free software report
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# Free Software Business Models

### Lean Manufacturing & Free Software

THE MACHINE THAT CHANGED THE WORLD. At first glance one might think that this machine could only be the computer. Not exactly. It's the title of a book that analyzes the evolution of mass production and lean production in the automobile industry. A key observation this book makes is that when a business model dominates the marketplace, the new ideas that arise tend to challenge the premise of that model. In the case of the automobile industry, the challenge to mass production came not from mega-mass production, but from a new concept called lean manufacturing. In reading this analysis, some very interesting comparisons can be drawn between lean production vs. mass production and the free software business model vs. the proprietary business model. This issue will highlight some free software businesses which, by challenging the proprietary business model, demonstrate that they, too, may have found a better way.

One aspect of lean manufacturing is that inefficiencies become immediately obvious and virtually unavoidable so there is no choice but to fix them. This leads to a virtuous cycle of lowered costs and increased responsiveness. In mass production, mistakes are so expensive that they are virtually impossible to correct. When a mass producer targets a market, they can make a good return on investment because mass production leads to low unit cost and large unit volumes. When market preferences shift, a window opens for lean manufacturers. The lean manufacturers took a significant share of the automobile industry because they could adapt to an unexpected shift in market preferences; instead of the shape or size of the automobile, the market chose to focus on the quality of the automobile. The mass producers were prepared for variations of style, but not of quality. The lean manufacturers were prepared for anything, and succeeded beyond anybody's expectations.

The free software business model challenges the basic assumptions of the proprietary business model by disconnecting the access to the software from payment for a license to use the software. Free software is similar to a lean product because there is very little overhead in copying it, and with the proper expertise, it is easily adapted to meet specific needs. When the market preference is quality, performance, portability, or any other feature, the market can modify free software to meet these needs without the worries of refilling distribution channels, shifting large inventories, etc.

Mass producers and proprietary software vendors tend to focus on driving markets rather than responding to them, with good reason: the economics of their business model do not permit them to do otherwise. Moreover, the primary factor over which they have control is quantity. The most difficult factor for them to

Continued on page 2

**In this issue:**

Continued from page 1

**Free Software Business Models**

control is quality. A single change to improve quality costs as much to propagate as an entirely new release. For this reason, quality, like performance, tends to be targeted at the outset. Adapting to any changes in the market preferences is extremely difficult and expensive.

Lean production and free software set their sights right where the market directs. If perfection is the standard, the market can cooperate to achieve it. If product variety or standards are the goals, both can be met. Free software, a paradox in itself, has yielded numerous paradoxical solutions. The evolutionary nature of free software mimics lean manufacturing in that it, too, permits a constant state of improvement. Incorporating bug fixes into source trees, providing vintage releases of software, and the availability of source code, creates endless opportunities to develop new and improved software. The greater the market participation, the greater the market benefit.

While a proprietor of cookies may not be happy that each bag of Nestle Chocolate Chips contains award-winning Tollhouse Cookie recipes, the cookie market is happy to choose between buy-your-own and bake-your-own. The choice enables the largest possible market to exist, and for those who make the chips (cookie chips that is), the best prospect for fortune.

Presented in this issue of the Free Software Report are three "free software" businesses that have characteristics closely resembling those of the lean manufacturer. All have made a niche for themselves battling the existing, outdated notions of traditional business tactics. If more companies followed the example of these three, the future would overflow with innovation. If we give out 'the recipe' and see what creative improvements can be made upon what we have all been fooled into thinking—tampering with the secret ingredients is sacrilege. ✌

# WAIS™, Inc.

**An interview with Brewster Kahle**
**Co-founder of WAIS™, Inc.**

Utilizing the power of WAIS™ (pronounced 'ways') gives those in need of specific information, an efficient way to search large amounts of text. The WAIS™ system was designed to be used by anyone from accountants and corporate executives to educational institutions—anyone who is relatively untrained in information search techniques. WAIS™ is perfect for those who have neither the time nor desire to learn a special purpose query language. The system uses English language queries augmented with relevance feedback. This method of searching has proven to be more than adequate for the types of searches and databases typically encountered.

Users interact with the WAIS™ system through a "question interface." The interface may appear different on various implementations: for example, a character display terminal will have a different look than one which is capable of displaying bit-mapped graphics. The key is that the user need only become familiar with one interface; that interface will give them access to all available information sources.

**Q: How do your customers benefit from the free versions of WAIS software?**

The key to Wide Area Information Servers is the quality of information people can access, and the customers that publishers can sell to. We are making tools for a new generation of "Network Publishers".

