Finance/Personnel/Facilities Subcommittee Meeting
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Finance/Personnel/Facilities Subcommittee Meeting

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Technology Usage and Staffing

Prepared for Farmington Valley Consortium

In this report, The Hanover Research Council summarizes current trends and practices in technology in the K-12 setting. Overall, we found that most school districts are using technology to decrease costs and increase student learning. Topics covered in this report include various aspects of IT staffing, software, data management and storage, and hardware. We conclude with a discussion of the ways in which technology and staffing in schools interact, support, and supplement 21st Century library media centers.

Introduction

Advances in computing, the Internet, and information technology have changed the way we interact with and access digital information. Students today have grown up with computers and the Internet, allowing them instant access to both educational resources and social interaction. While the Millennial generation (ages 18 to 29) represents the first truly "wired" generation and believes that the use of modern technology is their most distinguishing characteristic,[1] younger generations will undoubtedly continue to use and interact with technology at the same or an even higher level. As such, schools are recognizing the instructional benefits of integrating technology into the curriculum in addition to the fiscal benefits associated with streamlining processes and organizing information. Additionally, students are beginning to expect to see and use technology in the classroom as part of an integrated curriculum.[2] This report focuses on the staffing and technical requirements for successfully meeting the expectations of the 21st century student.

Educational Technology

Throughout this report, it is important to keep in mind that while we provide a focus on current trends in technology usage and staffing, school districts should always keep an eye towards the future of technology for educational purposes. The 2010 report by the New Media Consortium, *Horizon Report: 2010 K12 Edition*, outlines emerging technologies and their potential use in the K-12 setting. The report identities the following five overarching trends in school-based technology that are expected to emerge over the next five years:

- Technology will increasingly become a means to empower students, a method for communication and socialization, and a ubiquitous, transparent part of students' lives.
- Technology will continue to profoundly affect the way we all work, collaborate, communicate, and succeed.
- Innovation and creativity will increase in value and will enable students to find success in the workforce.
- Interest in and opportunities for online learning, mentoring, and independent study are increasing.

[1] "Millenials: A Portrait of a Generation." Pew Research Center. 2010. http://pewsocialtrends.org/assets/pdf/millennials-confident-connected-open-to-change.pdf
[2] McNulty, R. "Student Expectations Unmet: Where are the Electronics?" *The School Administrator*. 1:76. 2010. http://www.aasa.org/SchoolAdministratorArticle.aspx?id=11040&terms=Technology

- The nature of the learning environment is changing to include increasingly interdisciplinary and virtual communications and collaborations.[3]

The *Horizon Report* also identified specific trends in technology that are expected to have an impact on K-12 education over the next year. These trends are cloud computing and online collaborative learning environments. Both are discussed in detail in section two of this report.

Methodology

This report will provide an overview of information technology (IT) usage and staffing in K-12 school districts. The report is broken into **four major sections, each focusing on a different aspect of IT in a 21st century school**.

- **IT Staffing** – The first section discusses the human aspects of IT, including IT leadership, district-wide and school-based IT staff members, and technology professional development. The potential for outsourcing will be discussed.

- **IT Software and Data Storage** – The second section focuses on data management and the software aspects of IT in the K-12 setting. Software topics include thin-client computing, data storage solutions, cloud computing, Web 2.0 applications, and trends in outsourcing.

- **IT Hardware** – The third section focuses on the hardware component of IT, including equipment purchasing and computer replacement cycles. The potential for outsourcing will again be discussed.

- **21st Century Library Media Centers** – The final section examines materials regarding the design and purpose of library media centers, as well as examining trends in audio/visual distribution and storage.

Peer School Districts

In order to provide realistic and relevant examples of technology practices at other school districts across the U.S., we used the National Center for Education Statistics' Finance Peer Finder Tool to select peer school districts. The Finance Peer Finder Tool selects peer school districts based on five variables: district type, locale, total enrollment, student/teacher ratio, and the percentage of students in poverty.[4] We chose school districts that are peers to each of the four Farmington Valley

[3] Johnson, L., Smith, R., Levine, A., and Haywood, K. The New Media Consortium. "2010 Horizon Report: K-12 Edition." 2010. p 3-4. http://www.nmc.org/publications/2010-horizon-k12-report
[4] "How to use the Peer Search tool." National Center for Education Statistics. http://nces.ed.gov/edfin/search/info.asp?t=faq

Consortium (FVC) districts; however, overlap does occur and many of the districts are peers on these criteria to several of the FVC districts. The table below lists the peer school districts used as examples throughout this report. The FVC school districts are listed at the end of the table for reference. The Finance Peer Finder Tool uses data primarily from the 2006-07 school year and the data listed in the table below is also from 2006-07.

Table 1: Characteristics of Peer School Districts (2006-07)

School District (State)	# of Schools	Enrollment	Revenue per Student	Expenditures per Student	% in Poverty
Cheshire Town Schools (CT)	8	5,158	$12,456	$11,659	2.8%
Cromwell Public Schools (CT)	4	2,0103	$14,233	$12,582	3.5%
East Bridgewater Public Schools (MA)	3	2,484	$10,560	$9,477	3.9%
Hampton Township School District (PA)	5	3,148	$12,715	$10,159	3.4%
Haverford Township School District (PA)	7	5,612	$13,139	$10,788	3.6%
Needham Public Schools (MA)	7	4,995	$17,762	$13,377	2.1%
Newtown Public Schools (CT)	8	5,668	$13,112	$12,038	2.8%
North Reading Town Schools (MA)	5	2,773	$10,843	$9,996	3.0%
Perrysburg Ex Village School District (OH)	6	4,510	$10,244	$9,053	3.5%
Piedmont City Unified School District (CA)	6	2,589	$12, 931	$10,761	2.4%
South Windsor Public Schools (CT)	7	5,033	$13,569	$12,054	3.6%
Canton Town Schools (CT)	4	1,728	$13,942	$12,472	3.4%
Granby Public Schools (CT)	5	2,286	$13,822	$11,456	2.7%
Plainville Town Schools (CT)	6	2,629	$15,346	$13,028	6.8%
Simsbury Public Schools (CT)	7	4,994	$13,569	$12,484	2.4%

Key Findings

This report found several trends and common practices in IT usage and staffing in K-12 school districts. A summary of our findings is provided below.

IT Staffing

- Generally, centralized and strong technology leadership helps to promote technology integration and professional development. Most school districts

have one district-level technology administrator who oversees all technology-related activities.

- Some school districts combine technology and media/library services, curriculum, or other functions together into one district-level office. In some cases, the technology administrator also has non-technology related responsibilities, like curriculum review.

- We did not find any strong trends in the number of IT staff members at FVC peer school districts. However, the Connecticut State Department of Education collected information on the number of "Technical Staff" in each district. On average, school districts with between 2,000 and 4,999 students reported 4.9 full-time equivalent technical staff members.

- Some school districts utilize an outsourcing or IT consulting company to supplement their in-house IT staff. Outsourced staff members often provide technical support, network administration, or other support functions.

- Technical professional development programs are viewed as highly important for the successful integration of technology into the classroom and curriculum. Teachers and staff members benefit greatly from having access to a technology learning community for support and guidance.

IT Software and Data Storage

- Nearly all school districts in the U.S. have internet and network access at all or some of their school sites. In 2008, 42 percent of districts used T1/DS1 and 37 percent used direct fiber.

- Most school districts use some kind of data management system to organize, store, and analyze student and administrative information. Increasingly, school districts seem to be switching to an integrated data management system, often purchased from an outside vendor.

- Some districts use an outside website hosting and design organization. Many of these outsourced services are provided by companies that work specifically with educational institutions.

- Cloud computing is expected to be one of the biggest trends in 21st Century educational technology and computing over the next two years. At the most basic level, cloud computing can be described as internet-based computing with virtual servers accessed through the internet. Cloud computing applications can provide a number of functions, including communication and data management and analysis.

- Thin-client computers use virtual and networked servers to store applications and data. The stripped-down computer terminals allow for user access to applications stored on the server. This type of computing system has the potential to greatly reduce IT staffing costs through centralization.

IT Hardware

- Data collected by the Connecticut State Department of Education shows that on average, school districts have 4.2 elementary students per computer, 3.6 middle school students per computer, and 3.3 high school students per computer.

