DOCUMENT RESUME

ED 475 935 IR 021 933

AUTHOR Harris, George

TITLE Total Operational Costs Report.
PUB DATE 2002-06-00
NOTE 23p.; In: NECC 2002: National Educational Computing Conference Proceedings (23rd, San Antonio, Texas, June 17-19, 2002); see IR 021 916.
AVAILABLE FROM For full text: http://confreg.uoregon.edu/necc2002/ .
PUB TYPE Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; Computer Assisted Instruction; Educational Equipment; Educational Facilities; Educational Finance; Educational Resources; *Educational Technology; High Schools; *Program Effectiveness; *Program Evaluation; Secondary Education; *Technology Integration; *Technology Planning
IDENTIFIERS *Technology Implementation

ABSTRACT

Northern Valley Regional High School (New Jersey) has been involved in implementing a technology strategy for over a decade. This document outlines how the funding that the Board of Education has provided was spent and will be spent over the next 3 years. Included are several industry models that are geared towards business and public facilities. Findings from this analysis show that Northern Valley Regional High School is approximately six times more efficient than the average business in operating technology. When comparing Northern Valley to the public organization models, again, the school district surpasses the averages. The delivery of technology in Northern Valley is approximately three times more efficient than other public facilities. Use of funds in an effective manner, while providing not only technology for the Northern Valley organization, but also including support mechanisms that meet the organization's demands is a critically challenging task. Over the past 6 years, the support structure and mechanics have been constantly revised. The continuing cycle of implement, review, improve, and re-implement has resulted in a technology support product that has vastly improved users' expectations and confidence in the ongoing need for repairing and troubleshooting technology problems. This improved organization has provided the school district with the ability to support roughly three times the number of computers as an equally sized public institution and roughly six times the number of computers of an equally sized business. (AEF)

Total Operational Costs Report

By

George Harris

Revision: April 9th, 2002

Index

Summary

Northern Valley Regional High School has been involved in implementing a technology strategy for over a decade. In 1993, there was a large infusion of capital and a continued Board of Education commitment to provide for the integration of technology into the school's curriculum. The path that the school district chose involved several false starts, but many successes. It is the goal of the Technology Coordinator and Network Engineer, through this document, to explain to the stakeholders in the school district the outstanding performance and value they have received through their commitment to technology.

This document outlines how the funding that the Board of Education has provided was spent and will be spent over the next three years. Included with this outline will be several industry models that are geared towards business and public facilities. Comparing Northern Valley to both types of models will help the reader understand how to interpret the findings from this analysis.

The findings of this analysis show that, in summary, Northern Valley Regional High School is approximately six times more efficient than the average business in operating technology. When comparing Northern

Valley to the public organization models, again, the school district surpasses the averages. The delivery of technology in Northern Valley is approximately three times more efficient than other public facilities.

Use of funds in an effective manner, while providing not only technology for the Northern Valley organization, but also including support mechanisms that meet the organization's demands is a critically challenging task. Over the past six years, the support structure and mechanics have been constantly revised. The continuing cycle of implement, review, improve, and re-implement has resulted in a technology support product that has vastly improved users expectations and confidence in the ongoing need for repairing and troubleshooting technology problems. This improved organization has provided the school district with the ability to support roughly three times the number of computers as an equally sized public institution and roughly six times the number of computers of an equally sized business.

Evolution

For more than a decade private companies, industry analysts and technology firms have been exploring and researching two items. The first is called Total Cost of Ownership. The second is called Total Cost of Operations. Both are very important litmus tests in understanding how an organization functions and delivers technology through the years. Due to the same acronym for both processes (TCO) the writers have decided to change Total Cost of Operations to Total Operational Costs. This will allow for better distinction and less confusion between the processes.

Total Cost of Ownership (TCO) is based on two factors: Budgeted Costs and Unbudgeted Costs. Purchase of hardware, depreciation of hardware over its life cycle, software, staffing, an Internet connection, training, upgrades, repairs, and disposal costs are all part of the Budgeted Costs component. Lost work time due to broken hardware, downed connections, poor training, or inefficient processes are all Unbudgeted Costs. By adding the annually budgeted and unbudgeted costs associated with a computer over its lifetime, an organization can find the Total Cost of Ownership for a computer's operation in their environment. All of the

organization's individual computer costs are then averaged together to give an average Total Cost of Ownership.

