Case Studies in Detail

This chapter takes an in-depth look at two of the libraries that were part of the study on open source public workstations. Most libraries can use these two organizations as examples of how to set up an efficient, cost-effective open source system.

These two libraries were selected because each has extensive experience with open source software, because the use of open source software is pervasive in their organizations, and because they have—through their internal development activities, sponsorship of open source projects, and writing—made significant contributions to both the library and the open source communities.

When looking at this section, it may be helpful to look at these libraries with an eye towards organizational issues. Consider the following characteristics of organizations that successfully implement technology projects:[1]

- They encourage and allow time for employees to attend training.
- They hold effective meetings. Meetings are held on time, with an agenda and action plan as well as clear goals and objectives.
- They develop detailed project plans when taking on projects involving new services or technology.
- They have in-house technical support and don't depend on a city, county, university, or school IT department for support.
- Their technical support personnel are familiar with open source applications.
- Their employees have a clear sense of how using open source software will help them to meet organizational goals and objectives.
- They like to provide leading-edge services to patrons.
- They encourage risk taking.

- They provide strong technical support services for patrons.
- They use project management software to track progress when implementing projects involving new services or technology.

These characteristics do, in many respects, describe both of the libraries profiled in this chapter.

Howard County Library

Howard County Library (HCL) is a well-funded suburban library system located outside of Washington, D.C. It has six branches, 250,000 titles, and approximately one million items. Its collection continues to grow rapidly. Circulation is about five million transactions per year. Impressively, active library users constitute about 50 percent of the library's service population, perhaps because the library has a strong commitment to providing the best possible customer experience.

LuMix

In 1999, Brian Auger, deputy executive director of HCL, attended a demonstration of the Dynix Horizon integrated library system (ILS). One of the claims made at the demonstration was that future versions of the software would require only a Web browser to access all functions. At that time, HCL was using Windows NT on its public-access computers, and despite using Fortres 101 and a variety of configuration tweaks to secure the stations, it was still having significant problems with viruses and reliability. Workstations were frequently down or malfunctioning. Auger was intrigued by the idea that if Windows were not needed to run the library's ILS client, it might

Date	Event	Description
1999	SirsiDynix announces plans to go completely Web-based.	Brian Auger, deputy executive director, starts thinking about operating system independence and what it might mean for the library. Public workstations at HCL are running Windows NT and are both difficult to secure and unreliable.
Early 2000	Luis Salazar joins HCL as network administrator.	Salazar has a Unix background and begins to experiment with Linux and think about using it in the library.
2003	Salazar and Michael Ricksecker, network specialist, start development of LuMix.	LuMix is an in-house Linux distribution designed for public workstations in the library.
2004	HCL starts deploying LuMix for Internet kiosk stations.	LuMix uses a browser for the user interface, offers limited applications, and has a menu. Separate Windows machines are still offered for word processing and other office productivity applications.
2004	Development of LuMix 2.0 begins.	Plans for 2.0 version include a new menu and more applications.
2005	Amy Begg De Groff joins HCL as head of IT.	Discussions begin about whether to continue development of LuMix or look for vendor solution to reduce development and maintenance workload. Salazar finds vendor Open Sense Solutions.
2005	User survey.	Survey suggests unhappiness with time limits on dedicated word processing machines.
2005	Switch to Groovix from LuMix.	HCL decides to replace LuMix with Groovix, a custom Linux distribution based on Ubuntu supported by Open Sense Solutions. New Groovix workstations are designed to be all-in-one: all services and applications on all machines. Workstations include OpenOffice.org suite, Firefox, GAIM, and games.
2006	The HCL staff begins migrating to Ubuntu Linux.	Staff members are given the choice of migrating to Ubuntu. Web-based e-mail and calendar application facilitates this option.
2006	PACMon developed for monitoring public workstations.	PACMon is an in-house utility, developed by Salazar and enhanced by Danny Bauman, Web developer, which shows maps of public workstations in each branch, color-coded to show status as On, Off, or Printing. Software later adopted by Open Sense Solutions and made available to other libraries.
2007	HCL adopts Web-based e-mail and calendar application for internal use.	Adoption of Web-based software facilitates migration to Ubuntu for library staff.
2008	Decision made to replace Horizon ILS and AquaBrowser OPAC with Koha ILS.	The move to an open source ILS is expected to enhance the library's control over its software and to facilitate the library's continued focus on the customer experience.
November 2008	Most staff now working on Ubuntu Linux.	Only 67 of 280 people are still running Windows on their desktop. After migration to Koha, Amy De Groff predicts only 9 non-Linux users will remain.