- Many school districts and companies chose to lease computers rather than purchase them. Leasing allows districts to pay for the computers over several years, rather than paying the full amount upfront. Additionally, leased computers have a built-in replacement cycle, ensuring that computers will never become obsolete.

- Sixty-seven percent of school districts nationwide have a formal computer replacement plan. Most seem to follow industry standards with a 3 to 5 year replacement cycle.

21st Century Library Media Centers

- Library media centers and their staff should work in concert with teachers, administrators, and other members of the school community to encourage collaboration and technology sharing.

- 21st Century media centers should be designed to include a library media center office, work area, and storage area; circulation area; information reference area; production area; instruction area; technology connectivity area; reading area; professional area; social area; and a conference room.

- Centralized media control panels or Ethernet local area data networks are recommended for video/audio production, storage, and distribution. The use of outside consultants is sometimes recommended during the installation of in-house television or other distribution systems.

- The literature emphasizes the importance of the role of library media specialists in facilitating collaboration between the library media center and the school and leading teachers, students, and stakeholders in the use of instructional technology.

IT Staffing

In order to examine trends in IT staffing in K-12 school districts, we reviewed IT staffing levels at school districts across the U.S. When possible, examples are provided from peer school districts; however some larger school districts also serve as good examples of effective IT staffing policies. Research was primarily found on each school district's technology department website and the district's technology plan document. Information on IT staff hierarchy, positions, and responsibilities were gathered. This section also provides a discussion of technology-related professional development for teachers and staff.

Technology Leadership and Organization

Leadership within district technology was discussed a great deal in industry publications on educational technology. Strong, centralized leadership in technology has been shown to increase technology implementation and integration among services and staff.[5] Many school districts also use a **centralized IT staffing and support structure** in order to increase efficiency. In particular, as school budgets decline and technology demand increases, centralizing IT operations allows districts to reduce staff while sustaining the same level of IT support by redefining roles and implementing a district-wide helpdesk.[6]

The literature emphasizes strong, centralized leadership, often in the form of a district technology coordinator or director.

Most of the school districts reviewed for this report have **at least one full-time district technology coordinator or director**. In the FVC's peer district, the Piedmont Unified School District outside of Oakland, CA, the District Technology Coordinator is responsible for ensuring educational support at all schools and for managing the district's IT infrastructure.[7] The District Technology Coordinator reports to the district's Assistant Superintendent for Business Services and Facilities.[8]

In some cases the **highest technology administrator is also responsible for district curriculum or student services**. For example, the North Reading Public School District north of Boston, MA has one Director of Curriculum and Technology. The position is responsible for a variety of initiatives, including curriculum reviews, standards, updates, and technology planning and

[5] Mills, L. "Organizing and Staffing Technology Leadership. *District Administration*. 2005. http://www.aasa.org/SchoolAdministratorArticle.aspx?id=8620&terms=Technology
[6] Kaestner, R., and Salpeter, J. "Weathering the Storm." *Compendium*. 8:1. 2010. Consortium for School Networking. http://www.cosn.org/Portals/7/docs/compendium/2010/Executive%20Summary/CoSN-2010%20Comp%20Vol8%20Isu1%20ExecSmry%20v4.pdf
[7] "Instructional Technology Plan: July 1, 2010 – June 30, 2013." Piedmont Unified School District. http://www.piedmont.k12.ca.us/forms/tech_plan.pdf
[8] "Directory." Piedmont Unified School District. http://www.piedmont.k12.ca.us/district-info/directory

implementation.[9] The Needham Public Schools District, positioned southeast of Boston, MA, has a combined media and technology administrator. The **Director of Media and Technology Services** works out of the district-wide Educational Technology Center. The director oversees technical support, administrative technology, instructional technology, and library/information technology.[10]

The South Windsor (CT) school district takes another approach. There are two directors under the Office of Technology. The **Director of Information Services** works with one User Support Specialist to provide training to administrative users, purchase and maintain software, provide hardware support, and complete data analysis projects. The **Director of Instructional Technology** works with three Computer Technicians to provide technical support for the network, organize professional development programs, and conduct technology effectiveness studies.[11]

Some of the district technology departments list **computer classroom teachers, media specialists, or instructional technology specialists** under their department. Others do not, only listing district-level technical and support positions within the technology department. Some districts are more streamlined, organizing all technology-related positions and functions under one department, while others focus solely on district-wide technical integration and support. The summary table below shows staff positions that are found under each district's technology department. When possible, the responsibilities of each position are described.

Table 2: Staffing Summary Table

Location	Position	Responsibilities	Count	Notes
Cheshire Public Schools (CT)[12]				
District	Coordinator of Technical Services		1	
Information regarding other technology positions not available				
Cromwell Public Schools (CT)[13]				
District	Information Systems Manager		1	
District	Information Systems Specialist		1	
District	Technology Assistant		1	
East Bridgewater Public Schools (MA)[14]				
District	Director of Services and Instructional Technology		1	

[9] "Curriculum and Technology." North Reading Public School District. http://ps.north-reading.k12.ma.us/Pages/NRSDDistrict_C&T/Index.
[10] "Department of Media and Technical Services 2008-2009." Needham Public Schools. http://rwd1.needham.k12.ma.us/media_and_technology/documents/orgchart.media-tech.pdf
[11] "Office of Technology." South Windsor Public Schools. http://www.southwindsorschools.org/page.cfm?p=2842
[12] "Technology." Cheshire Public Schools. http://www.cheshire.k12.ct.us/technology/default.html
[13] "Information Technologies." Cromwell Public Schools. http://cromwell.k12.ct.us/page.php?pid=5
[14] "Five-Year Technology Infrastructure Improvement Plan 2006-2011." East Bridgewater Public Schools. http://ebps.schoolwires.com/14281012131063500/lib/14281012131063500/Plans%20and%20Policies/Infrastructure%20Plan.pdf

Location	Position	Responsibilities	Count	Notes
Schools	Technology Education Teacher	Teachers have full time teaching loads and do not provide technology support beyond their classrooms	3	2 at HS, 1 at MS
Schools	Business Education Teacher	Teachers have full time teaching loads and do not provide technology support beyond their classrooms	1	At HS
Schools	Computer Special Teacher	Teachers have full time teaching loads and do not provide technology support beyond their classrooms	2	1 at MS, 1 at ES
Schools	Instructional Technology Specialist	Provides day to day support for technology integration	0	*Position no longer exists*
District	Network Administrator *(Outsourced)*	Provides network support	1	Works part-time out of HS
Town	Site Technician *(Outsourced)*	Provides technical support Not assigned exclusively to schools, also supports other town departments	1	Works full-time
Schools	Secretary		1	Works out of ES
Hampton Township School District (PA)[15]				
District	Technology Director		1	
District	Network Administrator		1	
District	Applications Administrator		1	
District	Computer Technician		2	
School District of Haverford Township (PA)[16]				
District	Director of District Tech. Services		1	
District	Senior Network Administrator		1	
District	Student Info Systems Administrator		1	
District	District Communications		1	
District	District Technician/District Webmaster		1	
Schools	Technology Coordinator		2	1 at HS, 1 at MS
Schools	Technology Specialist		8	2 at HS, 1 at MS, 5 at ES
Needham Public Schools (MA)[17]				
District	Director of Media and Technology Services	Runs the Educational Technology Center and oversees all below staff	1	
District	Network Engineer	Works under Technical Support Division	1	
District	Technical Support Secretary	Works under Technical Support Division	1	
District	AV Production Specialist	Works under Technical Support Division	1	
District	Lead Computer Tech	Works under Technical Support Division	1	
District	Computer Tech	Works under Technical Support Division	3	
District	Information Technology Manager	Works under Administrative Technology Division	1	

[15] "Technology Services." Hampton Township School District. http://www.htsd.k12.pa.us/page.cfm?p=2495&pback=2488

[16] "Technology Department Staff 09-10." School District of Haverford Township. http://www.haverford.k12.pa.us/191710514151023643/blank/browse.asp?a=383&BMDRN=2000&BCOB=0&c=55648&191710514151023643Nav=|555|&NodeID=556

[17] "Department of Media and Technical Services 2008-2009." Needham Public Schools. Op. cit.

