

*Shared Information &
Communication
Technology
Infrastructure: The Next
Steps*

*Sponsored by
The Center for Education Innovation and
Economic Development*

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EXECUTIVE SUMMARY

CESA#1's Center for Education Innovation and Economic Development commissioned this project to analyze survey information collected from representative CESA#1 school district during the Regional Technology Infrastructure Feasibility Study conducted by CISCO and CESA#1. It also used the report of above study and CoSN report on Total Cost of Ownership (TCO) and Value on Investment (VOI). Based on the above sources and analysis of survey data areas for shared services such as integrated voice data and video communication which have high level of interest and potential benefits been identified. The next steps in the development of shared Information and Communication Technology (ICT) infrastructure are provided.

ABOUT THIS STUDY

The Center for Education Innovation and Economic Development (an affiliate of Wisconsin's Cooperative Education Service Agency #1) has commissioned a study to analyze survey information collected from representative CESA#1 school districts during the Regional Technology Infrastructure Feasibility Study conducted by CISCO and CESA#1 to identify the next steps in the development of shared Information and Communication Technology (ICT) infrastructure.

The current practice in southeastern Wisconsin has each district acquire and maintain their own information and communication infrastructure including, computer network, telephone systems, surveillance system and emergency response system. The development of new technologies and their complexities is making it difficult for the school districts to keep up with changing needs and technology. The effectiveness of the available infrastructure varies significantly from district to district.

Shared infrastructure seems to be an attractive option. This study explores this option and identifies next steps in the development of shared infrastructure.

Study Methodology.

In 2007 CISCO systems and CESA#1 conducted a Regional Technology Infrastructure Feasibility Study. As a part of that study representative CESA#1 districts were surveyed on their current information and communication infrastructure. This study analyzed the data collected during the survey and used report of above study and CoSN report on Total Cost of Ownership (TCO) and Value on Investment (VOI) as sources of information. Based on the above sources and analysis the next steps in the development of shared Information and Communication Technology (ICT) infrastructure have been identified.

DEVELOPMENTS IN INFORMATION & COMMUNICATION TECHNOLOGY and SCHOOL DISTRICTS

Information and communication technology is revolutionizing every aspects of our life today. Studies show that kids adopt these technologies much more easily than adults and they can significantly enhance student learning. Increased need for school security, surveillance, and effective communication between school district, student, parents and community makes it essential for school districts to install and maintain a state-of-the-art information and communication infrastructure. However, the resources and expertise required

to install and maintain the infrastructure is quickly outstripping the capabilities of individual school districts specially the small and medium school districts.

Fortunately the merging of computer and communication technology and developments in Internet and IP telephony is making it feasible to develop a shared regional information and communication infrastructure and manage it from a centralized location. CESA#1 with its stated goal of “*promoting cost-effective and equalized educational results across diverse school districts, all for the lifelong benefit of children*” is uniquely positioned to facilitate the development of shared infrastructure.

DISTRICT FINDINGS AND OBSERVATIONS

This section will present key findings and observations based on the data collected from seven representative CESA#1 district of various types and sizes. The data were collected through a detailed survey of school districts. The data, findings, and observations are organized around 12 main infrastructure topics described below.

1. Integration over IP: Integrating Data, Voice, Video, and Security on IP network from central location.
2. School Network: LAN/WAN and connection to Internet.
3. Wireless Network: Monitoring and control.
4. e-mail Services: Management of e-mail server, spam and virus checking.
5. Security: Security of client, server & network. Web security like spy ware, viruses, firewall rule management etc.
6. Security Policy Monitoring: Monitoring of district’s information security policy.
7. Physical security: Physical security of schools and video surveillance through IP based system.
8. Emergency Response: Support for response to emergencies including real-time information sharing with law enforcement, EMT, fire brigade and hospitals.
9. Equipment Location & Tracking: Asset management and tracking of school equipment.
10. Digital media system: Centralized storage and distribution of digital media.
11. Back-up and recovery services: Centralized system back-up, recovery and disaster management.
12. Central Storage: Central storage of information.

Although the districts varied in size, the issues they faced and their requirements of technology infrastructure remained fairly consistent across districts.

District Characteristics and Sizes

The representative samples included districts varying from small to fairly large, urban to rural, k-8 to k-12, etc. Table 1 below summarizes the key characteristics of the districts. To preserve confidentiality we have labeled each district A-G.

Table 1: Sample District Characteristics

Items	Districts						
	A	B	C	D	E	F	G
Number of Students							
District Type	K-8	K-8	K-12	K-8	K-12	K-12	K-12
Number of Buildings	3	3	42	2	7	3	16
Number of Class Rooms	67	150	1100	200	200	80	
Number of Staff	72	150		160	450	225	600

Findings & Recommendations:

The results of the survey are summarized in table 2. Topics similar to the above 12 topics were used to summarize the results. These results are discussed below along with the recommendations.