In the case of WAIS™, the idea is critical mass; both of information and of users. Without both, the system would not be interesting. We spend most of our time advocating and helping people to access available information. The key is not freeware versus commercial; the protocol keeps the system together. We are committed to international standards and making reference implementations that are free of copyright, patents, or anything. Around a good protocol, let a thousand flowers bloom.

Freeware serves two roles: global research and development, and marketing/sales exposure. The freeware community is the greatest—we develop important new tools, extend old tools in new ways, port, debug, integrate, the works! I am proud to be part of this productive community. A fellow in Utah has made a great WAIS™ interface on the NeXT. Jim Fullton in North Carolina made a great DOS interface to WAIS™ and has put up dozens of popular servers. Francios Schiettecatte made the first integrated picture/text view in WAIS™. The list goes on and on. I am completely amazed at the selflessness of the WAIS™ community. It is unlike anything I have ever seen. Freeware serves exactly the needs of most users.

Continued on page 6

# The Andrew User Interface System

By Wilfred J. Hansen
Director Andrew Consortium
and Susan Straub
Member of Technical Staff
Carnegie Mellon University

In too many instances applications have been little islands unto themselves: text editors that deal inadequately with text from other editors; mail systems, drawing editors, and spread sheets that employ their own incompatible formats. The situation is beginning to change with the advent of Object Linking and Embedding (OLE) and other integrated user environments. However, for Unix the solution continues to be free software that has been available for half a decade: namely, the Andrew User Interface System (AUIS).

AUIS was developed by the Information Technology Center as a joint project of IBM and Carnegie Mellon, designed to support the needs of the campus community for creating and communicating multimedia information.

The system is now widely used in research laboratories as a base for user interface development because of its open architecture and extensive set of existing high-level media objects, especially text. Several academic and business organizations have employed AUIS as the user support environment for programming, document preparation, and document access. The Andrew Toolkit (ATK) has been a basis for at least two commercial products, Rapport and the RS/6000 info system.

The scalability of AUIS is one of it's most attractive features to large institutions. There are a number of sites with over 1000 users, including the campus of Carnegie Mellon where AUIS is available to over 5,000 users. That, in addition to the fact that the software is free, makes AUIS a good alternative to commercial, "shrink-wrapped" products.

**The providers of any "free" software must pursue some strategy that promises to generate sufficient income to maintain the software.**

Let us consider a typical AUIS user. One day last week, Jack Watson, Professor of Economics, received in the mail, a figure from a colleague for their latest joint paper. Since he was also requesting help on editing figures, his screen looked like this:

All these windows are Andrew windows and all understand the same data formats and user interfaces. Jack can cut and paste between them at will. The console window in the upper left window shows the current system status. Below it the typescript is the sequence of commands Jack has given; in this case he has started applications and converted text from plain ASCII to `ez` format.

The help window in the lower left describes the figure media which is in control of the figure in the message shown in the messages window in the middle of the screen. Jack has just copied that figure from the messages window to the `ez` window on the right.

Jack uses the Andrew User Environment and Andrew Message System, which are only two of the three components of AUIS. One of Jack's graduate students uses these tools and the Andrew Toolkit, with which she constructs new applications needed in her research.

Continued on page 4

Continued from page 3

## Andrew User Interface System

The Andrew User Interface System (AUIS) is a portable user-interface environment and toolkit that runs under X11. It provides a dynamically-loadable object-oriented environment wherein objects can be embedded in one-another. Thus, one could use `ez` to edit text that not only contains multiple fonts and typographic styles, but also contains embedded raster images, spreadsheets, drawings, equations, simple animations, links, or any of several other inset classes. These embedded objects may themselves contain other objects, including text. The commonly requested X applications are all presented by Andrew: word processor, drawing editor, mail and news reader, font editor, documentation presenter, and directory browser.

The underlying Andrew Toolkit architecture offers not only screen display, but file storage, cut/paste across windows, an application construction environment, an extension language, and printing. There is full support for programmers to create new objects and new applications.

An extended version of Bison and an integrated lexeme description language provide fundamental tools for language processors. The Ness extension language is the only language available where styled text with embedded objects can be directly manipulated and can even be in comments and constants within the program.

The Andrew Message System(AMS) component of AUIS provides a multi-media interface to mail and bulletin-boards. It was the first and still one of the most comprehensive systems supporting the MIME standard for exchanging mail with styles and embedded objects. AMS contains many advanced features including authentication, return receipts, automatic sorting of mail, vote collection and tabulation, enclosures, audit trails of related messages, and subscription management. It also provides a variety of interfaces that support character-based terminals and low-function personal computers in addition to high-function workstations.

