Legislative Research Commission

Review of Education Technology Initiatives

Research Report No. 363

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Foreword

In December 2007, the Education Assessment and Accountability Review Subcommittee approved a research agenda for the Office of Education Accountability that included a review of Kentucky's education technology. This report provides an overview of the funding, governance, and current status of education technology initiatives and projects.

Information for this report came from many sources. In particular, Office of Education Accountability staff would like to thank the Kentucky Department of Education and the Kentucky Auditor of Public Accounts for providing the necessary information to complete this report.

Robert Sherman
Director

Legislative Research Commission
Frankfort, Kentucky
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Background

In recent years, millions of dollars have been invested in Kentucky's education technology through such initiatives as "intelligent classrooms," new computers, data systems, and high-speed online access to educational opportunities from any location. Some initiatives require new policies and procedures to protect individual privacy and to ensure that data collected across programs and agencies are uniformly reliable and accurate. This report reviews the status of Kentucky's education technology initiatives.

Definition of Education Technology

Education technology encompasses not only computers but also software, peripherals, routers and servers, communications equipment, audiovisual equipment, and technology-enabling aspects of facilities. It also involves libraries and information services, security and privacy issues, user support, professional development and training, institutional knowledge, and the policies and practices for planning and managing technology.

Benefits of Education Technology

Most researchers and policy makers agree that technology can improve the efficiency and effectiveness of education administration but are less certain about the benefits for teaching and learning such subjects as reading and math. Initiatives in various parts of the United States have been ineffective or counterproductive, while others have boosted achievement and enriched the learning environment.

Research suggests that technology is most effective for teaching and learning when it

- directly supports content standards; is used in conjunction with other learning methods;
- is an integral part of school improvement planning; not only imparts specific content knowledge but also builds higher-order thinking and problem solving; and
- teaches students to use such workplace applications such as word processors, spreadsheets, computer-aided drawing, Web site development, and Internet browsing.

Goals of the Kentucky Education Technology System

Following the Kentucky Education Reform Act of 1990, the Kentucky Education Technology System (KETS) was conceived as a means to provide equitable, statewide access to education resources. KETS objectives are to

- improve learning and teaching and the ability to meet individual students' needs to increase student achievement;
- improve curriculum delivery to help meet the needs for educational equity across the state;
- improve delivery of professional development;
- improve the efficiency and productivity of administrators; and
- encourage development by the private sector and acquisition by districts of technologies and applications appropriate for education

The most recent KETS master plan, which guides development and operations, established four areas of emphasis:

- Anytime, anywhere, always-on, differentiated teaching and learning
- Capacity building and enhancement of staff and resources
- Data-driven decision making for teachers and administrators
- Efficiency and governance

Funding

Since 1990, more than $1 billion has been invested in Kentucky's education technology. Of the $140 million spent in fiscal year 2008, approximately 64 percent came from state funds, 24 percent from federal sources, and 12 percent from local sources.

Accomplishments

Increased Opportunities. As a result of Kentucky's investments in education technology, courses, professional development, and other educational resources are available online using secure high-speed networks throughout the state. Students and teachers work on modern desktop and laptop computers. Intelligent classrooms provide new capabilities such as large screens for multimedia presentations, instant polling of students' knowledge, and Internet access to learning opportunities across the globe. Many schools conduct periodic online formative assessments. Remediation for struggling students is provided with the help of instructional software. Teachers, administrators, and policy makers can analyze the integrated longitudinal data in the Kentucky Instructional Data System for decision making and for tailoring services to students' needs. Students can use their individual learning plans to plan for careers, in collaboration with their parents, teachers, guidance counselors, and others.

Access. In fiscal years 2007 and 2008, approximately 100,000 desktop and laptop computers were purchased, reducing the percentage of outdated school workstations from about 75 percent to 25 percent. Over the years, the Commonwealth has often been ranked in the top tier of states on measures of teacher and student access and use of technology. This accomplishment is all the more remarkable given the below-average use of technology in Kentucky homes. As a result of Kentucky's emphasis on equity, high-poverty districts have the same student-to-computer ratio as those in low-poverty districts, in contrast to poverty gaps found in other parts of the U.S.

Kentucky Education Technology System Master Plan. The master plan for KETS is extensive and detailed, and it incorporates input from all major stakeholders. The plan guides district expenditures, to place priority on the more pressing unmet needs.

Deployment. Many initiatives have deployed rapidly across the state. Some are ahead of schedule.

Operational Efficiency. The Office of Education Technology in the Kentucky Department of Education (KDE) has been praised for its operational efficiency. Hardware and software have been deployed, maintained, and supported with a relatively lean staff.

Areas Needing Improvement

Governance. A lack of strong governance and coordination across KDE's business units has led to suboptimal performance of projects, delays, cost overruns, data integrity issues, and security risks. KDE has taken measures to correct the problems, but more improvement is needed. KDE should review recommendations regarding governance and office structure in reports by Kentucky's Auditor of Public Accounts and a consultant to ensure appropriate oversight and authority.

Security. The state Auditor recommends that KDE appoint a centralized security officer with the authority to enforce security best practices. In addition, now that Kentucky has a longitudinal data system, new data retention and redaction rules must be developed. The department should review and implement the Auditor's and the consultant's recommendations regarding formalized and consistently applied security policies and practices that apply to all KDE data initiatives.

Evaluation of Impact of Technology Initiatives. Kentucky, like many states, does not conduct systematic, quantitative evaluations of initiatives' progress toward meeting their stated goals. KDE should provide critical program analysis of all technology initiatives to ensure that the programs achieve the desired objectives. Progress indicators, and the means to collect them, should be developed with the help of evaluation research experts so that valid and reliable indicators are collected with the least possible burden on educators.

Financial Data. Currently, annual financial report data are not available in sufficient detail to conduct detailed program analysis. KDE's announced efforts to modify the chart of accounts should include modification of the report so that when it is submitted to the state, lower-level data are reported to KDE.

Individual Learning Plans. While it is commendable that this initiative is ahead of schedule in terms of the percentage of students opening individual learning plan accounts, no information is available as to how the plans are used. KDE should provide support to schools to ensure that the learning plans are used to their full potential.

Virtual Learning Initiatives. The rapid growth in online learning opportunities, such as Kentucky Virtual High School and Kentucky Virtual Campus, has created a somewhat disjointed landscape, without much coordination between K-12 and postsecondary initiatives. Utilization of virtual learning should be examined in more depth to optimize efficiency and effectiveness. KDE and the Council on Postsecondary Education should provide critical program analysis of all virtual learning offerings to optimize the effectiveness and efficiency of learning opportunities for all students.

Chapter 1

Introduction

Background

This report examines the status of education technology initiatives in Kentucky.

This report examines the status of Kentucky's education technology initiatives which are funded primarily by the General Assembly and the federal government. In recent budgets, the General Assembly has appropriated millions of dollars for technology, including such initiatives as "intelligent classrooms," new computers, data systems, and high-speed online access to educational opportunities from any location. Additional state funds have been granted to districts within coal-producing counties as part of the state's efforts to assist these counties in diversifying their economies beyond coal production. The Kentucky Department of Education (KDE) has received federal funding to collect and integrate educational data and to make it accessible to educators, parents, and the public. KDE has also teamed up with other education stakeholders to jointly fund such initiatives as a P-20—preschool through graduate school—data warehouse.

Some new initiatives require the collection and storage of individual teacher and student data. As these programs are implemented across the state, education agencies must implement security policies and procedures to protect individual privacy. In addition, policies and procedures must ensure that data collected across programs and agencies are uniformly reliable and accurate.

For this study, the Office of Education Accountability (OEA) reviewed how state appropriations are being spent and how programs and initiatives are being implemented and utilized statewide. This report includes a review of the extent to which measures are being implemented to ensure the accuracy and security of the data collected. The primary focus of the report is kindergarten through grade 12, although it discusses some technology initiatives that also serve postsecondary education. This study is a broad review of Kentucky's education technology landscape rather than an in-depth study of specific initiatives.

Organization of This Report

The remainder of Chapter 1 defines "education technology" and summarizes its benefits. Chapter 2 presents an overview of Kentucky's education technology, including current initiatives and projects. Chapters 3, 4, and 5 focus on infrastructure, enterprise applications, and portals, respectively. Chapter 6 presents conclusions and recommendations.

The remainder of Chapter 1 discusses how technology is defined and how it benefits education, according to the available research and expert opinion.

Chapter 2 presents an overview of Kentucky's education technology origins, goals, statutes, regulations, funding, and governance. Security and technical literacy are discussed.

Chapter 3 details infrastructure and shared services. Special attention is devoted to security and privacy issues.

Chapter 4 examines enterprise applications that support instruction and operations at the state and district levels. These include the Municipal Information System (MUNIS), the Student Information System, individual learning plans, and similar initiatives.

Chapter 5 discusses portals that provide access to education resources. These include the longitudinal student database, online assessments, and virtual schools.

Chapter 6 presents conclusions and recommendations.

The appendices contain supporting materials, followed by KDE's response to the conclusions and recommendations in this report.

Defining Education Technology

"Education technology" is a broad term, encompassing more than computer hardware and software and more than teaching students about technology. It includes technology used for teaching any subject, as well as technology-related equipment, facilities, services, people, policies, and practices.

The term "education technology" is often equated simply with computers. However, the term encompasses far more, including software, peripherals, routers and servers, communications equipment, audiovisual equipment, and technology-enabling aspects of facilities. It also involves libraries and information services, security and privacy issues, user support, professional development and training, institutional knowledge, and the policies and practices for planning and managing technology (U.S. Dept. of Ed. Natl. Forum).

The National Academy of Engineering, a division of the National Academy of Sciences, stresses the importance of distinguishing between "education technology" and "technology education." Technology education is the process of helping students understand and use technology (teaching technology literacy). Education technology is the actual technology used for teaching all

subjects, as well as for finance, administration, compliance, and virtually every other activity that takes place in the education system.

Technology planning and management often focus disproportionately on hardware and software, while underestimating the impact of end users.

Technology planning and management often focus disproportionately on hardware and software, while underestimating the impact of people. End users, technicians, managers, purchasers, vendors, hackers, policy makers, and planners have enormous impact on costs and effectiveness. For example, sophisticated security systems can be sidestepped easily if human nature is not adequately considered (Hewlett-Packard).

Benefits of Education Technology

While technology can improve education administration and technical literacy, the benefits for reading and math achievement are less clear. Some initiatives are ineffective or counterproductive, while others appear to boost achievement and enrich the learning environment.

In private industry, information technology (IT) has been credited with sustained increases in productivity, innovation, flexibility, and responsiveness to customer needs (Brynjolfsson; U.S. Dept. of Labor). There is widespread agreement that IT can do the same for education administration, allowing more cost-effective and accurate collection, management, and use of data for decision making (U.S. Government; Data Quality. *Tapping*; Bergner).

Technology in schools is necessary for teaching technology literacy. However, the benefits of technology for reading and math achievement are less clear. States considered leaders in education technology are not necessarily leaders in terms of student achievement (Editorial. *Education Week's Technology Counts*). Some educational technology initiatives, such as laptops for students, have been ineffective or even counterproductive in some cases (Hu). Other specific initiatives, when used properly and carefully coordinated with other school reforms, appear to boost students' understanding of concepts and enrich the learning environment (U.S. Dept. of Ed. What Works. *Beginning*, *Elementary*, and *Middle*; U.S. Dept. of Ed. Office. Policy. *State* 9).

Technology should be directly aligned with content standards and should be used in conjunction with other methods to build higher-order thinking, problem-solving skills, and job skills.

The Center for Applied Research in Educational Technology makes the following recommendations to maximize the benefit of technology on learning.

- Use technology in conjunction with collaborative learning methods and technology planning for school improvement purposes.
- Choose technology applications that directly support content standards to be learned and assessed.

- Choose applications that build higher-order thinking and problem-solving skills in addition to applications for specific content areas.
- Teach students to use and apply applications that are used in the world of work, such as word processors, spreadsheets, computer-aided drawing, Web site development, and Internet browsing (Cradler).

Chapter 2

Overview of Education Technology in Kentucky

Origins, Goals, and Objectives

As a result of the Kentucky Education Reform Act, a major impetus for the Commonwealth's sustained leadership in education technology has been to ensure equity of access to educational resources.

Kentucky has long been at the forefront of efforts to harness the latest technologies for education (West). The Kentucky Education Reform Act of 1990 drove these efforts to new heights and continues to be a major catalyst. Technology was seen as key to ensuring equal access to such resources as courses, instructional materials, and planning tools.

A major dispute during initial planning for the Kentucky Education Technology System (KETS) was whether decisions should be made centrally or by each district. Ultimately, planners chose the latter. Over time, some standardization has occurred for better security, performance, and costs savings, but most decision making remains decentralized.

Initial planning for the Kentucky Education Technology System (KETS) was an arduous, contentious process requiring 18 months. A major dispute concerned whether KETS should have state or local control. Proponents for a central, statewide system designed to serve both instructional and administrative needs argued that it would encourage standardization and offer advantages in purchasing and servicing equipment. Decentralization proponents argued that local control was vital to successful reform in every aspect of the school system, including technology, and, therefore, local decision makers should have the flexibility and responsibility to tailor technology to their specific needs (West). Ultimately, planners opted for local control, with guidance by a master plan. Over time, more standardization across districts has been encouraged, for better security, performance, and cost savings. However, decision making about education technology remains decentralized.

A master plan guides the purchase, development, and use of technology in order to improve learning, teaching, curriculum delivery, professional development delivery, and administrative efficiency and productivity. In addition, planners hoped to encourage private industry to develop new applications for education.

The master plan, which will be discussed in more detail later in this chapter, guides the purchase, development, and use of technology to enable the meeting of the following goals:

- improve learning and teaching and the ability to meet individual students' needs to increase student achievement;
- improve curriculum delivery to help meet the needs for educational equity across the state;
- improve delivery of professional development;
- improve the efficiency and productivity of administrators; and
- encourage development by the private sector and acquisition by districts of technologies and applications appropriate for education (KRS 156.670(1)).

The master plan is intended to ensure a uniform and integrated system of standards and guidelines for financial accounting, reporting, and student information. The system should provide comprehensive, current, accurate, and accessible information.

The current master plan is intended to ensure a uniform and integrated system of standards and guidelines for financial accounting, reporting, and student information to be used by all school districts. Legislators anticipated that the resulting integrated technology-based communications system would provide comprehensive, current, accurate, and accessible information relating to management, finance, operations, instruction, and pupil programs (KRS 156.670(4)). These data, once certified by the education commissioner, are used in administering the Support Education Excellence in Kentucky (SEEK) funding formula (KRS 157.360(1)).

As technology enables more functions, KETS objectives change and expand. Four new areas of emphasis are anytime, anywhere, always-on, differentiated teaching and learning; capacity building and enhancement of staff and resources; data-driven decision making for teachers and administrators; and efficiency and governance.

As more instructional and administrative functions have become technology-enabled, the goals and objectives of KETS have changed and expanded. In order to keep pace with the needs of education technology users, development of the current 2007-2012 master plan was based on input from students, parents, teachers, administrators, business leaders, and policy makers. This input prompted the plan to identify four areas of emphasis:

- Anytime, anywhere, always-on, differentiated teaching and learning
- Capacity building and enhancement of staff and resources
- Data-driven decision making for teachers and administrators
- Efficiency and governance

Statutes and Regulations

A number of Kentucky statutes and administrative regulations relate to education technology. These are listed in Appendix A and will be discussed in more detail throughout the report, at points where they are relevant.

Funding

Spending for KETS was $620 million in Phase 1 (1992-2000) and $420 million in Phase 2 (2001-2006). The plan for Phase 3 calls for approximately $665 million.

Development of KETS has occurred in phases. Phase 1 (fiscal years 1992-2000), which involved the initial creation of KETS, was fully funded at $620 million.

Phase 2 (fiscal years 2001-2006) entailed spending approximately $420 million toward operations, maintenance, and incremental replacements. However, KDE estimated that this was $330 million less than the identified unmet need, requiring delays in some investments such as replacement of outdated workstations.

The budget for Phase 3 calls for approximately $133 million each year from FY 2007 to FY 2012, for a total of approximately $665 million (Commonwealth. Dept. of Ed. *2007-2012*).

Kentucky's education technology purchases are made with a complex web of funding sources, initiatives, and projects. In addition to federal, state, and local government funding, corporations and not-for-profit organizations provide some funds, in-kind donations, and discounts. KDE's Office of Education Technology and the School Facilities Construction Commission oversee much of the funding, but some funds are received and spent outside of these channels.

The more than $140 million spent for education technology in FY 2008 involved a complex web of funding sources, initiatives, and projects.

Based on best estimates, FY 2008 technology spending by or on behalf of districts totaled approximately $134.5 million. Adding KDE's technology-enabled projects, such as Support Excellent Education in Kentucky and the MUNIS financial system, brings the statewide total to at least $140 million. Out of every dollar spent in FY 2008, an estimated 64 cents came from state funds, 24 cents from federal sources, and 12 cents from local sources. However, this may be an underestimate, especially for local spending. Not included are funds that districts may choose to spend using nontechnology funding sources, such as SEEK funds, professional development funds for teacher technology training, textbook funds for instructional software, special education funds for assistive technology, local tax funds, other federal funds that are not technology specific, and proceeds from local fundraisers.

Technology spending fluctuates considerably; a new technology that requires a large initial investment can require lower maintenance levels in subsequent years.

Technology spending fluctuates from year to year; a new initiative can require a large initial investment but lower costs in subsequent years. Table 2.1 presents the approximate KETS budget for fiscal years 2005 through 2009. This table does not account for technology purchases made with the nontechnology sources mentioned above. In addition, it does not include KDE's costs for developing and maintaining the technology components of some KDE projects, such as individual learning plans and SEEK.

Table 2.1
Kentucky Education Technology System Expenditures by or on Behalf of Districts, FY 2005 to FY 2009

	FY Budget (in $ millions)				
	2005	2006	2007	2008	2009
State Shared Discounted Services	**12.5**	**10.8**	**12.8**	**11.8**	**12.9**
Instructional/administrative software maintenance licenses and telecommunications lines for school districts	6.5	4.0	4.0	2.1	1.9
Instructional systems operations and maintenance services that students, teachers, support staff or school district leadership directly access daily	4.0	5.2	5.7	6.4	7.7
Administrative systems operations and maintenance for teachers, support staff or school district leadership	3.1	1.3	1.4	1.4	1.4
KETS leadership, planning, management, research and evaluation	1.1	1.6	1.7	1.9	1.9
Minus federal e-Rate rebate	-2.2	-1.3	0.0	0.0	0.0
Additional Funds To Address Districts' Unmet Need	**7.1**	**12.9**	**14.7**	**22.0**	**18.5**
KETS trust fund offers of assistance to all districts, up to	2.0	7.4	6.7	7.7	6.6
Coal severance funds for additional offer of assistance for 59 districts			1.5	1.5	0.0
Coal severance funds for technology KISTA projects for 59 districts			1.0	1.0	0.0
Coal severance funds for grid computing for 59 districts			2.5	2.5	2.5
Federal e-Rate rebates on KETS shared services, up to	2.2	4.0	1.5	8.0	7.8
Increase to raise KETS baseline to $18.1 million, for additional offers of assistance	1.3				
Contingency funds	1.0	1.0	1.0	1.0	1.0
Interest gained on KETS trust fund and escrow account, which goes toward offers of assistance, approximately	0.6	0.5	0.5	0.3	0.6
Other Major Funds That Can Address Districts' Unmet Needs	**47.6**	**50.2**	**94.3**	**103.7**	**70.2**
Local district funds that equally match KETS offers of assistance, up to	7.4	11.9	11.2	15.8	12.2
Federal NCLB technology funds	8.3	8.3	3.5	3.5	3.7
Federal e-Rate funds that districts apply for & are sent directly to districts, approximately	20.0	20.0	20.0	20.0	20.0
E-Rate funds that state applied for in FY 2004 and were in KETS offers of assistance in FY 2005	1.9				
State school facility construction funds, approximately up to	10.0	10.0	10.0	15.0	15.0
General funds for high-speed KEN					15.3
State Bonds for workstation replacements, KEN, and Infinite Campus SIS			49.6	49.4	4.0
Grand Total Funds, approximately up to	**67.2**	**73.9**	**121.8**	**134.5**	**101.6**

Notes**:** This table does not include funds for developing and maintaining the technology components of some KDE projects, such as individual learning plans and the Supporting Excellent Education in Kentucky data system. Also not shown are some funds used for technology out of districts' SEEK funds, professional development funds for teacher technology training, textbook funds for instructional software, special education funds for assistive technology, local tax funds, other federal funds that are not technology specific, and local fund raisers. ILP=individual learning plan. KEN=Kentucky Education Network. KETS=Kentucky Education Technology System. KISTA=Kentucky Interlocal School Transportation Association. NCLB=No Child Left Behind. SIS=Student Information System.