Table 3
Timeline of open source adoption at Howard County Library.

be possible to switch to a more secure and reliable operating system on the library's public workstations. "If that were true," he said, "we would be able to eliminate all the problems inherent in maintaining multiple Windows operating systems—patches, drivers, and fixes—by simply migrating to a Linux client environment."[2]

In early 2000, Luis Salazar joined the HCL staff as network engineer. Salazar had system administration experience with Solaris, Sun's Unix variant. For the fun of it and to keep his skills up, Salazar began to experiment with the Linux operating system. While Solaris and Linux have different source code, the utilities and the command line environment are quite similar. Soon he was thinking about how they could use Linux in the library.

Eventually, with Auger's support, he and Mike Ricksecker, network specialist at HCL, began working on their own Linux distribution called LuMix—Luis and Mike Linux. Initially, the idea was that the library would continue to maintain separate Windows NT machines for word processing stations. LuMix would be used only for Internet and catalog-access stations. The Firefox browser was the main user interface. There were limited applications. Users could download and view word processor, spreadsheet, and presentation content from the Internet using OpenOffice.org software. They could save to floppy disks (later thumb drives), and they could print. They were aided by the fact that the library had already taken steps to standardize its PC hardware. Salazar and Ricksecker report no troubles with hardware compatibility with the Dell PCs they were using; all the necessary drivers were already available.[3]

The first LuMix distribution went into production at HCL in 2003, first at one of the branches, then eventually in all of the Howard County locations. Library users seemed to like the new workstations—they were used constantly. "People came in and started using the browser," Salazar said. "Most of the stuff they expected to do, like at an Internet café, they could do."[4] The library saw improvement in uptime for the public workstations using the new software. Security problems all but went away. "With the permissions in a Unix-type operating system, it's harder for people to install a program or make any changes like that," said Salazar.[5] Salazar and Ricksecker also configured the workstations so that they would reset by deleting all user files and returning to a known state whenever a user logged out. They also employed a timeout so if a customer just walked away, the system would, after five minutes, log out and reset automatically. According to Auger, this made it "so we didn't have to worry about the actual system being compromised in any way."[6] When he wrote about it in 2004, Auger estimated that the library had saved $35,000 by using LuMix and avoiding the upgrade to Windows XP and the cost of licensing third-party security software.[7] Now that money could go into additional workstations for customers.

Still, there was an increasing demand for more workstations, particularly for more places to do word processing. In 2004, Salazar and Ricksecker began work on a second version of LuMix that would have a menu and more applications. This version would be designed to replace the dedicated Windows NT word processing stations.

Amy Begg De Groff joined HCL as head of the information technology (IT) department in 2005. Also in that year, a user survey showed that library customers were unhappy with the time limit the library placed on use of the word processing stations. It was clear that more word processing stations were needed, but the cost of developing and maintaining a custom Linux distribution was also apparent. The more applications and capabilities that Salazar and Ricksecker added, the more work was needed to keep the system up to date with security and bug patches and software updates.