Location	Position	Responsibilities	Count	Notes
District	Data Manager	Works under Administrative Technology Division	1	
Schools	Instructional Technology Specialists	Works under Instructional Technology Division	4.6	
Schools	Computer Teacher	Works under Instructional Technology Division	2.3	
Schools	Technology Assistant	Works under Instructional Technology Division	1	
Schools	Library Media Teacher	Works under Library/Information Technology Division	6.4	
Schools	Library Technical Secretary	Works under Library/Information Technology Division	3	
Schools	Library Assistant/Aid	Works under Library/Information Technology Division	5	
Newtown Public Schools (CT)[18]				
District	Director of Technology		1	
District	Technology Staff		6	
North Reading Public School District (MA)[19]				
District	Director of Curriculum and Technology		1	
District	Secretary		1	Reports to Director
District	Technology Technician		2	
District	Technology Integration Specialist		1	
District	Network Administrator		1	
Perrysburg Ex Village School District (OH)[20]				
District	Technology Director		1	
Information regarding other technology positions not available				
Piedmont Unified School District (CA)[21]				
District	District Technology Coordinator	Offers educational support at all sites, manages back end infrastructure, works with outside consultants	1	Half-time employee, reports to Ass't Superintendent for Business Services/ Facilities[22]
District	Data Manager	Addresses goals related to greater use of student information system data, organizes student information database	1	Half-time employee, reports to HS Principal[23]
District	Outside Consultants	Technical support after school hours	--	
Schools	Site Technology Coordinator	Works with classroom teachers to co-teach computer labs, provides ongoing equipment maintenance, repair, and replacement and technical support (during school hours)	6	1 per elementary and middle school, 2 at high school, some work less than full-time
South Windsor Public Schools (CT)[24]				
District	Director of Information Services	Information Services provides administrative user training and support, software purchasing and maintenance, data analysis, and hardware support.	1	

[18] "Directory." Newtown Public Schools. http://www.newtown.k12.ct.us/directory.php
[19] "Directory." North Reading Public Schools. http://ps.north-reading.k12.ma.us/Pages/NRSDDistrict_About/directory
[20] "Directory" Perrysburg Ex Village School District. http://www.perrysburg.k12.oh.us/directory.php
[21] "Instructional Technology Plan: July 1,2010 – June 30, 2013." Piedmont Unified School District. Op. cit.
[22] "Directory." Piedmont Unified School District. Op. cit.
[23] Ibid.
[24] "Office of Technology." South Windsor Public Schools. http://www.southwindsorschools.org/page.cfm?p=2842

Location	Position	Responsibilities	Count	Notes
District	User Support Specialist		1	Reports to Dir. of Information Services
District	Director of Instructional Technology	Instructional Technology provides technical support for network, runs professional development, and conducts technology effectiveness studies	1	
District	Computer Technician		3	Reports to Dir. of Instructional Tech.
District	Secretary		1	Reports to both Dir. of Information Services and Dir. of Instructional Tech.

Staffing Level

Based on our research, there is **no clear benchmark or standard for the number of IT staff members** found within each of the peer school districts researched in this report. This may be explained in part because of the different scopes found within district technology departments, as discussed above. However, some districts clearly have either a larger or smaller than average number of IT staff. Among the school districts highlighted in this report, most have **less than ten technology staff members** who report directly to the district's technology administrator or administrators. Needham Public Schools is unique in the large number of technology-related staff it lists – 32.3 staff members in total.

As can been seen, there is a fair amount of variance regarding the number and type of staff employed in the peer districts. While unfortunately position responsibilities are not available for all of the peer districts, a few key trends can be identified from the information that is available. Not only do most of the peer districts have a **centralized leadership position** (usually a "Director"), but most also have **one or two network administrators/engineers** who provide technical support and system development, and **one or two information technology specialists** who support daily technology integration and activities. It appears that network administrators tend to provide more school-based technical support, while specialists or site coordinators are more often used to provide classroom-based support. While it is difficult to discern trends regarding which positions are outsourced, it seems to be most common to outsource technology support staff.

Generally, assistive or adaptive technology specialists, who work specifically with special education and disabled students, are not incorporated into the IT department. Most peer school districts reviewed for this report do not seem to have any dedicated assistive or adaptive technology specialists. It is possible that these functions are being performed by other support staff members. While an in-depth discussion of assistive technology teaching practices may be beyond the scope of the report at this time, a review of the literature indicates that the use of teams of staff members in delivering assistive technology services is highly recommended. Not only does the

Individuals with Disabilities Education Act (IDEA) require a team of people to provide input into individualized education programs (IEP) for school children, but many school districts have created "Assistive Technology Teams which are charged with conducting AT evaluations, recommending AT devices, and providing training to other educators who then provide daily services."[25] Three main reasons are provided as to the benefits of teaching teams for assistive technology:[26]

- **Assistive technology crosses several disciplines**. Because of the nature of assistive technology and instruction, there isn't one expert who can implement assistive technology to the broad range of students who need it. Further, effective planning and problem solving in assistive technology requires multiple professional perspectives. This may be part of the reason why none of the FVC peer districts included a staff person dedicated to assistive technology as part of their technology staff/department.

- Relating to this, **successful implementation of assistive technology requires many collaborators**. A combination of individuals will most likely be needed to acquire assistive technology, train classroom staff, and evaluate assistive technology.

- Assistive technology often needs to be **used in multiple environments**, making it hard for a single service provider to take care of all needs. Teams can also help distribute the workload of providing assistive technology in multiple environments.

Further, the Connecticut State Department of Education collects and publishes district-level data on a number of characteristics, including the number of employees classified as "Technical Staff." The most recent district enrollment and staffing figures from the Connecticut State Department of Education were from the 2007-08 school year. School districts with enrollments between 2,000 and 4,999 students reported an average **of 4.9 full-time equivalent technical staff members**.[27] The tables below summarize the average, maximum, and minimum number of technical staff members by school district enrollment ranges. Enrollment and technical staff figures for the four FVC school districts are also provided for a frame of reference. Interestingly, the Canton and Granby districts have a higher than average number of technical staff compared to districts of similar enrollment in the state, while Plainville and Simsbury have a slightly lower than average number of technical staff compared to districts of similar enrollment in the state.

[25] Module 7: Teaming." Teaching Assistive Technology. http://www.teachingat.info/teaming/why.html
[26] Ibid.
[27] Connecticut Education Data and Research. Connecticut State Department of Education. http://www.csde.state.ct.us/public/cedar/index.htm

Table 3: Full-Time Equivalent Technical Staff Members in Connecticut by School District Enrollment (2007-08)*

Enrollment Range	Average	Max	Min
Less than 2,000	1.8	6	0.2
2,000-4,999	5.2	12.2	1
5,000-9,999	9.2	25.5	2
10,000 or More	13.4	37	7
All Districts	**4.8**	**37**	**0.2**

Source: Connecticut State Department of Education
*Does not include school districts without any technology staff members.

Table 4: Technical Staff Members in Farmington Valley Consortium School Districts (2007-08)

School District	Technical Staff	Enrollment
Canton	5	1,725
Granby	8.2	2,324
Plainville	3.5	2,601
Simsbury	4.0	4,949

Source: Connecticut State Department of Education

Staffing Formulas

Unfortunately, it was difficult to find information on IT staffing formulas at peer districts to the FVC. However, larger districts were more likely to have documentation on specific IT staffing policies and formulas. For example, Montgomery County Public Schools outside of Washington, D.C. uses formal staffing formulas to determine the number of employees for each position within the school district. There are several staffing formulas for IT-related positions:

- **IT System Specialist** – None in elementary schools; 1.0 per middle school; 1.0 per high school
- **Instructional Data Assistant** – 0.75 (6 hours/day) per elementary school with additional hours possible based on enrollment; 0.875 (7 hours/day) per middle school; none in high schools.
- **Media Specialist** – 1.0 per elementary and middle school; 1.0 per high school with the four largest receiving an additional media specialist.
- **Media Assistant**
  - *Elementary Schools*: 1.0 per elementary school with enrollment above 480 and 0.50 (4 hours/day) per elementary school with enrollment under 480;
  - *Middle Schools*: 1.5 per middle school with enrollment above 900 and 1.0 per middle school with enrollment below 900;

- *High Schools*: 2.5 per high school with enrollment over 2,500 and second media specialist, 2.0 per high school with enrollment between 2,100 and 2,499 and second media specialist, 2.5 per high school with enrollment between 1,850 and 2,099, 2.0 per high school with enrollment between 1,525 and 1,849, 1.5 per high school with enrollment between 1,250 and 1,524, and 1.0 per high school with enrollment below 1,250.[28]

Staff Outsourcing

School districts often turn to outsourcing for many non-academic tasks, including IT, food service, and transportation. Outsourcing allows districts to focus their energy on teaching and learning. Many districts have found that companies that provide IT services are **better equipped to facilitate the use and maintenance of cutting-edge technology in the classroom and to provide support for a wide range of IT problems**. An IT consulting company typically has the depth to provide the right employees for every challenge. IT outsourcing also typically results in a cost saving for school districts.[29] Many school districts are turning to IT staff outsourcing to combat shrinking budgets. Outsourcing warranty work and work that is not core to the district's mission have been used at school districts across the U.S.[30] Other sections of this report will discuss trends in outsourcing specific to certain software or hardware.