Source: Commonwealth. Dept. of Ed. *Kentucky Education Technology*.

State and Local Funding Sources

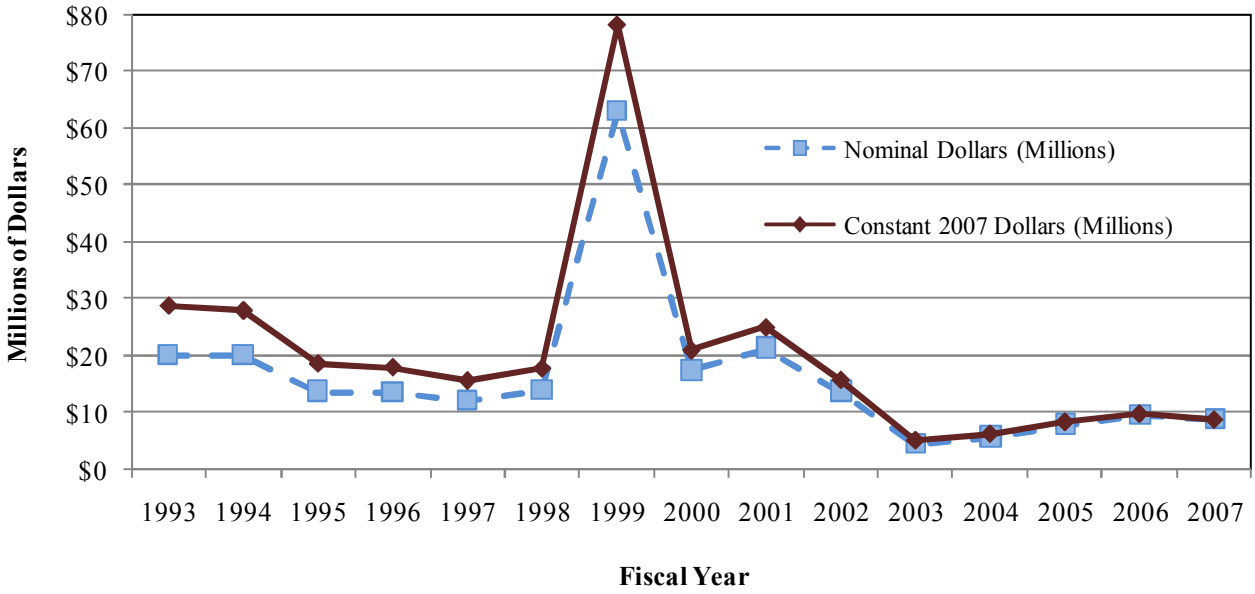
Most technology is purchased with offers of assistance from the Education Technology Trust Fund, which is funded by the General Assembly and managed by the Finance and Administration Cabinet. Districts must match offers of assistance dollar for dollar.

Education Technology Trust Fund. The Education Technology Trust Fund, established and funded by the General Assembly and managed by the Finance and Administration Cabinet, provides most of the technology funds that districts receive. Most technology is purchased with money from this fund, in concert with 1-to-1 district matching funds. Appropriations to this fund are made by the General Assembly through the Commonwealth's biennial budget process. Funds are distributed through KETS offers of assistance.

KETS Offers of Assistance. Funds from the Education Technology Trust Fund are distributed to districts by the School Facilities Construction Commission, through offers of assistance. School districts must match those offers dollar-for-dollar, but districts can escrow offers for up to 3 years if they lack matching funds at the time the offers are made. As a result of the escrow option, no district has ever turned down an offer of assistance (Tarvin).[1] As is evident in Figure 2.A, KETS offers of assistance have fluctuated, but the general trend has been a gradual decline, from $20 million in 1993 to $10 million in 2007. The exception is the substantial increase in 1999 from the Governor's surplus expenditure plan, which enabled the state to reach its infrastructure goals in Phase 1.

[1] Although no districts have turned down offers of assistance, occasionally a district does not have an unmet need and therefore does not receive an offer. The following districts did not receive offers of assistance for the years identified: Shelby County (1996, 1997, 1998, and 2000), Kentucky School for the Blind (1997, 1998, 1999, and 2000), Kentucky School for the Deaf (1997 and 2000), Wayne County (2000), Edmonson County (2000), and Letcher County (2002).

Figure 2.A
Trends in KETS Offers of Assistance: FY 1993 to FY 2007



Source: Staff compilation based on data from School Facilities Construction Commission.

In order to help coal-producing counties diversify their economies beyond coal production, the Kentucky General Assembly has set aside $5 million of coal severance funds for education technology each year since FY 2007. Many districts in coal-producing counties also qualify for interest-free loans

Additional Support for Coal Districts. In order to help coal-producing counties diversify their economies beyond coal production, the Kentucky General Assembly has set aside $5 million of coal severance funds for education technology each year since FY 2007. Half of this annual $5 million allocation was used for offers of assistance to districts in coal-producing counties, in addition to any KETS offers already received from the Education Technology Trust Fund. The other $2.5 million was used by the Kentucky Dataseam Initiative, Inc. to distribute new computers to districts in coal-producing counties, for use by schools and by researchers through grid computing; grid computing and Dataseam are discussed in more detail in Chapter 3. In addition to the new computers purchased with coal severance funds, Dataseam has also negotiated $350,000 in vendor discounts and fees for districts participating in grid computing (Gupton).

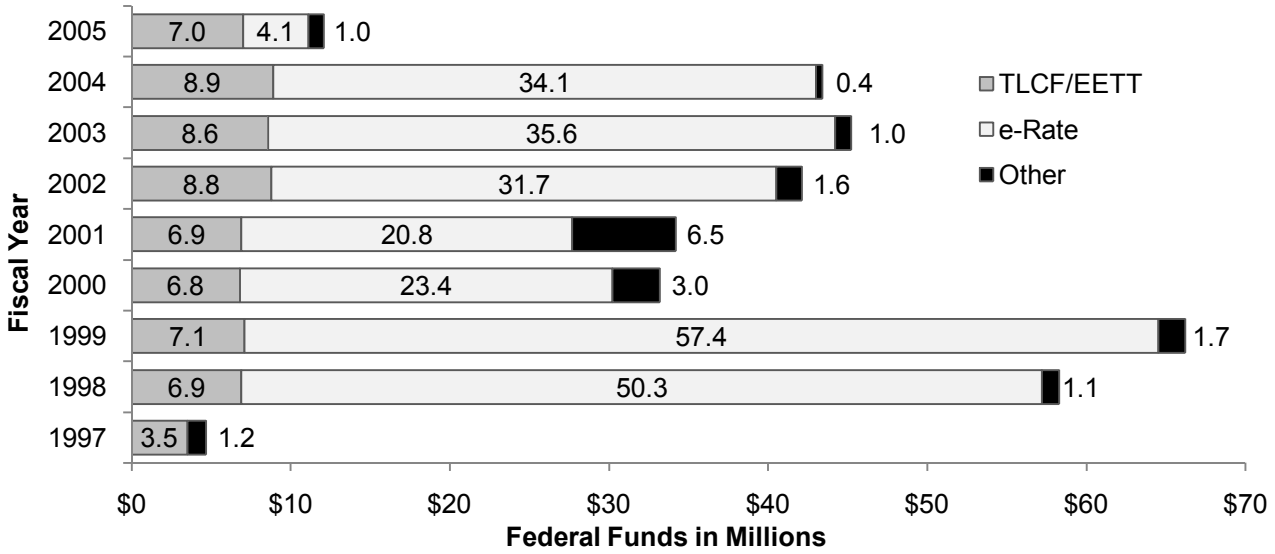
Many districts in coal-producing counties also qualify for interest-free loans from the Kentucky Interlocal School Transportation Association New Market Tax Credit Fund. This is discussed in more detail below.

Federal Funding Sources

Federal funding sources include the Enhancing Education Through Technology and e-Rate programs. Federal funds vary considerably from year to year.

In addition to state and local funds, there are a number of federal funding initiatives for technology. As Figure 2.B shows, most federal funds for technology in U.S. school systems were provided through the Enhancing Education Through Technology and e-Rate programs (U.S. Dept. of Ed. Office. Policy. *Federal* 3). Federal funds vary considerably from year to year.

Figure 2.B
Federal Funding, Kentucky, 1997-2005



Notes: EETT=Enhancing Education Through Technology program, Title II, Part D of the No Child Left Behind Act.
TLCF=Technology Literacy Challenge Fund, the predecessor of EETT.
Source: U.S. Dept. of Ed. Office. Policy. *State Strategies* 74.

The Enhancing Education Through Technology Program provides support for professional development, access to technology, the integration of technology into curricula, and the use of technology to involve parents and manage data for decision making.

Enhancing Education Through Technology Program. This No Child Left Behind Act program supports the use of technology in schools to improve student academic achievement. Funds may be used for high-quality professional development, access to technology and the Internet, the integration of technology into curricula, and the use of technology for involving parents and managing data for decision making. States distribute half the funds to school districts using a formula based on each district's share of funds under Title I, Part A, while the other half of the funds are distributed on a competitive basis. This program began in 2002, when it replaced the Technology Literacy Challenge Fund program (P.L. 107-110; U.S. Dept. of Ed. Office. Policy. *Federal* 3).

E-Rate provides discounts and rebates for telecommunications and Internet access for most schools and libraries in the United States.

E-Rate Program. This program, administered by the Universal Service Administrative Company under the direction of the Federal Communications Commission, provides discounts and rebates for telecommunications and Internet access for most schools and libraries in the United States. It is funded through a universal service fee charged to companies that provide interstate and/or international telecommunications services (Universal). KDE reports that up to $20 million of e-Rate funds have been available to individual Kentucky school districts each year from FY 2006 through FY 2008. In addition, varying amounts of e-Rate funds have been available to offset the costs of technology purchases shared across all districts (Commonwealth. Dept. of Ed. *Kentucky Education Technology*).

The Kentucky Interlocal School Transportation Association New Market Tax Credit Fund is a $25 million revolving loan fund that provides interest-free loans to low-income districts for the purchase of technology

Kentucky Interlocal School Transportation Association New Market Tax Credit Fund. This $25 million revolving loan fund program provides 7-year interest-free loans to low-income districts for the purchase of technology equipment, including projectors and other peripherals, whiteboards, servers, wiring, wireless hubs, and network upgrades. Purchases must meet the district's technology plan and be approved by the U.S. Department of Education. The startup funds were provided in 2005 from the U.S. Department of Treasury Community Development Financial Institutions Fund (Ross).

Competitively awarded grants through the Statewide Longitudinal Data System Grant Program help states develop and implement longitudinal data systems.

Statewide Longitudinal Data System Grant Program. This federal program provides competitive 3-year grants to help state education agencies to develop and implement longitudinal data systems. These systems, containing student data and other information, help states, districts, schools, and teachers make data-driven decisions to improve student learning, as well as facilitate research to increase student achievement and close achievement gaps (U.S. Dept. of Ed. *Statewide*). In late 2005, Kentucky was among the first 14 states to be awarded a grant to create KIDS, the Kentucky Instructional Data System (Commonwealth. Dept. of Ed. *Kentucky Wins*; Hackworth). KIDS and the $5.78 million that has supported its development are discussed in more detail in Chapter 5.

Other Sources

Some support is available through private foundations, such as the Bill and Melinda Gates Foundation; and corporations, such as AT&T, Microsoft, and Lexmark. Two similarly named programs—the Computers 4 Kids Networks and Computers For

Kids—refurbish donated computers for children to use in their homes and community centers.

Some support is available through private foundations and corporations. Some programs refurbish donated computers for children to use in their homes and community centers.

Private Foundations and Companies. Grants are sometimes provided by private companies and not-for-profit organizations. For example, in 2003, a $1 million grant from the Gates Foundation paid for hand-held personal data assistants and related professional development. This initiative, now called eWalk, is discussed in more detail in Chapter 4.

Computers 4 Kids Network. Started in 1999 by a 13-year-old Laurel County student, this program is now a statewide network of small programs run by Student Technology Leadership Program clubs. Each school's club takes the initiative to collect unwanted computers from businesses in the area and then refurbishes and prepares the computers for students to use in their homes (Commonwealth. Dept. of Ed. Computers; Scoville).

ConnectKentucky's Computers For Kids (formerly No Child Left Offline). In 2005, inspired by the Computers 4 Kids program and similar programs, Governor Ernie Fletcher established a statewide program called No Child Left Offline, which was affiliated with ConnectedNation. The name was later changed to Computers For Kids. This program donates computers not only to low-income families but also to community centers where many children can use them with the help of volunteers and community center workers. In addition, computers were donated for the dormitories of the Kentucky School for the Blind and Kentucky School for the Deaf. According to ConnectKentucky, the program has received donations valued at $2.5 million, mostly in the form of in-kind contributions. As of November 2008, it had provided more than 2,500 computers. In addition to donated computers, the program receives printers from Lexmark and software from Microsoft and eTrust. AT&T donated $150,000 in 2007 and $75,000 in 2008 (American; AT&T).

Education Technology Governance

Overview

The 5-year KETS master plan is the core of Kentucky's education technology planning.

The core of Kentucky's education technology planning and standard setting is a 5-year KETS master plan, which is updated by the Office of Education Technology and approved by the Kentucky Board of Education. District technology plans are aligned with the master plan and approved by the board, and ensure that funds are

spent on priority unmet needs. However, within these formal guidelines, districts have considerable flexibility in choosing the types of initiatives to pursue.

The Office of Education Technology (OET) supports infrastructure and services that are shared systemwide. However, OET's involvement in technologies specific to a particular business unit depends on the degree to which each unit and OET choose to work together. As a consequence, standards, policies, and practices are inconsistent. Several committees have been put in place over time in an attempt to improve oversight and coordination across KDE business units.

At the state level, KDE's Office of Education Technology (OET) supports basic infrastructure and services that are shared across all business units. As for technology-enabled projects specific to particular business units, OET's involvement varies widely depending on the degree to which each unit and OET choose to work together. As a consequence, standards, policies, and practices are not consistent across KDE. The governance of technology within business units is decentralized; each unit has its own technology staff and sets its own directions and standards. While decentralization offers advantages, the lack of coordination across business units has sometimes caused security risks, inefficiencies, and failed or suboptimal performance of projects. In response, several KDE-wide committees have been put in place over time to improve oversight and coordination across KDE business units. This issue will be discussed in more detail later in this chapter.

Kentucky Education Technology System Master Plan

By statute, the master plan guides all aspects of education technology, including software and hardware, video and computer systems, satellite, microwave, cable, fiber optics, preparation of school buildings for technology readiness, and staff development.

KRS 156.670 requires that a comprehensive 5-year master plan guide all aspects of education technology for instruction and administration, including software and hardware, video and computer systems, satellite, microwave, cable, fiber optics, preparation of school buildings for technology readiness, and the development of staff to implement the plan. The current 2007-2012 master plan is Kentucky's third.[2]

The Kentucky Board of Education has the obligation and authority to establish standards for administrative systems at the district and school level, including, but not limited to, uniform codes, processes, and software systems. The board may specify, as it deems necessary, a standard for any line item in the master plan budget.

Districts must procure only those technologies that meet KETS standards, regardless of the source of funds.

The statutes do not restrict the Kentucky Board of Education's standards-setting responsibilities to technology acquired with state

[2]The first master plan was created by the Council for Education Technology and approved by the Legislative Research Commission and the Kentucky Board of Education. The council was subsequently dissolved. Statutes establishing the council were repealed in 1992 (KRS 156.665) and 2006 (KRS 156.666). However, conforming amendments were not made to KRS 156.160, 157.615, 157.655, and 157.670, in which the defunct council is still mentioned. Since the 1992 Master Plan, updated master plans have been issued for fiscal years 1998-2000, 2001-2006, and 2007-2012.

funds; districts are required to procure only those technologies that meet KETS standards, if a standard for that category has been established, regardless of source of funds (701 KAR 5:110). Standards are laid out in the master plan and incorporated by reference into Kentucky Administrative Regulations pursuant to 701 KAR 5:110 and in compliance with KRS 156.160(1).

Kentucky Board of Education

Technology is specifically mentioned in the Kentucky Board of Education's strategic plan in order to provide a strong and supportive environment

KRS 156.029 charges the Kentucky Board of Education with developing and adopting policies and administrative regulations by which KDE is governed in planning, coordinating, administering, supervising, operating, and evaluating educational programs, services, and activities. The board approves the master plan and the technology plans of individual districts. The board's strategic plan includes a goal to:

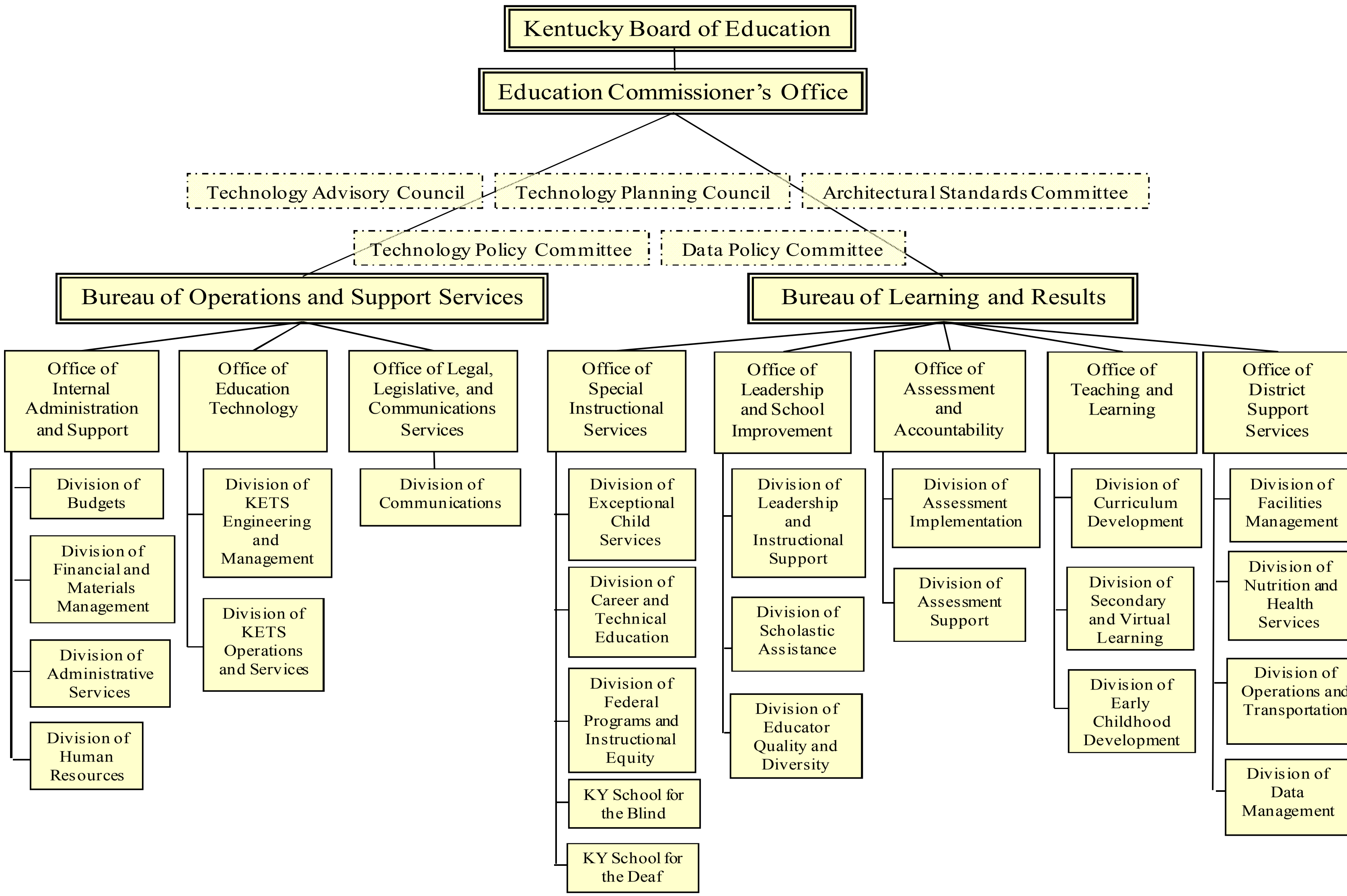
> Ensure that Kentucky remains in the forefront of providing students and teachers access to anytime, anywhere, always-on differentiated teaching and learning through funding of the Kentucky Instructional Data System (KIDS)/Knowledge Management Portal, Kentucky Education Network (KEN), the Kentucky Virtual High School, the individual learning plan, EncycloMedia and the systems necessary to collect reporting data (the Student Information System (SIS) (Commonwealth. Dept. of Ed. *Strategic* i).

