

DATA MANAGEMENT FEASIBILITY STUDY

*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 a study to look ahead at effective practices for managing K-12 student information. This study included a review of current practices in several school districts in southeastern Wisconsin. The leaders of these districts were forthcoming and candid in their responses. This report intentionally neutralizes the identities of the districts. However the leadership of CESA#1 and the team of investigators have expressed gratitude to each for collaborating with this project.

Current practices for management of student data are district centric. Staffing is very lean. All are using purchased products for management of student information. There are significant gaps in services. For example, all expressed a desire to be able to use a data warehouse to collect student longitudinal and formative assessment data, but are unable to do so. Also there are substantial inefficiencies that result from trying to maintain multiple student databases for various applications such as special education, food service, and transportation.

Analysis of current practice in small and medium businesses offers clues about how school districts could evolve current practices to increase efficiency and effectiveness. Of three major trends (Infrastructure-as-a-Service, Platform-as-a-Service, Software-as-a-Service) Software-as-a-Service (SaaS) holds great potential for districts to increase functionality and efficiency. Another advantage to this approach is to begin to treat student information systems as a utility instead of a capital expense.

The total cost of ownership (TCO) for current practices were estimated using data provided by each district. The TCO varied from \$49.21 to \$117.90 per student with smaller districts experiencing higher per pupil cost.

Alternative strategies for managing student information were investigated. The advantages and shortcoming of each alternative are discussed in the report. A regional strategy for implementation was found to be most attractive. This is possible because there are commercial products that have the functionality and capacity that would be required for a regional solution. A regional solution will enable districts to leverage the intellectual and financial capital of the region and industry leaders. A regional Total Cost of Ownership (TCO) was prepared based upon a projected project enrollment of 45,000 students, hosted by a district with excess capacity and using industry standard methodologies. Taking a conservative approach, the regional TCO illustrates that participating districts will have a state-of-the-art Student Information System at a cost less than their current SIS. While the difference in some instances may be small, the lack of capital investments required every few years make the regional approach attractive.

High School 2020

A Vignette

Charles Wright is excited! He can't wait to tell his friends. Yesterday his business advisor, Mr. Schloesser, confirmed that the red algae he discovered during his *Freshwater Ecologies Coop* is a new, unique species. This means a technical report that Charles is developing will be published! His discovery and the published report will be powerful evidence to include in his college applications. Charles thought, "Maybe I will be recruited. Then I'll have a come back when my all-state buddy, Mike, brags about the number of offers he has received."

Not every day is this exciting, but sticking with his specialization during high school is really paying off. Charles, 16 last month, just completed subject selection for his next learning cycle with considerable input from his teachers, his counselor, Mr. Schloesser and his parents. Charles is really looking forward to *Pacific Rim Governments*. This international seminar will actually include students from around the world and staff from their state departments. The time zones will be a bummer, but kids take turns doing the all-nighters. But it can't be much worse than his Spanish class. He already is navigating through 6 time zones for the on-line sessions.

Charles' aunt is still baffled by the change from credits earned each semester to certifications based upon demonstrated proficiencies. After all, what was wrong with doing things the traditional way... like when she was in school. And these learning cycles are on-going... no more three-month vacations. But it is hard to argue with results. Charles has already "banked" his first year of college by receiving deposits rewarding good performance. If things keep going well he will easily be able to "earn" the first three years of college before he graduates. She never had friends from other places in the world while she was in school, but it seems worth it for Charles.

For more information about Charles' subject selects and an analysis see Appendix C.

All of Charles' learning experiences described above are suggested to help us think about how our educational delivery models should be adapted so that learning will not be held back by old ways of doing business. The following report is structured to enable educational leaders to begin thinking differently about how to conduct business.

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 the efficacy of current practices in the management of data associated with K-12 students. The historic and current practice in southeastern Wisconsin has each district tackling this work individually. The effectiveness of this work varies from district to district.

Meanwhile the requirements and expectations for using data to report compliance and (hopefully) inform learning are escalating rapidly. This is happening at a time when resources are diminishing and the requirements to effectively meet expectations are escalating. Often districts find themselves at best, one deep... one person to handle critical technology related functions... and marginally prepared for their responsibilities. This situation is coupled with a world where the pace of change for technology is exponential.

Industry proven, effective practices for managing information eclipse the capacity of school districts adopt/adapt effective practices and will continue to do so until districts engage in alternate strategies to meet demands. Industry proven, effective practices for managing information currently exist. One proven model is an Application Service Provider (ASP).

Study Objectives

Student Information Systems play a pivotal role in tracking student progress, managing schools, directing and obtaining district resources and reporting to stakeholders including state and federal agencies. Timely and relevant information from the system are critical to monitor student learning and decision making at all levels. The constantly changing nature and complexity of information technology makes it very difficult and expensive for individual school districts to implement and manage full-service, state-of-the art student information systems. The objectives of the proposed feasibility study are to:

Develop an analytical methodology to determine all components of a district's cost (e.g. infrastructure, license, human resources, etc) for operating the current student information system including the special education component.

Test the analytical methodology in four or five districts in southeastern Wisconsin.

Investigate technical, managerial and economic feasibility of using an application service provider (ASP) model facilitated by a regional entity to provide and support shared state-of-the-art student information system to interested CESA # 1 districts.

Draw upon lessons learned from similar initiatives in various school districts and small/medium businesses across the country.

Analyze the cost of current practices versus an ASP strategy.

Study Methodology.

A representative sample of four southeastern Wisconsin school districts was invited to participate in this study. The focus was the use of student data, investigating:

- Capacity to analyze student performance;
- Services for students and teachers;
- Stability in delivery of services;
- Capability for compliance reporting;

Superintendents of the districts in this study served as the executive sponsors of the study to analyze investments, cost of operation, practices, and performance of their current student information and related systems. Each superintendent served as liaison between district staff and the investigators. Interviews were conducted with district staff in the areas of technology, student services, special education, business services, curriculum and instruction. School principals from each level also took part in the interviews. The investigators examined budgets, existing reports and workflows to obtain a complete picture of how SIS is used in each district. The observations and results of the investigators' analysis were then reviewed by participating superintendents for accuracy and completeness.

