PROPERTIES OF SHARED KNOWLEDGE – APPLICATION OF HIGHLY INTEGRATED INFORMATION SHARING SYSTEMS IN PUBLIC EDUCATION

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ABSTRACT

This research presents a business project the development of information sharing management system (ISMS) as a possible solution to the problem of delivering administrative services in a charter school. Charter schools are based on using technology in curriculum delivery, application delivery, and communication. Such multilayered use of technology must connect and integrate multiple locations without affecting academic performance or other aspects of school operations. Technology can indirectly increase the quality of managing the process of providing education, and positively influence the quality of education delivery. The paper follows a business project to improve the quality of information communication and data sharing system. The critical element of the project was a separation between strictly academic services – focused on students and delivering education to students, and administrative services – focused on providing business like services to all administrative employees. This principle was used with a strong support from application of business process reengineering (BPR). The development of highly integrated data communication and sharing model was later introduced as Information Sharing Management System (ISMS). This research finds a positive relationship between a centralized information sharing system and the quality of administrative services offered in a charter school. It demonstrates that school administration can be managed and improved by using widely available management theories and techniques.

INTRODUCTION

The opportunities in the education and knowledge industries have been consistently growing as modern society values knowledge and information as one of its most important assets. Early analysis of U.S. spending on education was estimated at more than $600 billion in 1997 [1]. The educational industry is measured to be the second largest industry, after health care. The market is utilizing all available technology products and service providers specializing in the education and knowledge markets. The business opportunities in the K-12 sector have been growing and the state-wide initiatives to allow parents a choice when selecting public school have attributed to growth of charter schools in education.

California Open School (COS) is an educational management company that oversees a number of charter school systems in the state of California. COS manages over 30 remote learning center locations throughout southern California that are connected in single virtual information sharing network. The IT department as a business unit evolved from the secondary to the primary role of electronic communication, curriculum delivery, electronic security, remote system access, identity protection, and business optimization. COS already created a framework for solid

information technology and secured system improvement funding. It is important to mention that all funding comes from the state education budget and the company must follow strict funding guidelines and complete detailed audits every year.

BUSINESS GROWTH AND CHALLENGES

California Open School (COS) realized that when technology was available as a service tool, it would not guarantee a success and was often cited as a failure cause. The opportunity to apply IT can be misguided by poor understanding or poor implementation. It is important to mention that computers in the academic environment cannot be classified as a strategic use of IT. Such a strategy must include fundamental properties of information technology as the administrative aspect of delivering education and to be as important as education itself. COS also established a baseline for benchmarking how education is delivered to the student population.

Using and placing computers in the classroom without the fundamental change in the way the organization provides an educational service does not influence the success rate. McCredie [4] pointed out that any strategy to use information technology would include personal computers but that would be the final aspect of the entire policy. Other authors pointed at the industry wide problems when discussing use of information technology [3] and used the following examples of poor use of technology in the modern education system:

- Lack of vision in application of modern IT.
- Lack of consistency in applying any strategy or chosen vision.
- Lack of depth in understanding how available tools can be used.
- Lack of adaptability in the use of IT as such is constantly evolving and changing.
- Lack of understanding how the IT works among educational practitioners and teachers.

All above mentioned problems are significantly magnified as a charter school must rely on IT to connect all traditionally static elements. It is not the single computer that enhances the educational service; it is the entire information sharing system with all elements of networking, software, hardware elements, and application used in the process that creates a common framework of operations. Such groundbreaking strategy is the only way that charter schools can succeed on a large, global scale [2].

The operational budget is directly related to the number of students. The volume of students dictates the capability of the business process. COS is calculating business growth at 15% next year and 10% each consecutive year. Information-driven growth requires the company to tightly integrate the Information Technology as a primary driver toward quality improvements and growth potential. Because of historical deficiencies in educational technology understanding and practice, there is a need to point out that such a systematic approach helps to integrate the curriculum and model the technology for a broader range of teaching. The problem needs to be identified as a lack of unified data retention and management policy that can interact with all available information about students, curriculum, administrative aspects of providing academic services, and school administration as business unit.

TECHNOLOGICAL ADVANCEMENTS AND OPPORTUNITIES

The selection of Michael Porter's 5 Force Model [5] was used to help the company to look at the problem from an outside the box perspective and treat the educational market like any other industry. It was applied to understand industry power relations and organizing industry research. Drawing from microeconomic theory, the model was applied to identify five forces that influence

the ability of California Open School (COS) to set business expectations. The patterns of forces had a dual purpose: to shape an industry and constrain company strategic choices within the industry and the company strategies choices and desire to change.