Kentucky Department of Education

There is no formal agency-wide authority over the technology used by the more than 30 business units within the Kentucky Department of Education.

The Kentucky Department of Education (KDE) is an agency within Kentucky's Education and Workforce Development Cabinet. KDE is divided into two bureaus, which are further divided into offices and divisions, for a total of more than 30 business units. As Figure 2.C shows, there is no formal departmental-wide IT structure with authority over technology. The Office of Education Technology is just one of eight offices; it provides basic support and recommendations to other offices, but these other offices are free to decide whether or not to act on these recommendations. The boxes with dashed outlines in Figure 2.C represent committees that KDE has added in an attempt to coordinate among offices and impose department-wide standards. The committees and the need for KDE-wide IT governance will be discussed in more detail later in this chapter.

Figure 2.C
Kentucky Department of Education Organizational Chart, 2008



Source: Staff compilation using information from Kentucky Department of Education.

KDE's Office of Education Technology monitors districts' technology purchases and provides the infrastructure and services that are shared across the education system. OET's performance of these duties has been commended for its efficiency. However, OET's involvement in technology specific to particular business units varies, depending on the degree to which the unit and OET choose to work together.

Office of Education Technology. OET provides a variety of services to approximately 700,000 users within KDE, districts, and schools. Services include planning technology policies and budgets; purchasing hardware, software, and services on behalf of districts; performing quality assurance; acting as liaison with the Commonwealth Office of Technology; and operating and maintaining basic infrastructure and services shared across Kentucky's education system, such as e-mail.

As mentioned earlier, OET's involvement in projects specific to particular business units varies widely depending on the degree to which each unit and OET choose to work together. As a consequence, standards, policies, and practices are not consistent across KDE.

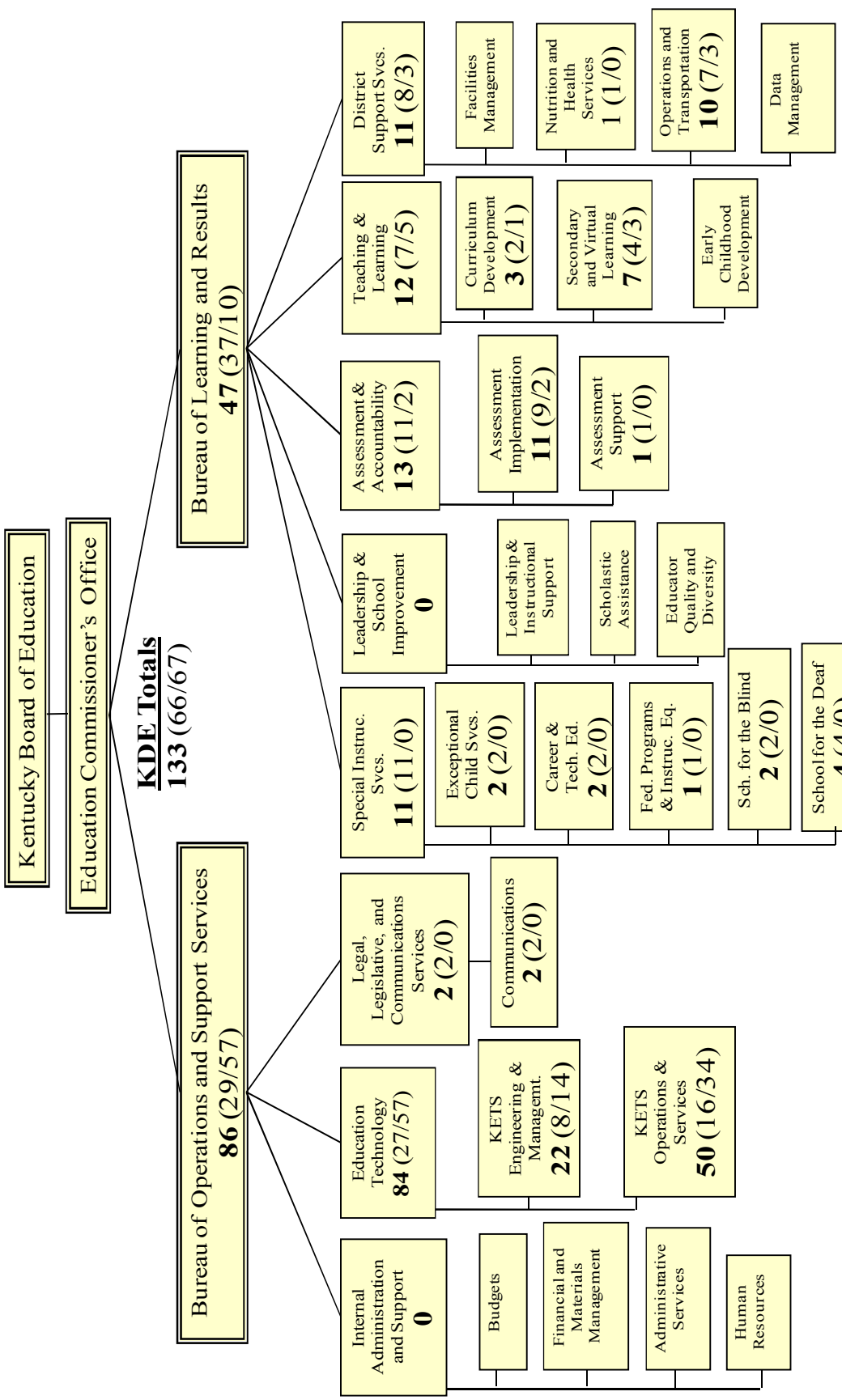
A 2004 study by Gartner, Inc. concluded that OET had fewer staff than would be advisable for the number of users and systems it supports. Gartner commended OET's operational efficiency, noting that its relatively small staff handled a large workload. However, some services must be outsourced. While OET may assist districts with all statewide applications, outside vendors provide the bulk of the support for the individual learning plan and Student Information System.

Several KDE business units are responsible for projects that have information technology (IT) components. Each unit has its own technology staff, policies, and standards. OET may make recommendations, but business units are not required to comply.

Other KDE Offices. Several of KDE's business units are responsible for projects that have IT components, such as SEEK, the Student Information System, the individual learning plan, and the online assessment. For such projects, units each have their own technology staff. These decentralized staff members have no relationship to OET, not even for professional development or for the dissemination and compliance with standards. OET may make recommendations, but business units are not required to comply.

Figure 2.D shows the number of technology staff in each KDE office and division. In the Office of District Support Services, technology employees are involved in such projects as SEEK and the new Student Information System. Technology employees in the Office of Assessment and Accountability manage assessment data and the online assessment. Kentucky Virtual High School uses technology staff in the Office of Teaching and Learning. Assistive technologies are the purview of the Office of Special Instructional Services. The total staff count for an office exceeds the sum of counts for lower divisions if some employees are at the division level only. For example, OET has 10 field services personnel who are neither part of the KETS Engineering and Management nor the KETS Operations and Services Division.

Figure 2.D
Numbers of KDE Technology Staff (Employees/Contractors), November 24, 2008



Note: The total staff count for an office exceeds the sum of counts for lower divisions when some employees are at the division level only. For example, the Office of Education Technology has ten KETS Field Services personnel who are neither part of KETS Engineering & Management nor KETS Operations & Services Division.

It should be noted that some KDE representatives believe this figure might undercount technology staff; it is based on certain job titles, which do not always accurately reflect actual job duties.

KDE has gradually put into place several committees intended to coordinate technology and data across its business units.

IT Committee Structure. KDE has gradually put into place several committees intended to coordinate technology and data across KDE business units. These are described below.

- The Technology Planning Council meets monthly as part of the agenda of the KDE Planning Committee. The purpose is to prioritize and manage KDE investment in IT projects (those costing $100,000 or more) and to manage the relationships and interactions among IT projects. Members are the commissioner, deputy commissioners, the associate commissioner of education technology (also called KDE's chief information officer), associate commissioners of program areas, the director of KETS Operations and Services within OET, and the director of KETS Engineering and Management within OET (Commonwealth. Dept. of Ed. *Technology Planning*).
- Detailed work on specific issues is performed by two subcommittees. The Technology Policy Committee is responsible for determining policies, procedures, products, and standards related to all operations of and access to information technology systems used by KDE. The Data Policy Committee is responsible for determining policies, procedures, definitions, and standards related to all data collected or used by KDE.
- The Architectural Standards Committee gives representatives of local districts throughout the Commonwealth an opportunity to provide guidance, input, and recommendations in the overall process of standards adoption. Standardization of IT components and services within and across KETS is intended to make support available across all districts; drive down product costs where appropriate; and simplify complex problems by identifying specific products, services, or processes known to produce the best results for Kentucky's education system. There are also separate Commonwealth Office of Technology standards in place to support the state technology vision (Commonwealth. Dept. of Ed. *Architectural*).
- The Technology Advisory Council was formed in July 2004. This council meets quarterly to provide input on education technology issues and projects being considered by KDE. The council represents different geographic areas of the state and includes membership from county and independent as well as urban and rural school districts. The group consists of technology users such as superintendents, finance officers,

assessment coordinators, instructional supervisors, teachers, directors of pupil personnel, technology resource teachers, library media specialists as well as chief information officers/district technology coordinators (Commonwealth. Dept. of Education. *Technology Planning*).

Districts

Each district must have an approved technology plan and must limit its procurements to satisfying specified unmet needs. Unmet needs are determined by comparing what each district has to what the master plan says is needed.

Each district is required to have a Kentucky Board of Education-approved technology plan that details its unmet technology needs. The district's unmet need is determined by comparing the district's current capabilities to those deemed necessary in the state board-approved master plan. Any capabilities that fall short are considered an unmet need. The district must limit its procurements to those that satisfy unmet needs identified in the plan until all needs have been met (KRS 156.660; 701 KAR 5:110).

Most districts have a district technology coordinator or chief information officer or both to manage the district's technology. Districts also need three other types of staff:

- Desktop Support staff provide assistance for workstations, including performing ongoing maintenance and providing break/fix support. They are also responsible for installing and upgrading software.
- Local Area Network staff support the local area network and other network operations that facilitate e-mail, Internet access, and use of printers and other peripherals.
- Help Desk staff provide first-level support for hardware and software. The number of each type of staff is a function of the number of personal computers or other connected devices and the number of help desk calls. Formulas for determining the need for district support staff are shown in Appendix B.

Districts have only about 30 percent of the technology staff they need.

The above personnel are what each district needs but not necessarily what it has. A 2004 study by Gartner, Inc. found districts to be significantly shorthanded, with only about 30 percent of the IT staff needed. Some 4 years after that study, this problem still exists, according to KDE.

Administration of the Education Technology Trust Fund

The Education Technology Trust Fund is funded by General Assembly appropriations. Offers of assistance are based on district information maintained by OET and are distributed by the School Facilities Construction Commission.

The Education Technology Trust Fund is housed within the Finance and Administration Cabinet. The General Assembly determines appropriations for this fund in each biennial budget. The School Facilities Construction Commission, within the Finance and Administration Cabinet, is responsible for distributing funds to local districts.

To receive funds, a district must have an unmet education technology need approved by the Kentucky Board of Education, meet certain other statutory requirements, and verify its schools' average daily attendance (Commonwealth. Dept. of Ed. *2007-2012*). The unmet need is determined by what it takes to minimally operate, maintain, and upgrade existing technology while acquiring new technology. OET uses two reports completed annually by districts to help monitor progress made toward meeting their unmet needs. The first report is the Technology Activity Report, which is generated from MUNIS to capture all technology purchased by the district. The second report is the Technology Readiness Survey, which provides a snapshot of the district's technology infrastructures, including not only the number of devices but also the percent of modern devices. The latter report captures all computers regardless of funding source and would include computers donated for Kentucky's Dataseam Initiative. In its annual determinations of unmet needs, OET rarely encounters districts with no unmet needs. Therefore, districts almost always receive offers of assistance.

Each eligible district receives a base level of assistance that is determined by dividing the total available funds by the total average daily attendance of A1 schools in those districts.[3] Additional expenditures from the fund require Kentucky Board of Education approval (KRS 157.655 and 157.660).

Linkages to Postsecondary Education Data

Efforts to link postsecondary and K-12 data have been made through the Kentucky Education Network (KEN), the P-16 Council, and the Kentucky Instructional Data System.

Efforts to link postsecondary and K-12 education data have been undertaken for several years, through the Kentucky Education Network, the P-16 Council, and, more recently, the Kentucky Instructional Data System. Committees bring together representatives of KDE, the Council on Postsecondary Education,

[3] An A1 school is under administrative control of a principal or head teacher and is eligible to establish a school-based decision-making council. A1 schools do not include preschools, alternative schools, vocational-technical, or special education schools.

the Education Professional Standards Board, and other education groups.

Integration of Data

The statute that established the KETS Master Plan called for a uniform and integrated system of standards and guidelines for financial accounting and reporting.

KRS 156.670(3) states that the master plan shall "establish and implement a uniform and integrated system of standards and guidelines for financial accounting and reporting which shall be used by all school districts." Thus, a key goal of the first master plan was to bring together the plethora of instructional and administrative systems (Commonwealth. Council for Education Technology 13, 37).

Some 18 years after the Kentucky Education Reform Act, attempts are still being made to integrate data. The Kentucky Instructional Data Systems initiative is making progress in its goal to bring together student information with financial, instructional, and assessment data in a central point of access. Data from the preschool through postsecondary levels will be linked in a P-20 data warehouse.

Data integration can be expensive and difficult, but it offers numerous benefits.

Data integration can be expensive and difficult, but it offers many benefits.

- Cleaner data processes and changes
- More analytical capabilities, using multiple sources
- Simplified reporting
- Less burden on school and district staff
- Lower costs due to less duplication of technology and labor
- More accessible information for educators and the public
- Ability to track student and cohort success over time
- Clearer communication of goals and accomplishments leading to a better understanding of outcomes
- Ability to gauge the impact of programs over time (Commonwealth. Dept. of Ed. *KIDS At a Glance*).

Systems for P-16 or P-20can answer questions like those listed below, at the state, district, and school levels and for different types of students (Data Quality. *P-20* 1).

- What percentage of high school graduates enters college within 15 months of graduation?
- How is student success in college related to high school courses, grades, and test scores?
- What factors help students make successful transitions such as enrolling in college, transferring from 2-year to 4-year colleges, and entering the workforce?

Governance Issues

Projects that are specific to particular KDE business units have their own IT staff, and each unit sets its own directions and standards. Such decentralization has unique advantages and disadvantages compared to centralization.

Projects that are specific to particular KDE business units each have their own technology staff, and each unit sets its own directions and standards. This decentralized arrangement is in stark contrast to a centralized model in which units would draw IT staff from a central pool and abide by standards and procedures in the master plan. Centralization and decentralization have advantages and disadvantages.

Centralization Pros and Cons

A key advantage of a highly centralized organization is that technical staff may be concentrated in a central pool, thus offering more opportunities to manage individual workloads, match the best person to each task, provide professional development and mentoring, and share and implement best practices. Business units must adhere to organization-wide standards and policies, which often leads to considerable cost savings and better implementation of best practices.

The primary disadvantage of too much centralization is the lack of flexibility to meet unique needs and goals. In reality, technology personnel need time to understand the specifics of a particular project and learn how to work with a particular team. Too much standardization may put in place technology and policies that are tolerable for everyone but not sufficient for anyone.

Decentralization Pros and Cons

On the other hand, decentralized information technology personnel, dedicated to one project or unit, are seen as more knowledgeable about the specific goals and needs of the unit and more responsive to requests. Giving units the flexibility to choose their own technology and set and enforce their own policies should, in theory, lead to the best solutions for their needs.

However, decentralized IT staff can tend to become isolated, with few opportunities to stay up to date with technology changes and with no peers or mentors to help solve difficult technical problems. Units may not have the expertise to choose the right technology and develop the right policies for their own needs. Moreover, they may lack the “big picture” perspective needed to choose technologies that are compatible with other systems. For the organization, too little coordination across business units can lead

to security risks, inefficiencies, and failed or suboptimal performance of projects.

Finding the Optimum Place on the Centralization Continuum

Successful organizations find a workable balance between the extremes of centralization and decentralization. The most important standards and policies are mandated for all units, while less important standards and policies remain flexible. A central security officer enforces security. Decentralized IT staff have "dotted line" reporting relationships to IT managers, who monitor adherence to best practices and provide training.

To be successful, all organizations strive to locate the best point on the continuum between these centralization and decentralization. Many organizations go through repeated pendulum swings over time, decentralizing and then recentralizing. Eventually, successful organizations find a workable balance between these extremes. Best practice standards and policies that are most vital to security, effectiveness, and efficiency are mandated for all units, while less vital standards and policies remain flexible. A central security officer enforces security best practices throughout the organization. In addition, decentralized IT employees have "dotted line" reporting relationships to IT managers, who monitor their adherence to best practices, and provide mentoring and professional development. [4]

KDE has not found the right balance between the extremes of centralization and decentralization. Its extreme decentralization has led to suboptimal performance of projects, delays, cost overruns, data integrity issues, and security risks. KDE has taken measures to correct the problems, but more improvement is needed.

KDE has not found the optimal balance, according to several sources, including the Kentucky Auditor of Public Accounts and consultants Gartner, Inc. and Claraview. KDE's extreme decentralization is characteristic of only 5 percent of organizations, according to a 2004 study by Gartner, Inc. A lack of strong governance and coordination across KDE's business units has led to suboptimal performance of projects, delays, cost overruns, data integrity issues, and security risks. KDE has taken measures to correct the problems, but more improvement is needed.

In 2004, the Kentucky Board of Education contracted with Gartner, Inc. to evaluate KDE's technology and IT governance. The study results indicated that, due to ineffective IT governance, KDE business units were not held accountable for projects that involved IT. The consultant established an effectiveness scale with 18 being the highest score. After reviewing the IT governance in place at KDE, Gartner gave KDE a score of 6.

[4] Organizational charts often show dotted lines between certain managers and employees indicating that the manager oversees the employees indirectly rather than on a day-to-day basis. For example, a technology employee may report directly to the manager of a business unit but receive mentoring and assistance from the manager of the IT unit.

In 2004, the consultant Gartner, Inc. recommended that KDE establish IT business and technical committees to strengthen coordination and accountability, as well as subcommittees and task forces to focus on specific technology issues. Some recommendations had still not been implemented by KDE in fall 2008. However, new senior leadership at KDE had begun to act on more recommendations in late 2008 and early 2009.

Gartner recommended that KDE strengthen the coordination and accountability of its technology-related activities by establishing an IT business committee and an IT technical committee. Within those two main committees, subcommittees and task forces would focus on specific technology issues. Gartner also recommended that OET improve its credibility with business units by transforming itself from a simple technology provider to a provider of IT-enabled business solutions.

In response to the Gartner report, KDE implemented some recommendations immediately. This included the formation of an IT business committee in the form of the Technology Planning Council. Other major recommendations had not been acted on and remained issues in the fall of 2008. However, in late 2008 and early 2009, new leadership at KDE established the remaining recommended committees and was pursuing other measures to improve the situation.

Kentucky Auditor of Public Accounts Reports

A 2007 information technology audit by Kentucky's Auditor of Public Accounts found 12 significant IT deficiencies, many stemming from a lack of KDE-wide enforcement of standards and best practices. In October 2008, these issues had still not been resolved.

Three years after the Gartner report, a 2007 IT audit by Kentucky's Auditor of Public Accounts found 12 significant IT deficiencies, many stemming from a lack of KDE-wide enforcement of standards and best practices. The Auditor found that

> no governance model or oversight authority has yet been established to ensure adequate IT control policies and procedures are implemented to secure IT resources of the various KDE Business Units (Commonwealth. Auditor).

Each unit was responsible for establishing and adhering to its own policies and procedures. As a result, the Auditor noted a lack of any basic formal IT security control policies. The Auditor strongly urged the establishment of comprehensive, centralized governance, with one centralized security officer or one group in charge of maintenance, security, legal, and appropriate use of IT resources (Commonwealth. Auditor).

In October 2008, OEA staff met with KDE staff responsible for various IT initiatives. KDE staff admitted that the 2007 issues identified by the state Auditor were still not resolved.

Impact of Weak Governance

KDE's IT governance issues have impeded and driven up the costs of projects. Decentralized decision makers lack the expertise to plan and budget effectively, and turf wars impede progress.

KDE's IT governance issues have impeded and driven up the costs of projects. Decentralized decision makers often consider only initial costs of a system because they lack the expertise to estimate the ongoing total cost of ownership. As a result, funds are sufficient to start an initiative but not to complete and maintain it. For example, a data warehousing initiative called The MAX Enterprise Data System, costing approximately $7 million, was eventually abandoned before it was ever completed (Commonwealth. Dept. of Ed. *Comprehensive* 1). The Kentucky Instructional Data System has made considerably more progress toward creating a comprehensive education data source than MAX did. However, KIDS has encountered many delays due to the lack of coordination and cooperation among business units responsible for data (Claraview).