INFORMATION TECHNOLOGY IN SMALL AND MEDIUM BUSINESSES and ITS APPLICATION TO SCHOOL DISTRICTS

There are a number of trends that will affect the way technology services are delivered. These trends will impact small and medium businesses and they will have a similar effect on school districts. Here are a few:

Competition. Forces in the K-12 sector are expanding rapidly to compete for the opportunity to serve children and families. This is happening with charter, choice and private schools. It is also happening because of open enrollment. The impact of on-line courses and on-line schools is growing very rapidly. The traditional guaranteed stream of students for public schools is no longer guaranteed.

Economic Development. Regional leaders across the country are striving to gain an edge by focusing on their ability to sustain local businesses and support their community. A well-trained workforce is

vital to their success and these leaders are recognizing the critical role that K-12 education plays into this agenda.

Globalization. Princeton economist, Alan S. Blinder [1] analyzes the movement to take jobs off shore. The careers most at-risk from this trend are ones that offer services that can be delivered through a wire. There are a host of service careers that will not be moved off shore and this insight implies a strategy for K-12 experiences. Thomas Friedman's *The World Is Flat* [3] also puts globalization trends into play for educators.

Increased Dependence On Technologies. Ray Kurzweil [4] offers an intriguing analysis of technology's impact on society. One only needs to read a short excerpt from his writing to realize that the revolutionary changes delivered by technologies are going to accelerate, not subside.

School districts in Wisconsin with the exception of Milwaukee Public Schools can be compared to small and medium businesses in terms of its size and operating characteristics.

Until recently little attention has been paid to the unique aspects of small and medium businesses (SMB) by the information technology (IT) industry. Here we briefly review major research studies conducted on the use of IT in SMBs and discuss how the results of these studies can be applicable to Wisconsin school districts.

Research literature suggests that SMBs may be differentiated from large enterprises generally by a number of key characteristics described below [13]. We believe that these characteristics are also applicable to school districts.

Severe resource limitations in terms of management, manpower, R&D, finance etc.

Flat and flexible structures.

High innovation potential.

Reactive and fire fighting mentality.

Informal and dynamic strategies.

To operate the school districts in volatile and unpredictable environment, the availability of the right type of information in almost real time is becoming essential. According to a recent Forrester study [9] SMBs are expected to save about 21% in IT operations cost through automation and consolidation. They are expected to invest this savings in new software initiatives. SMBs have also shown marked preference for buy over build. Only 20% of the companies show preference for custom development. Tremendous success of companies like salesforce.com indicates that *software-as-a-service*

concept with capability to *easily self customize* some of the features is getting traction with SMBs.

A large study of SMBs on Web use [7] found that companies that experience a higher level of market pressures and have developed flexible IT infrastructure benefit greatly from use of advanced technology for surveillance and electronic business transactions. On the other hand companies with a broader scope of operations get benefits by using web information search. This study recommends that SMBs operating in competitive environment should consider proactively developing a responsive IT infrastructure and integrating broad arrays of application software in different areas of activities. We believe that these findings are applicable to Wisconsin school districts of all sizes and with limited resources.

Studies have also found formidable barriers to adopting advanced IT by SMBs. A review of literature suggests that there are at least six forms of barriers [11].

Unaware of the potential of advanced IT to enhance their business operations. We believe and found in our study that this holds true for Wisconsin school districts with respect to the potential for IT to support learning.

Perception of unresolved security and privacy issues related to Internet. We found a wide variance in district network security practices and policies.

Lack of necessary IT skill base and staff to implement advanced IT. It is too difficult and expensive to hire and retain people with necessary and changing IT skills. We found in our study that this is true for Wisconsin school districts.

Most SMBs are not capable of taking advantage of less expensive high quality resources available through outsourcing. We found that total cost of operating systems vary widely between districts.

High initial set-up costs and perceived ongoing cost. We found in our studies that peak and valleys in technology cost can create major problems in school district budgeting.

Legacy of IT sunk costs. Most SMBs do not have the resources needed for experimentation in IT. Their investments need to work for them for the long term and cannot be quickly written off. We think that this is especially true for school districts.

Overcoming these barriers is a major challenge for school districts. However, some of the latest developments in IT such as virtualization, service oriented architecture, software-as-a-service (SaaS) and infrastructure-as-a-service

(IaaS) may offer very attractive options. We analyze some of these options here.

Virtualization and Service Oriented Architecture

Virtualization encompasses a variety of mechanisms and techniques used to address problems such as security, performance, and reliability. It does so by decoupling the user perceived architecture (hardware & software) from their physical implementation. It introduces a programmable layer between the software environments and the hardware. This layer is transparent to the software above it and makes efficient use of the hardware below it. Virtualization allows computers to run multiple operating systems simultaneously, thus making it possible to time-share expensive hardware without requiring software modifications. Thus, instead of running servers at only 15 to 20 percent capacity (typical current utilization level), servers can run at 80 to 90 percent of capacity. Thus, server requirements can be significantly reduced, power consumption goes down and servers can be better secured [5]. Servers can run multiple operating systems leading to increased availability. However, implementation of this solution requires technical skills generally not available in school districts.

Another major trend in application architecture is called Service Oriented Architecture. SOA allows the application to be designed as a set of services that can be put together in a flexible manner to support specific business processes of the district. The service is an abstracted, *logical* view defined in terms of what it *does*, typically carrying out a business-level operation. The service is formally defined in terms of the messages exchanged between provider agents and requester agents, and not the properties of the agents themselves. Messages are sent in a platform-neutral, standardized format (using XML) delivered through the interfaces. This architecture allows a software application to meet varying needs of different school districts. Other advantages include easy integration with existing application systems such as HR, finance and transportation, thereby reducing redundancy in data spread across multiple systems, increasing data sharing, and eliminating duplication of work.