Outsourcing Examples

Several of the peer school districts researched for this report utilize some kind of outsourcing to supplement their IT staff. Piedmont Unified School District uses an **outside consultant to provide technical support after school hours**. An outside consultant also provides additional expertise when needed. The school district plans to use an outside consultant in the future to **replace aging switches to run gigabit to the desktops and to support web, blog, grade, e-mail, home directory, library, and data servers**. The District Technology Coordinator is responsible for working with any outside consultants.[31]

The East Bridgewater Public Schools in southeastern Massachusetts uses outsourced staff to **provide technical support and network administration**. The Town of East Bridgewater has a contract with **HUB Technical Services** to provide network administration and support to several town departments, including the school district.

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[28] "MCPS K-12 Budge Staffing Guidelines – FY 2011." Montgomery County Public Schools. http://www.montgomeryschoolsmd.org/departments/budget/FY2011/superintendent/pdf/appendixD.pdf
[29] Sturgeon, J. "Finding tech support outside the school." *School Planning & Management*. March 2001. http://www.peterli.com/spm/resources/articles/archive.php?article_id=236
[30] Kaestner, R., and Salpeter, J. "Weathering the Storm." *Compendium*. 8:1. 2010. Consortium for School Networking. Op. cit.
[31] "Instructional Technology Plan: July 1, 2010 – June 30, 2013." Piedmont Unified School District. Op. cit.

The school district works with one part-time network administrator from HUB. The network administrator works out of the high school. A full-time HUB site technician also provides technical support to the school district. However, the site technician is not assigned exclusively to the schools, also providing support to other town departments.[32]

Perrysburg Ex Village School District outside of Toledo, OH **contracts IT support and projects through SchoolDude**, a nation-wide IT provider specializing in educational institutions. SchoolDude also provides online management systems, including inventory management and facility scheduling.[33] Perrysburg uses SchoolDude for their helpdesk and to organize IT activities, like work orders and support requests. The district's technology plan states that the helpdesk service allows for increased efficiency within the IT department. The plan goes on to say that "SchoolDude is, quite literally, the only thing that allows us to keep our departmental head above water."[34]

School districts that decided to outsource any staff positions will undoubtedly have to deal with **some degree of dissent** among current staff members and the public. Privatization in the public schools is an issue in many areas. Some states also require negotiation with employees who may be affected by service outsourcing.[35]

Professional Development

Professional development activities are crucial for helping teachers and administrators use technology to improve instruction.

A survey by the Consortium on School Networking (CoSN) of technology decision makers in schools found that **professional development has the potential to be the key to successfully integrating technology into teaching and learning**. The survey also found that while cost and budget constraints are often prohibitive to the implementation of other technology initiatives, professional development does not necessarily require significant upfront costs.[36] However, successful professional development programs do face other challenges. When asked to select the biggest technology challenge that they face, 56 percent of survey participants chose teacher professional development.

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[32] "Five-Year Technology Infrastructure Improvement Plan: 2006-2011." East Bridgewater Public Schools. p 10. http://ebps.schoolwires.com/14281012131063500/lib/14281012131063500/Plans%20and%20Policies/Infrastructure%20Plan.pdf

[33] "SchoolDude.com." SchoolDude. http://www.schooldude.com/about/

[34] Educational Technology Plan for Perrysburg Ex Vill SD – 045583." April 2009. Perrysburg Ex Village School District. p. 32. http://faculty.perrysburgschools.net/sandbox/groups/technology/wiki/17e48/attachments/65e61/Perrysburg%20Ex%20Vill%20SD%20Technology%20Plan.pdf?sessionID=fc0f6bf50d9c81d36472c888b8e9f3220fee235d

[35] Maciejewski, J. "Ins and Outs of Outsourcing." *District Administration*. 2007. http://www.districtadministration.com/viewarticle.aspx?articleid=1247

[36] "Digital Leadership Divide." Consortium for School Networking. p. 2. http://www.cosn.org/Portals/7/docs/digital_leadership_divide.pdf

The same percentage of participants chose integrating technology into the classroom and learning experience as their biggest technology challenge.[37] Technology leadership experts recommend that **up to 30 percent of a school district's technology budget** should be set aside for professional development.[38]

Creating a Successful Program

Professional development for technology should follow best practices and standards for any professional development program. The National Staff Development Council outlines the following **key aspects of educator development programs** that improve the learning of all students:

- Organizes adults into learning communities whose goals are aligned with those of the school and district.
- Requires skillful school and district leaders who guide continuous instructional improvement.
- Requires resources to support adult learning and collaboration.
- Uses disaggregated student data to determine adult learning priorities, monitor progress, and help sustain continuous improvement.
- Uses multiple sources of information to guide improvement and demonstrate its impact.
- Prepares educators to apply research to decision making.
- Uses learning strategies appropriate to the intended goal.
- Applies knowledge about human learning and change.
- Provides educators with the knowledge and skills to collaborate.
- Prepares educators to understand and appreciate all students, create safe, orderly and supportive learning environments, and hold high expectations for their academic achievement.
- Deepens educators' content knowledge, provides them with research-based instructional strategies to assist students in meeting rigorous academic

[37] Ibid. p. 7.
[38] Ibid. p. 11.

standards, and prepares them to use various types of classroom assessments appropriately.

- Provides educators with knowledge and skills to involve families and other stakeholders appropriately.[39]

The Center for Implementing Technology in Education (CITEd) provides additional **best practices for integrating technology into the classroom**. While professional development is one of the most effective aspects of integrating technology into the classroom, success also relies on the following:

- **Community of Practice** – Establish a learning community where teachers are engaged in learning through technology. Communities can provide support and collaboration and aid in technology implementation.

- **Administrative Support** – School administrators should allow for and enable teachers to dedicate time towards technology professional development and implementation. Administrators can also encourage professional development by outlining their expectations for technology integration.

- **Context and Curriculum Relevance** – Stress the need for and importance of integrating technology into the curriculum.[40]

Continuing Education Units

Some of the school districts reviewed for this report offer continuing education units for technology proficiency and professional development. In the **Cheshire (CT) Public Schools, teachers and staff members can apply for a 1.5 CEU waiver for demonstrating technology proficiency**. Employees must demonstrate proficiency in 15 of 17 elements in four areas: educational technology concepts and operations, creating environments for learning, productive and professional practice, and social, legal, ethical, and human issues. Proficiency must be demonstrated in two ways – technical ability to use equipment and programs and application of skills in the classroom with students.[41]

The North Reading (MA) Public Schools offer several professional development courses related to technology in the classroom. For example, "Microsoft Excel in the Math and Science Classroom" provides teachers with basic knowledge in Excel in

[39] "NSCS's Standards for Staff Development." National Staff Development Council. 2001. http://www.nsdc.org/standards/index.cfm
[40] "Strategies for Successful Professional Development to Support Technology Integration." Center for Implementing Technology in Education. http://www.cited.org/index.aspx?page_id=100
[41] "The Process for the Technology CEU Waiver." Cheshire Public Schools. http://www.cheshire.k12.ct.us/asi/files/B1AFB35C2F014091831BEC71285238DB.pdf

addition to strategies for integrating Excel into the lesson plan.[42] Other school districts either offer professional development courses through a **third party vendor or allow teachers to use a variety of activities to earn CEUs**. It is unclear if technology-related professional development is specifically permitted or encouraged in these cases.

