, it can require that any software incorporating the open source product becomes open source itself. In this way, using an open source product within another product can "infect" the second product and cause it to become open source. Open source can "infect" commercial software.

Sleepycat Software of Berkeley, California, offers its Berkeley DB database under a dual-licensing scheme. Sleepycat offers Berkeley DB free of charge to anyone who wishes to use it and the download includes source code as well as linkable libraries. The open source license requires that if you distribute an application that incorporates Berkeley DB, your product must be open source as well. Sleepy-

cat is itself based on open source products from the University of California, Berkeley, and from Harvard University. Their licenses enable commercial products to be created from the original product source code without the resulting products themselves becoming open source. Sleepycat created its product and then released it under both a proprietary licensing scheme and the Sleepycat open source license.

Companies that need a product like Berkeley DB will use it under the open source license and are forced to share their intellectual property with everyone in the world. For companies that want to avoid that possibility, Sleepycat sells a different license for the product that allows companies to embed Berkeley DB without turning their product into open source. Sleepycat's customer list includes Cisco, EMC, Google, Motorola, Sun and others.

Sleepycat uses the dual-licensing scheme to enable them to run a profitable company while still offering an open source product. Companies can download the product easily and build their own application. When the time comes to distribute that application, they recognize they must purchase a commercial license or lose their own intellectual property rights. Sleepycat lets the customer decide the product is right and then realize it needs to purchase a commercial license.

Open source provides a powerful tool for getting a business on a faster revenue trajectory and for improving value. Business managers should understand open source business strategies and determine which strategies are useful for their companies to adopt.

### Conclusions

Open source becomes more widely used and a formalized method of selecting and assessing open source software and all of its elements will be extremely useful. Open source is going to be widely used throughout the industry. I believe the move to open source is consistent with the cost-reduction trend in all industries via customer self-service and self-reliance. A good example is the hardware transformation driven by Dell; you get a low price but are expected to install and configure

the system yourself. The software is going to tread that same path: low prices (free in the case of open source) accompanied by more do-it-yourself work.

The different open source business models are continuing to evolve. Entrepreneurs are creating new business models that take advantage of open source licensing and the market conditions that accompany open source products: widespread distribution, source availability, and an enthusiastic community. The services business model (installation, support, and consulting) based on a freely available open source product will continue to evolve and more and more companies will be founded based on existing open source products, as those products reach critical mass user communities.

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