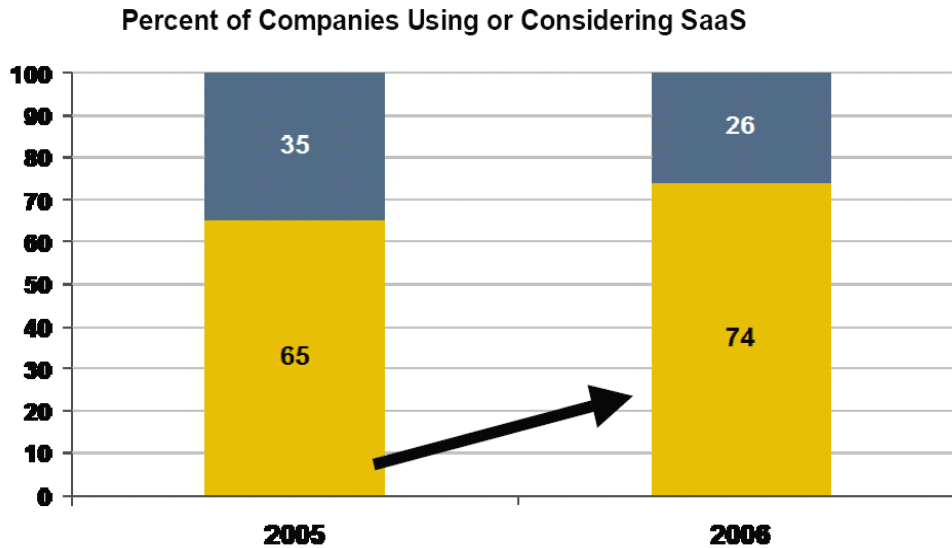
Software-as-a-Service (SaaS)

Reduced cost and increased availability of broadband data communication technology has made it feasible for organizations to shift to a new paradigm and use software-as-a-service as a methodology to deliver applications [8]. SaaS solutions allow remote, centrally hosted software to be accessed by multiple organizations through their browsers. Typically a broadband

communication capability is required. The only other infrastructure required is a client machine with browser software. This approach offers the advantage of reduced and more predictable costs (typical pricing structure is a monthly per user cost), improved reliability and security (through the use of advanced technology at the hosting site), protection from technology obsolescence and reduced requirements for technology professionals.

Small and medium businesses during the past few years have begun adopting SaaS as a way to reduce their need to establish a full suite of technology products to meet their day-to-day operational needs [12]. This approach enables them to focus on their core business and reduce the distraction of procuring, staffing, maintaining and upgrading technology services within their organization. To facilitate this practice several major technology driven organizations such as SAP, Amazon.com and Salesforce.com are offering hosted solutions for small and medium businesses.

THINKstrategies, in conjunction with Cutter Consortium, has surveyed IT and business decision-makers worldwide and found the proportion of organizations that have adopted or are considering SaaS solutions has jumped from 65% in 2005 to 74% in 2006 (see Figure 1). They also found that over 80% of SaaS users are satisfied with their on-demand solutions, plan to expand their use of SaaS and would encourage their peers to consider SaaS solutions [12]. The success of these SaaS deployments has convinced Gartner Group to predict that 25% of software sales will be via an on-demand model by 2010. IDC expects that SaaS market will grow at a 21% compound annual growth rate (CAGR) over the next two years and reach \$10.7B worldwide in 2009. On the other hand, Forrester Research believes traditional, on-premise enterprise application revenues will only grow 4% per year through 2008.



Source: THINKstrategies/Cutter Consortium 2005 and 2006.

INFORMATION TECHNOLOGY IN EDUCATION

An Overview—The Last 15 Years.

Prior to the mid 1990's school district's use of information technologies mainly occurred with the use of business applications e.g. financials, payroll, and use of school management systems for scheduling, report cards, student demographics etc. These applications in many cases were homegrown, especially in larger districts. Experimentation using technologies in classrooms was happening in isolated pockets, most often focused on offering computer science related experiences. There were instances of linking technology and learning for basic skill development and occasional application in areas like art, music and social studies.

K-12 school districts experienced a surge of interest and funding beginning in the mid 1990's to explore the roles technologies could play in supporting their mission. Initiatives from districts tended to fall in the following categories: [2]

- Connectivity
- Hardware acquisition
- Professional development
- Program development
- Assessment and accountability

While responses from schools/districts were nearly universal, approaches varied widely. Some districts used the renewed national/state interest as an opportunity to make wholesale changes to their infrastructure and applications. A few districts worked to connect their investments in information technology to supporting student achievement. Solving the Y2K issue spurred further technology investments.

There were great expectations for technology to transform K-12 teaching and learning, but patience and sustainability have not been a part of those expectations. Much of what technologies could make possible to enhance learning has yet to be realized. Few understand that this is not a chicken-egg question; without the investments in infrastructure, hardware, professional development and program development there can be no transformation. There are many promising examples that encourage a smaller audience to stay the course, but the patience of policy makers to weather the sea change needed has worn thin. Increased pressures for accountability (NCLB) have caused many to retrench into their familiar 20th century experience instead of forging ahead to create 21st century learning models [6]. Resources to achieve significant transformation are withering in the U.S.

The shift in emphasis toward accountability is resulting in technology investments being directed toward compliance reporting. The retrenchment is also resulting in the fragmentation of student data systems. Multiple applications support student related functions like school management, special education, food services, transportations etc. These individual applications cannot generally “talk” with one another. There are significant productivity losses that occur as a result, including the large amounts of time being spent trying to enter information in multiple systems synchronize databases.

Managing Student Data Today

The design and delivery of student information systems has matured significantly since the mid-nineties. The use of homegrown student information systems is nearing extinction and the increased capacities and expectations for student information systems are rapidly escalating. Drivers for this change include:

- Exponential growth in technologies;
- Competition;
- Improved systems capabilities;
- Increased demands for accountability;
- Emerging need for effective learning management systems;
- Escalating school safety requirements.

However, the response of schools and district to this fast moving environment has been uneven, at best. Evidence of the challenges associated with this occurs in varying degrees in each location studied for this report.