[42] "Professional Development Catalog." North Reading Public Schools. http://www.north-reading.k12.ma.us/Pages/NRSDDistrict_C&T/Current.PD.Catalog.pdf

IT Software and Data Storage

Increasingly, school districts are using computers to manage and store information and to provide students and teachers with technologically advanced experiences and tools. This section of the report summarizes **trends and challenges related to data storage and delivery and software typically used in the K-12 setting**. Topics covered in this section include networking, website design and administration, data storage and servers, and the use of cloud computing. Outsourcing is also discussed as an option in this section.

Local Area Networks or district-wide networks and integrated data management systems are used by the majority of public school districts across the U.S. Cloud computing, however, is rapidly gaining popularity due to potential cost savings and other benefits.

District Computing

The National Center for Education Statistics (NCES) collects data on educational technology in a survey of school districts across the nation. In 2008, the survey was sent to approximately 1,600 public school districts. About 90 percent provided answers to the survey.[43] The survey results and key findings help to quantify the use and availability of educational technology. These results and findings are used throughout this section of the report.

Internet Access and Networking

The 2008 NCES educational technology survey found that **97 percent of public school districts had a local area network in all schools**. The majority, eighty-one percent, of districts also had a **district-wide network in all schools**. School districts used a range of sources to provide internet access. 42 percent of districts used T1/DS1, 37 percent used direct fiber, 18 percent used wireless connections, 13 percent used broadband connections, and 12 percent used T3/DS3 to provide internet access. Direct fiber was more commonly used in urban school districts, while T1/DS1 was more common in rural districts.[44]

Data Management Systems

Most school districts use some kind of data management system to organize, store, and analyze student and administrative information. Some districts use a variety of different systems that are not necessarily integrated. **Increasingly, school districts seem to be switching to an integrated data management system**. Several companies sell fully integrated systems designed specifically for the K-12 environment. For example, Newtown (CT) Public Schools began to use **Pearson's**

[43] "Educational Technology in Public School Districts: Fall 2008." National Center for Education Statistics. December, 2009. p. 2. http://nces.ed.gov/pubs2010/2010003.pdf
[44] Ibid. p. 2-3.

PowerSchool during the 2009-10 school year. The district uses PowerSchool for maintaining student demographics and information, scheduling, course enrolment, grade history, and intermediate and middle school report cards. In the future, other functions will be integrated into PowerSchool.[45] The Cheshire (CT) Public Schools use **Pearson's Inform**, a web-based system to "collect, store, and analyze benchmarking assessments, CMT, and CAPT student achievement data."[46] The district also has plans to start using PowerSchool in conjunction with their current system.[47]

District Website

While it is difficult to determine trends in outsourcing website development and management among the FVC peer districts, several of the school districts researched for this report use an outside website hosting and design organization to power their district's website. There are several companies that work specifically with educational institutions to provide website design, hosting, and other services. The **Hampton Township (PA) School District website was designed by finalsite**.[48] finalsite provides website design, management, content management systems, and portal software. Their primary market is private and independent schools. **Haveford Township (PA) School District uses schoolwires** to power their district's website. schoolwires offers website hosting, implementation, training and consultation, creative services, technical support services, and community and support networking.[49] schoolwires focuses on community-based solutions for K-12 school districts.[50] **Newtown (CT) Public Schools use SchoolCMS for their website**. The SchoolCMS software offers a number of services, including web hosting, staff and student e-mail, teacher websites, and calendar management.[51]

Cloud Computing

Cloud computing was identified in the New Horizons K-12 2010 report as an educational technology trend that is **expected to be see widespread adoption** in one year or less. The 2009 New Horizons report found very few examples of cloud computing in schools. However, the 2010 report found a much higher level of cloud computing use in the schools.[52] Cloud computing is an attractive option for many

[45] "Technology Plan." Newtown Public Schools. 2009. p. 16.
http://www.newtown.k12.ct.us/site/files/educationaltechnologyplan.pdf
[46] "Technology Plan." Cheshire Public Schools. 2009. p. 18.
http://www.cheshire.k12.ct.us/technology/files/164F5ADCCC20480EA8C9666516CE0718.pdf
[47] Ibid. p. 31.
[48] finalsite. http://www.finalsite.com/
[49] "Services." schoolwires. http://www.schoolwires.com/20071061914233859O/site/default.asp
[50] "Community-Based Solutions Overview." schoolwires.
http://www.schoolwires.com/20071061913254150/site/default.asp
[51] "SchoolCMS Features and Benefits." SchoolCMS. http://www.schoolcms.net/page.php?pid=1
[52] Johnson, L., Smith, R., Levine, A., and Haywood, K. 2010. The New Media Consortium. "2010 Horizon Report: K-12 Edition." p 9. Op. cit.

school districts, as it allows students, teachers, and staff members to access sophisticated applications and services without the need for any significant infrastructure upgrades.[53]

At the most basic level, cloud computing can be described as internet-based computing with virtual servers accessed through the internet. Cloud computing applications are often referred to as software as a service (SaaS). SaaS programs, like Google Apps and Gmail, are run through an internet browser and require no upfront investment in servers by the user. Cloud computing also allows for several other types of applications and services:

- **Utility Computing** – Data storage and virtual servers accessed on demand.
- **Web Services** – Used to conduct specific actions over the internet, rather than providing full applications (like SaaS). Services run as an application programming interface (API) with larger software programs.
- **Platform as a Service** – Rather than providing software, uses cloud computing to provide a platform to enable the development of applications. Examples include Google App Engine.
- **Managed Service Providers** – Often used to provide security and virus scanning for cloud computing applications and services. Includes internet-based e-mail virus scanning and desktop management services.
- **Service Computing Platforms** – Can be used to coordinate several services within a centralized user hub.
- **Internet Integration** – New technology used to integrate cloud-based services.[54]

Cloud computing has been used in the K-12 setting **to reduce data storage and server costs**. Using cloud-based applications can also **reduce software, hardware, and IT support needs**. Schools most often use cloud computing to create online collaborations and tools. The 2010 New Horizons report found that school administrators and teachers used cloud computing to manage calendars, rosters, and grade books and to communicate with others at the school and with parents at home. Students are less likely to use cloud-based applications. However, some are using these applications to facilitate student learning. The New Horizons report identified the following **examples of cloud computing in the classroom**:

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[53] Ibid. p. 10.
[54] Knorr, E. and Gruman, G. "What cloud computing really means." *InfoWorld.* http://www.infoworld.com/d/cloud-computing/what-cloud-computing-really-means-031

- **Shared Documents** – Students use Google Docs, Google Spreadsheets, and Adobe Buzzword to work on peer reviewing and editing skills.

- **Remote Access** – iLab Central allows students to access labs and scientific testing tools online.

- **Data Processing** – University-based applications are used to process large amounts of data for scientific research that would otherwise be too large for the school's desktop computers.

- **Application Use** – Students utilize online mapping applications, like ArcGIS Online and Google Maps, to record geographic information about historical events.[55]

Web 2.0 Technology

Web 2.0 applications can encourage social networking and information sharing within the school and classroom when used appropriately

Web 2.0 is used to describe **web-based applications that enable users to share information, collaborate, and communicate with each other**. Web 2.0 technology is often used in cloud computing applications. Web 2.0 applications include iGoogle homepages, blogging, social networking sites, and Wikipedia.[56] Collaborative environments were identified in the New Horizons K-12 2010 edition report as a technology that will see **widespread adaptation in one year or less**.[57] While many districts have banned students from using social networking websites during school, **social networking can be leveraged in a positive way for educational purposes**.

For instance, a 2007 National School Board Association survey found that 60 percent of students age 9 to 17 who use social networking already talk about educational topics online.[58] Students working in a group can use shared workspaces and online communication to collaborate. Teachers can also **create wiki sites or RSS feeds to direct students to relevant online content**. Many educational websites are also beginning to incorporate social networking tools to allow for collaborations and communication between users. Web 2.0 technologies can benefit both teachers and students by providing space for collaboration, support, and research.[59]

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[55] Johnson, L., Smith, R., Levine, A., and Haywood, K. 2010. The New Media Consortium. "2010 Horizon Report: K-12 Edition." p 10. Op. cit.
[56] Sharma, P. "Core Characteristics of Web 2.0 Services." *TechPluto*. 2008. http://www.techpluto.com/web-20-services/
[57] Ibid. p. 13.
[58] Deubel, P. "Social networking in schools: incentives for participation." *The Journal*. 2009. http://thejournal.com/articles/2009/09/16/social-networking-in-schools-incentives-for-participation.aspx
[59] Johnson, L., Smith, R., Levine, A., and Haywood, K. 2010. The New Media Consortium. "2010 Horizon Report: K-12 Edition." p 13. Op. cit.