**Did Y ou Know?**

*Quorum Software Systems, Inc. compiles its commercial software products with gcc and debugs with gdb both on Sparc and SGI's operating system, Iris.*

### Survey Results

In the last Andrew View newsletter of 1992, we posed a survey. The wide range of responses came from research companies, universities and corporations, to someone with a personal system used at home. Please note that these results are merely representative of Andrew usage. We know of numerous sites—including consortium members—from which no response arrived.

The number of users at each site ranged from one to more than a thousand, with small sites being the more general case. Of course, the majority of users are in large sites.

Most sites reported running Andrew on more than one hardware platform type, with one running on eight. Platforms included systems from Sun, IBM, DEC, HP, Solbourne, SGI, and i486PC. AUIS is being used for mail management at all but one of the sites and document production at all but four. Almost half use it for project development.

One of the strong points of Andrew has been its advantages as a system for developing applications, so we anticipated that there would be many "AUIS programmers" reported. However, small sites generally use AUIS for its applications and have at most one AUIS programmer: five sites had none at all and eight sites had only one. Four of the larger sites claimed two to ten programmers and only two sites had more than ten.

Sites reported varied sorts of projects under development, many of which have appeared or will appear in the `contrib` section of the distribution.

Continued on page 5

**Free Software Business Ideas**

**Contract programming** - You can sell your time to write free software.

**Hand-holding** - You can sell your time to help people RTUM (Read The Unfriendly Manual)

**Hardware bundling** - Sell hardware with free software preinstalled.

**Software distribution** - distribution of free software.

**Manual sales** - selling printed copies of free software documentation.

Continued from page 4

**Andrew User Interface System**

About a third of respondents—six of the eight reporting project development—expressed an interest in sharing their efforts with other sites.

Only five sites have the Andrew File System (from Transarc) and of these, all but one have at least a hundred AUIS users. When asked why they use AUIS, respondents indicated that price (free) was a factor. Also mentioned was that the AMS/AMDS interface played a part in their decision, while AFS integration was an important factor for two sites.

**Free Distribution**

AUIS is supported and distributed by the Andrew Consortium. The primary distribution is anonymous FTP of the source code. We also sell a CDrom version and versions on tape. The distribution is also available on the XV11R5 tape and a newer version will be on the XV11R6 tape.

One remarkable feature of our distribution is a remote demonstration service. With the command `finger_help@atk.itc.cmu.edu`, readers will get instructions on how to execute AUIS on our machine and have it display on their local X server.

**Revenue**

The providers of any "free" software must pursue some strategy that promises to generate sufficient income to maintain the software. In the case of the Andrew User Interface System, Carnegie Mellon decided to form a consortium to preserve, distribute, update, and extend the software. Memberships in the resulting Andrew Consortium are offered to organizations making use of Andrew and wishing to ensure its continued existence and growth. To encourage membership in the consortium, several advantages are offered to members, ranging from consultation and collaboration to redistribution rights. The most obvious advantage is that members receive new releases immediately while the rest of the world must wait a year or more until the release is integrated in an X distribution. For instance, members are already using the new drawing editor which will not be freely released until XV11R6 at the end of 1993.

Despite the small size of the Consortium staff, we have been able to make major enhancements in addition to maintaining the system on various platforms. Last year saw the introduction of new editors for drawings, fonts, and preferences. This year we are converting the entire source to C++. At the end of the year we will have the most extensive and extensible user interface environment library available under C++.

**Memberships**

Memberships are available at three levels: Full, Contributing, and Associate. Included are: source tape, CDrom with both source and executables, bibliography, copies of papers, videotapes and conference proceedings.

For information about services and offerings of the Andrew Toolkit Consortium please see the access information section on page 7. ✌

## Did Y ou Know?

*The beta version of the GNU CHILL compiler is, conservatively, 50 times faster than its predecessor. CHILL (the CCITT high level language) is used in embedded control applications such as telephone switching systems.*

## Accessing AUIS Software

Sources and binaries are available online, via anonymous ftp from:
**emsworth.andrew.cmu.edu** (128.2.45.40) where the full CDrom release is in the **/cdrom** directory. See the README there.

Another ftp site is:
**export.lcs.mit.edu (18.30.0.238)** in directory **/contrib/andrew;** this is cloned on many servers, world-wide.

On the nationwide AFS file system, AUIS is available in:
**afs/andrew.cmu.edu/itc/sm/releases/X.V11R5/ftp/cdrom/**

To try the AUIS applications on your local X server, try the Remote Andrew Demo service:
**finger_help@atk.itc.cmu.edu**

Send subscription requests to:
**info-andrew+@andrew.cmu.edu**

On the Usenet, see:
**comp.soft-sys.andrew**

Continued from page 2

## WAIS

We would not be getting thousands of elementary school kids using WAIS™ if we charged for everything. We would not have spacial searching of maps if we charged. There would not be users in 28 countries today if we charged.