Technologies are becoming embedded in the fabric of schools and districts. It would be difficult to find a functional area that is not dependent upon technologies. Student transportation relies upon student demographics to populate their routing application. However in many cases the source of student demographics is not the student information system, but an independently developed and maintained student data base. The same is true for learning management systems, electronic storage of longitudinal student data, security, parent on-line access, food services, special education, library services, recreation services, state interfaces, Title I services, Medicare claims and a host of locally developed management applications. Reasons for this situation are many, but often can be attributed to failing to reengineer local practices to make optimal use of their current student information system. This leads to significant excess operational costs. One way to address this problem is to review current data models for redundancy and link policy decisions to improving implementation practices.

Because technologies are embedded in the fabric of schools and districts it becomes increasingly important for the district technology leader to assume responsibility as a senior staff member in the district. This is an idea that has been endorsed by the Council of Great City Schools (www.cgcs.org) and by the Consortium for School Networking (www.cosn.org). If the technology leader is in a senior staff role this will help assure that technology investments align with the strategic direction of the district and that the implementation of systems across the district will reduce redundancies and fragmentation while increasing application effectiveness. Further, it will create an opportunity for technology implementations to become more forward thinking and strategic, rather than reactive.

Another prevalent condition is schools/districts being at best, one deep in key technology positions. The risk borne by schools/districts as a result of this condition is huge. For a variety of reasons including scarce resources school districts have assigned too few people to critical operational technology roles. These individuals are enthusiastic about their work and are very committed to succeeding in their roles. They are also overwhelmed by the never-ending demands created by changing technologies and user expectations. They recognize that their absence from work may place the school/district in jeopardy because their work underpins large portions of the day-to-day business.

There is limited evidence of cross training, largely because there is no one available to be trained. And there are service gaps that occur because staffing is so lean. One school principal estimated that when he began

working for his district they were using about 10% of the capabilities of their student information system. His experience and leadership have allowed that usage to increase to about 50% during the past two years. This school district is fortunate to have a school principal with the expertise and energy to take on these added responsibilities. While his efforts are commendable and the entire district benefits as a result, districts should not rely upon this as a long-term strategy.

Managing Student Data – A Look Ahead

Here are a few trends that will have a significant impact on how K-12 services are delivered.

Scarce Resources. Extraordinary pressure is being placed on our K-12 public education programs to offer quality services with fewer resources. Scarce resources have also become a driving force in the movement toward increased accountability. Lessons learned from small and medium businesses can help us reduce costs for the delivery of core technology services while we grow in the capacity to be more effective in the delivery of services.

SaaS. Software-as-a-Service is adding functionality in small and medium business. This movement is growing very rapidly and holds promise for increasing functionality and cost effectiveness in K-12 districts.

Capturing and analyzing data that informs learning. The building blocks for learning that result in success for students are becoming better understood. One critical factor in this increase in understanding is the application of technology to the learning process. There are commercial technology-based products being used today that reduce the analytical burden for individual reading teachers and help them focus on appropriate interventions that will lead to success for each of their students. There are very sophisticated analytics that can be applied to huge data sets to help researchers ferret out indicators and factors that will lead to more students succeeding. Key factors that will contribute to their success are the isolation of formative indicators and having this analysis available to teachers in a timely manner.

Interoperable Management Systems. Especially perplexing for districts today are the stand-alone systems that cannot “talk” with one another. The most troublesome of this is special education and student information systems. However, it is clear that the SIS market is maturing and beginning to recognize both the opportunity and the obligation to develop interoperable systems.

Teachers will be faced with many age-old problems as we move into the 21st century. They will also find new challenges to overcome. Their opportunity to succeed will depend upon school leaders being able to embrace change while working to use all opportunities available to optimize success for students.

DISTRICT FINDINGS AND OBSERVATIONS

This section will present key findings and observations. The findings and observations are derived from the interviews and source documents. The findings and observations are organized around three main topics: Utilization, Human Resources and Total Cost of Ownership. Although the districts varied in size, the issues they faced, their concerns and the functionality of the SIS remained fairly consistent across districts. On-site data collection was conducted at four districts, ranging in size from 950 students to almost 8600 students. To preserve confidentiality we have labeled each district A-D.

Utilization

Installed Student Information Systems

Each of the districts recognized the critical role that Student Information Systems (SIS) play in managing student data and reporting to local and statewide stakeholders. They have invested considerable resources, both monetary and staff resources, to implement the technology and to train staff on its use. All have experienced either installation of a new SIS or an upgrade within the last three years. District A and D use Pearson Centerpoint (PowerSchool), District B uses Skyward and District C has Infinite Campus. All districts effectively use the SIS to record, store and report student data. Most common features used are grade/test score reporting, attendance, discipline and class scheduling. All were web-based products enabling parent's on-line access to their children's grades.

Limited Satisfaction with SIS

In general, districts viewed their SIS as user-friendly, were satisfied with the SIS and the support received. However, district staff, at all levels, expressed frustration with their district's inability to fully utilize the capabilities of the SIS. Staff indicated that they utilized between 10%-50% of the SIS features, with the skill level among staff varying widely. Teachers are trained to enter attendance and grade data, clerical staff enters demographic data and school and district administrators create reports. In each case instructional leaders expressed a desire to use student data to be more proactive in developing

teaching and learning strategies. District B saw an effective SIS as a competitive advantage in recruiting and retraining students. All districts understood that their SIS must move to include a data warehouse capacity, but felt that this is beyond their current resources.

Lack of Integration of Data and Applications

In each district, the SIS is a stand-alone application, with little or no integration with food service, transportation or special education databases. The absence of integration with special education is especially problematic for the districts. In essence, each district maintains separate databases and student information systems for regular education students and special education students. Pearson Centerpoint and Infinite Campus have an IEP module, but the districts use a separate application, OASYS for special education. Double entry of data is required. District C has established a routine to transfer data between the SIS and the special education management system (OASYS). However, to date, the district manually enters the data into each application separately. In all districts, staff and administrators viewed the current lack of integration as a major drawback and saw the need to integrate information from various sources as critical to future success.

