

Tackling TCO in K–12 Education



By Steven Moskowitz

Subject: Any

Audience: Teachers, technology coordinators, library/media specialists, school and district personnel, teacher educators

Grade Level: K–12 (Ages 5–18)

Technology: All

Schools are purchasing and installing computers within their organizations at an ever-growing rate. Many districts enjoy a single digit ratio of students to personal computers, substantially lower than a decade ago. As school districts continue this trend, it is critical that they implement strategies to maximize their investments. Total cost of ownership (TCO) is a concept well known in industry and recently introduced to education. TCO calculates the true cost of a personal computer over its lifetime within the organization. It is a method by which technology administrators understand and manage all costs related to technology purchases, including up-front costs, after-purchase direct costs, and after-purchase indirect costs. The following are factors in calculating TCO:

- Procurement costs (bids, contracts)
- Original equipment cost
- Software
- Service and support
- Upgrade costs
- Training costs
- Loss of productivity (down equipment, recreational computing)
- File server costs
- Cabling
- Internet access
- Asset tracking

The GartnerGroup, a Connecticut-based national consulting company, recently calculated the TCO of a personal computer in an average corporate setting between \$9,000 and \$12,000 per year (Kirwin, 1997). If an organization understands TCO, it can work to lower the costs by changing how it implements technology. As educational institutions spend more and more on technology, they would be well advised to implement some of these strategies.

When personal computers were introduced to schools in large quantities in the 1980s, they were often purchased and maintained by separate departments for specific uses. For example a math department would purchase a

computer-programming lab, an English department would purchase a writing lab, and elementary schools would purchase equipment specific to their needs. With the advent of building-wide networks, wide area networks (WANs), and the rapid expansion of the Internet, computers are currently being deployed in large numbers in entire school districts. Districts are in a transition from supporting their equipment departmentally to supporting it centrally. However, many districts are not looking at the big picture in supporting and maintaining this equipment.

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How Will Technology Be Used?

The key to minimizing TCO is to examine related factors. However, before a district can implement a TCO model, it must first clearly define how technology will be used within the district. Usually, the school district's technology plan will serve as a valuable resource during this phase. If the software platforms do not adequately support the curriculum, or if the systems are designed in isolation, the investment in technology may be compromised.

For example, a school district may decide its priority is information literacy, so it would design its equipment to support a limited amount of applications, such as accessing Web sites, online databases, and so on. The hardware in this model may be well suited to closed-end computers, such as terminals or network computers. Another district may be more interested in integrated learning systems, so its priorities for hardware, software, and deployment would be totally different. That district would need more graphics capabilities, labs, and/or clusters. Once district personnel define their use for technology, they can then implement strategies to

analyze and reduce their TCO. For additional information in technology planning, visit NCREL's Web site at www.ncrel.org or the National Center for Technology Planning at www.nctp.com (which was founded by former ISTE Board member Larry Anderson).

Solutions

As schools move ahead, they must rethink their support strategies. The current model of one technician servicing a single computer at a time is very expensive and not practical. For example, a computer running Microsoft Windows has multiple icons and settings that often need to be configured and adjusted. An organization that has 1,000 computers would have a high TCO if it serviced these computers individually. Organizations that have standardized on a limited number of applications or have implemented some of the solutions outlined below can potentially have a lower TCO. School districts can take steps to reduce their TCO in the following ways:

Standardization. Hardware and software should be standardized as much as possible to reduce complexity and the uniqueness of the computer environment. It is simpler and less expensive to support a limited number of applications and computer environments. Fewer technology platforms mean lower costs. Defining standards takes only up-front time, with periodic evaluations. End users and technicians can be trained to work with a specific set of hardware and software and will become familiar and proficient with the equipment.

Implement terminal servers. Terminal servers such as Citrix and Microsoft® networking products can deliver software from a centralized file server, reducing the need to load and manage software on the individual computer. Users simply need to connect to the network and all applications are delivered centrally from the file server. This

technology is not platform specific, so nearly any computer can be used. For example, older Macintosh® computers, Windows® systems, even handheld computers attached to the local area network (LAN) can run applications from the file server. Citrix is a platform-independent product that enables you to connect PCs and Macs to act as terminals on a network, starting sessions. To connect Macs and PCs, additional file servers are required to run central applications (www.citrix.com/products). TCO is reduced over time when technicians are not dispatched to every computer.

This delivery method has many advantages, specifically the ability to centrally manage applications. Most configuration and management tasks can be performed centrally, and there is no need to configure individual clients. However, this approach demands a robust network with powerful file servers, and considerable expertise to manage the system.

The Network Computer. The Network Computer (NC) is a closed system that runs applications from a centralized server. These units are also referred to as *thin clients* and are increasing in popularity. Because it is a closed system, maintenance is minimal. The installation consists of connecting the keyboard, mouse, and monitor and turning the unit on. NCs are connected to the building-wide network, and all applications are configured and run from a centralized server. The TCO is significantly lower using these units because all maintenance is performed remotely, including managing software applications, updates, data backups, and more. Current prices for these units range from \$400 to \$900. As long as one can connect to the network using a LAN or WAN, the price includes remote maintenance. These units are in their infancy and will become more popular—and presumably cheaper—as the technology advances. They require a robust infra-

structure, including 100 MB Ethernet network and high-capacity servers. Companies such as Oracle (www.oracle.com) are investing considerable resources in developing this technology as a viable option. These systems could essentially run any software applications that a standard computer would run, only they'd do it in a central processing mode.