In addition to the above mentioned benefits of cloud computing and Web 2.0 technology, many school districts are **using this technology to save on energy and paper consumption costs**. By moving processes online, paper usage will decline. For example, using an online application for human resources and payroll requests and processing will reduce the need for printing out forms and letters for recordkeeping. A paper trail is fully contained within the online application. In addition to the economic benefits of moving online, some districts also cite environmental or "green" initiatives as reasons to use online applications.[60]

Piedmont Unified School District utilizes several Web 2.0 applications to deliver online resources to students. The middle school uses an **RSS tool called pageflake** to organize resources by curricular subject. **School and classroom websites** also serve as a resource center for students by sharing websites of interest. The district subscribes to several online educational service providers, like Ed1Stop, Discovery School, Brainpop, Grollier's, and Worldbook Online, to give teachers and students access to materials. The district has also purchased educational software, like EveryDay Math, Fosswebs, and Curricular Companion. These programs can be accessed online.[61]

Newton (CT) Public Schools also uses several Web 2.0 applications. All **district e-mail is run through Gmail**. Staff members also use **Google Docs** and **Google Calendar**. Additionally, the district uses web-based services to "gather information and communicate through the Internet with parents and students."[62]

Thin-client computing can dramatically reduce costs while facilitating support and trouble-shooting through a centralized server system.

Thin-Client Computing

Thin-client computing utilizes many of the cloud computing and Web 2.0 technologies discussed above to **strip down desktop computers** to the bare essentials. Many corporate environments are forgoing the traditional desktop PCs for thin-client network terminal stations. Thin-client computers use **virtual and networked servers to store applications and data and uses terminals that to provide user access**.[63]

Wyse, a company that provides cloud computing and thin-client consultation, identified several benefits in the educational setting:

[60] Kaestner, R., and Salpeter, J. "Weathering the Storm." *Compendium*. 8:1. 2010. Consortium for School Networking. Op. cit.
[61] "Instructional Technology Plan: July 1,2010 – June 30, 2013." Piedmont Unified School District. p. 46. Op. cit.
[62] "Technology Plan." Newtown Public Schools. 2009. Op. cit.
[63] "New Ideas in Thin Computing." *The New York Times*. Bits Blog. 2007. http://bits.blogs.nytimes.com/tag/thin-client-computers/

- Students and teachers do not need to learn new technology to use thin-client computers. It is the same PC experience for the user.
- Lower costs allow for more computers in the classroom.
- Centralized servers allow for increased control over what students can access.
- No additional IT support is required, since there is less hardware per computer.
- Allows students to access a broad range of applications.[64]

Gartner, a technology research organization, published a 2008 report comparing the total cost of ownership of traditional PCs and server-based computing. Their report found that the **total cost of ownership of a server-based computer used to deliver all applications to the user is about 50 percent lower** than an unmanaged PC. Server-based computing was found to be especially cost-effective when computers are shared by multiple users.[65]

The **Danbury (CT) Public Schools utilized Wyse to set up a district-wide thin-client system**. The district has about 10,000 students across 18 schools. While the school district had funds set aside for purchasing new PCs, they did not have enough to cover the long-term costs associated with hiring additional IT staff members to support the new PCs. By switching to thin-client computing, the district was able to manage more computers with their existing IT staff. One of the benefits of thin-client computing is the ability to update applications and software from a centralized location, rather than visiting each computer to make updates. The district's IT support went from one staff member per 200 PCs to one staff member per 600 thin-client computers. This represents a significant saving for the district.[66]

Western Wayne School District near Scranton, PA also worked with Wyse to set up a thin-client system. The district serves about 2,500 students in five schools. The district used funds from a *Classrooms of the Future* grant to upgrade to a thin-client system. They were able to purchase **300 new laptops** for classroom use. The same **three-person IT department was able to provide support for these additional computers**. The district cites these technology improvements as one reason for increases in mathematics and language arts testing scores. Students use thin- client laptops to access educational software and resources from the classroom. Additionally, students and teachers are able to easily stream video and audio files

[64] "Solutions for Education." Wyse. http://www.wyse.com/solutions/education/index.asp
[65] Troni, F, et. al. "Total Cost of Ownership Comparison of PCs with Server-Based Computing." Gartner RAS Core Research. http://www.citrix.com/site/resources/dynamic/news/Gartner_SBC_TCO_Research.pdf
[66] "Danbury Schools Case Study." Wyse. http://www.wyse.com/resources/casestudies/pdf/Wyse-CaseStudy-Danbury.pdf

from their classroom computers. In the past, the district's IT staff was overwhelmed by failing computers and trouble-shooting. The old PC computer model also did not provide easy access to the applications and technologies currently used in the classroom.[67]

Outsourcing

Some school districts utilize an IT consultant to complete specific tasks associated with software and data storage. As discussed above, Wyse often **consults with school districts as they set up thin-client computing**. Outsourcing may also be used for smaller application programming projects. Newton (CT) Public Schools hired an outside consultant to **develop a database system for tracking and analyzing student achievement**. However, the school district notes that the project is falling behind schedule and they are subsequently thinking about purchasing an out-of-the-box program from Pearson's Inform for student achievement data that will integrate with their current system.[68]

[67] "Western Wayne School District Case Study." Wyse. http://www.wyse.com/resources/casestudies/pdf/Wyse-CaseStudy-WesternWayne.pdf
[68] "Technology Plan." Newtown Public Schools 2009. p. 16. Op. cit.

IT Hardware

The number of students per computer in CT schools districts is usually the highest in early grades, and decreases from middle to high school.

Most school districts provide a combination of desktop and laptop computers for students, teachers, and staff members to use. As mentioned above, thin-client computing can reduce the amount of hardware necessary for each station. The table below shows the **number of students per computer** in Connecticut school districts. Typically, the ratio of students to computers increases with district enrollment. Overall, high schools typically have the lowest ratio of students to computers.[69] Generally, the **FVC districts' numbers of students per computer fall in line with the average number students per computers for comparable school districts**. Canton Public School District and Simsbury Public Schools have more students per computer at the elementary, middle, and high school levels than the average for the Connecticut school districts of comparable enrollment. The remaining FVC districts appear to have slightly fewer students per computer than the average for school districts of comparable enrollment as grade level increases.

Table 5: Students per Computer in Connecticut School Districts by School District Enrollment (2007-08)*

Enrollment Range	Average	Max	Min
Elementary Schools			
Less than 2,000	3.8	7.1	1.1
2,000-4,999	4.5	7.7	2.2
5,000-9,999	4.7	12.4	2.2
10,000 or More	3.5	4.9	2.6
All Districts	**4.2**	**12.4**	**1.1**
Middle Schools			
Less than 2,000	3.2	7.3	1.4
2,000-4,999	3.6	6.1	1.5
5,000-9,999	4.0	10.5	1.7
10,000 or More	3.0	3.3	2.7
All Districts	**3.6**	**10.5**	**1.4**
High Schools			
Less than 2,000	2.8	5.1	1.4
2,000-4,999	3.2	5.1	2.0
5,000-9,999	4.0	8.6	2.0
10,000 or More	3.3	4.4	2.4
All Districts	**3.3**	**8.6**	**1.4**

Source: Connecticut State Department of Education
*Does not include school districts without any computers per computer.