Voice Communication:

In terms of the current voice communication systems districts varied widely from fairly old PBX system to voice, video, and data integrated IP based unified communication systems. In many cases no upgrades to the software or support to old system is available. The cost of operating these old out dated systems is relatively high. Couple of districts have recently upgraded to IP based systems couple of other districts are thinking about it. All districts seem to be very interested in moving to modern VOIP based integrated system if it can be done in cost effective manner. I think this is an area shared services pilot can be started.

WAN & LAN Environment:

Most of the districts use T1 connections between buildings. Within the building most districts had some type of LAN using switches and routers. In many cases these are maintained by some staff member on a part time basis. In larger districts full IT department exist and dedicated person maintains these resources. I do not believe this area has good potential for shared services at least initially.

Table 2: Summary of results

Items	DISTRICTS						
	A	B	C	D	E	F	G
Current Voice System	NEC PBX (1998)	Not Known	Cisco Unified	IWATSU PBX	IP Phone	Old PBX	PBX
Current WAN	ISDN / T1	T1	T1	T1	T1	T1	T1
Current LAN	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Voice Mail	Part of phone	Not Known	Yes (IP)	old	Cisco Messsaging	Part of Phone	Yes
Acceptable Use Policy	Yes	Not sure	Yes	Yes	Yes	Not sure	No
Infrastructure security	Yes	Limited	Yes	Not much	Yes	Very Limited	Yes
Firewall	Yes	Yes	Yes	No	Yes	No	Yes
Single security appliance inc.	No	No	Yes	No	No	No	No
Security managed	to some extent	to some extent just	Yes	No	Yes	No	Some
e-mail services	spam filtering	purchased	Yes	None	Yes	No	Yes
Disaster recovery plan	Very limited	Not known	Yes	No	Yes	No	Yes
Video surveillance	IP based	No	Analog	No	Analog	Analog-limited	Analog
Video Central storage	No	No	No	No	No	No	No
Digital media	Very limited	Limited	Yes	No	Limited	No	Limited
Conferencing facility	No	No (plan to add)	Yes (IP)	No	Yes	No	No
VPN	No	No	Yes	No	Yes	No	No
Integration over IP	No	Yes	Yes	No	Yes	VoIP & Data	No
Wireless Network	No	Not sure	Not sure	No	Yes	Some	Not sure
Security Policy monitoring	No	No	Yes	No	No	No	No
Emergency Response	No	No	No	No	No	No	No
Equipment Location							
Tracking	No	No	No	No	No	No	No
Central Storage	No	No	No	No	Yes	No	No

Wireless Network:

Little more than half the districts seem to have at least partial wireless network in some buildings. For many districts this information was not easily available. In most cases they seem to be managed internally. Even though technology is available to remotely monitor and manage this network, I do not believe this area has good potential for shared services at least initially.

e-mail Support:

Management of e-mails varies widely. Most districts run a type of spam control software. It is not very clear if they do virus checking of incoming and out going mail. Smaller districts tend to have simple e-mail packages with very little support for checking e-mails. I do believe that potential for a shared e-mail server with full support for spam, spy ware and virus checking of incoming and outgoing mail exist. However, this may be considered as phase 2 service.

Security:

Security is a major issue for most districts. Except the larger districts most districts are venerable to security breaches. Fewer than half the districts manage security at the central level. Most of them run the some type of spy ware software, limited virus protection and firewall. It is harder for the districts to keep up with the threats. However, most districts are concerned about security and might be interested in a shared security management service. Technology does exist to remotely manage security in a shared environment. I think this is an area of high potential for shared services.

Security & other policy monitoring:

Most districts do have security and use policy. Many do not have a written policy. No district except one has system to actively monitor security policy. There may be some potential to develop and monitor security and use policy in a shared environment. However, this may be considered as phase 2 service.

Physical Security & Video Surveillance:

Physical security inside the school is becoming increasingly important. Only one district uses a state-of-the-art digital IP based Video Surveillance system. Two districts do not have any video surveillance system and rest have analog system. Only couple of districts monitors them in real time. No district has central storage of video. There may be a potential to use a state-of-the-art digital IP based shared video Surveillance system. However, the initial investment required to switch over to digital camera may be significant. Thus, this may be considered as phase 2 service.

Emergency Response:

Emergency response is becoming very important. None of the districts have a state-of-the-art emergency response and information system. Most districts use a radio based system to inform police. There seems to be no automated system for informing the parents. The technology for such systems is available today but resources may be an issue. There might be grant opportunities for developing a regional emergency response system. I think CESA#1 in co-operation with school districts explore these opportunities.

Equipment Location Tracking:

None of the districts seems to have electronic equipment location tracking systems. There is not much interest in it either. This may be considered for later time frame.

Digital media system:

Except for a couple of larger school districts none of the districts have capability to generate, store and share digital media and learning material. However, there is interest in sharing digital media with other school districts. A shared digital media generation, storage and distribution environment can allow sharing of best practices between school districts and significantly improve learning. I think CESA#1 should consider developing such an environment in phase 2.

Back-up and recovery services:

Disaster recovery seems to be an area of major vulnerability. Except for 3 to 4 larger districts none of the districts seem to have a credible disaster recovery plan. However, all districts do see an importance of these. A shared backup and disaster recovery plan may be quite useful. CESA#1 should look into developing this in phase 2.