Groovix

The decision by HCL staff to stop development of LuMix and find a commercially supported Linux distribution was a difficult one. De Groff knew how proud her staff was of the work on LuMix. She wanted to keep Salazar or Ricksecker happy and didn't want to lose them, but they were spending a lot of time on development and maintenance of LuMix. "As we expanded what we wanted to offer," De Groff said, "we were going to have more care and feeding to do."[8] Their success with LuMix had raised user expectations. "The moment customers sat at a computer, while they liked everything they had," she said, "they also wanted more. 'Why can't this computer do this? My computer at home can.'"[9] So they began looking for alternatives. They tried out Userful DiscoverStation, now known as Userful Desktop. But they were not completely satisfied with the appearance of the user interface. In addition, while Userful's product is also based on a custom Linux distribution, it is not fully open source. It includes proprietary session and printing management tools that HCL didn't need. HCL IT staff members are proud of their work with open source software. They feel that they are contributing to the library community by showing how open source tools can be used to enhance the customer experience and use the library's community's funding more efficiently, so they were motivated to find a fully open source alternative.

It was Salazar who found the solution: Open Sense Solutions. Open Sense Solutions sells support and development services for a custom Linux distribution called Groovix, which is based on the Ubuntu Linux distribution. In Groovix they found a fully open source solution, and in Open Sense Solutions HCL gained a responsive vendor that would help create a workstation solution HCL's customers would like. With Mike Pardee from Open Sense, they created a Groovix distribution that is an all-in-one

workstation solution. It fully supports Internet access, office productivity applications, video and audio playback, and games. Some staff members were not sure about the games at first, but according to De Groff, the customers love them.

As of December 2008, HCL has 307 public workstations running Groovix. Its current standard is a Dell GX270 with 1 GB of RAM. Most are bought either used or refurbished on eBay or from National Computer Distributors. According to De Groff, "The reason there aren't more machines is because there is no more space, because the cost of these machines is nominal. It's under $200."[10] Updates to the Groovix distribution are loaded automatically from servers at each branch by scripts that run when the machines are started. These servers also run Linux and cost about $1,000 each. Open Sense Solutions handles the software updates to the Groovix image and has been responsive to ideas from HCL for improvements to the system. The cost of subscribing to Open Sense Solutions' support services is under $10,000 per year for all HCL's public workstations.

Indeed, HCL staff members describe the relationship with Open Sense Solutions as being more like a true partnership than most vendor/customer relationships. In 2006, Salazar wrote an application to monitor the workstations at each branch. Danny Bauman, the library's Web developer, later modified the application to a graphical display of each branch showing the location of each workstation. Now, you can look at a map and tell the status of each workstation by its color: green for on, red for off, and blue for printing. Open Sense Solutions has since added a version of the utility to its product line. Since everything supported by Open Sense is licensed as open source, the utility is available to anyone who wants it.

Figure 18
Howard County Library's Groovix.

Customer Reaction

For the most part, HCL customers' primary reaction to the Groovix workstations has been to *use* them. De Groff said that statistically, feedback was extremely positive. She notes that 80 percent of users didn't notice that they were running Groovix rather than Windows, 17 percent liked the change, and 3 percent "were confused because things were different."[11]

Problems

Browser Compatibility

Browser problems have been relatively rare since HCL switched to using Linux-based workstations and Firefox. Occasionally, users have complained about a website that won't display correctly using the Firefox browser. Sometimes an alternate browser can solve the problem. If the problem is with the website (i.e., standards noncompliance or code written specifically for Internet Explorer), De Groff will try to explain the problem to the customer. She has also tried addressing these issues directly with the site's webmaster.

HCL's experience with Tudor.com was instructive. When customers reported problems using the site with Firefox, the IT department came up with a solution based on running CrossOver Office (now CrossOver, a commercial variant on Wine, the Windows emulation environment that runs under Linux). It also contacted the website to see if it could get the problem fixed. Eventually, it was successful, and the vendor came up with a new version of the website that worked with all platforms. "That was probably the first success we had communicating with a vendor and getting them to work with us. . . . It was a great experience," says De Groff.[12] Since then, only one site has refused to work with the library to resolve a browser compatibility issue.