The industry numbers associated with Total Cost of Ownership are highly subjective. This is due to the addition of unbudgeted costs. Lost work is very difficult to quantify in any organization. The range of Total Cost of Ownership is from $8,000 to $16,000, depending on the values that companies associate for lost work.

Total Operational Costs (TOC) is based on a slightly different model. Structured on the understanding that technology is not stagnant and requires continual maintenance; Total Operational Costs are defined as the cost to maintain a piece of technology within an organization per year. By adding all of the real costs associated with technology and dividing by the number of computers, an organization can find their cost per computer per year. The reader should note that these numbers do not include lost work or organizational inefficiencies due to poor process implementation, such as with Total Cost of Ownership.

Operations Costs look at every facet, just like Ownership Costs, but are less subjective. By looking at only the financial obligations required to maintain technology, Operations Costs can be compared very easily across all types of associations, companies and organizations.

Organizations with similar budgets and structures can realistically compare their effectiveness and efficiency. It should be noted that Total Operational Cost numbers are significantly lower than Total Cost of Ownership numbers. As stated before, Ownership Costs range from $8,000 to $16,000 per computer, where Costs of Operation are typically under $6,000 per computer.

To understand what the Total Operational Costs mean to the Northern Valley School District, the Network Engineer and Technology Coordinator have gathered all of the components that pertain to the organization. With the help of the business office, the financial information that was required was extracted from the previous years' budget reports and extrapolations were made for the next three years.

Future projections were then made based on many factors. All of the same items that had to be researched from the previous budgets now have to be projected for three years. The list of items to take into consideration is quite long. All of the following factors are included in the analysis, but this is by no means the full list: (computer purchases, longevity of legacy equipment, construction, network wiring, research and developement projects, server upgrades, software upgrades, changes in classroom usage, changes in software used in curriculum, employee costs,

technology services provided to the community, repair and maintenance contracts, data processing costs, repair costs, disposal fees, office costs for technology, telephone services, training costs, peripherals such as printers, scanners, and projectors, and technology supplies).

The Total Operational Costs lifecycle begins with the understanding that the District must be committed to technology and its evolution. Based on the following chart, the district can self-test itself in six categories. This chart is provided by The Consortium for School Networking. They are a non-profit organization that helps schools organize and understand Total Operational Costs and Total Cost of Ownership objectives and responsibilities within the context of an academic setting.

Comparing the six TCO categories in Table A to Northern Valley's operating procedure, we can note the following items: Northern Valley spends about 17% of its budget on professional development. Support is an integral part of the Northern Valley technology model and there are eight full-time technical people supporting the district's technology initiatives. Software is centrally supported and upgrades are regularly planned, though not on an annual basis, but the choices for software are left to the individual departments and Office of Curriculum and

Instruction. Technology is replaced based on the district's six-year curriculum cycle. The district has continually explored the importance of facility planning and has done modifications to its electrical structure and plans for future growth both in the current buildings and in any new construction. The school completed a network infrastructure upgrade that will meet the current needs and provides the accommodations to grow to meet district's future requirements.

Over the past seven years, Northern Valley has done an excellent job of identifying the many items needed for supporting technology initiatives. Once identified, the district has committed the necessary structure to support all of the facets needed to maintain technology. Some of these items were proactively looked at and solved before problems occurred; others were continually modified over the past years to reach an appropriate solution. Regardless of the path chosen, all of these items have been and will continue to be adjusted to meet the needs of the district.