Central Storage:

Except for one or two large district none of the districts uses a central storage area network. There also not much interest in it. This may be considered for later time frame.

Next Steps

There are significant advantages and opportunities for improving learning in south eastern Wisconsin by development of shared services under the leadership of CESA# 1. However, the approach needs to be in stages with strong interest and high benefit area addressed first. I recommend that CESA #1 pursue the next steps in

establishing a regional shared Information and communication Infrastructure for southeast Wisconsin school districts starting with high priority area identified above.

The next steps are:

1. Survey all CESA #1 districts to validate the results of this survey and determine high priority areas. The survey will also help establish an implementation timeline and level of interest.
2. Initiate an implementation study of phase 1 areas identified above.

APPENDIX A

The Center for Education Innovation and Regional Economic Development

The Center for Education Innovation and Regional Economic Development is a consulting/professional development enterprise serving the southeastern Wisconsin communities and their educational service providers. The Center is committed to insuring a high quality of life for the region by proactively enabling education, business, and civic partnerships to develop and implement education innovation as a fundamental component of southeastern Wisconsin's economic development.

The Center is the regional conduit for the 21st Century Learning Program. The Center provides new learning and instructional models based on future skills that will be needed by our economy and our youth. It advocates a position of support for education institutions that are evolving toward 21st century schools.

The Center is affiliated with Cooperative Educational Service Agency #1. In its first year of operation it is bringing to bear over a million dollars in resources to focus on the delivery of the Center's plan. These funds have been secured from grants, partners, donations, governmental entities and school districts.

APPENDIX B

Cooperative Educational Service Agency #1 – CESA #1

Cooperative Educational Service Agency #1 (CESA #1) is one of twelve regional agencies created by the Wisconsin Legislature to "serve educational needs in all areas of Wisconsin by serving as a link between school districts and between school districts and the state. Cooperative Educational Service Agencies may facilitate communication and cooperation among all public and private schools, agencies and organizations that provide services to pupils" (Wisconsin State Statute, Chapter 116, 1983). We are a cooperative governed by an eleven-member Board of Control representing 45 public school districts in southeastern Wisconsin. The fundamental mission of CESA #1 is to:

- Equalize educational opportunity by providing quality and equitable opportunities to meet diverse school district needs
- Enhance quality education
- Provide technical services\Promote cost effectiveness by providing linkages to state, regional, and national resources
- Provide a network to make maximum use of regional diversity

APPENDIX B

CESA #1 is a direct instructional service and consulting enterprise. The services of these two divisions are provided to the 45 public school districts in its region, the Department of Public Instruction, several private schools, and other education providers in southeastern Wisconsin. The overall business purpose of CESA #1 is to:

- Provide instructional and technical staff for multi-district services
- Apply for and distribute state, federal, and private resources on behalf of school districts and other local education providers
- Provide consultation in a variety of service areas to meet local district service needs
- Provide direct instruction/therapy services for multi-district programs serving low incidence students
- Provide a communication network for school districts, the Department of Public Instruction, Institutions of Higher Education, and other local educational providers
- Mobilize collaborative action regarding educational initiatives of interest to the 45 school districts

As a result of CESA #1 value added services, our clients are able to:

- Implement cost effective services for low incidence, high cost students
- Provide technical and consultative support for their staff at a low cost due to shared staffing arrangements
- Implement research-based, systemic change due to access to regional, state, and national resources
- Pilot/test services and programs at reduced cost due to shared information from consortia
- Purchase technology and other services at a reduced cost due to large-scale, multi-district purchasing services
- Implement DPI/State legislative requirements using supporting expertise and resources provided through the agency
- Access additional resources not otherwise available
- Collaborate with other partners in the design and piloting of innovative solutions to critical issues
- Utilize just-in-time services and staff
- Be a service vendor through cooperative networks

About the Principal Investigators

Hemant Jain is Wisconsin Distinguished & Tata Consultancy Services Professor of Management Information System in Sheldon B. Lubar School of Business at University of Wisconsin - Milwaukee. Dr. Jain's interests are in the area of Electronic Commerce, System Development using Reusable Components, Web Services, Service Oriented Architecture, Business Architecture Design, and application of information technology in education setting.

Dr. Jain established Real Time Enterprises research program at UWM with the support of Tata Consulting Services and Rockwell Automation. He served as director of the UWM MIS Consortium from 1995 to 2000. Prof. Jain played a key role in developing technology strategy and architecture for Milwaukee Public School from 1996 to 2003. He has also served as consultant to Ameritech (SBC), Northwest Mutual Life Insurance, and Rockwell Corporation. He is quoted on economic and technology issues in the Wisconsin business press.

Dr. Jain is Associate editor-in-chief of IEEE Transaction on Services Computing. He also serves on the editorial Board of the Journal of Association of Information Systems, Information Technology & Management, International Journal of Web Services Research, and International Journal of Information Technology and Decision Making. He is the co-chair of IEEE international conference on web services to be held in Beijing, China Sept. 2008. He has published over fifty articles in leading journals like Information Systems Research, MIS Quarterly, IEEE transactions on Software Engineering.