Limited Access to Student Data

Each district expressed frustration with their SIS inability to use student data to improve teaching and learning or to identify trends in student achievement or behaviors. All districts recognized that individualized instruction is the future, and the need for some type of data warehouse will become increasingly important. Principals and even Superintendents re-entered data from their SIS into EXCEL spreadsheets or SPSS statistical applications to attempt some trend analysis or historical reporting. For District D, manually entering WKCE scores into an EXCEL spreadsheet was the extent of their historical data. Teachers and support staff maintain manual profiles of interventions and test scores. A principal in District B stated “teachers are starved for student data.” Parents are able to see grade/attendance data, but as in the case of District B comments are limited to a few characters or a drop-down menu of responses. Even though districts have installed SIS for 4-5 years, all use a combination of SIS generated data and manual reports to compile student information.

Following students as they move from school to school is a major issue. In District A, student mobility is high, and the district is unable to obtain student record folders or IEPs for weeks after the transfer. District B does not share student data with the high school district, nor do they monitor the performance of their recent middle school students. All districts expressed a desire for longitudinal student data.

A lack of resources, both fiscal and human, was a major reason for not moving forward in utilizing their SIS more effectively. District D cancelled installation of INFORM due to budget constraints, and for District C it was the lack of professional development.

Human Resources

Outsourcing

Each district currently outsources many administrative functions and indicated a willingness to expand outsourcing of services. All districts in this study outsourced food service and transportation operations. Each district outsources some of the SIS functions. District IT departments maintain the network infrastructure and provide some training and support. Vendors often provide help-desk and consulting service. Based on staffing levels and knowledge base of current staff, it is highly unlikely that districts will be able to develop a fully integrated suite of applications. A third-party solution provides the only credible avenue for districts to implement the desired SIS functionality. In fact, district staff recognized the inherent benefits of the ASP model.

Limited Professional Development

Staff training on the SIS has been limited to functional literacy for teachers, administrators and clerical staffs. There is little cross-training, with each person responsible for their area. Teachers are trained in attendance and grade reporting; school administrators are further trained in reports and scheduling, while clerical staff are trained in data entry and reports. The extent of training varied widely. In District A principals do not know how to generate reports, while in District B a technology savvy principal understood about 50% of the district's SIS. District C principals had ad hoc reporting training, though staff was unsure how widespread its use is. While all districts expressed a desire to more effectively use student data, no district had a structured professional development plan that uses the SIS to improve teaching and learning. Staffs consistently expressed frustration with the lack of knowledge of the SIS capabilities and functions. The ability to generate interim progress reports, not after the fact data was viewed as critical to moving to a individualized education model.

Limited Succession Planning

All districts recognized their vulnerability in having limited or no-cross functional training on the various SIS components. Staffing is usually one-

deep in their functional knowledge. As stated earlier, this is a huge risk for districts. District administrators expressed concern regarding staffing levels, and recognize that to fully utilize the capabilities of the SIS requires adopting methodologies and reengineering practices, which will require more robust professional development and greater cross-training. In each district a clerical staff person was identified as the “guru” for entering student data and preparing reports. When asked what the district would do if that person left the response was “we would get by.” While this is probably true the effort would be considerable and the risks of error substantial.

A critical function of the SIS is to provide the data to complete reporting for state aid purposes. In all cases, there were only a select few who were able to compile the information from the SIS. Given that district revenues are based on these figures, each district could lose significant aid if the information is in error or incomplete. Compounding this problem is that this information is time-critical. District A lost state aid due to an inaccurate count. In District D, data quality must be checked by IT.

As stated earlier in this report effective use of technology will often require significant changes in workflow and tasks. A senior staff member of the district could align technology investments such as the SIS with the strategic direction of the district. This would also reduce redundancies and fragmentation of data management tasks.

Total Cost of Ownership

The Total Cost of Ownership (TCO) is an assessment tool used to determine the cost of operating a district’s SIS. The TCO is a calculation of costs for factors related to the operation of the SIS. These factors include hardware, software, personnel and communications. The final result is a cost per student for the SIS. Since no district included the Special Education student management system in their SIS, the TCO excludes any costs associated with a Special Education system.

For this study, the TCO is intended to provide an understanding of the costs associated with a SIS. Districts identify and account for costs in varying ways. District budgets did not break out IT costs or professional development costs by function. Therefore, to establish a TCO for each district’s SIS, assumptions were made. When costing staff time or professional development a conservative approach was used. The investigating team was especially conservative in allocating costs to the SIS. Nevertheless, the percentage of staff time directed to maintaining the SIS was remarkably similar. Table I below provides the TCO for the districts examined, and the assumptions associated with each cost element. They provide an initial

benchmark for other districts as well. A full breakdown of costs and the assumptions with each cost element is listed in Appendix E.

Table I

District	Enrollment	TCO	TCO per Pupil
A	946	\$ 55,006	\$ 58.14
B	1,430	\$168,600	\$117.90
C	8,592	\$422,776	\$ 49.21
D	3,442	\$174,957	\$ 50.83

The TCO for the districts examined range from \$49.21 per pupil to \$117.90 per pupil. The per pupil cost has no relationship to the efficacy or efficiency of the district's operation of the SIS. The number of pupils and the annual cost of the software are the main factors. Table II details the system costs associated with the SIS in each district.

Table II

District	Enrollment	System Cost	System Cost per Pupil
A	946	\$ 29,545	\$ 31.23
B	1,430	\$ 34,512	\$ 24.13
C	8,592	\$128,568	\$ 14.96
D	3,442	\$ 50,015	\$ 14.53

Districts with small enrollments and significant annual license cost are prime candidates for a regional SaaS approach. Regional SaaS approaches are being used effectively in a number of regions including Denver and British Columbia.