Table A: TCO Category Chart

	The "TCO-Savvy" District	The "Doing the Best We Can" District	The "Worry About It Tomorrow" District
Professional Development	Devotes 15-30% of its budget to staff development	Provides some staff training, but not at times that are convenient or when staff is ready to put the lessons to work	Assumes that teachers and staff "will learn on the job"
Support	Provides computer support at a ratio of at least one support person for every 50 to 70 computers or one person for every 500 computers in a	Relies on a patchwork of teachers, students and overworked district staff to maintain network and fix problems.	Relies on the "hey Joe" sort of informal support

	closely managed networked environment	Does not track the amount of time its network is down or computers are not in use	
Software	Recognizes that the greater diversity of software packages and operating systems, the more the support that will be required. Makes provisions for regular upgrading of software packages	Utilizes centralized software purchasing, but choice of application and respective support left to individual schools and/or staff members	Expects support personnel to manage whatever software happens to be installed on a district computer
Replacement Costs	Budgets to replace computers on a regular schedule, usually every five years, whether leased	Plans to replace computers when they no longer can be repaired	Assumes that when computers are purchased with 20-year bonds

	or purchased		that they will last forever
Retrofitting	Recognizes that many school buildings will require modifications of electrical, heating and cooling systems, as well as asbestos removal, to accommodate new technology, and budgets accordingly. When possible, makes these improvements when schools are being built or renovated.	Understands minimum and recommended requirements for electrical and other infrastructure improvements and incorporates them when funding is available	Pulls the wires and then blows the fuses
Connectivity	Plans its network to provide connections that provide enough	Has the bandwidth it needs today, but has no plan for	A phone and a modem, what more do you

	bandwidth to manage current--and future-- needs, especially multimedia applications	scaling it upward as demand grows	need?

Cost Analysis

With a commitment to a Total Operational Costs process and its lifecycle, the district can look at the three phases that make up TOC. In the Analysis phase, all of the pertinent numbers are acquired. In the Improvement phase, alternatives are modeled and then selections are made to reduce TOC. In the Management Phase, implementation, trend analysis and validation processes are measured. This cycle should be done every six months, but in a public organization, the cycle is stretched out to accommodate the fiscal year.

The analysis of Northern Valley Regional High School's TOC can be found in Appendix A. The table shows the breakdown of all technology spending in the school district. Personnel Totals are the costs for all of the persons hired by the school district that are directly involved in technology. This includes staff development, data processing, technical support and secretarial support. The general computer fund is used to purchase any technology for the district. Repair/Maintenance is for fixing broken computers; where the services account is used for annual support contracts. The training account covers the staff development costs for outfitting the three support rooms in the district. Substitute costs are

paid for by the Office of Curriculum and Instruction. These are the fees associated with having a teacher attend a technology-training workshop. Telephone costs are only the telephone fees associated with technology. These are Internet access fees, T1 connection costs, and Dial-in access line fees. Data Processing contains all of the expenses associated with the student database system. Hardware, software, forms, supplies, training, and any other costs that are incurred by the department are taken from this account.

The Distant Learning Refund is money that the New Jersey Department of Education allocates to the school district. This money can only be used for certain types of technology expenditures. The current amount of the refund is based on $43.00 per enrolled student. In the 2000-2001 school year, the school district was able to carry-over part of the money from the previous fiscal year.

This carry-over coupled with the purchase of the new student database system (TENEX) has skewed some of the numbers between the 1999-2000 and 2000-2001 school years. Approximately $17,000 was moved into the 2000-2001 school year from the previous year. The TENEX purchase also inflated the 1999-2000 Data Processing element by an additional $50,000. These two factors caused an overall increase of

$100,000 to occur between the 1998-1999 and the 1999-2000 school budgets.

The 2000-2001 school year also had a large percentage increase in expenditures. This increase was due to the increased support commitment by the stakeholders. Several personnel additions were made to the support structure, which greatly increased this particular expense. Overall, this was the primary cause for the second large percentage increase in total expenditures. One should note that the average percentage increase over the past five years for technology expenditures in the school district is 4.23%.

Based on research done by the Gartner and Forrester Groups, the average technology budget is between 2% and 9% of the total operating budget. Percentages increase proportionately with the total size of an organization's budget. Based on this research, Northern Valley School District's targeted technology budget should be 4% of the total budget. The average technology percentage of the Northern Valley budget for the past five years is 3.69%. Including into this average the 2001-2004 school year projections, the average percentage will be 3.80%.

Based on similarly sized corporations the average Total Operational Costs are $4,950.00. Similar sized public organizations are expected to

expend half of this amount, or $2,475.00. The reduction in operation costs is based on public organizations inability to acquire appropriate commitments from federal, state, or local leaders when dealing with technology. As can be seen in Appendix A, The Total Operational Costs for the Northern Valley Regional High School has continually dropped, from a cost of $1,197 per computer down to $880 per computer.