Integrating postsecondary and K-12 data will add layers of complexity, requiring KDE's collaboration with other agencies within Kentucky's Education and Workforce Cabinet, the Council on Postsecondary Education, and universities.

Hidden Costs of Decentralization and Flexibility

A central tenet of Kentucky's education reform has been to hold schools and districts accountable for achievement goals, while giving them maximum flexibility as to how to meet those goals. The desire for flexibility must be balanced with its consequences in terms of higher costs and less interoperability among systems.

A central tenet of education reform in Kentucky has been to drive decision making down to the local level, holding schools and districts accountable for achieving specific goals, while giving them maximum flexibility to decide how best to meet those goals within their unique situations. This principle of decentralized decision making carried over into the design of Kentucky's education technology system throughout the Commonwealth. However, in recent years, OET has guided districts toward using some standardized hardware and software, for better costs savings, technical support, and interoperability among systems.

The desire for flexibility must be balanced with its consequences, in terms of higher costs and less interoperability among systems. One illustration of this comes from a 2006 study of the feasibility of making all of Kentucky's school-, district-, and state-level systems work together. Gartner found that the least expensive approach, at an estimated $6.1 million, would require considerable compromise among districts, with all using the same standardized hardware, software, and policies for most operations. At the opposite end of the spectrum, allowing each district complete flexibility would cost an estimated $79.1 million because of the inability to share applications and leverage investments across

districts (Gartner. *HB341* 5-6). The implications of the feasibility study are applicable to many other KDE initiatives.

Need for Evaluation

Gartner reported that KDE needed better evaluation of IT projects. The tracking of expenditures, as well as the value that projects delivered, was informal and inconsistent.

Another area in which Gartner found a need for improvement was the evaluation of IT projects. The consultants found informal and inconsistent methods of tracking project expenditures and the value those projects delivered.

Security, Privacy, and Acceptable Use

Security measures protect individual privacy and data, and they shield students from exposure to inappropriate content and online predators. Student records are subject to provisions of the Family Educational Rights and Privacy Act.

Security measures protect the privacy of individuals and the integrity of data and systems. In addition, schools, districts, and KDE have unique responsibilities to shield students from exposure to inappropriate content and online predators. They are also subject to provisions of the Family Educational Rights and Privacy Act, a federal law that protects student privacy and gives parents and the student certain rights with respect to the student's records.

Education information systems may seem an unlikely target for hacking because they appear to offer less monetary potential than corporate systems. Hackers act out of other motivations besides monetary reward, especially in educational settings. In addition, security breaches often occur inadvertently, due to human error.

Security should be a key consideration in all decisions and should be seen as everyone's responsibility.

Security should not be seen as simply the job of technology staff. It should be a key consideration in all decisions and should be seen as the responsibility of everyone who uses education technology.

Best Practices in Place

Security best practices currently in place for KETS include multiple layers of security, private Internet Protocol addresses that access the Internet through a proxy network, protection from viruses and junk mail, distribution of an acceptable-use policy, and promotion of good digital citizenship.

According to OET, KETS has instituted a number of best practices. Several examples are discussed below.

Multiple Layers of Security. Security is based on multiple layers, including two layers of firewalls. The first firewall wards off intrusions from the Internet. The second firewall, installed in each district, offers even more stringent protection.

Private Network. Security is most successful when it goes beyond warding off intrusions and makes systems invisible from would-be intruders. Therefore, a private Internet Protocol network was put in place in 2000. Only certain aspects, such as Web sites, are allowed

to be visible to the Internet. According to OET, the system is kept up to date, with all security patches installed promptly.

Proxy Network. Another protection is a proxy network, through which students and teachers pass instead of accessing the Internet directly. This allows the management of not only incoming traffic but also of outgoing traffic, which blocks access to certain Web sites and monitors the use of others. Individual districts have the option of managing their own content. Most districts depend on shared services managed by OET because they lack the needed staff to manage their own content. A study by Gartner found that districts have only about 30 percent of the needed IT staff (*IT Assessment*).

Antivirus Protection. Workstations and servers have virus protection, which is updated daily by an automated delivery system. This system also installs patches, which are tested on a few computers before being installed systemwide.

Junk Mail Protection. This manages incoming e-mail and can also manage outgoing e-mail to screen out SPAM.

Appropriate Use Policy. An Appropriate Use Policy is distributed to all students, teachers, and other employees.

Active Promotion of Digital Citizenship. Digital citizenship is a concept that promotes the proper use of technology in schools. Using information provided by the International Society for Technology in Education, OET actively promotes elements of digital citizenship such as computer etiquette, proper communication, e-commerce, rights, and security.

KETS Security Weaknesses

Some KDE business units, districts, and schools lack strong password policies, written procedures for responding to security breaches, disaster recovery plans, or modern data retention and redaction rules.

Although best practices are prevalent throughout much of KETS, security weaknesses have been found in particular KDE business units, schools, and districts. For example, students gained unauthorized access to the Student Information System when they found a teacher's password written on a note on the teacher's desk. No written procedures were in place for responding to this security breach.

Need for Strong Passwords That Are Changed Regularly. Although OET recommends that all users choose strong passwords and change their passwords regularly, such best practices are not mandatory. The current KETS network comprises 177 active

directory domains, including one for each school district, the Kentucky School for the Blind, the Kentucky School for the Deaf, and KDE. Password policies are set at the domain level. KDE has a domain-level password policy that is enforced within KDE, and local districts have the responsibility for determining and enforcing the appropriate password policies for their users.

Need for Written Procedures for Responding to Security Breaches. Security breaches can allow considerable damage in a short period of time. For this reason, organizations must be ready to act immediately and effectively, based on written procedures established before any breach occurs. OET has offered written procedures to all business units, but units have the option of creating their own instead of using those offered by OET. When students gained unauthorized access to the Student Information System, the KDE division responsible for the system had neither adopted OET's procedures nor written its own.

Need for Disaster Recovery Plans. Annual audits by the state Auditor found inadequate disaster recovery plans. One response to this deficiency was KDE's deployment of a new backup system for disaster recovery. However, this is only a partial solution; the backup system does not extend to many systems, including the ILP, SIS, and KIDS. These systems have their own unique backup systems. Initiatives to enhance security are discussed further in Chapter 3.

Need for Modernized Data Retention and Redaction Rules. Another concern that arose in discussions with KDE personnel is the need for new data retention and redaction rules. Existing rules that school records be kept for no more than 5 years conflict with the need to accumulate longitudinal data for better decision making (Commonwealth. Dept. for Libraries). Florida's longitudinal data system has data reaching back 30 years. Also needed are rules for redacting certain data in reports so that users cannot infer the identity of individual students from the information reported.

Technical Literacy

Kentucky requires technology training for teachers and provides technology standards for students but assesses the technical knowledge and skills of neither teachers nor students.

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Kentucky requires technology training for teachers and provides technology standards for students but assesses the technical knowledge and skills of neither teachers nor students (Editorial. *Education Week's Technology Counts*). Provisions for student technical literacy are discussed below, while teacher professional development is discussed in Chapter 4.

Program of Studies for Technology

Kentucky's Program of Studies for Technology sets out what students should know and be able to do with respect to technology. However, only one general question about technology is included in the Core Content for Assessment.

Kentucky's Program of Studies for Technology is aligned with the following national standards:

- International Society for Technology in Education National Education Technology Standards for Students
- International Technology Education Association standards for students
- 21st Century Skills
- American Association of School Librarians/Association for Educational Communications and Technology

Student Technology Leadership Program

The Student Technology Leadership Program provides opportunities for students to gain technical literacy and help their schools and communities.

The Student Technology Leadership Program is a project-based learning program established in 1994 that empowers students in all grade levels to use technology. The program is open to all students and helps to develop technology, communication, and team-building skills. Student-designed projects, products, and services are created to help the school and community; and some participants learn to provide technical support in their schools and districts.

Chapter 3

Overview of Kentucky's Education Technology Initiatives and Discussion of Infrastructure and Shared Services

Overview of Kentucky's Education Technology Initiatives and Projects

The KETS master plan groups technology into three categories: infrastructure and shared services, enterprise functions, and portals.

The KETS master plan organizes elements of education technology into three categories: infrastructure and shared services, enterprise functions, and portals.

Infrastructure and Shared Services

These form the foundation of KETS. They include hardware, software, and services that are shared by everyone, such as communications, maintenance, Help Desk, local and wide area networks, and desktop operating systems.

Enterprise Functions

These are applications that support instruction and operations at the state and district levels. Examples of enterprise applications include financial applications, the student information system, teaching, learning, and assessment. Shared enterprise applications promote data-sharing across different databases within KDE.

Portals

These initiatives provide students, educators, policy makers, and the public with access to educational resources.

This chapter discusses in detail initiatives relating to infrastructure and shared services, Chapter 4 discusses enterprise functions, and Chapter 5 covers portals.

It should be noted that some initiatives involve more than one of the three levels. For example, professional development involves the use of enterprise functions as well as portals. Also, some services and initiatives are developed and maintained by outside vendors in addition to KDE.

KDE has identified mandatory or optional initiatives to align Kentucky's education technology with best practices.

KDE has identified a number of initiatives to align Kentucky's education technology with best practices. These initiatives are divided into mandatory and optional categories.

Mandatory Initiatives

Mandatory initiatives have priority because they are essential for effective and efficient operation. Initiatives deemed mandatory by the current master plan address ease and equity of technology access, intelligent classrooms, student performance, professional development, data systems, instructional infrastructure, and security.

A number of mandatory initiatives have been approved that focus on ease and equity of technology access, intelligent classrooms, student performance, professional development, data systems, instructional infrastructure, and security. These initiatives have been given priority because they are essential for the effective and efficient operation of KETS. Appendix C provides information about the funding of these and selected other technology initiatives, including budgeted amounts, expenditures, and continuation costs.

Initiatives deemed mandatory by the current master plan are listed in Table 3.1, along with the schedule for their implementation.

Table 3.1
Implementation Schedule for Mandatory Initiatives

Type/Name of Mandatory Initiative	Schedule for Implementation (Fiscal Year)						
	2007	2008	2009	2010	2011	2012	Beyond 2012
Ease and Equity of Access							
Instructional student device upgrades and replacements	●	●					
Intelligent Classroom							
Internet 2	●	●					
Next generation virtual learning environment	●	●					
E-mail and content management	●	●					
Student Performance							
Math Achievement	●	●					
Large-scale summative testing (not yet funded)				●	●	●	●
Professional Development							
Continuing technology PD for KDE and district staff	●	●	●	●	●	●	●
Data Systems							
Document and content management	●	●	●				
Next generation student data system	●	●	●	●			
Individual learning plans	●	●					
Kentucky Instructional Data System	●	●	●	●			
Knowledge management portal (not yet funded)			●	●	●		
Reading First/Read to Achieve database	●	●					
Instructional Infrastructure							
Kentucky Education Network	●	●					
Grid computing	●	●					
Security							
ISA 2006	●	●					
Backup system	●	●					
Identity management		●	●	●			
Authentication and authorization	●	●	●	●			

Source: Commonwealth. Dept. of Ed. *2007-2012* 27.

Optional Initiatives

Optional initiatives are recommended but not essential. The extent of implementation varies across districts. Initiatives deemed optional in the current master plan address can become mandatory in the future.

Optional initiatives, listed in Table 3.2, are best practices that are recommended but not essential. The extent to which each of these is implemented varies from district to district. Over time, some initiatives will be moved from optional to mandatory, depending on changing district and KDE needs, the availability of funds, and the progress made on current initiatives.

Table 3.2
Optional Initiatives

Ease and Equity of Access
Lower Workstation Ratio
Wireless
Personally Owned Devices
Intelligent Classroom
Video conferencing (desktop & large group)
Electronic white boards
Speech recognition
Pod casting
Large-scale e-books
Student Performance
Large scale formative testing
Data Systems
Consolidated program monitoring
School facilities inventory
Instructional Infrastructure
Hardware/services consolidation
Capacity planning
Differential service delivery
Differentiated service delivery
Performance-based service delivery
Project portfolio management
Application and project portfolio management
Procurement strategy
Governance
Governance
Organizational structure
Enterprise architecture foundation
Communication planning

Source: Commonwealth. Dept. of Ed. *2007-2012* 27.

Infrastructure and Shared Services

The remainder of this chapter discusses infrastructure and services that are shared by all users of educational technology such as e-mail and certain types of hardware, software, and communications. This chapter will also discuss grid computing, through which scientists are given remote access to conduct research on school computers when they are not being used for education. In return, thousands of new computers have been donated to schools that participate in the grid computing program.

Security, e-mail and content management, the Kentucky Education Network, Internet2, upgrades of instructional devices, and grid computing are all mandatory infrastructure and shared services initiatives discussed in this chapter. Brief descriptions of the optional initiatives are included at the conclusion of this chapter.

Security Enhancements

The current master plan mandates enhancements to Internet security, backup systems, and identity management.

In addition to the security measures already in place, initiatives considered mandatory in the 2007-2012 master plan include enhancements to Internet security, backup systems, and identity management.

Enhanced Internet Security and Acceleration

In fiscal years 2007 and 2008, advanced firewall protection was installed in each district to enhance performance, replace outdated equipment, and comply with statutes.

The Enhanced Internet Security and Acceleration initiative, implemented in FY 2007 and FY 2008, involved the installation in each district of advanced firewall protection from hackers. The changes were meant primarily to

- mitigate the slowdown that security features can cause. Using higher-capacity or faster computer networks reduces the need for caching. One example of caching is storing copies of Web sites, so that if a user visits a Web site more than once, the page is already in the computer's memory and does not have to be downloaded again.
- replace the proxy server, which was at the end of its useful life. A proxy server manages access to Internet-based content such as sites and chat rooms.
- comply with statutory requirements to provide Internet management ability to local school districts (Commonwealth Dept. of Ed. *2007-2012* 90).

Backup System for Disaster Recovery

In FY 2007 and FY 2008, a backup system and disaster recovery plan were implemented for districts and systems maintained by OET.

This initiative, also implemented in FY 2007 and FY 2008, was meant to prevent the loss of information stored on computers. Best practices require backup copies of data on separate computers for faster recovery in case of computer failures, natural disasters, or infiltration by hackers. The initiative entails

- developing a disaster recovery strategy and detailed plan; and
- providing school districts with backup and disaster recovery for such services as active directories, e-mail systems, education enterprise database systems, student enterprise data collection systems, and KDE systems (Commonwealth Dept. of Ed. *2007-2012* 90)

It should be noted that this initiative covers only the systems that are maintained by OET. Backups and disaster recoveries are managed separately by the outside vendors for ILP, SIS, and KIDS.

Streamlined Identity Management Process

The Streamlined Identity Management Process initiative, scheduled for completion in FY 2010, will make data systems more user friendly by eliminating the need for a separate identification and password for each system.

Identity management is a system of directories and policy-based controls that ensure that information is accessed by only authorized users. It includes the maintenance of the system, such as additions, changes, and deletions of user profiles (Ziff). Kentucky's streamlined identity management initiative will create a single login identification for all users and will require 3 years to implement, FY 2008 through FY 2010. This initiative will eliminate the need for a separate identification and password for each system. Having one login process for all systems will reduce user confusion and streamline the administration time required of technology service providers.

The master plan points out that this initiative will be challenging because districts use a variety of systems that are homegrown, internal, off-the-shelf, hosted internally within a single district, and vendor-provided external applications. Each system can require unique programming and hardware adaptations in order to communicate with a central identity management system. KIDS, online assessment and several other initiatives will rely heavily on identity management to reduce multiple user-identifications (Commonwealth Dept. of Ed. *2007-2012* 91).

Enhanced Authentication and Authorization

The Enhanced Authentication and Authorization initiative, a type of identity management, is meant to prevent unauthorized access to data systems.

This initiative, which is another aspect of identity management, identifies and manages the risk of unauthorized access using security programs at all levels, from the classroom to the statewide network. The strategy developed in this initiative will be a foundation for all districts, schools, and KDE offices and divisions. The security program must be ongoing and must rapidly respond to new threats and vulnerabilities. Schools, districts, and KDE will focus on the following issues.

- Policies and standards—Building security into state education policies from the beginning
- Architecture—Considering costs, usefulness to staff, and potential impact on security when making ongoing decisions regarding new computers, servers, networks, and applications
- Awareness—Developing awareness and educational programs so employees know their security responsibilities and are always reminded of changes to those responsibilities as specific technology changes
- Security products—Understanding, on the part of technology staff, of security products
- Decision-making processes—An audit, investigation, and monitoring program that focuses on security standards, processes, and education (Commonwealth. Dept. of Ed. *2007-2012* 91).

E-mail and Content Management

E-mails and Internet content are monitored and filtered using a multilayered approach implemented in FY 2007 and FY 2008.

This initiative, implemented in FY 2007 and FY 2008, provides guidance for monitoring and filtering Internet content and for managing network access and SPAM. KDE is careful to point out that content management applications can never be perfect. "Any system or solution can be compromised by someone with the skill, opportunity, and determination to do so" (Commonwealth. Dept. of Ed. *2007-2012* 84). KDE's multilayered approach targets the four functional areas described below.

SPAM Management

SPAM management blocks and filters unsolicited, unwanted, irrelevant, or inappropriate messages. It is especially meant to manage commercial advertising sent in mass quantities. On a daily or weekly basis, updated lists of keywords or phrases are obtained from external organizations that monitor SPAM.

Access Management Controls

Access management controls limit the audience to which an end-user can send e-mail or from which an end-user can receive e-mail.

Content Monitoring

In order to protect students and ensure appropriate use of technology, content monitoring compares all Internet browsing and all inbound and outbound e-mail for each individual user to a standard set of keywords or phrases. Usage that appears to be inappropriate is reported to designated personnel, but information is not blocked or filtered.

Content Filtering

Like content monitoring, content filtering compares e-mail and Internet content to a standard set of keywords or phrases in order to identify inappropriate usage. Content monitoring also blocks or filters inappropriate content from being sent or received.

Kentucky Education Network

In 1995, Kentucky became the first state to connect every district to the Internet with what was then considered a high-speed connection. In 2000, the network speed was increased to meet today's standard for a high-speed connection, making Kentucky again the first state to provide a high-speed connection to all districts. As a result, Kentucky's teachers incorporated the Internet into instruction at a faster rate than the rest of the nation (Commonwealth. Dept. of Ed. *Kentucky Education Network*).

KEN is a high-speed network implemented in fiscal years 2007 and 2008 to address the education system's urgent need for increased bandwidth.

The Kentucky Education Network is a next generation high-speed network that was implemented in FY 2007 and FY 2008 to address the urgent need at the school, district, and state levels for increased bandwidth. With educational technology capabilities increasing and online content including new media, the network capacity approached its maximum level. This initiative was a top issue identified by the Technology Advisory Council. In 2007, KEN was installed in all districts, and support is available 24 hours a day, 7 days a week. According to KDE, the installation stayed on budget and on time even though it involved 174 districts, 19 telecommunications partners, several state agencies, and KETS vendor partners (Commonwealth. Dept. of Ed. *2007 Technology*).

KEN is an adaptable network design that should support future growth.

Just over $23 million was spent on KEN in fiscal years 2007 and 2008. Ongoing maintenance is expected to be $15 million annually. In the future, KEN will include all Education and Workforce Development Cabinet locations statewide.

KEN also will serve as the base for the development, deployment, and operation of a set of seamless P-20 applications. It will connect every college, university, K-12 school district, and Workforce Development resource center to enhance the learning experience of students at all educational levels, regardless of geographic location. In the future, KEN will include all Education and Workforce Development Cabinet locations.

The KEN project was completed in April 2008. All 174 school districts, 26 Workforce Development local offices, and 55 area technology centers are connected to KEN. Just over $23 million was spent on KEN in fiscal years 2007 and 2008. To continue, KEN is expected to need $15 million annually (Day).

Internet2

Internet2 is a high-performance, high-bandwidth national network specifically dedicated to research and education.

Internet2 is a high-performance, high-bandwidth national network specifically dedicated to research, education, and collaboration. It also provides opportunities for worldwide collaboration. Internet2 will soon complete its migration to a new high-bandwidth and high-performance backbone that is 10 times faster than the old one. In April 2007, the University of Louisville officially became one of the 26 Internet2 network optical switching nodes in the U.S.