In another way, freeware gets people to use the tools and sometimes they want real support or advanced features... that is where commercial product comes in. Being in a commercial company lets customers understand your intentions—we are very easy to predict. This makes some people more comfortable because they know we will be serving them tomorrow.

Production tools help us attract the bigger players that need a high level of quality. We sell to publishers, libraries, government organizations, and distributed corporations that spend millions on distributing information. WAIS™ tools are an insanely inexpensive way to distribute information in a high quality way.

**Q: How does your company manage the split between a free version and a proprietary version of software?**
The clients are freeware, and the good servers are proprietary. WAIS Inc. has made a couple of new client programs and given them away free—this is part of our strategy.

The freeware server works fine for databases under 10MB, but over that, the search system is not strong enough and users get lost in the information mess. Freeware is basically a keyword search system, and the commercial server is a powerful fuzzy search, boolean, and fielded search engine.

While at *Thinking Machines*, the bulk of the freeware server was written by Harry Morris, Jonathan Goldman, and myself in order to catalyze the market. We did not make it very good for handling large databases because we wanted commercial players like *Thinking Machines* and other companies to compete in that environment. Believe it or not, government funded freeware projects can stifle markets—we did not want that to happen here.

**Q: Beyond free software, what additional facilities are available to your customers?**
We offer production-grade software with support, installation and all of that. Our customers invest in us to keep ahead of the pack. They are not only buying a product, they are making sure we continue to lead in the standards arena and deliver the best software.

But more than that, we have found that freeware has worked well at the grass roots, and now the tops of organizations want to know how these tools can help transform their organization. In these cases, we do consulting and contract work to help people set up successful systems for publishing or for using other information.

**Q: To what extent do you consider WAIS Inc. to be in the free software business?**
We use free distribution of software when it makes sense. We think that the client software should be free or bundled with hand-held devices. The cost of *selling* software like that is too high.

The real value will be in the information put on the servers—that's what real users will want to pay for. All of this software is there to let the users get at the information.

**Q: What benefits do you see in having a compatible, free version of WAIS available, as well as a proprietary product?**
Freeware is a crucial part of our strategy. We need the protocol to be evolved and kept standard. Freeware and reference implementations of the protocol are crucial. We are fighting to keep this implementation free of copyright, patents, or anything that would keep people from integrating it into their products and services.

### Did You Know?

*Paragon Systems based "diff" and "patch" capabilities for their text editor, QUED/M, on GNU Software.*

"If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of everyone, and the receiver cannot dispossess himself of it."... "He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me. That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature, when she made them..."

Thomas Jefferson
Inventing America, p. 234-5

## Yggdrasil, Inc.

**By Adam Richter—Founder**

Yggdrasil Computing is an up and coming free software company that has sold over 2,000 beta copies of its free software environment, LGX.

The name Yggdrasil is that of a giant ash tree of Norse mythology that supported the heavens and had roots that reached into the underworld.

The name LGX refers to the product's principal components: the Linux kernel, the GNU software suite, and the X window system.

Since LGX is a complete operating system for 386 IBM PC clones, it needs no other software to run, although it can share a machine with other operating systems, such as MSDOS, OS/2 or Microsoft Windows.

Many of the beta testers are businesses that are looking at using LGX as an inexpensive development environment for their projects and have expressed an interest in support services. Yggdrasil does not have the resources to offer support services yet, but a number of these companies make the modifications that they need themselves.

Since LGX is free software, these companies know that they can expect the sort of open market in support services that does not exist for proprietary software, even though Yggdrasil is a relatively small company. Shortly after the production release ships, Yggdrasil will begin offering support and development services, but an open market in third party support will always be an important selling point for LGX, which is why Yggdrasil actively recruits third party support vendors and lists them in the LGX manual. ✌

### More Reading On Free Software and Related Topics

**"The Machine That Changed the World"**
James Womack, Daniel T. Jones, and Daniel Roos—Harper Collins

**"Software Development Environments Get Real"**
SunWorld, June 1993

**"Unix Related Freeware CD-Roms"**
SunExpert, May 1993

**"Crypto Rebels"**
Wired Magazine, May/June 1993

**"Zen And The Art Of The Internet"**
Brendan Kehoe—Prentice Hall

We want to hear from you! Please send your inquiries to the editor:
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## The Fine Print



## Access Information

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