The Coming Software Revolution

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ABSTRACT
The growing adoption of collaborative software development will change the global software industry by altering its economics of scale, location, and price. The growth of non-proprietary code will depress prices in the proprietary sector, and the possession of source code will enable the growth of more software industrial centers around the world; their emergence will threaten the business of current leaders. National governments which see themselves as disadvantaged or even threatened by the current software powers will encourage collaborative software development and the services that this development model drives. Only world-wide draconic legislation by the current software powers has any hope of preserving the status quo.

Categories and Subject Descriptors
D.2.7 **Software Distribution, Maintenance, and Enhancement**

K.1 **THE COMPUTER INDUSTRY:** *market, standard, suppliers,* **Public Policy Issues**, **Organizational Impacts**, *Computer-supported collaborative work, employment*

K.6 **MANAGEMENT OF COMPUTING AND INFORMATION SYSTEMS: General:** *Economics*, **Software Management:** *software development, software maintenance*

General Terms
Management, Economics.

Keywords
software development, Open Source, collaborative development, peer production, globalization.

1. OPEN SOURCE SOFTWARE DEVELOPMENT AND SOME ECONOMIC CONSEQUENCES
The computer industry as a whole is catching on to collaborative software development and beginning to call it "peer production." The methods of bringing together widely dispersed developers (and their employers) united only by an interest in contributing to a shared software project have been worked out in Open Source projects, and the benefits (and problems) are well-known in those circles. Likewise, more and more corporations are experienced in dealing with distributed development, at least within their own firms or by outsourcing development, including to overseas locations.

1.1 The Open Source Software (OSS) Services Model
The business model for Open Source software (OSS) is not to charge for the product (available to all), but to rely on services for revenue. The proprietary software world is also trying to shift to a subscription model for revenue, turning software from a product into a service in order to achieve both stable revenues and a loyal customer base. But in the case of a service offering, proprietary software vendors will have to amortize R&D costs across a support subscription, while support subscriptions for OSS products can be priced for their support costs alone, not for R&D. In this way OSS will gain a permanent price advantage, increasing its use. At the same time, many companies will be able to take advantage of the increased customer control in OSS relationships to build communities and participation around their products, while others will be unable to make the switch to this closer cooperation. Service companies will be able to excel only if they learn to leverage the resources available through the Internet, whether or not they are paying these remote developers and experts.

1.2 OSS Enables Any Nation to Become a Software Power
In the case of paid developers, OSS makes possible the building of local software and support industries through their access to source code. The chief consequences of this for the United States will be the exporting of software and support jobs (already underway), and a follow-on of increased competition from emerging native industries. The United States has seen this cycle before: the higher-skilled locations in nation originate and build an industry, and eventually engineer it to the point that the lower-skilled portions of the country can also practice it. As the industry evolves, the unskilled work is eventually shipped overseas, along with the bulk of the industry. Only the highest levels of engineering and planning remain in the United States.

1.3 Effects of OSS on Large Computer Firms
The largest U.S. software company (IBM) has grasped the idea that software is a cost and should be "peer produced" as much as possible, and is returning to its original corporate emphasis on hardware and service. IBM is pushing Linux development (much of it at its own expense) in order to eventually drop its own operating systems; as a consequence Sun Microsystems, a hardware company that is actually in the software business, may

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eventually face a Linux strong enough to replace IBM's top operating system and compete with Sun's own Solaris.

2. GOVERNMENT ATTITUDES

2.1 OSS is Strong Overseas

Although the United States leads the world in the building of entrepreneurial businesses atop Open Source software, acceptance of OSS itself is stronger overseas than in the U.S. Overseas users tend to make decisions on technical grounds rather than on brand choice, and smaller budgets favor Open Source software.

2.2 Government Interest in OSS

There is also a rising movement by foreign governments to consider and in some cases to mandate that government software be OSS-based. The biggest examples are Europe (the EC and a number of member states) and China.

2.3 Reasons for World Interest in OSS

China and Europe have reasons in common for the shift to OSS:

2.3.1 Foster Local Software Industry

A desire to build a local software industry independent of foreign control exerted through the secrecy of proprietary code or by other means (e.g., paid licensing).

2.3.2 National Security

A reluctance to have government operations (and particularly the military) dependent on software that is essentially under the control of foreigners. Part of this is the security risk: no one knows what foreign proprietary code may contain in the way of Trojan horses or trapdoors.