[69] Connecticut Education Data and Research. Connecticut State Department of Education. http://www.csde.state.ct.us/public/cedar/index.htm

Table 6: Students per Computer in Farmington Valley Consortium School Districts (2007-08)

School District	Elementary	Middle	High	Enrollment
Canton	4.2	4.3	3.6	1,725
Granby	4.8	3.4	2.2	2,324
Plainville	3.2	3.5	2.6	2,601
Simsbury	5.3	4.1	3.3	4,949

Source: Connecticut State Department of Education

Hardware Leasing

Many school districts and companies chose to lease computers rather than purchase them. Leasing allows districts to **potentially replace all of their computers at once, rather than purchasing only a set amount each year**. This will streamline IT support and software updating, as all computers will work on the same platform. Through a leasing contract, districts are able to pay for the computers over several years, rather than paying the full amount upfront. Leasing agreements also typically allow districts to purchase the computers at the end of the contract at a significant discount. These computers can then be re-purposed or re-sold to students and their families.[70] Experts with the Consortium on School Networking cite leasing computers as one way to **reduce the initial purchasing costs**. Leasing is also beneficial because it creates a built-in computer replacement plan. As the leases run out, new computers will come in.[71]

Leasing computers and other hardware is recommended as a way to reduce initial costs and to facilitate equipment replacement. However, regardless of whether computers are leased or purchased, they should be replaced every three to five years.

A review of technology infrastructure plans at the peer school districts used in this report found that **very few FVC peer districts lease equipment**. Piedmont Unified School District's technology plan does state that the district has two leased T1 lines used for data and voice.[72] Additionally, the plan states that leasing equipment has been proposed as a cost-saving option.[73]

Several **larger school districts have entered into leasing contracts** with computer companies like Dell. In 2008, the Hernando County School District near Tampa, Florida leased 11,000 Dell computers in a four-year $8.1 million deal. The district essentially replaced every computer in the district at once.[74]

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[70] Marshall, T. "School may lease 11,000 computers." *St. Petersburg Times*. 2008. http://www.sptimes.com/2008/02/17/Hernando/Schools_may_lease_11_.shtml

[71] Kaestner, R., and Salpeter, J. "Weathering the Storm." *Compendium*. 8:1. 2010. Consortium for School Networking. Op. cit.

[72] "Instructional Technology Plan: July 1,2010 – June 30, 2013." Piedmont Unified School District. p. 45. Op. cit.

[73] Ibid. p. 56.

[74] Marshall, T. "Hernando schools selling old PCs for recycling." *St. Petersburg Times.* http://www.tampabay.com/news/education/k12/article928025.ece

Computer Replacement and Reuse Plans

Computer **replacement and reuse plans are often implemented in school districts to ensure that computers are as up-to-date as possible**. The 2008 NCES survey of educational technology found that 67 percent of school districts had a formal computer replacement plan. Thirty-seven percent of districts use an asset recovery program from all computers and 22 percent use an asset recovery program for some computers.[75]

Replacement Plans

Computer replacement plans are an important aspect of any school technology department. Replacement of older computers and hardware has been shown to be more cost-effective than undertaking expensive repairs to increase the longevity of the computer.[76] A review of technology plans at peer school districts found the following computer replacement practices:

- **Piedmont Unified School District (CA)** – District equipment (if obsolete) is replaced every five years and servers are replaced every three years. School equipment is replaced "when it is non-functioning, not upgradeable, non re-purposeable, or around eight years old."[77] Computer replacements are supported by the local parent's club, therefore replacements tend to lag. Most computers are older than four years.[78]

- **East Bridgewater Public Schools (MA)** – The technology plan indicates that the district has fallen behind on computer replacement.[79] The plan, however recommends that the district implements a replacement policy and budget to allow for a 3 to 5 year cycle for equipment replacement.[80]

- **South Windsor Public Schools (CT)** – The district uses a five-year replacement cycle for all computers and servers. After replacement, old computers are re-purposed as secondary workstations in the classroom.[81]

- **Newtown Public Schools (CT)** - The district has plans to create a formal replacement cycle. Currently, they "review the inventory of each building on

[75] "Educational Technology in Public School Districts: Fall 2008." National Center for Education Statistics. December, 2009. Op. cit.
[76] Kaestner, R., and Salpeter, J. "Weathering the Storm." *Compendium*. 8:1. 2010. Consortium for School Networking. Op. cit.
[77] "Instructional Technology Plan: July 1,2010 – June 30, 2013." Piedmont Unified School District. p. 56. Op. cit.
[78] Ibid. p. 11.
[79] "Five-Year Technology Infrastructure Improvement Plan 2006-2011." East Bridgewater Public Schools. p. 2. Op. cit.
[80] Ibid. p. 8.
[81] "Educational Technology Plan." South Windsor Public Schools. 2009. p. 10. http://www.southwindsorschools.org/uploaded/documents/technology/TechPlanFinal.pdf

an annual basis to determine the inventory of obsolete and budget for the replacement of said equipment."[82]

- **Cheshire Public Schools (CT)** – There is a five-year replacement cycle currently in place at the district. However, the district cannot keep pace with the policy because of budget shortfalls.[83]

Generally, districts ideally want to **replace their computers every three to five years**. This falls in line with industry standards for computer replacement. Technology changes quickly and older computers become obsolete.[84]

Reuse Plans

Many argue that computers should be **reused, repurposed, or recycled** if at all possible. There are environmental and economic benefits to taking this approach. Millions of working computers end up in landfills each year. This can be avoided if more organizations participate in a computer reuse program. **Several programs, already in place across the country, take in unused computers for refurbishment and redistribution**.[85] For example, the Microsoft Community Authorized Refurbisher program helps supply refurbished PCs with preinstalled Microsoft software to qualified charities, nonprofits, schools, and government programs.[86]

School districts can also **organize internal reuse plans**. Many school districts give older, unused computers to students to take home. Districts may also use this program to send home computers that are donated to the schools. Donated computers often require extra refurbishment and software updates that IT budgets cannot afford to make.[87]

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[82] "Technology Plan." Newtown Public Schools. 2009. p. 26. Op. cit.
[83] "Technology Plan." Cheshire Public Schools. 2009. p. 17.
[84] Dunn, Darrell. "The PC Replacement Decision." *InformationWeek*. 2005. http://www.informationweek.com/news/hardware/showArticle.jhtml?articleID=164900387&pgno=1&queryText=&isPrev=
[85] Furr, P. "Building a Successful Computer Reuse Program." Computers in the Classroom. 2010. http://www.computersforclassrooms.org/Building%20Successful%20Manual%202-18-10.pdf
[86] "Microsoft Refurbisher Programs." Microsoft OEM Partner Center. http://oem.microsoft.com/script/contentpage.aspx?PageID=552862
[87] Sausner, R. "Are Desktops Dead?" *District Administration*. 2003. http://www.districtadministration.com/viewarticle.aspx?articleid=4&p=3

21st Century Library Media Centers

It is important to consider that school instructional technology and library programs overlap in many ways, and consequently, **many benefits can be achieved from having staff members and technology across departments work together as a team** – rather than as separate entities – to help a create a "functional and physical merger" of the school library and IT program.[88] As such, it is important to consider that many of the school- or district-wide technologies and staffing elements reviewed in previous sections of this report should both compliment and support the library media centers.

Most of the literature on school library media centers focuses on recommendations for the design of these areas. Design elements typically integrate technology with teaching and learning areas, social areas, and meeting areas for teachers and administrators

Sometimes a challenge in the current state of fast-paced technological innovation, schools and their libraries or media centers must be designed such that they support the current instructional environment. In order to aid schools and school districts in this process, the South Carolina Department of Education put together a series of **21st Century media center design considerations and recommendations**, including a list of areas that need to be included in the library media center:[89]

- **Library Media Center Office, Work Area, and Storage Area**: Includes the needed office space for library professionals and support staff, library work room, library staff restroom, and storage with equipment and materials.

- **Circulation Area**: Area for material check-in and out, as well as services for answering questions. The Circulation Area should include telephone access and library staff circulation administrative computers with LAN and internet access. If available, this area may include a workstation for express self-checkout.

- **Information Reference Area**: Area includes access to photocopiers, computers with online public access card catalogs (OPAC), LAN and internet connectivity, printers, and shelving units.

- **Production Area**: Includes equipment for multimedia production such as computer with OPAC access, internet, LAN, and wireless access points.

[88] "Imagining the Future of the School Library." DesignShare. http://www.designshare.com/index.php/articles/school-library-future

[89] Quoted with slight variation from: Rex, Dr. James H. "School Library Media Services Office of Technology: School Library Media Center Design Considerations and Recommendations." South Carolina Department of Education. P. 3-4. http://martha.alewine.googlepages.com/DesignConsiderationsandRecommendatio.doc

Other important multimedia technology including scanners, printers, digital cameras, LCD projectors and screens, a studio for video and audio recording and broadcasts, as well as other necessary furnishings.