The University of Kentucky and the University of Louisville have access to the Internet2 backbone. State and regional networks may include nonprofit and for-profit K-20 educational institutions, arts organizations, or hospitals. The system enables collaboration on research projects, promotes virtual learning, and links digital libraries across the globe. In 2005, there were already 33 state K-12/K-20 networks participating when Kentucky joined the program. This opens the Internet2 access to comprehensive universities, the Kentucky Community and Technical College System, K-12 systems, and the Education and Workforce Development Cabinet.

The Education and Workforce Development Cabinet will be expected to provide $95,000 per year for Internet2.

According to KDE, the cabinet will be expected to provide $95,000 per year to fund Internet2 (Day). The Council on Postsecondary Education hired a coordinator in July 2008 to facilitate the use of the Internet2 applications available to the K-12 community.

Instructional Device Upgrade

The instructional device upgrade (IDU) initiative allows bonds to be sold to increase student and teacher access to modern workstations. The 2006 General Assembly appropriated $50 million to launch this initiative. In addition, districts may use other fund sources.

The instructional device upgrade (IDU) initiative allows bonds to be sold to replace or add desktop and laptop computers so that students and teachers have more access to up-to-date workstations. Modern workstations are needed to support tools such as advanced virtual learning courses, Internet 2 instructional opportunities, and online assessments. Before this initiative, an estimated 75 to 80 percent of workstations were 7-13 years old. By the end of 2007, as a result of the initiative, only about 25 percent of workstations failed to meet modern standards (Commonwealth. Dept. of Ed. Highlights 2). In addition to updating school computers, the initiative allowed teachers and students' families to purchase home computers at discount prices.

The 2006 General Assembly appropriated $50 million to launch IDU. Funds are distributed per average daily attendance, at approximately $85 per student. In addition to this source of funds, districts may use other fund sources (federal, state, or local) to reduce the student-computer ratio (Commonwealth. Dept. of Ed. *2007-2012* 27-28).

Implementation of this initiative occurred in phases, which were completed on or before schedule in most cases. By the end of 2007, expenditures totaled $43 million, with $200,000 spent on project management and the remainder going to districts. KDE reported saving $15 million by leveraging the money with a state contract (Commonwealth. Dept. of Ed. *2007 Technology*).

By February 2008, 98,975 computers had been purchased, including 63,758 purchased with IDU funds, 34,861 with local district funds, and 356 purchased for home use with personal funds. Appendix D provides more detail on these purchases. By April 2008, districts had spent $46.9 million, or 94 percent, of the available IDU funds they received in February 2007.

The IDU and other efforts to provide instructional computers have been successful at improving the student-to-computer ratio. These improvements have been equitable across districts.

The IDU initiative and Kentucky's other efforts to provide instructional computers have been successful at improving the student-computer ratio. Moreover, student-to-computer ratios show that these improvements have been equitable across districts. Data from Editorial Projects in Education note that while nationally, low-poverty districts have much better student-computer ratios than high-poverty districts, there is no significant poverty gap in Kentucky (Education Counts).

Grid Computing

The not-for-profit group Kentucky Dataseam Initiative, Inc. is supported with state funds and operates a computing grid that uses untapped computing power. The program focuses on coal-producing counties because coal severance funds are used to promote the grid computing initiative. The program is part of a larger effort to diversify and boost the economies of counties that are currently dependent on depleting coal reserves.

State funds support grid computing, which allows researchers to tap into unused computing power when school computers are idle. Participating schools receive student learning opportunities, teacher training, and servers. Districts in coal-producing counties have received over 8,000 free computers.

This initiative has the dual purposes of supporting cancer research and improving computer access in schools. The program gives researchers remote access to the unused processing power of school computers, especially outside school hours when the computers are idle. In return, schools receive free computers, teacher training, and opportunities to learn about the cancer research being conducted (Gupton).

According to Dataseam, training on how to use new servers and computers has been provided for 2,160 school personnel, including 239 who attended advanced training, earning 194 advanced certifications. In most cases, these are individuals who serve as both teachers and technicians for the school's program. Thirty-one school districts have sent staff to certification training, the first step to gaining the ability to apply for Perkins grants.

Forty-four school districts in coal counties now participate in the grid and are eligible to receive computers as part of the program. In addition, eight school districts in noncoal counties have signed up, although they are not eligible to receive free computers. As of October 2008, these 52 participating districts represented an estimated 146,854 students and 10,095 teachers.

The participating districts have 9,650 computers on the grid. Of these, 8,259 were purchased with funds from coal severance taxes, the Kentucky Education Finance Economic Authority, and the Coal County Computing Program funded by the legislature in FY 2008.

Grid computing is estimated to cost $3.5 million annually.

Dataseam estimates that it spends about $3.5 million annually on grid computing, with 70 percent going to computers, 15 percent to operating, and 15 percent to training and workshops. Of that amount, $2.5 million comes directly from the legislative-sponsored program, $650,000 from school districts, and $350,000 from vendor discounts and fees (Gupton).

Chapter 4

Enterprise Functions for Instruction and Operations

This chapter discusses enterprise functions, including the Student Information System (SIS), the financial management system, individual learning plans, and local district applications.

Enterprise functions are applications to support instruction and operations at the statewide or district level. This chapter discusses enterprise functions including the Student Information System, the financial management system, individual learning plans, and local district applications.

Student Information System

SIS is a central repository that manages enrollment, attendance, grades, health, behavior, special education plans, program participation, student transfers, and compliance.

The Student Information System is a central data repository that supports all facets of administrative management, including enrollment, attendance, grades, health, behavior, special education plans, program participation, and student transfers. Data are used by teachers, school administrators, and parents. Certain data are also reported to state and federal agencies as required by law.

The system is undergoing a change of vendors, from Software Technology, Inc., to Infinite Campus.

SIS is currently undergoing a transition from one vendor to another. Kentucky's first statewide system was provided by Software Technology, Inc. in 1995. When the term of that contract ended in 2006, Infinite Campus (IC) was awarded the contract. The Software Technology, Inc. system, commonly referred to as the legacy system, will no longer be available to districts after June 30, 2009; however, districts will still have access to their archived data from the legacy system (Commonwealth. Dept. of Ed. *Education Commissioner* 4).

In July 2007, the new IC system was piloted in 19 districts beginning with Jefferson County. The purpose of the pilot was to identify system malfunctions, reporting errors, and training needs. Additional districts have been added in waves. As of December 1, 2008, 94 districts were using IC, and the remaining districts are scheduled to be fully operational by March 2009. It is anticipated that end-of-year reports will be filed at the close of the 2008-2009 school year using exclusively the new system (Commonwealth. Legislative. Interim).

A number of steps are required to prepare staff and district data for the new system.

Each district is required to perform a number of tasks in order to prepare staff and district data for the transition. IC provides districts with comprehensive training programs, data clean-up training, and two data trials. District and school personnel are required to attend training that will help them implement the program. The most important and time-consuming step in the process has been cleaning up data. In the previous legacy system, each school entered information for each individual student, including parent, guardian, address, phone numbers, and emergency contact information. In the legacy system, each record was an individual student. In contrast, in the IC system, each record is a household or family. In order for the individual student records in the legacy system to properly convert to household records in the IC system, siblings must have the exact same parent/guardian names, addresses, and phone numbers in each school database. For example, if Jane Doe attends State Elementary School and has her address listed as 105 Capitol Drive, and her brother Jon Doe attends State Middle School and has his address in the legacy system as 105 Capitol Dr., then these two students would not be grouped into the same household in the new system. The same is true for phone numbers. If a cell number was listed as the contact number for Jane Doe but a home or work number was listed for her brother at the middle school, then the siblings' records would not convert correctly, and each of these students would appear to be in a different household.

KDE commented that Kentucky's was the largest project that Infinite Campus had ever undertaken, prompting the vendor to add staff. Since implementation of this program started, problems have arisen and continue to occur, especially in the larger districts. KDE staff and the vendor attempt to be responsive in correcting problems as they occur and provide training. However, in order to have a smoother transition, it is important for districts to have properly prepared existing data when converting to the new system (Commonwealth. Legislative. Interim).

Several districts have reported that their employees spend considerable time preparing for conversion, but they report numerous problems after conversion. In addition, frequently used reports are unavailable or incomplete. Support can be slow and insufficient.

The problem of improperly prepared data was identified during the pilots but its resolution is the responsibility of each district. Several districts raised concerns about the extensive amount of time it takes to clean up data before the conversion only to find that there are reporting issues after conversion. Districts have also complained that the IC system does not include standard monthly reports supported by the old system. While the IC software does allow districts to develop ad hoc reports, some districts lack the time and expertise to create them. Another area of concern is timely product support. Some IC users have reported that

immediate assistance is often unavailable. IC uses an automated online system to log requests for support. Districts say the response time is slow, and they would prefer to be able to get immediate assistance by phone. IC provides an on-site support person for 3 to 4 days after conversion to assist with transition issues. However, most districts said this level of support is insufficient.

For fiscal years 2007 and 2008, the General Assembly approved $10 million to implement the new SIS. There is no funding in the budget for FY 2010. KDE estimates a need for $6.8 million annually for operational expenses.

For fiscal years 2007 and 2008, the General Assembly approved $10 million in bonding to implement the new system statewide. By June 30, 2008, about $7.6 million had been spent, leaving a balance of $2.4 million for FY 2009. Currently, there is no funding in the budget for FY 2010. KDE estimates a need for $6.8 million annually for operational expenses (Commonwealth. Dept. of Ed. *Education Commissioner* 4). According to KDE, the lack of operational funding for the new system in FY 2010 will require taking resources from other programs and services.

Financial Management System

The Municipal Information System (MUNIS) is a financial software package used by all districts in Kentucky. The collected financial data are important for many decisions, such as evaluating a program's impact on student achievement.

The Municipal Information System (MUNIS) is a financial software package used by all districts in Kentucky.[1] It includes reporting, budgeting, personnel, and payroll functions. Financial data collected through MUNIS are important for many decisions, such as evaluating a program's impact on student achievement.

Tyler Technologies has provided MUNIS since September 15, 1994.[2] In 2005, MUNIS was renewed under a "not practical to bid" contract for a period of 2 years, with three 1-year renewals, thus providing continuity through June 30, 2010. Competitive bids will be required in 2010 (Commonwealth. Office of the Controller).

Some useful capabilities of MUNIS are underutilized, and data integrity issues threaten reliability and validity of the data collected.

MUNIS helps districts track financial information and report it to KDE. However, some capabilities of MUNIS are underused, and data integrity issues threaten reliability and validity of the data collected by KDE. For example, some financial data are not collected at a fine enough level of aggregation to support rigorous program evaluation. Even when detailed data are recorded by districts, KDE's methods for aggregating district data sometimes rolls up detailed data into general codes, unsuitable for targeted analysis; the only way to obtain the detailed data would be to ask for the data again from each district. Some codes are not used

[1]Jefferson County chose not to implement the payroll and personnel modules. However, it is required to implement these by the beginning of FY 2010.
[2]At the time the contract was awarded, Tyler Technologies was called Process, Inc., dba The Computer Center.

consistently across districts, which can lead to misleading comparisons. Frequently, the method of data reporting does not align with federal reporting guidelines (Commonwealth. Legislative. Office. *A Rev*iew and *Indicators* 97-144).

In November 2008, the Commissioner of Education announced plans to resolve some issues by revising the chart of accounts that school districts use for reporting financial data through MUNIS.

On November 7, 2008, the Commissioner of Education announced plans to revise the chart of accounts that school districts currently use for reporting financial data through MUNIS. These changes, combined with more accurate coding procedures, should provide more accurate financial data.

Ten districts will pilot the changes and submit their June 30, 2009, annual financial reports with account codes in compliance with the new chart of accounts. All other districts will be expected to have updated account codes by the time they submit their June 30, 2010, annual financial reports.

The Commissioner identified the following educational and financial benefits to districts as a result of the changes in the chart of accounts:

- Districts will have more specific and accurate data to make improved program and budgeting decisions.
- The General Assembly, district program staff, and administrators can tie program funding and expenditures to program outcomes as an indicator of program success. Program success could lead to additional program funding.
- The changes promote public participation in the school system, while providing accessible, accurate school financial data. This will boost public confidence in district financial data at the district and state levels.
- Specific clarification of data elements will be supported by detailed definitions, which will provide consistency in reporting.
- Districts, KDE, and OEA can more accurately evaluate program efficiency and effectiveness.
- Districts, the public, and the General Assembly can compare revenues and expenditures across Kentucky and nationally (Commonwealth. Dept. of Ed. “Re: Chart”).
-

In fiscal years 2007 and 2008, MUNIS cost $2.7 million. Continuation costs are expected to be $1.6 million per year.

For fiscal years 2007 and 2008, approximately $2.7 million of KETS funds were spent for MUNIS. Continuation is projected to require approximately $1.6 million per year (Day).

Individual Learning Plans

The individual learning plan (ILP) is a Web-based planning tool that helps secondary school students better focus their coursework on individual goals as they prepare for postsecondary studies and careers.

An individual learning plan (ILP) is a Web-based planning tool that helps students in grades 6-12 better establish individual goals as they prepare for postsecondary studies and careers. Development of the ILP system began in 2007. Middle and high school students began creating ILP accounts in 2008. By 2012, each student's coursework and other learning experiences must align with the ILP (Commonwealth. Dept. of Ed. *Individual* and *Education Commissioner*).

The ILP, set out in 704 KAR 3:305 section 4, will replace the paper-based individual graduation plan that schools use for students in grades 8 through 12. A learning plan contains the same information that students gathered with a graduation plan, but its Web-based format provides more opportunities for schools, teachers, advisors, students, and parents to be involved in the student's secondary educational experience (Commonwealth. Dept. of Ed. *Individual*).

ILP features and resources are designed to involve students on a variety of levels

ILP features and resources are designed to involve students on a variety of levels.

- Exploring careers
- Finding careers that match their skills and interests
- Creating education plans
- Establishing personal goals and revisiting these as they progress through school
- Creating, maintaining, and changing résumés
- Tracking and reflecting on their community services experiences, work experiences, career-planning activities, and extracurricular and organization activities
- Exploring colleges and postsecondary opportunities that match their career, postsecondary, and life goals
- Connecting to the GoHigherKY.org Web site for help with college planning, tuition assistance information, and applications
- Collecting personal information such as assessment results, advising activities, demographic information, and educational history (Commonwealth. Dept. of Ed. *Individual*).

Schools and districts are currently making decisions about how to implement the ILP process.

Schools and districts are currently making decisions about how to implement the ILP process, which is governed by 704 KAR 3:305. Under Section 4 districts must

- implement an advising and guidance process to support the creation of an ILP for each middle and high school student.

- evaluate the effectiveness and results of the ILP process, incorporating input from students, parents, and school staff. One evaluation criterion will be the status of the student in the 12 months after graduation.
- require schools to work cooperatively with students and parents about the relationship between education and career opportunities, including financial planning for postsecondary education.
- require that the school maintains each student's ILP so that it is readily available for student and parent review and so that it is approved at least annually by the student, parents, and school officials.
- require that, beginning in the student's 8th-grade year, the ILP set learning goals based on academic and career interests and that it identify required courses, electives, and extracurricular opportunities aligned to the student's postsecondary goals. Schools must use this information to plan the academic and elective courses they offer.
- require, beginning with the graduating class of 2013, the development of an ILP for each student by the end of the 6th-grade year.

In FY 2008, the adoption of ILPs was 72 percent, which was ahead of schedule. Students accessed more than 59 million career- and college-readiness pages.

KDE reported that in FY 2008, 248,000 of Kentucky's 342,700 middle and high school students were using their ILPs, a 72 percent adoption rate. This rate was reportedly ahead of the projected target for full utilization by the class of 2012 (Commonwealth. Dept. of Ed. *Education Commissioner* 3). However, information on exactly how ILPs are being used is not yet available; KDE is exploring methods for monitoring ILP use.

Continuation costs for the ILP are estimated to be $600,000 per year. The most recent state budget contained no appropriations for this initiative.

In FY 2008, funds budgeted and expended for the ILP initiative amounted to $465,000. According to KDE, continuing the program will require $600,000 per year, and adding enhancements would bring the required amount to $750,000 per year. The 2009-2011 biennial state budget contains no appropriations for the ILP program (Day; Commonwealth. Dept. of Ed. *Education Commissioner* 3).

Local District Applications

eWalk

Administrators record observations on handheld computers during school walkthroughs called eWalks.

Principals and administrators sometimes conduct walkthroughs to observe day-to-day classrooms activities as a tool for instructional and administrative decision making. They can record their observations with Web-based programs on handheld computers, a

system known as eWalk. They can later send their notes to teachers and present charts and graphs at faculty meetings.

The Bill and Melinda Gates Foundation funded handheld computers for more than 700 administrators and training for many more. eWalk has been used by more than 1,600 administrators in over 128 districts for more than 20,000 walkthroughs.

In 2003, a grant of approximately $1 million from the Bill and Melinda Gates Foundation provided handheld computers and training for more than 700 school and district administrators. In addition, administrators who purchased their own handheld computers received free training. This first generation of eWalk, called Data Walk, was somewhat limited. In 2005, KDE contracted with Media-X Systems to create a program that could be customized to specific schools and districts and for a wider variety of uses. With this increased flexibility, eWalk could be used for recording issues with maintenance, food service, and technology.

In January 2007, KDE reported that more than 1,600 users were employing eWalk in over 128 districts. More than 20,000 electronic walkthroughs had been conducted statewide since the program's inception in 2005 (Commonwealth. Dept. of Ed. *ISN*).

Math Achievement

Mathematics Achievement uses software-based, individualized computer lessons and collaborative, real-world problem solving to promote discourse, collaborative work, and depth of understanding.

Among the initiatives for improving and assessing student performance is Math Achievement, which uses software-based, individualized computer lessons and collaborative, real-world problem solving to promote discourse and depth of understanding. These programs are correlated to Kentucky's Program of Studies and supported by a comprehensive professional development plan (Commonwealth. Dept. of Ed. *2007-2012* 29; Carnegie).

Math Achievement began in 2006 as part of a $1.2 million program funded by the General Assembly to improve middle school math performance. Six pilot districts were chosen to participate: Campbellsville Independent, Clark County, Madison County, Marion County, Shelby County, and Washington County. These districts were awarded $200,000 each year for the 2006-07 and 2007-08 school years to implement either the Carnegie Tutor or the I Can Learn middle school mathematics technology program. Washington County, Marion County, and Campbellsville Independent are implementing I Can Learn; Shelby County, Madison County, and Clark County are implementing Carnegie Tutor.

In 2007, 33 Kentucky middle and high schools were chosen to participate in a 5-year $6 million federally funded study to evaluate the effectiveness of Carnegie Learning's Algebra I curriculum. Beginning in the fall of 2007, half the schools were selected at

random to use the Carnegie curriculum, while the other half continued to use their existing Algebra 1 course. The Carnegie curriculum was chosen because it was among the few that met the U.S. Department of Education's grant requirements for strong prior evidence of effectiveness (Chute). The results of the evaluation study have not yet been published.

Interest in software-based learning programs has widened beyond these studies. In September of 2008, the Kentucky State Textbook Commission approved Carnegie's Bridge to Algebra, Algebra I, and Algebra II software programs for use in middle and high schools from 2009-2015 (Commonwealth. Dept. of Ed. *Adoption*).

Continuing Technology Professional Development

The goals of technology professional development are to enable instructional personnel to use technology to support instructional, diagnostic/assessment, and administrative needs and to simplify business processes.

The master plan places priority on helping teachers understand and feel comfortable using technology in their classrooms. The goals of technology professional development are to enable instructional personnel to use technology to support instructional, diagnostic/assessment, and administrative needs and to simplify business processes. Professional development objectives are shown in Table 4.1

Table 4.1
Objectives of Technology Professional Development

- Facilitate convenient access to a range of technology-related professional development solutions, including individualized, just-in-time support; self service training; and periodic classroom style instruction that evolves as the integrated instruction capabilities mature and expand
- Provide for increased collaboration among instructional personnel within the state and with external communities
- Provide online learning communities and independent development options
- Identify technology support personnel with combined instructional and technology expertise to facilitate learning and sharing of best practices
- Overcome fears and reluctance of instructional personnel with respect to technology
- Deploy administrative and instructional solutions, such as e-forms and student administration, to improve instructional productivity
- Enable teachers to shed the unnecessary tasks and processes resulting from disparate systems and redundant data entry and handling
- Streamline the ability to conduct diagnostic and other assessment activities.
- Provide consistent leadership around instructional technology initiatives through all levels of the organization to improve overall return on investment in technology
- Improve the technical proficiency of administrators to promote an environment of technological openness and importance
- Frequently research and evaluate new tools for instruction and professional development

Source: Commonwealth. Dept. of Ed. *2007-2012*, Appendix B.

Specially trained teachers called technology integration specialists provide on-site and on-demand assistance for other teachers to integrate technology into their teaching.