In the three projected years (2001-2004), several factors will help drive these costs lower. First, a replacement of several departments' legacy technology will drive the repair costs down. Many of these components are out of warranty and require a great deal of maintenance to continue their operation. Before the full implementation of the school district's technology plan there will be computers in the district that are ten years old. Removal of these computers will greatly enhance the district's ability to manage repair costs. Second, the school district's highly fluctuating costs associated with Data Processing will be under control. The previously installed system was too cumbersome to adequately control costs and there was no consistent support structure to manage those costs. Finally, an overall structured technology implementation plan was used to layout six years of cost estimates. This plan has organized where and when technology expenditures will be made.

The structure, provided by the technology plan, has helped to normalize costs over future fiscal years without over-burdening any single year. Ultimately, the Total Operational Costs are estimated to drop to $842 per computer.

Results

This analysis shows that Northern Valley Regional High School has shown a great commitment to implementing technology in an effective manner. The school district is also able to drive Total Operational Costs well below the corporate and public institution averages. In fact, the district's TOC is almost one-third the cost of the public institution average and nearly one-sixth the corporate average.

In Appendix B, Technology Expenditures, it can be seen that the financial commitment for technology will continue to grow. The largest portion of the technology commitment will be towards personnel costs, accounting for 60% of the total technology budget. Data processing and the general computer fund will account for about 25% of the budget. The remaining 15% will be divided between the remaining accounts. The accounts that comprise the 15% section do not have the fluctuation or projected growth that can be seen in the General Computer Fund, Data Processing or Personnel accounts.

Appendix C, Total Operational Costs – TOC vs. Computers vs. Expenditures, shows a comparison between expenditures, the number of computers, and the actual Total Operational Costs. Even with the increase

in expenditures and the numbers of computers in the school district, the Total Operational Cost is being driven down.

As the school district's stakeholders look into the next three years, there will be a continued analysis of technology costs. By understanding all of the costs involved, the stakeholders can better manage the overall technology budget. As can be seen from the historical data, TOC has dropped from $1,197 to $880 per computer. This figure is expected to be lowered an additional $38, over the next three years, bringing TOC to $842 per computer.

Stakeholders should feel proud of their accomplishments with technology. The delivery of quality services at an economic price underscore the management, organization and dedication of all members involved in the process. A typical public organization would either have to spend three times more money to achieve the same results or make due with one third of the technology and services deployed at Northern Valley.

References

Compaq.com - Total Cost of Ownership (TCO).Compaq. 24 03 2001. <http://www.compaq.com/tco/>.

David Cappuccio, Bill Kirwin, Siva Namasivayam, Lock Pawlick . Total Cost of Ownership: Reducing PC/LAN Costs in the Enterprise. , Stamford, Connecticut: Gartner Group, 1996.

DMTF Education: Presentations.Distributed Managment Task Force, Inc.. 25 03 2001. <www.dmtf.org/educ/pres.html>.

DPS Tech Plan Builder.Denver Public Schools. 23 03 2001. <http://edtech.denver.k12.co.us/planner/exmp/cyca/manual/cycaman_over.htm>.

Gartner Group Distributed Computing Analysis.City of Seattle. 26 03 2001. <http://www.ci.seattle.wa.us/seattle/compute/default.htm>.

Lowering Total Costs in Education.Microsoft. 23 03 2001. <http://www.microsoft.com/Education/planning/implement/tco/default_sch.asp>.

Sustar, Lee. Mapping the Total Cost of Ownership in K-12 Education.Microsoft. 22 03 2001. <www.microsoft.com/education/instruction/articles/tco_kernhs.asp>.

Taking TCO to the Classroom.The Consortium for School Networking. 22 03 2001. <www.cosn.org/tco>.

Understanding the Total Cost of Ownership, Cupertino, CA 95014: Apple Computer, 2000.

Understanding the Total Cost and Value of Integrating Technology in Schools. Framingham, Ma 01701: International Data Corporation, 1997.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

X	This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
	This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").