- **Instruction Area**: Area for the main "classroom area" of the media center, large enough to accommodate at least two classes simultaneously. This area should include internet and LAN connectivity and equipment to facilitate large group instruction such as computers, LCD projectors and screens, and interactive white boards.

- **Technology Connectivity Area**: This area is the school's main connectivity location for file servers, cabling, LAN, electrical, telephone, and television with closed circuit distribution.

- **Reading Area**: An area for recreational reading that provides shelving units for books, magazines, and newspapers.

- **Professional Area**: Area for faculty, staff, and administrators that includes at least one computer station with OPAC access, LAN and internet connectivity, printers, telephones, a conference table and chairs, comfortable seating, and shelving units.

- **Social Area**: Area for students, teachers, and other library visitors to socialize while in the library that is removed from work-related areas.

- **Conference Room**: An area for small group work, committee meetings, and community use.

Library media centers should also provide multiple telephone lines for voice, data, and intercom connections, appropriate cable connections for video and data transmission, and acoustical treatment on walls, ceilings, and floors.[90]

While it was difficult to find information regarding video/audio distribution and storage practices, a variety of state education department policy documents provide an indication as to policies and planning for media distribution and storage. The *Facilities Guide for Technology in New Jersey Schools* provides additional suggests as to the equipment/considerations needed in video/audio distribution and storage centers. The *Facilities Guide* recommends that a **centralized media control panel** is developed so that laptops or desktop computers can be connected to a wide range of video and audio teaching resources. These centralized media control panels should have a built-in cable TV tuner that is connected to the school's network so that visual

[90] WBDG Staff. "Best Practices – School Library Design." LibraryWorks. http://www.libraryworks.com/LibraryWorks_Supplements/1009/BP_School_Library_Design.htm

information can be displayed via a projector, or can be displayed via a DVD, camcorder, through another auxiliary input. If this control is connected to a camcorder, it can be connected to the internet for video conferencing.[91]

If regular video or audio production and distribution is performed at the school, it is also important to consider the creation of a permanent location for these materials. The *Facilities Guide* suggests that "installing complete analog Coax-based video distribution networks in new school facilities has been declining as schools select to **distribute video over the Category 5e/6a switched Ethernet local area data networks**," due in part to cost savings from eliminating a separate system for the purpose of video distribution.[92] Additionally, digital distribution systems can offer "increased flexibility, quality and ease of program distribution." Planning considerations for a video/audio distribution network include:[93]

- Live video/audio production may require **different infrastructure** then the distribution of recorded materials. Generally, the requirements of the school will drive the extent of the infrastructure need.

- Digital video production and distribution is very different from analog video production and distribution. Schools implementing digital production and distribution should **take advantage of data networks** to achieve the benefits and cost savings of a converged network of voice, video, and data.

- Finally, schools should consider **design elements** such as lighting, sources of noise, acoustics, and access control in selecting a location for live media production.

Other state education documents provide further recommendations regarding television distribution and data networking and storage. In terms of the distribution of in-house television, it is recommended that the design and installation of television production studios, cable, or satellite distribution should be completed with consultation with cable company representative and other design experts. In particular, the school will need to work with consultants to determine the "location of the "head end" of a distribution system, the location of cable/satellite jacks and drops, and any special features, such as a media retrieval system."[94]

Data networking and storage can sometimes be complicated in 21st Century media centers, and it is necessary to **consider the amount, type, and size of data, as well**

[91] "Facilities Guide for Technology in New Jersey Schools – Section 4: Administrative and Learning Environments." State of New Jersey. http://www.state.nj.us/education/techno/facstan/section4.htm
[92] Ibid.
[93] Ibid.
[94] "Design Considerations for School Library Media Centers." Wisconsin Department of Public Instruction. http://dpi.state.wi.us/imt/desgnlmc.html

as the speed and bandwidth required for transmission. Media centers need to provide enough "data drops and wireless access points for student access to network research, telecommunications, circulation desk, printers and online catalog stations."[95]

The Franklin Independent School District in Texas provides an example of the use of a new control system solution for multimedia distribution centers. The solution, the **CampusSV solution from SchoolView Technologies, LLC., interfaces almost all audio and visual devices in each school and provides a single integrated platform** for administrators to distribute audio, video, and control signals throughout the district schools. Additionally, administrators integrated to Campus SV system with their classroom interface equipment so that teachers could control multimedia and presentation devices from their computers and in front of the classroom using a wall-mount button panel.[96]

Library Media Centers at Peer Districts

A review of the FVC peer districts websites concluded that it is difficult to determine whether most of the FVC peer districts studied in this report use the type of 21st Century library media center described above. However, one district, Needham Public Schools, does note an extensive policy regarding schools' library media centers. It is worth noting that Needham's technology department also appeared to be the largest of all the peer districts reviewed in the "IT Staffing" section of this report. The goal of the library media program at Needham Public Schools is

> …to help students develop literature skills and information skills as they use print and electronic resources in conjunction with the classroom curriculum. These skills are specifically described for the primary, intermediate, middle and high school levels. The information skills follow The Big6 format, an information problem solving process.[97]

Needham's library media center and this goal has been developed over the past fifteen years, during which **every school library media center in Needham has had furniture, shelving, and technology upgrades** to improve the student learning environment.[98] These upgrades have resulted in increased satisfaction from both parents and students. The usage of the library media center is high at all levels of schooling: at the elementary level, classes visit the library media center an average of 24 times a week; at the secondary level, there are 10 to 40 class visits a week. In order

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[95] Ibid.
[96] "Texas SD installs new multimedia distribution centers." *Tech and Learning.* June 3, 2009. http://www.techlearning.com/article/20866
[97] "School Libraries and Information Literacy." Needham Public Schools. http://rwd1.needham.k12.ma.us/media_and_technology/School%20Libraries
[98] "Subcommittee Report #2: Teaching/Learning Library Media." Needham Public Schools. 2007-08. P.2. http://rwd1.needham.k12.ma.us/media_and_technology/documents/SchoolLibraries.pdf

to help the library media center staff keep up with this high number of class visits and growing district enrollment, the centers rely heavily on parent volunteers.[99]

Role of the Library Media Specialist

Apart from these design and audio/visual distribution/storage considerations, a review of the literature determined that Library Media Specialists are important to fostering collaboration and learning between the media center and the school.[100] This is further reflected in the book *Information Power: Building Partnerships for Learning* by the American Association of School Librarians. In this book, the role of the school's **library media specialist as the facilitator of collaboration, leadership, and technology** is discussed. It is important that library media specialists collaborate not only with teachers, but also with administrators, parents, and other stakeholders. Practical approaches to collaboration are suggested, including:[101]

The important role of the school library media specialist in facilitating the use of technology in teaching and learning is cited by numerous sources.

- Establish a good relationship with teachers; be approachable
- Raise teachers' expectations of what the school library media program can do
- Become an expert on the curriculum goals
- Show the connections between information literacy and content-related objectives
- Solicit teachers' assistance in library media program development
- Be flexible in expectations and timing
- Be persistent

The main leadership role that library media specialists must take on is one in **leading educational reform** by showing teachers, students, and administrators the connection with information-based learning and the skills students will need in the 21st Century. Specifically, library media specialists will need to "lead from the middle" – that is, they will need to coach others to use the technologies themselves, act as a sounding board for key decision-makers, and work to encourage collaboration.[102]

Finally, the technology component of the school's library media specialist is key. Not only is the library media specialist the **primary leader in the school's use of**

[99] Ibid. P.4-5.
[100] "Best Practices." School Library Media Best Practices. http://www.slmbestpractices.org/bestpractices/index.html
[101] Practical approaches to collaborating quoted verbatim from: "Information Power: Building Partnerships for Learning." American Association of School Librarians. P.49-51. http://books.google.com/books?id=hH57eSwK38UC&printsec=frontcover&dq=information+power+building+partnerships+for+learning&source=bl&ots=bGTqtS4nsn&sig=_oMAGZBGj1j1eDZGM_vtyjR_XD0&hl=en&ei=fNkDTI2eG8G78gaLwPjADQ&sa=X&oi=book_result&ct=result&resnum=5&ved=0CDEQ6AEwBA#v=onepage&q&f=false
[102] Ibid. P.53-54.

instructional and information technology, but also the designer of students' learning experiences.[103]

[103] Ibid. P. 55-56.

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