Station Timeouts

The five-minute inactivity timeout initially set up on the public workstations proved to be insufficient and has since been adjusted to ten minutes. This allows people a slightly longer period to step away from a machine without losing their session or any data not yet saved to a diskette or thumb drive. Even with this extension, there have been a few incidents where a user has left a machine long enough for the station to automatically reset, thus deleting any work that the user hadn't saved on a microdiskette or thumb drive.

Microsoft Office 2007

Microsoft Office 2007 also presented a challenge because it defaults to saving a file with a .docx extension. Files with that extension could not be opened with the OpenOffice.

org software. De Groff was able to find a conversion utility that worked. Open Sense Solutions incorporated the utility into its standard Groovix distribution.

Hardware

The Dell computers that HCL uses are well supported by the Ubuntu Linux distribution on which Groovix is based. Thus, the HCL staff members report no driver or device compatibility issues. However, they did find that when the machines were first converted to Groovix, many of the floppy drives were not working and had to be replaced. HCL also upgraded the memory on many of its older PCs when it converted them to the all-in-one configuration. Currently, help desk queries are down to one or two a week. Usually the problem is a failed hard drive.

HCL's procedure for dealing with workstation problems is straightforward. The staff member who discovers the problem enters a help desk ticket via a Web form. If the machine is running at all, one of the three IT staff members assigned to respond to such tickets will establish a secure shell (SSH) connection to the disabled machine to see if there is an obvious problem. If the staffer can't see a problem that can be fixed quickly, he or she will arrange to visit the disabled machine with a new hard drive in hand. The hard drive will be preloaded with an image of the Groovix distribution. It takes only a few minutes to change the drive and reboot the system. The IT department stocks replacement hard drives. In addition, the branches stock spare keyboards and mice, and staff members in those locations are encouraged to swap out those accessories themselves as needed.

Because most patrons are still using the OpenOffice.org software to do their word processing, temporary local storage for patrons is needed. Most HCL workstations have microdiskette drives as well as USB ports where the patrons can plug in a thumb drive. HCL also sells 1 GB thumb drives for about $10.

HCL prides itself it its customer service, and the staff is empowered to do whatever it takes to help people. According to De Groff, if a customer forgets to bring a thumb drive or floppy to store work, the staff may just give away a thumb drive. The customer usually returns to pay for it the next day. "There is something to be said for just being civil. You usually get civil back," says De Groff.[13]

Staff Support

As soon as the first workstations were converted to LuMix, a few staff members wanted to switch their own workstations to run the same software because they could help customers better if they themselves were users of the same software. However, they were the exceptions. Others were more cautious. De Groff did not push them too hard; she believes that if the open source software is as good as she thinks it is, then staff members should not need to be forced to use it. Her IT staff members are proud of what they are doing, and they connect their work with the educational role of the public library. "I feel like we're empowering people. . . . If more libraries join us in going open source, I think that it will end up with a more knowledgeable population," says Salazar.[14] Other personnel needed time to see the benefits before they switched.

"I think at first this seemed like some crazy thing the IT people came up with," De Groff said. However, as more and more staff members have switched over attitudes have changed. "I think the staff [is] beginning to feel really quite proud of what we're doing," she added, "and the significant cost savings." Referring to buying commercial software licenses when good open source alternatives is available, she says, "I think that at some point that's not [a] very responsible way to spend tax dollars. I'd rather buy a book."[15]

As of November 2008, 67 of 280 employees at HLC still run Windows on their desktops. After the library completes its migration to the Koha ILS next year and personnel no longer need to run Windows to be compatible with their Horizon ILS client, De Groff expects that as few as nine staff members will continue to run Windows.

Other Open Source Projects

HCL has not stopped at installing open source software on its public and staff workstations. The library recently launched a new website that uses an internally developed content management system written by Bowman. The library plans to make that software available as open source. Next year, the library plans a migration from its current ILS solution of SirsiDynix Horizon with an AquaBrowser public catalog for discovery to the Koha ILS.