Specially trained teachers called technology integration specialists provide on-site and on-demand assistance for other teachers to integrate technology into their teaching.[3] They show teachers ways to enhance student learning through the thoughtful applications and best practices of new tools. KDE believes there is evidence that these specialists are more effective in helping teachers incorporate technology into teaching and learning than any other form of professional development (Commonwealth. Dept. of Ed. *Technology Integration*).

As of December 2008, 241 technology integration specialists were employed across the state. A high percentage of these positions are paid for with the federal Title II Part D funds, which OET manages and sends to districts each year. For the past 3-4 years, OET has emphasized that districts should use these funds for professional development-related services. About half of these funds are noncompetitive, going to 173 districts.[4] The other half of these

[3] Some schools and districts still refer to the title technology resource teacher, which is the older name for this position.
[4] Under federal guidelines, Anchorage Independent is considered too wealthy to receive these funds.

funds are competitive, usually going to high-poverty districts that identify a need for this type of position.

Since 2000, districts are also allowed to pay technology integration specialists salaries with funds from KETS offers of assistance that are sent to districts and matched dollar-for-dollar by districts. General district funds are also an option.

Technology specialists and other teachers also provide guidance to students participating in the Student Technology Leadership Program.

Chapter 5

Portals for Accessing Educational Resources

This chapter discusses portals, which are Web pages and other gateways that allow users to access educational resources.

This chapter discusses portals, which are Web pages and other gateways that allow users to access to educational resources. This chapter focuses on the Kentucky Instructional Data System, document and content management, intelligent classrooms, virtual learning, online assessments, and the Knowledge Management Portal.

Kentucky Instructional Data System

The Kentucky Instructional Data System (KIDS) is a longitudinal data warehouse developed with federal support that will assist tracking, managing, and analyzing individual student data to support decision making at the state, district, school, and classroom levels.

KIDS is a data warehouse developed with federal support that integrates data from multiple sources, including the Student Information System, assessments, and district-level financial management systems. KIDS permits the tracking, management, and analysis of individual student data to support decision making at the state, district, school, and classroom levels. The purpose of data warehouses like KIDS is to integrate student information with data on assessments, finances, and instruction. KIDS could also help to link P-12 data to postsecondary data, which is needed to analyze college readiness and student transition from secondary to higher education (Hackworth).

Primary funding for KIDS was a $5.78 million federal grant. The National Governors Association provided an additional $150,000.

The primary funding source for KIDS was a $5.78 million Statewide Longitudinal Data System grant from the U.S. Department of Education. The 3-year grant was awarded in August 2005 and ended in December 2008, with funding available through June 2009. As of June 30, 2008, approximately $1.2 million in grant funds remained. In FY 2008, the National Governors Association provided an additional $150,000 to Kentucky from its pool of federal funds (Commonwealth. Dept. of Ed. KIDS At a Glance).

KDE has applied for additional federal funds for KIDS, but that funding is not certain. Even if it is, the new grant cannot be used for maintenance. No source has yet been identified for the estimated $1.2 million needed annually to support, maintain, and improve KIDS.

KDE has applied for additional federal funds for KIDS, but they would be intended for expansion instead of maintenance or upkeep. While the budget of the initial KIDS project is currently sufficient through the end of this fiscal year, no source has been identified for the estimated $1.2 million needed annually to support, maintain, and improve KIDS once the grant period ends in June 2009 (Hackworth).

KIDS includes several objectives that are anticipated to be completed by the December 2008 grant deadline. To date, KDE has successfully designed and installed hardware and software solutions, developed and provided training for system users, and enabled users to generate individual student reports, district financial reports, and district staff reports (Commonwealth. Dept. of Ed. KIDS At a Glance).

While KIDS is on track to meet its broad objectives, progress on some specific goals has been limited by the change to a new SIS vendor, active directory limitations, and interdepartmental power struggles.

While KIDS is on track to meet the broad objectives of the grant, progress on some of the specific goals that KDE envisioned for the KIDS project has been limited. Due to the timing of conversion of the Student Information System to a new vendor and platform, little demographic or attendance data has been made available in KIDS. Access to KIDS was planned to include KDE personnel, district personnel, school administrators, and teachers starting with limited pilot group access and then being open to all stakeholders. Currently, only a limited pilot group has access.

KDE's directory system is problematic because it does not use a standardized set of job categories that can be used to efficiently identify who can be enrolled in KIDS and which types of data each person should be given access to. Because that information is omitted, it is estimated that 20,000 staff do not have access to KIDS. Instead, only 150 users currently have access (Hackworth). This is not a limitation of the technology; rather, KDE and districts have not grouped job titles into standardized categories and entered the data into the active directory. The KIDS advisory team has proposed several solutions, but none has been implemented because of a lack of support and guidance from KDE.

Document and Content Management

The Document and Content Management initiative allows education professionals to create, manage, store, distribute, search, and view digital content via the Internet.

This initiative allows schools, districts, and state agencies to create, manage, store, distribute, search, and view digital content such as pictures, text, video, audio, and data. Implementation started in FY 2007 and is scheduled for completion at the end of FY 2009. Content management will promote data sharing across schools, districts and state agencies (Commonwealth. Dept. of Ed. *2007-2012* 30).

Intelligent Classrooms

An intelligent classroom is a suite of technologies that enhance learning, improve access, keep students engaged, and allow teachers to quickly measure and assist the progress of each student.

The term "intelligent classroom" refers to a suite of technologies that enhance learning, improve access, keep students engaged, and give teachers a way to quickly measure and assist the progress of each student. The technologies include electronic projectors, wireless hubs, student response systems, videoconferencing, electronic whiteboards, speech recognition, pod casting, and large-scale electronic books. In addition, Internet2 and virtual learning initiatives provide the necessary infrastructure to support intelligent classrooms (Commonwealth. Dept. of Ed. *2007-2012* 27).

Almost 60 percent of Kentucky's classrooms now have the major intelligent classroom components.

Over the past several years, districts have been acquiring various technology components, but the initiative to implement full suites of intelligent classroom components started in 2007. OET reports that the installation of intelligent classroom components increased by 84 percent in 2008 and is expected to continue growing. Almost 60 percent of Kentucky's classrooms now have the major intelligent classroom components.

Most classrooms have a large image-projection screen on which teachers display electronic content. Many classrooms have student response systems that provide immediate feedback on what students are learning.

Table 5.1 shows the number of components installed, as reported by districts. The most common component is an image-projection device, such as an electronic projector with an electronic whiteboard or a plasma/LCD screen. Teachers can use these viewing screens to display content from the teacher's desktop computer or the Internet. About one-third of classrooms have student response systems that allow students to answer questions on hand-held devices and then allow students and the teacher to see the responses immediately (Couch. "Re: Intelligent").

Table 5.1
Implementation of Intelligent Classrooms, October 2008

Intelligent Classroom Component	Number in Place
Electronic image-projection devices	23,296
• Mounted	14,020
• Mobile	9,276
Plasma/LCD wall-mounted units	816
Interactive electronic whiteboards	7,658
• Mounted	6,047
• Mobile	1,611
Student response systems	4,900
Wireless interactive slates/pads	8,040
Document cameras	6,739

Source: KY Dept. of Ed. *Technology Readiness*.

Virtual Learning

Kentucky was the first state in the U.S. to offer a comprehensive package of online educational resources consisting of a virtual university, a virtual high school, and a virtual library. Kentucky's virtual learning opportunities have increased, with complex funding and governance structures.

Kentucky was the first state in the nation to offer a comprehensive package of online educational resources, consisting of a virtual university, a virtual high school, and a virtual library (Commonwealth. Council. *About*). The number of virtual learning opportunities has increased rapidly. However, due to different funding and governance structures, name changes, and redesigns, it is difficult to determine how well the programs are coordinated. In particular, there does not appear to be much coordination between P-12 and postsecondary virtual learning offerings. For example, both CPE and KDE have programs targeted to high school students, but there is no coordination between the two. In effect, the two programs compete with each other. The following section discusses some of the major virtual learning opportunities in Kentucky.

Kentucky Virtual Schools

Kentucky Virtual Schools (KYVS), operated by KDE, provides online courses, training, and materials for Kentucky secondary students, educators, school board members, and school council members.

Kentucky Virtual Schools (KYVS) provides online courses, training, and materials for Kentucky secondary students, educators, school board members, and school council members. KYVS is operated by the Division of Secondary and Virtual Learning within KDE's Office of Teaching and Learning. In addition to providing courses and materials that are unique to Kentucky, KYVS also provides access to such external sources as the National Repository of Online Courses, Massachusetts's Institute of Technology Open CourseWare, and Curriki Open Source Educational Materials (Commonwealth. Dept. of Ed. *Kentucky Virtual*).

The KYVS Web site provides links to several virtual learning environments, including the Kentucky Virtual High Schools, Kentucky Virtual Area Technology Center, Kentucky Virtual Adult Education, Kentucky Virtual Library, E-Learning Kentucky, and the Kentucky Virtual Campus (formerly called Kentucky Virtual University).

Through the Blackboard component of KYVS, teachers can access a variety of materials and tools for use with instruction in regular classrooms. These include online course content, formative assessments, lesson plans, and units. Blackboard also provides teachers with opportunities to participate in communities of practice. Through these online communities, teachers can share and critique content- and student-specific instructional strategies. Teachers gain access through $25 user licenses purchased by their districts.

Kentucky Virtual High School

Kentucky Virtual High School (KVHS), offered by KDE, allows students anywhere in Kentucky to earn course credits online. Offerings include content not available statewide, such as Advanced Placement courses, credit recovery, instructional support for at-risk students, expanded learning opportunities for gifted and talented students, and foreign languages.

Kentucky Virtual High School (KVHS) is a statewide educational service offered by KDE that provides Kentucky secondary school students with the opportunity to earn credits through online courses. Courses are taught by teachers certified at the secondary level in the appropriate content area. KVHS provides access to specialized content not offered statewide, such as Advanced Placement, credit recovery, instructional support for at-risk students, expanded learning opportunities for gifted and talented students, and foreign languages. These types of courses may be especially important to students in small or rural schools who would otherwise have limited access in some content areas. More than a third of students take Advanced Placement courses.

Course fees for full-time students are generally paid by local districts for courses that count toward graduation. The fee for middle and high schools in FY 2008 was $150 per student per half-credit course. Since most courses require a full credit, the total cost is $300. However, the cost can be reduced to $100 per year for a student using KVHS for credit recovery (Commonwealth. Legislative. Office. *A Review* 64).

In FY 2007 and FY 2008, three-fourths of districts had students enrolled in KVHS courses. However, the number of students enrolled is relatively small. In FY 2008, KVHS enrollment was 1,943 students, which is equivalent to 1 percent of Kentucky's approximately 200,000 high school students. One reason for this low enrollment might be that districts find it less expensive to purchase instructional software than to pay per-student fees for KVHS.

In FY 2007 and FY 2008, three-fourths of Kentucky's 174 districts had students enrolled in KVHS courses. However, the number of students enrolled is relatively small. In FY 2008, 1,943 students were enrolled in KVHS, which is equivalent to 1 percent of Kentucky's approximately 200,000 high school students (Commonwealth. Dept. of Ed. *2006-07 SAAR*). No one offered reasons for this low enrollment. One possible reason is that many schools have purchased other instructional software that costs less than the $100-$300 per student for KVHS. Moreover, unlike the KVHS program, these software packages often have formative assessments built in, and some adapt the content as the student progresses, based on the knowledge and skills the student demonstrates along the way. It also should be noted, that unlike KVHS, these software packages usually do not provide support from a teacher specially trained in virtual learning. These software packages also are not aligned to Kentucky's Program of Studies.

In FY 2008, KVHS received $800,000 from KDE and $450,000 in agency receipt funds. Continuation is projected to cost $1.25 million in FY 2009 and $1.6 million in FY 2010.

In FY 2008, KVHS received $800,000 from KDE and $450,000 in agency receipt funds, usually paid by the district. Continuation costs are projected to be $1.25 million in FY 2009 and $1.6 million in FY 2010 (Day).

E-Learning Kentucky

E-Learning Kentucky provides educators, school board members, and school council members with access to professional development courses.

E-Learning Kentucky provides educators, school board members, and school-based decision-making council members with access to professional development courses. E-learning courses can be used for up to 24 hours of professional development credit required for administrators by 704 KAR 3:325 in connection with the Effective Instructional Leadership Act. The courses also can be used by teachers for up to 24 hours of professional development toward the continuing education requirements outlined in 16 KAR 8:030.

In FY 2008, educators enrolled in over 30 different professional development courses and 30 different communities of practice. School-based decision-making council enrollments were concentrated in three courses.

Table 5.2 shows enrollments in professional development courses, training, and communities of practice in FY 2008. In FY 2008, educators enrolled in over 30 different professional development courses and 30 different communities of practice. Enrollments for school-based decision-making council members were concentrated in three courses.

Table 5.2
Enrollments in E-Learning, FY 2008

Adult Learning Opportunity	Enrollments
Professional development	2,202
School-based decision-making online training	300
Communities of practice	1,326

Source: Staff compilation of unpublished data provided by the Kentucky Department of Education.

Kentucky Virtual Campus

Kentucky Virtual Campus provides online courses for postsecondary academic degrees and professional development. Courses are provided by the Kentucky Community and Technical College System, state universities, and the Education Professional Standards Board.

The Kentucky Virtual Campus (formerly called the Kentucky Virtual University) provides online courses for academic degrees and professional development. Postsecondary students can earn associate and bachelor degrees in information technology, telecommunications management, business, public administration, criminal justice, communications, organizational/workplace leadership, and integrated studies. Educators can complete professional training and licensing requirements such as those required for substitute teaching or rank change. Courses are provided by the Kentucky Community and Technical College System, state universities, and the Education Professional Standards Board.

Kentucky Virtual Library

Kentucky Virtual Library (KYVL) allows educators, students, and the general public to search databases of books and articles, Kentucky statistics, and digitized public documents online. Over 1 million searches are conducted each month.

The Kentucky Virtual Library (KYVL) allows educators, students, and the general public to conduct online searches of databases of books and articles, Kentucky statistics, reference books, and digitized public documents. Since KYVL's inception in late 1999, users have conducted almost 80 million searches. More than 1 million searches are now conducted each month (Commonwealth. Council. Kentucky Virtual. *Facts*).

KYVL is administered within the Council on Postsecondary Education but relies on funds from KYVL member organizations. All members contribute fees that are applied to database subscriptions.

KYVL is administered within the Council on Postsecondary Education, but it relies on funds from KYVL member organizations. All members contribute fees that are applied to database subscriptions. Since KYVL's inception, KDE and the Kentucky Department for Libraries and Archives have been significant contributors. KDE's annual share is $320,000. Contributions are also received from Kentucky's public universities, community and technical colleges, and public libraries. This collaborative funding subsidizes use of KYVL by the public, who avoid more than $10 million in costs per year.

Due to recent general state budget cuts, the annual KYVL budget was reduced by 19.5 percent..

Recent state budget cuts reduced the annual KYVL budget by 19.5 percent. However, KYVL has been able to extend some database subscriptions because of additional voluntary member contributions and forbearances by some companies offering database subscriptions.

KYVL staff consists of a director, an executive secretary, and an electronic resources librarian. The Virtual Library Advisory Committee advises KYVL on policies and programs, and the Kentucky Virtual Library Users' Group provides advice on specific issues.

Kentucky Educational Television EncycloMedia

EncycloMedia is a partnership between Kentucky Educational Television and KDE. It offers free Internet-based multimedia learning experiences to all Kentucky public school students and educators.

EncycloMedia is a partnership between Kentucky Educational Television (KET) and KDE. It offers free Internet-based multimedia learning experiences to all Kentucky public school students and educators. Resources include more than 5,000 videos, 50,000 video clips, and thousands of digital images. EncycloMedia provides access to digital, video-based learning through a contract with Discovery Education. All resources are indexed to and searchable by Kentucky's academic standards, grade level, content, and keyword. KDE has purchased "local host" software that allows districts to store, index, and access materials in local electronic libraries. Teachers can use KET to access and share instructional

materials and lessons plans (Commonwealth. Kentucky Educational).

EncycloMedia is used regularly by Kentucky K-12 public schools, private schools, and universities.

EncycloMedia is used regularly by Kentucky K-12 public schools, private schools, and universities: there were 46,132 K-12 users in January 2008. KET consultants train teachers how to use EncycloMedia. According to KET, a majority of educational buildings across the state have access to EncycloMedia.

KDE pays $300,000 annually toward the support of EncycloMedia. Federal funds in FY 2008 provided $186,505.

EncycloMedia receives support from a variety of sources. KDE provides $300,000 of KETS funds annually. Federal funds in FY 2008 provided $186,505 (Day). Additional funds are received from other sources, but information about these funds was not available for this report.

Kentucky Learning Depot

The Kentucky Learning Depot is a digital library that allows educators to share standards-based digital content to improve their courses. Users have a single point of entry where they can browse, search, upload, download, update, rate, and reuse learning content.

The Kentucky Learning Depot is a digital library that allows educators to share standards-based digital content to improve their courses. Users have a single point of entry where they can browse, search, upload, download, update, rate, and reuse learning content. The benefits include

- providing easy access to quality digital learning content that expands resources available to Kentucky educators.
- improving teaching and learning by providing opportunities for Kentucky educators to create and share best practices in online teaching and learning.
- achieving cost savings and maximizing resources by allowing educators to create resources once and reuse and share them many times.
- opening digital borders, allowing educators to share not only in Kentucky but also with the Southern Regional Education Board's 16 states and with repositories in the U.S. and the world (Kentucky Learning).

Online Assessments

Summative assessments are usually conducted at the end of a school year, term, or course and are designed to gauge whether students learned what they were expected to learn. Summative assessments are central to state education accountability systems. These assessments may also be used for grading, certification, evaluation of progress, or researching the effectiveness of a curriculum (Bloom). Kentucky's large-scale summative

assessment is the Commonwealth Accountability Testing System (CATS), which is conducted statewide.

Formative assessments encompass a variety of approaches for gathering timely feedback during instruction, in order to adjust ongoing teaching and learning to students' specific needs (Boston).

Summative Assessment

The Large-scale Summative Testing initiative will move the Commonwealth Accountability Testing System (CATS) online for all students. The master plan lists this as a mandatory initiative scheduled to begin in 2010, but budget constraints make it unlikely to be funded in the near future.

Kentucky's Large-scale Summative Testing initiative will move the current paper-and-pencil CATS to online for all students. The master plan lists this as a mandatory initiative scheduled to begin in 2010, but budget constraints make it unlikely to be funded in the near future.

KDE has been building online assessment expertise with the tests it already provides for special populations. Since 2002, an online version of the Kentucky Core Content Test has been available each year as an accommodation for students with disabilities or limited English proficiency who use technology in their everyday instruction.

KDE has identified significant obstacles to implementing statewide online assessment. It requires significant investment in the purchase and maintenance of hardware and software. Certain types of responses, such as drawing a curve on a graph, cannot be captured on a computer screen. Many schools are reluctant to help pilot-test online CATS for fear that it would cause lower scores or missed deadlines.

The general population CATS online test is still in development. Although KDE has conducted pilots in several schools, significant obstacles remain, some of which are described below. Similar obstacles are responsible for slow progress in implementing online assessments in other states (Ash).

Need for More Hardware and Software. Test security cannot be assured if schools lack enough workstations and network capacity to test all students at the same time. Integrity may also be compromised if workstations are so close together that students can see each other's monitors. Implementing online assessments will require a dedicated server in each district, which is not in the budget for most districts. Increasing the number of workstations to achieve a one-to-one ratio of computers to students would allow tests to be administered to all students at the same time; however, this would require a sizable investment, not only in terms of the initial purchase cost but also in the maintenance and replacement costs every 5-6 years as workstations become outdated.

No Solutions for Capturing Responses to Some Test Items. Answering multiple-choice questions online is relatively quick and simple, but other types of questions present challenges. Some younger students may not have the skills to type their answers to open-response questions. Some math and science questions require

responses that are difficult to record with a keyboard. For example, a student may be asked to draw a curve on a graph to represent an equation or set of observations. According to KDE, technology does not exist that allows students to record these types of responses.

Reluctance To Participate in Pilots Due to High Stakes. Many schools have been reluctant to help test the online version of CATS for the general student population because they are concerned that test scores may suffer and deadlines may be missed if there are system problems. Given the high stakes and narrow testing window of CATS, it might be better to move it online only after formative testing has been moved online.

One common misconception about online testing is that results are available immediately. KDE estimates that it would trim about 10 days off the turnaround time.

One common misconception about online testing is that results are available immediately. KDE estimates that administering all tests online would trim about 10 days off the turnaround time by eliminating the time needed to process and mail paper exams. However, most other processes will still require the same amount of time. A complete redesign of CATS would be required to take full advantage of the time savings and other advantages of online administration.