For comparison purposes the team examined the projected TCO of a regional SaaS model for multiple districts using the Milwaukee Public Schools (MPS) as a host. It should be noted that the hosting entity could be a public organization, such as a school district, an education service agency, or a private, for-profit firm. The team used MPS because the district has a robust infrastructure and experience with large multi-site application installations. The team wishes to thank the staff at MPS for their time and information regarding their multi-site SIS application.

Appendix E details the cost elements for a regional SaaS hosted model for 45,000 students from multiple districts within SE Wisconsin. Hardware and software cost figures were taken from a previous feasibility analysis

conducted by MPS for CESA #1 in 2006. For district staff cost, the team used the per pupil figures from District C, the largest district in the study. For consistency purposes, the regional SaaS TCO must include the same elements as the districts' TCO analysis.

The TCO for the regional SaaS model is \$49.12. This is slightly lower than the largest district, District C, in the study and significantly lower than the smaller districts in the study. Further exploration of other hosting options such as hosting by vendor may be able to reduce this cost further because of economy of scale and better utilization of hardware resources through virtualization.

Student Information Systems are major capital investments that are not regularly included in district budgets. To fund a new SIS system or upgrade the current SIS, funds are often redirected from purchasing classroom equipment. District B recently spent \$48,000 on an upgrade to their SIS. The purchase of classroom laptop computers was delayed to pay for the system. District A purchased a new SIS in 2006 at a cost of \$30,000. The regional SaaS model would eliminate expensive capital purchases and provide a predictable cost for budget purposes.

ALTERNATE SOLUTION APPROACHES

The following section presents three scenarios that school districts may wish to consider as they consider how best to serve their students and communities.

1. Business As Is

The districts continue to do business as is in terms of student data management. This means districts continue to operate on their own individual systems including the management of infrastructure required to support various application systems. Districts periodically will need to upgrade these systems as required by vendor.

Advantages

- Current SIS system is functional
- People have learned how to deal with the current system
- Familiarity
- Local control

Disadvantages

- Not meeting the needs of principals and teachers
- Limited/no interoperability with other district applications
- Excessive burden on a few individuals increases risk
- One deep
- System complexity eclipses district ability to optimize use
- Limited access to longitudinal student data
- Limited economy of scale
- Inertia drives decisions
- Data redundancies
- Capital budget expenditures
- Limited capacity to stay current
- Expertise for local decision making is not a given

2. A Common Statewide System

In this option a common statewide student data management system is selected and implemented by DPI. All the school districts in Wisconsin will use this common system. Some kind of cost sharing arrangement is developed between DPI and school districts.

Advantages

- Operational management not district's responsibility
- Economies of scale
- It is likely that a more robust solution will be selected
- Potential for cost sharing
- State reporting may be simplified
- Statewide opportunity to reduce challenges from student mobility
- Increased opportunity to reengineer local business processes
- State procurement may enhance cost effectiveness

Disadvantages

- One size fits all... limited capacity for meeting local needs (e.g. calendars, schedules, report cards, ...)
- Loss of local control
- Lack of responsiveness to local concerns
- Larger districts will dominate and smaller districts will lose their voice
- Weak track record for state-level installation of major systems
- Added layer of administration and policy

3. A Regional Approach to Student Data Management

In this option a regional system is implemented using the Software-as-a-Service (SaaS) model. In this model all the software and infrastructure required to run the system is centrally managed. Districts will just need to have client machines with high-speed Internet access. Each district gets their own customized view of the system and has some capability to customize the system on their own with an easy to use interface. It can accommodate various calendars, schedules, report cards and report formats. This service is offered at a fixed monthly cost with no upfront or ongoing upgrade investment required on district's part. District's participation is voluntary. Various options can be used for implementing this e.g. vendor can serve as provider taking care of hardware and software management, regional service agencies can interface with vendor, facilitate implementation, provide professional development and provide a help line. On the other hand, the hardware and software environment may be managed by larger districts in the region like Milwaukee Public Schools.

Advantages

- Autonomy of local districts can be maintained
- Increased opportunity to reengineer local business processes

Regional opportunity to reduce challenges from student mobility
Significant opportunity to establish support system of expert advisors familiar with regional environments
Allows regional consideration of emerging solutions from multiple vendors
Systems costs can be budgeted like a utility

Disadvantages

Ramping up for a regional approach is a significant undertaking
Requires major alterations to current practices
Requires collaboration among regional districts
Internal resistance at the district level

RECOMMENDATIONS

The Principal Investigators strongly recommend that CESA #1 pursue the next steps in establishing a regional SIS for southeast Wisconsin school districts (alternative #3). The steps are:

1. Survey CESA #1 districts to determine acceptance of the regional approach. CESA #1 could conduct a series of informational sessions for district administrators and school board members. The survey will also help establish an implementation timeline and provide student count data that will be needed to answer cost and scale issues.
2. Initiate an implementation study and/or fit analysis for providing a regional SIS. The study will explore the following issues and provide CESA #1 and participating districts a full and complete understanding of the installation process.

- Identify the entity that will run the SIS.
- Identify any infrastructure requirements/upgrades
- Identify security administration/protocols
- Identify required data elements and functionality
- Identify data conversion issues/processes
- Identify Help Desk/Support requirements
- Identify professional development/training requirements
- Identify staff resources and skill requirements for participating districts
- Identify hardware costs for participating districts.
- Project an annual per pupil cost.
- Project an implementation schedule.
- Prepare a Request-For-Proposal, if necessary.
- Evaluate proposals against the requirements and make a recommendation.

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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

APPENDIX C

High School 2020-A Vignette

Charles Wright is enrolled in Sweetwater High. He is about two-thirds complete with his **certifications** for high school and has begun entry-level experiences with a **specialization**. Charles has also accumulated 1.3 years in his **IHE.vest account**. Charles, 16 last month, just completed subject selection for his **next learning cycle**. The offerings he selected with considerable input from his teachers, his counselor, his business advisor and his parents include:

Technical Writing

This course is offered in a traditional classroom setting and emphasizes professional report writing. Certification will be awarded when the student has three reports judged successful by a **panel of managers from the community**.
Pre-requisite: Certification at level 4 writing.