Crawford County Federated Library System

Under the direction of John Brice, the Meadville Public Library and Crawford County Federated Library System (CCFLS) in Pennsylvania has been utilizing open source tools for approximately ten years. In addition to running Linux on its public workstations, CCFLS has also been a major contributor to the Koha open source ILS and has migrated its ILS system to Koha. It currently employs a developer who has written a number of enhancements to its ILS and has also written a workstation management tool called libKi, which he has made available to other libraries as open source.[16]

Meadville Public Library is located in a small town of about 14,000, located in the northwest corner of Pennsylvania, about forty miles from Erie. The library

has approximately 100,000 books and circulates 250,000 items annually. Meadville is the largest of the nine libraries that make up the Crawford County Federated Library System. In 1996, John Brice, director of the library and system administrator of CCFLS, had a friend and mentor who was a retired meteorology professor from Enbrel University. The professor was a fan of open source technology and the Linux operating system. "He really wanted to do a project with us, with that," Brice said. [17] He was interested, but it wasn't until he had a problem to solve that his library started using Linux.

The problem that got him started was precipitated by a vendor that failed to come through with a promised solution to finish a project to connect seven of Brice's smaller libraries. Brice decided to see if the router could be created with Linux. It turned out that it could.

Shortly after that, Brice and Cindy Murdock, his systems librarian, were taking a class from another local professor. "We actually hired somebody at the beginning to train us on how to use Unix or Linux," Brice said. "We actually hired a college professor to come in." [18] For six weeks, they took classes and did a little homework, or Crawford did, anyway. Brice laughs when he recounts the story. "Cindy actually did the homework, so she learned more." [19]

At Meadville, the use of open source solutions accelerated quickly once the door was open. Since the solution devised for the router problem involved using the Linux Terminal Server Project software, or LTSP, Meadville was soon using that same software to set up terminal-based public workstations. Other projects soon followed. Within a few years, the firewall, Web server, e-mail server (for the whole of CCFLS), and acquisitions system were all open source. In 2006, CCFLS hired a programmer by the name of Kyle Hall to work on various projects for the libraries. This year, CCFLS began implementation of the Koha ILS throughout the library system. Hall has become a regular contributor of code to the Koha open source project and produced a number of Koha-related tools, including an off-line circulation system. CCFLS has also sponsored Koha development from LibLime, which is currently the largest vendor of Koha-related support services. Brice points that open source projects may not actually save money, but "When you're done, you actually own something that you can leverage in your infrastructure year after year after year, and there's no monthly or yearly payment to a vendor." [20]

Besides Koha-related work, one of Hall's other development projects has been to create libKi, the kiosk software that CCFLS uses to manage its public workstations. The libKi software is described on SourceForge, where you can download it:

> a multi-platform kiosk management system for public terminals and kiosks. The administration system is web-based for easy use from any operating system. The client runs on any operating system that has Gtk2 support. [21]

CCFLS has made a practice of reusing older hardware as LTSP terminals. But Meadville Public Library has also purchased low-power diskless terminals for at least one project. These come from DisklessWorkstations.com and cost about $200 each. Each contains a network card that is designed to allow the terminal to boot and to load its software off the LTSP server. "What is interesting is that I spent more money on the furniture and desk (it's a custom cherry table) than I did on the computer hardware. The overall cost of the complete project came in slightly more than a $1,000 a seat." [22]

In addition to the PC-based LTSP terminals and diskless terminals, CCFLS also has a small number of stand-alone Linux PCs, Windows PCs, and one Mac. CCFLS public workstations are broken down at present as shown in table 4.