Online assessments offer unique advantages, such as the inclusion of interactive and multimedia items and the ability to vary the order in which test questions are presented. Having more workstations and servers would make more computers available year-round.

Online assessments offer unique advantages. Interactive and multimedia items can be incorporated. Test questions can be presented in random order for each student, making it impossible for students to copy answers from those next to them. Another benefit of boosting the student-to-computer ratio and adding servers is that technology would be available all year. This would offer more opportunities for students to gain technological literacy, for teachers to integrate technology into instruction, and for frequent formative assessment to be conducted. Fully exploiting these advantages would require extensive redesign.

Formative Assessment

Compared to large-scale summative tests, formative tests provide more timely and tailored feedback. One option would be to have the state purchase formative testing capabilities on behalf of districts, for better pricing.

Compared to large-scale summative testing, formative assessment provides more timely and tailored feedback for schools to adjust instruction and intervene with struggling students (Commonwealth. Dept. of Ed. *Education Commissioner* 5). Currently, each individual district chooses and purchases formative assessments. If the state were to purchase formative testing capabilities on behalf of districts, there would be more opportunity to negotiate on pricing.

Although no state appropriations have been made for formative assessments, many districts have been moving forward on their own for several years.

Even though no state appropriations have been made for formative assessments, many districts have been moving forward on their own for several years.

- Districts that have student response systems as part of the intelligent classroom are conducting formative and diagnostic assessments frequently throughout the school year. This tool gives teachers and students immediate feedback on each student's knowledge.
- Many districts have purchased formative software packages, such as Methodology for Academic Progress and Compass, which they feel are predictive of their CATS scores.
- Some districts also are purchasing instructional software that includes diagnostic testing for gauging student performance.

Statewide formative assessments will cost an estimated $8 million. No funds have been appropriated.

According to KDE, the hardware for and development of formative assessments statewide will require $8 million (Day). No funds have been appropriated by the General Assembly for this initiative (Commonwealth. Dept. of Ed. *Education Commissioner* 5).

Knowledge Management Portal

The Knowledge Management Portal would simplify access to information, promote collaboration, and personalize the information displayed based on each user's unique interests and job duties.

The Knowledge Management Portal would simplify and secure access to information for students, parents, teachers, administrators, policy makers, third-party researchers, and vendors. Building on the capabilities of KIDS, it would also provide advanced Web-based features such as online collaboration and user personalization. It would recognize users and display information based on their specific interests and job duties. For example, using the features of a fully developed Knowledge Management Portal, a teacher could analyze the results of a formative assessment, research Web-based instructional resources, and then direct students to appropriate remediation opportunities.

Although the master plan classified the Knowledge Management Portal as mandatory and scheduled implementation to begin in FY 2009, the General Assembly did not appropriate the $6.25 million requested.

Although the master plan classified the Knowledge Management Portal as mandatory and scheduled implementation to begin in FY 2009, the General Assembly did not appropriate the $6.25 million requested by the Kentucky Board of Education for this initiative.

Chapter 6

Conclusions and Recommendations

This study was a broad review of Kentucky's education technology landscape rather than an in-depth examination of specific initiatives. Nevertheless, it is possible to provide conclusions and recommendations of a general nature.

Accomplishments

Access

Kentucky consistently ranks above the national average—often in the top tier of states—on measures of teacher and student access and use of technology.

Kentucky consistently ranks above the national average—often in the top tier of states—on measures of teacher and student access and use of technology. This accomplishment is more remarkable given the below-average use of technology in Kentucky homes (Gartner. *IT Assessment*; Editorial. Education Counts).

Kentucky's investment in technology has opened many new doors to learning. Before KETS, a student typically had access only to those courses the school offered, taught by teachers the school hired. Tools included textbooks, a blackboard, and paper and pencil. For research, resources were limited to the school and local library.

Today, a wide array of opportunities are available, all connected through the high-speed KEN. In addition to courses a particular school can offer, many courses are available through KVHS. For research, students can access KYVL and EncycloMedia at home and at school. Intelligent classrooms have electronic whiteboards with sophisticated features. There are also student response systems that let teachers poll students periodically during class to determine if they understand the materials covered. Many schools conduct online formative assessments at the beginning, middle, and end of the year to identify struggling students; these students often receive help through instructional software.

Teachers, administrators, and policy makers can tailor a wide variety of educational services to their students' needs by analyzing the integrated longitudinal data in KIDS.

The individual learning plan helps the student explore and plan for careers by bringing together helpful information and offering opportunities to collaborate with parents, teachers, and guidance counselors.

Equity

As a result of Kentucky's emphasis on equity, high-poverty districts have the same student-to-computer ratio as those in low-poverty districts.

Equity continues to be a key focus of Kentucky's education technology initiatives. Kentucky has many funding mechanisms and policies in place to counterbalance some of the fiscal advantages of large or wealthy districts. Unlike the U.S. as a whole, Kentucky has no significant differences in the student-computer ratio between low-poverty and high-poverty districts.

KETS Master Plan

Kentucky's 2007-2012 Education Technology Master Plan is extensive and detailed, and it incorporates input from all of the major stakeholders.

Kentucky's 2007-2012 Education Technology Master Plan is extensive and detailed, and it incorporates input from students, teachers, parents, business leaders, universities, and other major stakeholders. Each district is required to have its own technology plan, coordinated with the master plan that defines specific unmet needs. District plans must be approved by Kentucky Board of Education, and districts must focus their spending on priority unmet needs.

Deployment

Many initiatives, such as intelligent classrooms, have deployed rapidly across the state.

Many initiatives, such as intelligent classrooms, have deployed rapidly across the state. Some initiatives appear to be ahead of schedule. These include the opening of individual learning plan accounts and the conversion of the student information from Software Technology, Inc. to Infinite Campus.

OET Operational Efficiency

OET has been praised for its operational efficiency. Hardware and software have been deployed, maintained, and supported with a relatively lean staff.

OET has been praised for its operational efficiency. Hardware and software have been deployed, maintained, and supported with a relatively lean staff (Gartner. *IT Assessment*).

Areas Needing Improvement

Governance

Key weaknesses include insufficient coordination among KDE business units and a lack of strong centralized enforcement of critical standards and policies.

Key weaknesses include insufficient coordination of technology-related activities among business units within KDE and a lack of strong centralized enforcement of standards and policies that are critical for security, data integrity, timeliness, efficiency, and effectiveness (Commonwealth. Auditor; Gartner. *IT Assessment*).

Regardless of which unit manages an initiative, all stakeholders must have meaningful input in the process from the beginning.

Given the number of systems and organizations involved in education technology, strong governance is required to continually combat the tendency for groups to make decisions in isolation. Regardless of which unit manages an initiative and where its financial support originates, OET and other key groups should be involved early on in order to provide a "big picture" perspective and to estimate the initiative's ongoing total cost of ownership. Widespread communication must occur early in the process and offer a chance for meaningful input from all stakeholders.

Decision-making processes must be more transparent. Decisions must balance flexibility with standardization. Policies that profoundly impact security and cost effectiveness should be mandatory.

Decisions must balance the desire for flexibility with the need for standardization. There are benefits to allowing local districts and KDE business units to make their own decisions. However, these decision-making processes need to be more transparent, and the benefits of flexibility must be weighed against the added costs and reduced interoperability of systems. Also, policies that profoundly impact security and cost effectiveness should not be optional.

IT employees need a formal reporting relationship to OET, for access to professional development and to carry best practices back to the individual business units. Information should flow between offices so that information and advice regarding the needs of the projects are shared.

Chapter 2 discussed the fact that KDE offices and divisions have their own staff for supporting the IT components of projects. While it is important to have centralized coordination of technology initiatives, there are instances when staff dedicated to particular projects can provide a level of responsiveness and project knowledge that would not be available from centralized IT staff. However, all technology employees need a formal reporting relationship to OET for access to professional development to keep their IT knowledge up to date and to carry best practices back to the individual business units. Information should flow between offices so that information and advice regarding the needs of the projects are shared.

Gartner, Inc. and the state Auditor noted an urgent need for KDE to implement a comprehensive IT policy and provide oversight. KDE must stop its practice of allowing offices to choose whether and how to work together.

Over time, KDE has added committees to improve coordination across business units, but more must be done to address the issues identified by the state Auditor, Gartner, and Claraview. Both Gartner and state Auditor have pointed to an urgent need for KDE to implement a comprehensive IT policy and provide adequate

oversight. KDE must discontinue its longstanding practice of allowing offices to choose whether and how to work together. Instead of avoiding conflict by allowing offices to go their separate ways, conflict should be confronted and resolved with coaching and management.

Recommendation 1

Recommendation 1 is that KDE should review all recommendations from the state Auditor and Gartner, Inc. regarding governance and office structure and implement those that will provide appropriate oversight and authority.

The Kentucky Department of Education should review all recommendations regarding governance and organizational structure presented in the Auditor of Public Accounts and the Gartner, Inc. reports and implement those that will provide a comprehensive information technology system with appropriate oversight and authority.

Security

Security should be a key consideration in all decisions.

Security is not solely an OET issue. It should be a key consideration in all decisions, and everyone who uses education technology should do their part to ensure security.

KDE needs a centralized security officer, modernized data retention and redaction rules, logical security policies that are formalized and consistently applied, and segregation of duties where appropriate.

The state Auditor recommends that KDE appoint a centralized security officer with the authority to enforce security best practices. Now that Kentucky has a longitudinal data system, new data retention and redaction rules must be developed. The current rules recommended by the Kentucky Department for Libraries and Archives allow data to be retained no more than 5 years. This is not long enough; analyzing long-term trends requires student data to be accumulated for decades. The Auditor noted that OET provides best practice information to KDE's other business units, but there is no central authority to ensure that business units comply. Other recommendations are that logical security policies be formalized and consistently applied. Also, system security requires segregation of duties; having more than one person involved in key duties helps to prevent fraud and errors.

Recommendation 2

Recommendation 2 is that KDE should implement recommendations from the state Auditor and Gartner, Inc. regarding formalized, consistently applied security policies and practices.

The Kentucky Department of Education should review and implement the recommendations from the Auditor of Public Accounts and Gartner, Inc. regarding formalized and consistently applied security policies and practices that apply to all department data initiatives.

Evaluation of Impact of Technology Initiatives

Progress toward meeting stated goals and objectives should be evaluated with systematic, quantitative indicators. Research experts should be consulted to ensure that valid and reliable indicators are collected while minimizing burden on educators

Kentucky, like many states, relies too much on anecdotal evidence of program benefits. Teachers and administrators are often urged to use research-based methods but are not always given specific examples. Kentucky's progress toward meeting its stated goals and objectives, listed in Chapter 1, should be evaluated with systematic, quantitative indicators. These indicators, and the means to collect them, should be developed with the help of evaluation research experts so that valid and reliable indicators are collected with the least possible burden on educators.

In addition to the need to evaluate the broad impact of technology on student achievement, there are many other unanswered questions regarding the extent to which Kentucky's education technology is meeting its stated goals.

In addition to the need to evaluate the broad impact of technology on student achievement, the following specific questions have yet to be answered:

- How proficient are students in touch-typing and other specific technology skills?
- Are teachers proficient and comfortable enough with technology to be effective at teaching it?
- Is technology strategically integrated into teaching and learning for maximum impact?
- Does technology increase the productivity and efficiency of teachers, administrators, and staff? If so, in what ways?
- Is technology encouraging data-driven decision making?

Recommendation 3

Recommendation 3 is that KDE should provide critical program analysis to ensure that initiatives achieve their objectives.

The Kentucky Department of Education should provide critical program analysis of all technology initiatives to ensure that the programs achieve the desired objectives.

Financial Data

As previously recommended by OEA, the ability to get lower-level functions on the annual financial reports is necessary to conduct detailed program analysis (Commonwealth. Legislative. Office. *Indicators* 52). Currently, without the lower-level data, research will not be able to determine program costs. For example, all district program costs in this study are estimated. KDE's new initiative to revise the chart of accounts and require more accurate coding practices should improve the integrity and usefulness of financial data.

Recommendation 4

Recommendation 4 is that KDE should modify the annual financial reports process so that lower-level data are available for analysis.

The Kentucky Department of Education should modify the annual financial reports so that when they are submitted to the state, lower-level data are reported to KDE.

Individual Learning Plans

While it is commendable that students are ahead of schedule in opening individual learning plan accounts, KDE should provide support to ensure that individual learning plans are used to their full potential.

It is commendable that students are ahead of schedule in opening accounts for the individual learning plan. However, KDE is not yet monitoring how these plans are being used. KDE should provide support to ensure that individual learning plans are used to their full potential. 704 KAR 3:305 section 4(7) requires districts to evaluate the effectiveness and results of the individual learning plan process, incorporating input from students, parents, and school staff. One evaluation criterion will be the status of the student 12 months following graduation.

Recommendation 5

Recommendation 5 is that KED should provide support to schools to ensure that individual learning plans are used to their full potential.

The Kentucky Department of Education should provide support to schools to ensure that individual learning plans are used to their full potential.

Virtual Learning

The rapid growth in virtual learning opportunities has created a somewhat disjointed landscape, without much coordination between K-12 and postsecondary initiatives. Utilization of virtual learning should be examined in more depth to optimize efficiency and effectiveness.

Recommendation 6

Recommendation 6 is that KDE and the Council on Postsecondary Education should provide critical program analysis of all virtual learning offerings to optimize the effectiveness and efficiency of learning opportunities for all students.

The Kentucky Department of Education and the Kentucky Council on Postsecondary Education should provide critical program analysis of all virtual learning offerings to optimize the effectiveness and efficiency of learning opportunities for all students.

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Appendix A

Kentucky Statutes and Regulations Relevant to Education Technology

Kentucky Revised Statutes
KRS 156.660 Definitions
KRS 156.670 Development of master plan for education technology
KRS 156.671 Strategic plan for distance learning
KRS 156.675 Prevention of transmission of sexually explicit materials to schools—Administrative regulations—Local school district policy on student Internet access
KRS 156.690 Teachers' computer purchase program
KRS 157.650 Construction of certain sections relating to educational technology—Power of School Facilities Construction Commission
KRS 157.655 Education technology program
KRS 157.660 Procedures for providing assistance for education technology
KRS 157.665 Kentucky education technology trust fund
KRS 158.807 Data research initiative—Purposes—Implementation (grid computing)
KRS 168.00 Kentucky Educational Television

Kentucky Administrative Regulations
701 KAR 5:110 Use of local monies to reduce unmet technology need
701 KAR 5:120 Prevention of sexually explicit materials transmitted to schools via computer
703 KAR 5:020 The formula for determining school accountability (lays out how the individual learning plan relates to the definition of successful transition to adulthood)
704 KAR 3:305 Minimum requirements for high school graduation (lays out how the individual learning plan will be used to fulfill graduation requirements)

Source: Staff compilation.

Appendix B

District Support Staff Needed According to Master Plan

The following formulas guide districts to determine an adequate number of support staff. When a district's staff falls short of these specifications, salaries for the needed staff are included in the districts' calculation of unmet need (Commonwealth. Dept. of Ed. *2007-2012 79*).

Desktop Support Staff

These staff support workstations by performing ongoing maintenance and providing break/fix support. They are responsible for software installs and upgrades. To determine the recommended number of desktop support staff, divide the number of personal computers (PCs) by the scale factor. For example, 2,000 PCs need desktop support staff of 11 (2,000/182 = 11).

# PCs and connected devices	<1,000	1,000 – 5,000	5,000 – 10,000	>10,000
Scale factor	48	182	204	252

Local Area Network/Network Staffing

These staff support network operations. To determine the recommended number of staff for local area networks (LANs) and other networks, divide the number of PCs by the scale factor. Example: 3,700 connected devices need staff of 8 (3,700/464 = 7.9).

# PCs and connected devices	<1,000	1,000 – 5,000	5,000 – 10,000	>10,000
Scale factor	206	464	462	728

Help Desk Staffing

These staff provide first-level support for hardware and software. To determine the recommended number of Help Desk staff, divide the number of average monthly calls by the scale factor. For example, 2,600 calls per month would require a staff of 9 (2,600/289=8.9).

Calls per month*	<1,000	1,000 – 3,000	3,000 – 5,000	5,000 – 10,000	10,000 – 15,000
Scale factor	160	289	373	379	477

Note: *If the number of calls is unknown, assume 25 calls per user per year.

For example, using the formulas provided above, a district with 3,600 devices connected to its network (3,000 workstations, 150 servers, and 450 printers) and generating 6,000 help desk inquiries per month would require the following staff:

	Formula	Staff Needed
Desktop Support	3,600/182	20
LAN/Network Support	3,600/464	8
Help Desk	6,000/379	16

Appendix C

Funding for Selected Kentucky Education Technology Initiatives

Initiatives for All Districts	Fiscal Years Budgeted	Funding				Expenditures		Continuation Operational Costs		Notes
		Federal	State	Other	Total	Thru 6/30/08	FY 08 only	FY 09	FY 10	
Instructional Device Upgrades (IDU)	2007 & 2008		$50,000,000		$50,000,000	$49,667,799	$27,479,545			
Internet2	2008						$0	$95,000	$95,000	Paid by Education Cabinet
Kentucky Virtual High School (KYHS)	2008		$800,000	$450,000	$1,250,000	$1,250,000	$1,250,000	$1,250,000	$1,600,000	Other funding is Agency Receipt Funds (Supplement)
Kentucky Virtual Library (KYVL) (KDE portion)	2008		$320,000		$320,000	$320,000	$320,000	$320,000	$320,000	KETS Funds
KET Encyclomedia (w/ KET)	2008	$186,506	$300,000		$486,506	$298,000	$298,000	$300,000	$426,000	State funds are KETS
On-line Assessment	2007 & 2008		$1,538,674		$1,538,674	$1,404,893	$220,692	$130,748		CATS online for students with disabilities or LEP
Student Information System - STI	2007 & 2008		$1,688,377		$1,688,377	$2,668,589	$1,862,785	$1,726,300		Phase out end of FY 09
Student Information System - Infinite Campus*	2008 & 2009		$10,000,000		$10,000,000	$7,552,873	$4,548,341	$2,447,127	$6,800,000	Implement FY 08/09. FY 09 is the capital balance.
Individual Learning Plan (ILP)	2008		$465,000		$465,000	$465,000	$465,000	$600,000		
Kentucky Instructional Data System (KIDS)	2007 & 2008	$5,930,275			$5,930,275	$5,148,055	$5,148,055	$1,200,000		Includes $5.78mm SLDS grant for FY 07-09 plus NGA $150K for FY 08 (1 of 2 years)
Kentucky Educational Network (KEN) (KDE Portion)	2007 & 2008		$23,394,688		$23,394,688	$23,050,000	$12,994,688	$15,300,000	$15,300,000	
KETS Offers of Assistance	2007 & 2008		$7,580,080		$7,580,080	$6,905,103	$6,905,103	$11,588,868		$7.580M offer was for FY 08 only, please confirm with SFCC, KBE approved a KETS offer of $11.6M for FY 09
Financial Management System (MUNIS)	2007 & 2008		$2,812,192		$2,812,192	$2,686,918	$1,390,906	$1,576,421	$1,655,242	KETS Funds
eWalk	2008						$0			Paid by Districts
Totals for All Districts	2007-2009	$6,116,781	$98,899,011	$450,000	$105,465,792	$101,417,231	$62,883,115	$32,525,676	$33,776,322	

Additional Funds for Coal Severance Districts	Years Budgeted	Funding				Expenditures		Funds Available		Notes
		Federal	State	Other	Total	Thru 6/30/08	FY 08 only	FY 09	FY10	
Grid Computing (Dataseam)	07 & 08		$5,000,000		$5,000,000	$5,000,000	$2,500,000	$2,500,000	$2,500,000	$2.5m each FY 07/08/09/10
Additional KETS Offers of Assistance	07 & 08		$1,500,000		$1,500,000	$1,396,008	$1,500,000			
KISTA New Market Tax Credit (NMTC)	07 & 08	$21,072,922	$2,000,000		$23,072,922	$20,036,712	$1,000,000	$3,036,210		$1m FY 07, $1m FY 08
Totals Additional for Coal Districts	**2007-2009**	**$21,072,922**	**$8,500,000**		**$29,572,922**	**$26,432,720**	**$5,000,000**	**$5,536,210**	**$2,500,000**	

GRAND TOTALS	**2007-2009**	**$27,189,703**	**$107,399,011**	**$450,000**	**$135,038,714**	**$127,849,951**		**$38,061,886**	**$36,276,322**	

Note: For Infinite Campus, the amount shown in the FY 2009 column is the capital balance.
Source: Dav.