Applications on the Internet. With the first widespread use of networks in the 1980s, most applications were delivered from a central file server. The trend however, in the 1990s has been to run applications locally on the workstations. This approach is expensive and difficult to manage. A new generation of software called *Application Service Providers* (ASPs), which allow users to use applications directly from the Internet, is currently being developed. An old idea made new, these applications reduce an organization's TCO by requiring only an Internet browser such as Netscape® Navigator or Internet Explorer to run on the computer. The user simply accesses a Web site and runs the application remotely. All updates, backups, and maintenance are performed remotely. A fee is paid to the ASP for the use of the application. Prices can range from an annual fee of \$1,000–\$5,000 depending on the application to a per-seat charge comparable to standard software pricing. Some additional sources of information include ASP Street.com (www.aspstreet.com) and the Application Rental Guide (www.findapps.com).

Purchase new computers “cloned.” It can take an hour or two to load software on a single computer and customize it as needed. Multiply this by dozens or hundreds of new computers as schools are purchasing today, and an installation can be extremely time consuming. However, organizations can use several techniques to minimize this expense. A single computer can be purchased and customized as needed, loading all soft-

ware, network drivers, and other programs necessary to the computing environment. Using disk-imaging software such as Norton Ghost™, the hard drive can be copied in its entirety to a network or CD drive, and easily installed on other computers in minutes. In addition, several computer manufacturers such as Dell (www.dell.com) and Gateway (www.gateway.com) offer this service at a minimal cost. Schools can send them a customized hard drive, and they will install the image of the hard drive on new computers at the factory. When they are shipped to the district, they are loaded with the appropriate software. This greatly simplifies large installations. The cost for this service can range from \$35 to \$50 per system.

Leasing. Leasing can be a viable alternative for school districts when considering TCO. Once dismissed as impractical because of limited tax advantages for schools, leasing can allow a district to have newer computers more frequently and allow more machines to be acquired at one time (Banks, 1999). This model will often fit into a district's staff development needs, having all the computers arrive at once, instead of splitting them over a multiyear rollout. For example, it may be more cost effective to train staff members in one condensed time frame instead of doing it over a multiyear period.

Remote management. Remote management is a technique that enables technicians to resolve technical issues over the network. Most remote management applications available today can perform only a limited number of functions, such as checking BIOS, hard drive, and other basic information. Most users have software issues that cannot be addressed in this manner. However, a new generation of remote management software is being developed that will address these limitations and be an important tool in the very near future.

An example of this type of software is Microsoft's SMS software suite. SMS

can roll out new software applications, remotely manage Windows PCs, schedule the execution of maintenance procedures, and maintain automatic inventories of their Windows systems. Users do not have to be logged on the system for this software to execute. In addition, the system can manage a WAN, managing bandwidth and bottlenecks.

For Macintosh networks, Thursby software (www.thursby.com) offers several file-sharing and network utility packages, including DAVE, MacNFS, MacSolo, and TSStalk. Other remote management products include Novell's ManageWise (www.novell.com/products/managewise), AimIT from Computer Associates (www.ca.com/products/aimit.htm) and WinINSTALL 2000 from Veritas Software. (www.veritas.com/us/products/wininstall2000).

Organizations that incorporate this approach will lower their TCO substantially. Initially, software will need to be purchased. The savings will be realized over time, when technicians do not have to visit every desktop to modify the computing environment. The actual savings will vary from organization to organization, depending on the frequency of service currently performed. Remember, this software is heavily discounted to educational organizations.

Outsourcing and using resources effectively. Often teachers are asked to maintain computer systems in the interest of cost savings. However, this model may be more expensive than districts think. Consider the following example:

A teacher employed by a school district makes \$45,000, and works 185 days. The hourly rate for that individual is approximately \$40 dollars per hour. Many computer vendors can supply network technicians for approximately the same hourly rate. The difference is that the network technician may be able to solve and resolve technical issues in less

time, because this is their business and they have more resources at their disposal including manufacturer support agreements, training, and shared experiences inside their organization.

Consider the fact that teachers are rarely asked to repair other types of instructional equipment in schools. Computers should not be an exception. Good educational technology teachers are hard to find, and their time would be better-spent empowering students and teachers to work productively and independently. This in and of itself will reduce an organization's TCO.

Extended warranties. I highly recommend school districts purchase extended warranties on their equipment. These are usually relatively inexpensive at the time of purchase and are well worth it. If any component fails within the three-year period, the manufacturer handles it, usually within 24 hours. To many organizations, this service is the equivalent of another technician.

Planned obsolescence. Many school districts spend a substantial amount of money in hardware replacement costs, technician time, and loss of instructional time because they have older and ailing computers. School districts must estimate at the time of initial purchase the years they can expect to keep the hardware operational and make adequate provisions at that time. For example, extended hardware warranties are substantially cheaper to purchase initially than purchasing spare parts and labor for older computers that have long been discontinued.

Professional development. Finally, one of the most important undertakings a district could take to lower its TCO is to implement a well-designed staff development program. When staff members are properly trained in the uses of technology, they will make good use of the technology available to them, and the investment in equipment will be

sound. One of the common indicators of having a high TCO is a general lack of training (Van Dam, 1999). Adequate training needs to be provided to different members of the organization, including teachers, administrators, clerical staff, and instructional assistants. TCO costs, as applied to training, will be reduced when users have adequate training on the use and mechanics of how to use computers (e.g., power on, off, basic configuration, solving basic printing problems, etc.).

Conclusion

The way to reduce TCO is to have the ability to constantly assess how technology is being delivered and supported within a school district. It is also important to have the flexibility within the organization to adjust when necessary to changes in trends, technology, personnel issues, and more. By considering all the obvious and hidden costs of technology implementation, the potential for success in the instructional and administrative arenas will be greatly improved (Van Dam, 1999). Applying the principles of TCO is key for school districts to continue to afford to bring the valuable resources of educational technology to students.

References

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