Applied Algebra 2

This course is offered in a traditional classroom setting and features applications of mathematics in problem-based settings. There will be an emphasis on working with very small numbers and judging reasonableness of conclusions. Certification will be awarded when the student has successfully **achieved proficiency in five units of instruction**. Students will also be expected to **complete on-line skill development units**.
Pre-requisite: Certification at level 2 mathematics

Spanish 4

This course emphasizes conversational Spanish and is presented four days per week (M-Th) via interactive video by instructors from Mexico (weeks 1-4), Puerto Rico (weeks 5-8), Colombia (weeks 9-12) and Catalonia (weeks 13-16). It will feature the cultures of each of these locations. Certification will be awarded when a student achieves level 4 proficiency as judged by the review panel. Times for performance reviews can be scheduled on Fridays.
Pre-requisite: Certification in Spanish 3 and sponsorship by a local teacher-advisor.

Pacific Rim Governments

This seminar is offered to students from nations around the world. There are five topical seminars that are offered via interactive video as synchronous events. Time zone considerations will require interaction during late night/early morning. Local universities offer access for students that do not have those functions available at home. Students will also engage in on-line, international brokered discussions. These will be asynchronous. Students will be awarded **certification upon successful completion of papers juried by peers and a representative of their nation's state department**.
Pre-requisite: Sponsorship by a local teacher-advisor.

Life Sports 3

This course is taken two evenings per week (T,Th) and Saturday morning and is offered by the local YMCA. The emphasis is on conditioning and gymnastics and is offered as a multi-age (12-19) group. Certification will be awarded to students that: **(1) Engage continuously for 15 weeks; (2) Demonstrate proficiency in two skills**. Students that successfully complete LS3 will be eligible to apply for employment as a coach for the YMCA's Gymnastics Club (ages 4-7).
Pre-requisite: None

APPENDIX C

Freshwater Ecologies Coop [this is a *continuing course from the prior cycle*]

This course is offered three afternoons per week (T,W,Th) in conjunction with an internship (M-F) at the local water treatment plant and is co-presented by a manager and a professor from the Great Lakes Program at the local university. There is an **articulation agreement** with the local college for dual certification. Course certification will be awarded based upon review of lab performance and successful completion of two research reports. Internship performance will be based upon the same criteria used to review entry-level employees at the water treatment plant.

Pre-requisite: Enrollment in Environmental Studies specialization.

ANALYSIS

Let's take this vignette from the top.

The “specialization” enables Charles to develop a concentration of studies in an area of interest. This “specialization” has evolved from a series of **intentionally created experiences (beginning in elementary school)** that help him identify his strengths and interests... information that is embedded in his **personalized student profile**. Charles is not “locked” into this specialization, and in many cases there are **related pathways** that he can pursue should he discover as his knowledge expands. Too often, today, we are losing our students because they are unable to recognize a connection between their formal learning experiences and future opportunities.

Some courageous people, in 2010 began a student development program that made investments in post-secondary student learning accounts. This “IHEvest” program provides a scaled set of rewards for all students for accomplishments. Some of the smaller investments are offered to reward appropriate behaviors such as good attendance, punctuality and citizenship. Other larger investments are offered to encourage students to pursue specializations in areas considered high-need. Students may monitor the growth of their personal IHEvest account. The genesis for this program was modeled, in part, on the GI Bill, a program available to military personnel during the last half of the 1900's.

The “Technical Writing” course reflects the importance of **achievement over “seat time.”** It also bridges the business and education communities, benefiting children, educators and business personnel. Technology readily eases the unnecessary and disruptive burden of frequent face-to-face meetings. Certainly, the “readers” should be included in the celebration of the student's certification, an experience where everyone is a winner.

Not all learning in mathematics needs to be done with the direct support of a teacher. Practicing routine skills is done more efficiently and effectively in an on-line environment. However, helping students grasp major concepts, personalizing learning and offering concepts that more closely match the applications of mathematics in the real world continues to require the leadership of a skilled teacher.

ANALYSIS continued

There is a special teacher certification that has evolved during the last 15 years. This certification recognizes the special skills developed to support learning in distributed environments. The Spanish content, in this case, appropriately draws upon native speakers and equips students to function effectively in second-language environments. The far-end locations provide students with enriched learning experiences that reach well beyond their local neighborhood. If the world is going global, it might serve our children well to enable them to learn what this means at every opportunity.

What better way for children to learn about the function of governments than to have “classroom” experiences that engage students in real applications of government with government workers? What better way to learn about the impact of time zones for a global workforce than to simulate that environment with a meaningful learning experience? And what better way for children to begin to understand about post-secondary education opportunities than to give them an opportunity for carefully constructed on-campus experiences?

Globalization will play increasingly important roles in the lives of today’s young people. Engaging, international experiences will accelerate the capacity of young people to become effective participants in a global economy.

Schools recognize the need to encourage students to learn the value of an active life style. However, due to limited resources, communities expanded functions for schools in their communities, and in some cases eliminated duplication. For example, branch libraries are now located within schools. Community centers have also been combined with schools. In this case a local service provider, the YMCA, contracts for the use of school facilities during non-peak hours. This also makes access for neighborhood residents more convenient and has built community support for improved school facilities.

An intentional partnership that includes local schools, colleges and regional government create high-quality, high-need learning experiences for students. Once again, Charles gains exposure to post-secondary learning and he gains real-world employment experiences that will serve him well when there are fewer safety nets.

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.

Robert Nelson is the founder of *Leadership, Learning & Technology, LLC*. His work focuses on learning in urban communities. Current projects include:

Affiliation with Consortium for School Networking [www.cosn.org]

Affiliation with the Council of Great City Schools [www.cgcs.org]

Affiliation with the *Partnership for 21st Century Learning* [www.21stcenturyskills.org]

Consultant to Wisconsin's Cooperative Education Service Agency 1
[www.cesa1.k12.wi.us]

Nelson was presented Wisconsin's CESA#1 *21st Century Educator Award* in 2006 and the CGCS's *Distinguished Service Award* in 2005. He retired from Milwaukee Public Schools in 2003 after 35 years of service. Bob's latest assignment in MPS was director of technology where he spent 8 years leading capacity building to use technologies to support learning in over 4000 classrooms. This work has been guided by strategic planning involving local, state and national partners, and has been featured in numerous national publications. Previously, Nelson worked in MPS high schools for 27 years as a teacher and principal.