	Diskless terminals running the LTSP client	PCs running the LTSP client	Linux PCs	Windows PCs	Apple Macs
Meadville	5	15		4	1
Benson		9		2	
Linesville		3		2	
Springboro		6			
Saegertown		7		1	
Cambridge Springs		5			
Cochranton		6			
Shontz			1	2	
Stone			3	2	

Table 4

Problems

Browser Compatibility

CCFLS does not report a large number of browser compatibility issues. However, it has taken some steps to address any problems that could arise. While Firefox is its primary browser, it also makes the Opera and Mozilla browsers available to customers. Sometimes one of these alternate browsers will work with a website that doesn't work with Firefox. According to Brice, "We have found that in most cases our Web solution or Web kiosk solution [can] bring up just about everything that can be brought up on the Web. [But] there are certain sites that are very vendor specific. . . . We do have one computer [in] the main area that still runs on Windows, so in those cases, we can bring that up."[23]

Printing

Windows users generally assume that drivers will be available for any printer they buy. Such an assumption can lead to problems for Linux users. Many printers are either not supported or partially supported (i.e., with a generic driver that does not support all functionality offered by the printer), or supported by one spooling system but not another. Nevertheless, there is no shortage of fully supported printers for Linux.

One of the Linux's dirty little secrets is that there is no one way to print or one spooling (queuing) system for print jobs. Application developers can choose from a set of competing spooling systems. Linux distribution developers may choose to give priority to one system over another.

Fortunately, there is an open source project that attempts, with considerable success, to tame the ferocious complexities of printing under Linux: Foomatic. Foomatic is described this way on the Linux Foundation homepage:

> Foomatic is a database-driven system for integrating free software printer drivers with common spoolers under Unix. It supports CUPS, LPRng, LPD, GNUlpr, Solaris LP, PPR, PDQ, CPS, and direct printing with every free software printer driver known to us and every printer known to work with these drivers.[24]

Foomatic is included with all the major general-purpose Linux distributions, among them Debian, Mandriva, Red Hat, SUSE, and Ubuntu. Using Foomatic greatly simplifies printing for Linux users. Before buying a printer, check to see if it is fully supported by Foomatic. Alternatively, you can check for a driver compatible with one of the spooling systems supported by Foomatic, such as CUPS, and install the driver manually. A great deal of valuable information about printing under Linux is available at OpenPrinting on the Linux website, including a database of printers supported by the various spooling systems and distributed with Foomatic. Check at this site first before buying printers.

> *OpenPrinting*
> www.linuxfoundation.org/en/OpenPrinting

Notes

1. These characteristics were derived from the author's project planning and implementation experience at UCLA, the Detroit Public Library, and VTLS, Inc, and as a consultant at PALINET.
2. Brian Auger, "Living with Linux," *Library Journal* (April 15, 2004): 16, 18.
3. Luis Salazar, network administrator, Howard County Library, interview with author, Nov. 20, 2008.
4. Ibid.
5. Ibid.
6. Auger, "Living with Linux."
7. Ibid.
8. Amy Begg De Groff, head, Library Technology Services, Howard County Library, interview with author, Nov. 20, 2008.
9. Ibid.
10. Ibid.
11. Ibid.
12. Ibid.
13. Ibid.
14. Salazar interview.
15. De Groff interview.
16. Cindy Murdock, "Libki Kiosk Manager," Jan. 7, 2008, Meadville Public Library Technology Blog, http://meadville library.org/techblog/libki-kiosk-manager.html (accessed Jan. 3, 2009).
17. John Brice, executive director, Meadville Public Library and system administrator, Crawford County Federated Library System, interview with the author, March 6, 2007.
18. Ibid.
19. Ibid.
20. Ibid.
21. "libKi," SourceForge.net, http://sourceforge.net/projects/libki (accessed Feb. 4, 2009).
22. Brice interview.
23. Ibid.
24. "OpenPrinting/Database/Foomatic," The Linux Foundation, http://linuxfoundation.org/en/OpenPrinting/Database/Foomatic (accessed Feb. 4, 2009).