2.3.3 Anti-Americanism

A free-floating anti-American sentiment which crystallizes in strong dislike for Microsoft's business practices, if not for its software.

2.3.4 Conservation of Foreign Exchange

A desire not to use government budgets not to pay licensing fees to foreigners, but to help grow local software development and service industries.

2.4 Governments will Foster OSS SMB

That government should be bringing on such a technology revolution should not be surprising since governments have sponsored many technological advances, such as the Internet itself. Further, governments are more willing than are large companies to look to small vendors for service contracts. The stumbling block to the service model for OSS-based companies has been that large companies buy service contracts only from large companies (such as IBM), and small companies that tend to buy from small companies are tight-fisted in buying service contracts, preferring incident models. This wider spreading of government money will build a deeper software industry in those countries.

2.5 Globalism a Threat to Current Software Leaders

Currently the United States counts on its momentum to keep its lead at the high end of the computing industry. It may retain that lead for a long time, even as rival computing industries build up in China and India. But the globalizing of the software industry means that U.S. export restrictions on high-end computing such as supercomputers are meaningless as countries like China chain together large numbers of obsolete U.S. PC's to create supercomputers using widely-available Open Source software.

2.6 The World Takes the OSS Desktop Seriously

It is especially at the low end that the overseas trend to Open Source will affect the U.S. software industry. In the United States it is almost always the smaller corporations already running on UNIX systems that make the transition to OSS desktops for office workers. European governments are showing a great interest in OSS desktops, a use ignored by U.S. corporations. Although a recent British government-sponsored report on Open Source decided that the OSS desktop was not yet ready, it said that a year might make a big difference in that judgment. As in the United States, some small municipalities are using Open Source software for offices, but on the Continent, and particularly in France, national government ministries are starting the switch

2.7 Government Investment a Key Factor in OSS Improvement

The growing number of OSS office suites available (including some from Asia) draws attention to this trend. The biggest impact in the U.S. will be on Microsoft. The British report names OSS difficulties with Microsoft file formats as the chief reason that the OSS desktop is not yet ready for widespread use. But if, for example, the British government (or anyone else with the money) decided to invest in solving this problem, Microsoft would begin to lose its European and Asian markets.

3. THE INTERNET . . . AND THE LAW

3.1 The Internet is Key to World OSS Development

The Internet made OSS possible by enabling distributed development of software projects by many hands, some academic, some amateur and some corporate. The Internet is the means not only of building the software, but of distributing it, and the Internet itself began as a collaborative OSS project. Its open and international character are the chief reasons for the trends listed above. It not only boosts OSS projects, but makes it possible for U.S. proprietary software vendors to put development shops and even support call centers in places like China and India, whose developer power is only faintly beginning to be felt over here.

3.2 Governments Can Make the Internet Hostile to OSS

The Internet itself is not the free and happy playground that OSS developers like to believe it is. It suffers from growing government and industry restrictions around the world. Countries like Saudi Arabia and China funnel their users' Internet connections through servers that refuse to connect to unapproved sites; countries like France and the United States pass laws to control Internet content. New technologies such as the ability to identify the geographical location of users will help in their enforcement.

3.3 Corporations Will Influence Internet Legislation

Corporations are also looking to technologies and legal means to make software globalization more comfortable for themselves. Some obvious trends:

3.3.1 Content

The film and music industries are using legal and technical means to lock down access to digital materials to such an extent that payment can be required for a single or repeated viewings; copyright terms are extended and more material is covered as the default state of public domain is legislated away. Corporations gain increasing control over what is said about them on the Web.

3.3.2 Access

The Baby Bells are overcoming all other broadband competition over telephone lines, leaving satellite and cable access as the only commercial alternatives. Microsoft is promoting .NET, a shifting of Internet standards that will promote exclusive use of Microsoft servers and browsers in order to gain added functionality; less noticed is the domination of the trunk lines (that carry the bulk of Internet traffic) by a handful of vendors.

3.4 Microsoft May Escape the OSS Threat

As OSS comes to play a greater role in the software industry, large vendor Microsoft is placed to escape from this dwindling market by exploiting its content holdings and may very well (based on its .NET plans) decide that a shift to the domination of Internet (Web) services and of the large Internet carrier pipes would enable it occupy the strategic position of railroads a century ago and to skim profits from all who use this transportation system.