Michael Turza is the Director of Business Services for the Milwaukee Public Schools. Mr. Turza has over 20 years of experience in school district administration. Mr. Turza has Master degrees in Business Administration and Human Resources. As a member of the Council of the Great City Schools, Mr. Turza has participated in peer reviews and management studies for large, urban school districts, such as Los Angeles Unified School District, Jacksonville Public Schools and Kansas City District Schools.

APPENDIX E

Total Cost of Ownership Work Sheets

DISTRICT A		NOTES
Hardware Costs		
-Equipment	\$12,015.00	25% of Hardware fees
Total Hardware	\$12,015.00	
Leases and Software Licenses		
-SIS	\$7,500.00	Pearson
-Support	\$7,108.00	Mary Stowasser
-Communication	\$2,922.00	50% of Internet Service
Total Software	\$17,530.00	
Staff Cost		
-Management/Administration	\$10,776.00	10% of IT budget
-School Administration	\$1,500.00	1% of School Administration Costs
-Clerical (Schools)	\$8,000.00	10% of School Clerical Costs
-Clerical (Admin)	\$13,200.00	33% of Clerical staff
-Professional Development	\$4,000.00	10% of Staff Development Cost
Total Staff Cost	\$37,476.00	
Total Cost of Ownership	\$55,006.00	
Enrollment	946	
Cost per Pupil	\$58.14	

APPENDIX E

Total Cost of Ownership Work Sheets

DISTRICT B		NOTES
Hardware Costs		
-Equipment	\$15,902.00	1% Capital Budget
Total Hardware	\$15,902.00	
Leases and Software Licenses		
-SIS	\$12,270.00	ICS
-Support	\$2,800.00	Novell Maintenance
-Communication	\$3,540.00	25% of Internet Service
Total Software	\$34,512.00	
Staff Cost		
-Management/Administration	\$39,781.00	10% of IT budget
-School Administration	\$10,205.00	1% of School Administration Costs
-Clerical (Schools)	\$32,481.00	10% of School Clerical Costs
-Clerical (Admin)	\$40,290.00	33% of Clerical staff
-Professional Development	\$11,331.00	10% of Staff Development Cost
Total Staff Cost	\$134,088.00	
Total Cost of Ownership	\$168,600.00	
Enrollment	1,430	
Cost per Pupil	\$117.90	

APPENDIX E
Total Cost of Ownership Work Sheets

DISTRICT C		NOTES
Hardware Costs		
-Equipment	\$25,000.00	Marsha Brenner Assoc. purchase of AS400
Total Hardware	\$25,000.00	
Leases and Software Licenses		
-SIS	\$75,268.00	Infinite Campus License/Hosting/Support
-Reports	\$7,500.00	Business Objects-Crystal Reports
-Support	\$11,000.00	CIMS to Pearsons
-Support	\$5,800.00	Marsha Brenner Assoc. support of AS400
-Communication	\$4,000.00	25% of Wiscnet
Total Software	\$103,568.00	
Staff Cost		
-Management/Administration	\$134,325.00	10% of IT budget
-School Administration	\$49,467.00	1% of School Administration Costs
-Clerical (Schools)	\$32,481.00	10% of School Clerical Costs
-Clerical (Admin)	\$40,290.00	33% of Clerical staff
-Professional Development	\$37,645.00	10% of Staff Development Cost
Total Staff Cost	\$294,208.00	
Total Cost of Ownership	\$422,776.00	
Enrollment	8,592	
Cost per Pupil	\$49.21	

APPENDIX E

Total Cost of Ownership Work Sheets

DISTRICT D		NOTES
Hardware Costs		
-Equipment	\$12,015.00	25% of Hardware fees
Total Hardware	\$12,015.00	
Leases and Software Licenses		
-SIS	\$24,500.00	PowerSchool & OAY SIS
-Support	\$2,000.00	School Dude
-Communication	\$5,250.00	25% of Internet Service
-CISCO	\$6,250.00	25% of CISCO
Total Software	\$38,000.00	
Staff Cost		
-Management/Administration	\$40,776.00	10% of IT budget
-School Administration	\$18,997.00	1% of School Administration Costs
-Clerical (Schools)	\$24,000.00	10% of School Clerical Costs (6 @40K)
-Clerical (Admin)	\$26,400.00	33% of Clerical staff
-Professional Development	\$14,769.00	1% of Instructional Staff Cost
Total Staff Cost	\$124,942.00	
Total Cost of Ownership	\$174,957.00	
Enrollment	3,442	
Cost per Pupil	\$50.83	

APPENDIX E

Total Cost of Ownership Work Sheets

ASP MODEL: MPS AS HOST		NOTES
Hardware Costs		
-Equipment	\$218,000.00	
Total Hardware	\$218,000.00	
Leases and Software Licenses		
-SIS	\$200,000.00	
-Oracle	\$161,700.00	
-Communication	\$267,370.00	
- System Maintenance	\$10,000.00	
Total Software	\$639,070.00	
Staff Cost		
-Management/Administration	\$351,900.00	5% of IT budget (\$7.82 per student)
-School Administration	\$258,750.00	1% of School Administration Costs (\$5.75 per student)
-Clerical (Schools)	\$170,100.00	10% of School Clerical Costs (\$3.78 per student)
-Clerical (Admin)	\$210,600.00	33% of Clerical staff (\$4.68 per student)
-Professional Development	\$197,100.00	1% of Instructional Staff Cost (\$4.38 per student)
HELP DESK	\$164,736.00	
Total Staff Cost	\$1,353,186.00	
Total Cost of Ownership	\$2,210,256.00	
Enrollment	45,000	
Cost per Pupil	\$49.12	