The next step was to analyze all known and assumed barriers to entry as discovered during the historical data analysis and presented in Table 1. At that time, COS was struggling to provide any services. The idea of quality of services was not yet considered and the majority of the efforts were focused on fixing existing administrative problems. Lack of planning and lack of understanding as the root cause of the problem was destroying any real efforts by the IT team.

Table 1: Perceived system weakness and barriers to entry

Type of Barrier	**Relationship to Information Technology**	**Business Technology Impact**
IT Infrastructure (Reliable, stable, secure)	The essential element of Information Technology Infrastructure, The foundation that is required for any future planning and growth.	Prerequisite to any business planning, Will require a significant capital investments, Will require change in internal IT department, Will require high level of technical expertise and skill set.
Application Development and Support	Corporate applications can be separated by their function to: Network Core, Business Core. and Education Core,	Each element will be analyzed separately (unless required to be combined with other element) improvements will focus on the overall network/system/application improvement. Current academic application provider will be used. No changes are planned or will be evaluated within the next 24-36 months. Might add significant cost to the project (application upgrade, licensing cost, support and maintenance cost). .
Centralized technology management	Will significantly change the decision center at IT department. Will add partner in any business discussions and will change how technology is perceived and valued at the highest level of management and control.	IT outsourcing will become a viable option when planning IT growth. Strong IT management will be required to influence future IT initiatives and development. Will add a significant value to the administrative services offered by the charter school managing company.
Industry regulations	Will influence future of technology as related to privacy, security, and characteristics of a K-12 environment.	Will require a constant evaluation of current/available/future technology. Federal regulations will follow the same trends as already observed in public school systems.

DATA SHARING AND ACCESS IMPROVEMENTS

The second phase of the project was focused on following objectives:

- Reduce data system complexity.
- Increase data availability.
- Increase data safety at all levels of data access.
- Increase data management.
- Reduce cost associated with data lifecycle business process.

The early business objective to: *complete all work as soon as possible and focus on cost to performance ratio*, was later changed to: *understand and improve the complex relationship between data acquisition, communication, manipulation, exchange, and sharing processes*. The question was

finally asked: *What was the connection between the scope of the data access and the creation of entirely new concept of Information Sharing Management System network infrastructure?* One interesting element was discovered: data protection was classified at the lover level than data access. Over 80% of responders listed unlimited data acquisition and access as the first objective of the new system. Data security and protection was listed by 58% of responders. The low level of technical knowledge of the responders indicated that they were concerned if the access to all information was going to be reduced or the system created an additional level of complexity. A typical corporate user had six to seven network data repositories that were used daily. A typical teacher had five to six network data repositories that were used for the academic purpose. Data Lifecycle infrastructure initiative was not only an opportunity for a future growth; it was also a business necessity to survive unnecessary system complexity and to increase data management.

Access to any information was possible from any remote or corporate location but was often unpredictable in the quality of service or uptime. System backup was performed in each physical location as a separate process. Each backup application had to be individually licensed and managed. The data management element required a part time employee to make sure all backup and archiving processes were conducted and completed successfully. Before this phase of the project was officially approved, the company requested a complete *disaster recovery drill* that was focused on recovering all data. The results of a *disaster recovery drill* were later used as one of the project justifications elements.

One important element was identified as a critical data access factor. Data access and usage is related to the business function of an employee, not the employee's function inside the corporate structure. Two administrative employees were identified as data power users (accounting and payroll services). To understand all limitations and requirements, extensive interviews were conducted with all layers of corporate management. The system benchmarking was focused on how the new information sharing system could add value to the overall IT Infrastructure and provide more tangible level of quality to administrative services. Information sharing performance benchmarking was based on two distinct categories: (a) system protection and disaster recovery and (b) data lifecycle access and manipulation. Results of the system benchmarking are presented in Table 2.

Table 2: Data Access Results Summary

Information Sharing Element	**Distributed Data Access System (old)**	**Centralized ISMS (new)**	**Comments**
Total Number of data server	43	13	Reduction of 30 servers (330.75% improvement)
Data Repository Servers	27	3	Reduction 24 servers (900% improvement)
Access to Academic Data 25 locations 3 locations 2 locations	 6 repositories 8+ repositories 10+ repositories	 2 repositories 2 repositories 2 repositories	 Reduction of 4 Reduction of 6 Reduction of 8
Network Storage	1,258 GB (gigabytes)	485 GB (gigabytes)	Reduction in space requirements 773 GB (385% improvement)
Total active storage space	3,287.25 GB (gigabytes)	658 GB (gigabytes)	Reduction in space requirements 2,629.25 GB (499.58% improvement)

INTEGRATED SYSTEM

That idea that all available information could be perceived in its organic matter (is being born, grows into adulthood, and is finally retired or recycled) allowed creation of three distinct levels of data access as a complete lifecycle of the process as presented in Figure 1.