Appendix D

Instructional Device Upgrade Project Purchases by Funding Source Through February 10, 2008

							Percentage Breakdown by Device Type
		Apple	**Dell**	**Hewlett-Packard**	**Lenovo**	**Totals**	(regardless of funding source)
Desktop							**Desktop**
	IDU	2,268	40,839	6,081	4,925	54,113	70.21%
	Local	1,223	11,764	8,745	935	22,667	29.41%
	Personal	24	253	15	4	296	0.38%
	Total	*3,515*	*52,856*	*14,841*	*5,864*	*77,076*	
Laptop						-	**Laptop**
	IDU	314	5,465	959	1,165	7,903	47.29%
	Local	300	5,425	1,433	1,591	8,749	52.35%
	Personal	27	28	2	3	60	0.36%
	Total	*641*	*10,918*	*2,394*	*2,759*	*16,712*	
Tablet						-	**Tablet**
	IDU	-	-	1,741	1	1,742	33.58%
	Local	-	-	3,392	53	3,445	66.42%
	Personal	-	-	-	-	-	0.00%
	Total	*-*	*-*	*5,133*	*54*	*5,187*	
Total Computers		4,156	63,774	22,368	8,677	98,975	
Market Share		4.2%	64.4%	22.6%	8.8%	100.0%	
Microsoft Office Licenses							
	IDU		55,375				
	Local		27,236		**Percent of District IDU Devices Also Purchased with Office License**		
	Personal		1,431				
	Total		84,042		85%		
Summary of purchases by funding source							
	IDU		63,758				
	Local		34,861				
	Personal		356				
	Total # of devices		98,975				
							Regardless of
Summary by type of device			IDU	Local	Personal		funding source
	Desktop		84.87%	65.02%	83.15%		77.9%
	Laptop		12.40%	25.10%	16.85%		16.9%
	Tablet		2.73%	9.88%	0.00%		5.2%

Note: IDU=Instructional Device Upgrade.
Source: Couch. "Re: IDU."

Appendix E

Response From the Kentucky Department of Education
February 11, 2009

In general, KDE is in agreement with the overall findings of the OEA review/study on the Kentucky education technology program that was presented by OEA to the Education Assessment and Accountability Review Subcommittee on December 9, 2008. KDE greatly appreciates OEA's pointing out the positives of the status of education technology in Kentucky, as well as areas we can improve on. We have had some time to look at and respond to the conclusions and recommendations in regards to our accomplishments and areas needing improvement. Our responses to these findings are shown below, preceded by "KDE Response" in bold italics.

Also, because we agree with the recommendation that we follow the recommendations of the recent audit performed by the Auditor of Public Accounts, we have included the applicable responses KDE has already sent to the APA in Section 2 below, following our responses to OEA's recommendations.

Section 1: KDE Response to OEA's Conclusions and Recommendations

Accomplishments

Access. The Commonwealth consistently ranks above the national average—often in the top tier of states—on measures of teacher and student access and use of technology. This accomplishment is all the more remarkable given the below-average use of technology in Kentucky homes.

Kentucky's investment in technology has opened many new doors to learning. Figure 6.A contrasts the opportunities that existed before KETS to those available today. Before KETS, a student typically had access only to those courses his school was able to offer, taught by the teachers the school was able to hire. Tools included textbooks, a blackboard, and paper and pencil. Parents bore the burden of homework help. For research papers, parents had to find time to drive the student to the public library.

Today, a wide array of new opportunities are available, all connected through the high-speed KEN. In addition to courses a particular school can offer, a wide variety of courses are available through KVHS. For research papers, there are KVL and EncycloMedia, which students can access at home as well as at school with their new laptops. Intelligent classrooms have electronic whiteboards with sophisticated features. There are also student response systems, which let teacher's poll students periodically during class, to determine if they understand what has been covered so far. Many schools conduct online formative assessments at the beginning, middle, and end of the year to identify struggling students; these students are often helped with instructional software.

Teachers, as well as administrators and policy makers, can also tailor a wide variety of educational services to their students' needs by analyzing the integrated longitudinal data in KIDS.

The ILP helps the student explore and plan for careers by bringing together helpful information and offering opportunities to collaborate with parents, teachers, guidance counselors, and others.

KDE response: KDE agrees.

Equity. Equity continues to be a key focus of Kentucky's education technology initiatives. Kentucky has many funding mechanisms and policies in place to counterbalance some of the advantages of large or wealthy districts. Unlike the U.S. as a whole, Kentucky has no significant differences in the student-computer ratio between low-poverty and high-poverty districts.

KDE response: KDE agrees.

Written Plans. Kentucky's 2007-2012 Master Plan is extensive and detailed, and it incorporates input from students, teachers, parents, business leaders, universities, and other major stakeholders. Each district is required to have its own technology plan, coordinated with the Master Plan that defines specific unmet needs. The Master Plan and district plans must be approved by KBE, and district must focus their spending on priority unmet needs.

KDE response: KDE agrees.

Deployment. Some current technology initiatives appear to be progressing ahead of schedule. These include the opening of ILP accounts and the conversion of the student information from STI to Infinite Campus.

KDE response: KDE agrees.

OET Operational Efficiency. OET has been praised for its operational efficiency. Hardware and software have been deployed, maintained, and supported with a relatively lean staff.

KDE response: KDE agrees.

Areas Needing Improvement

Governance. Key weaknesses include insufficient coordination of technology-related activities among business units within KDE and a lack of strong centralized enforcement of standards and policies that are critical for security, data integrity, timeliness, efficiency, and effectiveness.

The success of Kentucky's technology initiatives requires effective coordination and collaboration among KDE, districts, schools, and technology providers. Given the number of systems and organizations involved, strong governance is required to continually combat the tendency for groups to make decisions in isolated "silos." Regardless of which unit manages an initiative and where its financial support originates, OET and other key groups should be

involved early on, in order to provide a "big picture" perspective and to estimate the initiative's ongoing total cost of ownership. Widespread communication must occur early in the process and offer a chance for meaningful input from all stakeholders.

Decisions must balance the desire for flexibility with the need for standardization. There are benefits to allowing local districts and KDE business units to make most of their own decisions. However, these decision making processes need to be more transparent. Also, policies that profoundly impact security and cost-effectiveness should not be optional. The current Master Plan identifies a number of strategic education initiatives that will only be successful if coordination and collaboration are addressed along with the fundamental technology capabilities. These are listed in Appendix I.

Chapter 2 also discussed the fact that KDE offices and divisions have their own staff for supporting the IT components of projects. While it is important to have centralized coordination of technology initiatives, there are instances when staff dedicated to particular projects can provide a level of responsiveness and project knowledge that would not be available from centralized IT staff. However, all technology employees need a "dotted line" relationship to OET, for access to professional development to keep their IT knowledge up to date, and to carry best practices back to the individual units. Information should flow in the opposite direction, too; technology employees who are dedicated to other offices can impart valuable information and advice regarding the needs of the projects and the best ways to collaborate with the other offices.

Over time, KDE has added committees to improve coordination across business units, but more must be done to address the issues identified by the APA, Gartner, and Claraview. Both Gartner and the APA have pointed to an urgent need for KDE to implement a comprehensive information technology policy and ensure adequate oversight authority. KDE's senior management must put an end to the longstanding practice of allowing KDE's offices to choose whether and how to work together. Instead of avoiding conflict by allowing offices to go their separate ways, conflict should be confronted and resolved with coaching and management.

***Recommendation 1*:** KDE should review all recommendations regarding governance and office structure in the APA and Gartner reports and implement those that will provide a comprehensive information technology system with appropriate oversight and authority.

KDE response: KDE agrees. Please see the responses KDE sent to the APA in Section 2 below. Additionally, as KDE has previously discussed with you a few times in regards to the "dotted line relationship" recommendation, there will be official approval required of the Office of Internal Administration Services (OIAS) , Office of Legal, Legislative and Communication Services (OLLCS) and the Office of Education technology (OET), as well as the affected program area, for any contract for education technology products, services, projects or staff to be used by school districts, schools or KDE. This approval is necessary regardless of the funding source (e.g., federal, state, local, university, corporate, private), what entity is performing the contract (e.g., vendor, university, Commonwealth Office of Technology (COT), KDE, or private individual), or what type of contract is established (e.g., RFP, RFI, MOU, MOA, or sole source) when technology is acquired, leased or used. The approval process requires that OIAS, OLLCS and OET be informed and invited to participate in education technology initiatives from their

inception, and advised of all material developments, including contract negotiations and communications with school districts regarding technology initiatives and services. The KDE senior leadership and program area staff will have the lead in establishing the educational and investment priorities for technology enabled initiatives and services. OET will have lead responsibility for education technology architecture, infrastructure strategies, engineering, product standards, principles, and controls for technology enabled initiatives and services as well as the creation, implementation and stewardship of the KETS Master Plan, in consultation with other KDE staff, consultants, school districts and industry experts. KDE will also continue to build upon and use the IT governance model that has been recommended in the past and recently implemented which includes the Technology Planning Committee, the Technology Policy Committee and the Data Policy Committee.

Security. Security is not simply an OET issue. It should be a key consideration in all decisions and should be seen as the responsibility of everyone who uses education technology. The APA recommends that KDE appoint a Centralized Security Officer (CSO) with the authority to enforce security best practices.

Now that Kentucky has a longitudinal data system, new data retention and redaction rules must be developed. The current rules recommended by the Kentucky Department of Libraries and Archives allow data to be retained no more than 5 years. This is not long enough; analyzing long-term trends requires student data to be accumulated for decades.

The APA has noted that OET provides best practice information to KDE's other business units, but there is no central authority to ensure that business units comply. Other recommendations are that logical security policies be formalized and consistently applied. Also, certain duties should be segregated; for example, if one person is in charge of receiving check requests, issuing checks, and then balancing the account, a misuse of funds could be by that person could occur over a long period before being noticed by someone else.

Recommendation 2: KDE should review and implement the APA and Gartner recommendations regarding formalized and consistently applied security policies and practices that apply to all KDE data initiatives.

KDE response: KDE agrees. Please see the responses KDE sent to the APA in Section 2 below.

Evaluation of Impact of Technology Initiatives. Kentucky, like many other states, still relies too much on anecdotal evidence of program benefits. Teachers and administrators are often urged to use research-based methods, but are not always given specific examples. Kentucky's progress toward meeting its stated goals and objectives, listed on pages 5 and 6, should be evaluated with systematic, quantitative indicators. These indicators, and the means to collect them, should be developed with the help of evaluation research experts, to ensure that the indicators are valid and reliable, and that the data collection process imposes the least possible burden on educators.

Aside from the broad impact of technology on student achievement, the following specific questions have yet to be answered:

- How proficient are students in touch-typing and other specific technology skills?
- Are teachers proficient and comfortable enough with technology to be effective at teaching it?
- Is technology strategically integrated into teaching and learning for maximum impact?
- Does technology increase the productivity and efficiency of teachers, administrators, and staff? If so, in what ways?
- Is technology encouraging data-driven decision making?

Recommendation 3: KDE should provide critical program analysis of all technology initiatives to ensure that the programs achieve the desired objectives.

KDE response: KDE agrees**.**

Chart of Accounts: As previously recommended by OEA in the Efficiency and Effectiveness study, the ability to get lower level functions on the Annual Financial Reports (AFRs) is necessary to conduct detailed program analysis. Currently, without the lower level data research will not be able to determine program costs. For example, all district program costs in this study are estimated. KDE's new initiative to revise the Chart of Accounts and require more accurate coding practices should improve the integrity and usefulness of financial data.

Recommendation 4**:** KDE should modify the AFR so that when the report is submitted to the state, lower level data are reported to KDE, as suggested by OEA in the Efficiency and Effectiveness report.

KDE response: KDE agrees and is in the process of developing the necessary procedures to ensure that revisions to the Chart of Accounts will be implemented for all districts by the submission of the 2009-2010 AFR.

ILP. While it is commendable that students are ahead of schedule in opening accounts for the Individual Learning Program, this is just a start. KDE should provide support to schools to ensure that ILPs are used to their full potential. 704 KAR 3:305 Sec. 4(7) requires districts to evaluate the effectiveness and results of the ILP process, incorporating input from students, parents, and school staff. One evaluation criterion will be the status of the student in 12 months following graduation.

Recommendation 5: KDE should provide support to schools to ensure that ILPs are used to their full potential.

KDE response: KDE agrees. If interested, KDE can provide more information about our (a) current support to schools/districts and (b) needs for increased support through additional resources.

Virtual Learning. The burgeoning growth in virtual learning opportunities has created a somewhat disjointed landscape, without much coordination between K-12 and postsecondary

initiatives. Utilization of virtual learning should be examined in more depth, to ensure that it is being used to its maximum potential.

Recommendation 6: KDE and CPE should provide critical program analysis of all virtual learning offerings to ensure that they are effective and efficient learning opportunities for all students.

KDE response: KDE agrees to continue current collaborations with CPE in order to analyze all virtual learning offerings in order to provide effective and efficient learning opportunities for all students. In regards to technology services there are already many services that we work collaboratively and effectively together on with higher education for services for K-20. Some examples of these are: The Kentucky Virtual Library, The Kentucky Learning Depot, the peering link connection and services (e.g. e-mail, on-line courses, K-12 and higher education web service, Internet2 content) between the Kentucky Information Highway (used by K-12 and state government) and the Kentucky Postsecondary Education Network (used by higher education), unique student identifiers for easier transition of data between K-12 and higher education (e.g. for academic transcripts sent from high schools to universities), KCTCS, and JCTS.

Section 2: KDE's Response to APA's Recommendations

Below are the recent Auditor of Public Accounts (APA) recommendations with the KDE Management responses that were discussed with the APA in Oct and November and were formally sent to the APA in December from KDE.

FINDING: The Kentucky Department of Education Should Implement A Comprehensive Information Technology Policy And Ensure Adequate Oversight Authority Is Established

Cause/Effect:

Each of the Business Units within KDE is responsible for establishing and adhering to its own policies and procedures regarding information technology. Because of the organizational structure of KDE, Business Units do not report to OET. Therefore, OET cannot require the Business Units to comply with policies or procedures developed and implemented by this office. This situation results in inconsistent and incomplete controls over the KDE network and IT resources. Business Units were not required to ensure they had adequate IT resources necessary for the establishment and implementation of formal IT control policies and procedures.

Criteria:

A comprehensive information technology (IT) policy defines management and user responsibilities and obligations for the maintenance, security, legal and appropriate use of the KDE network and IT resources. Much of the information that KDE employees use or rely on is provided via the data network and the Internet itself. While these networks offer invaluable opportunities for sharing information and for working more efficiently, they also offer potential points of unauthorized access into KDE's data, e-mail accounts, and other valuable and often confidential information. IT control policies and procedures should be standardized, consistently applied, and monitored for compliance to ensure proper system and control development, implementation, and management.

Recommendation:

We recommend that KDE staff continue to coordinate with the Commissioner in order to establish an appropriate IT governance authority to design and implement standard IT controls and to provide centralized oversight of these controls for all KDE IT resources. Further, we recommend that the Data Policy Committee and the Technology Policy Committee continue to work towards their goals. We recommend that OET be provided the authority to develop and govern this process. If that cannot be accomplished through OET, then we recommend that any authority that is established for this purpose have the necessary qualifications to ensure established IT control policies and procedures are adequately designed and implemented. We recommend that management of all Business Units and the applicable system users be properly advised of the responsibility to comply with established IT control policies and procedures. Consideration of IT controls, at a minimum, should include acceptable use of network resources, physical and logical access security controls, program change controls, and business recovery.

KDE Management's Response and Corrective Action Plan:

KDE agrees. This issue was also part of the recent Office of Education Accountability (OEA)study, past 2 APA audits and 2 Gartner Group studies.KDE Sr leadership has made a decision to follow the recommendation from these past audits and studies on the subject of education technology governance and leadership. KDE will continue to establish an appropriate IT governance authority to design and implement standard IT controls and to provide centralized oversight of these controls for all KDE IT resources. The Data Policy Committee and the Technology Policy Committee will continue to work towards their goals. KDE intends to provide OET the authority to develop and govern this process. KDE system users will be properly advised of the responsibility to comply with established IT control policies and procedures. Consideration of IT controls, at a minimum, will include acceptable use of network resources, physical and logical access security controls, program change controls, and business recovery.

FINDING: The Kentucky Department of Education's Office of Education Technology Should Formalize and Consistently Apply Logical Security Policies For The KETS Network and MUNIS

Cause/Effect:

Without strong, formalized, logical security controls, the opportunity increases for unauthorized modification to financial and staffing reports as well as the likelihood of errors or losses occurring from incorrect use of data and other resources. Granting users local administrator rights to their workstations allows those users the ability to download and install unauthorized software as well as possibly pirated data. Allowing users to share user IDs eliminates the ability to identify specific individuals accessing system resources. Not adequately removing user account access following job separation of staff increases the possibility of unauthorized access to agency data and resources.

Criteria:

Formalized security policies set the tone of management concern for strong system security and provide a security framework used to educate management and users of their responsibilities. System security should be administered in such a way as to ensure proper

segregation of duties. System access should be limited to the level necessary for performing assigned duties, and system accounts should not be shared to ensure individual user activity could be tracked. Granting users system administration access to their computers increases the likelihood that unauthorized and unlicensed software could be installed and increases the chance of system attacks by viruses or other malware.

Further, access to servers that house critical financial and staffing data should be restricted to only necessary employees. Intruders often use inactive accounts to break into a network. If an account is not used within a reasonable period of time, the account should be disabled until it is needed. This minimizes the possibility that an unauthorized user will access the account. Accounts that are not anticipated as being used in the future should be purged periodically. Finally, system user accounts and audit trails should be reviewed periodically in order to ensure identification and tracking of user activity.

Recommendation:

We recommend that OET develop and implement a formalized security policy to standardize security responsibilities for all OET employees and ensure critical programs and data, as well as the servers housing such data, are properly secured. Specifically, the agency should, at a minimum:

- ***Develop procedures related to the management of locked and disabled accounts on agency servers. These procedures should address the process of disabling or removing terminated employee accounts, as well as unnecessary generic accounts. Accordingly, a methodology should be developed so that a distinction can be made between accounts that can be safely removed versus accounts that must be retained on the server for performance reasons or audit trail history. These procedures should include the requirement for a periodic review of disabled and locked accounts to determine their necessity. If an account is deemed unnecessary, it should be permanently removed from the OET servers unless there is a pragmatic reason for maintaining the account, in which case it should be, at a minimum, disabled. All disabled accounts should be removed from current group membership on the OET servers.***
- ***Evaluate all security group assignments on the OET servers to ensure that all assigned users require membership in the assigned groups.***
- ***Implement procedures to periodically review security audit logs with special attention being given to users with high-level privileges so that inappropriate use of resources can be further investigated, if the need arises.***
- ***A security log should be established for all authorized KDE employees to log their access to the school districts' MUNIS servers, and these logs should be monitored and periodically reviewed.***
- ***Local Administrator rights should be restricted to only technical and support staff that requires this type of access.***

This comment is a result of our IT Audit fieldwork, which focused specifically on logical security policies governing MUNIS and the KETS Network. The same type of audit was performed on specific critical applications for which the Office of District Support Services (ODSS) is responsible; also resulting in a comment governing ODSS logical security policies see 08-KDE-03. KDE should determine whether this same type of weakness (a lack of security

policies) exists throughout the Department concerning critical applications that were not a subject of this audit. If so, then we recommend that KDE ensure that either a central level or individual security policies are developed and implemented to cover all critical applications owned by KDE.

KDE Management's Response and Corrective Action Plan:

KDE agrees. OET has a full time security program manager (CSO). KDE intends to have that position providing CSO leadership for all of KDE. The CSO will play a critical role in the direction and scope of the KDE Security Program. The CSO will work with the Technology Policy Committee is working to establish a KDE Security Program and is working with the Technology Policy Committee to draft needed Security control policies and a comprehensive Security Policy.
A plan exists to draft a policy to state:
A process will be established to monitor active employees vs. active accounts that will ensure:
inactive accounts are disabled
generic accounts are minimized
security group assignments are reviewed
high-level privileged accounts are minimized
access to MUNIS servers is logged

KDE will be reviewing the hardware and software application inventory of all KDE the agency workstations to determine the appropriate and best approaches to identify who has a true enterprise need for administrator privileges for workstations and laptops in KDE the agency.

FINDING: The Kentucky Department of Education Should Develop a Formal Disaster Recovery Plan

Cause/Effect:

Failure to develop and implement a formalized disaster recovery plan increases the possibility of loss due to excessive recovery time, costs, and disruption of processing capabilities in the case of a disaster or extended system outage.

Criteria:

Good management practices minimize risks through planning. The goal of a disaster recovery plan is to improve preparedness for extended system outages at minimal cost using available resources. Disaster Recovery Plans should be documented, approved, properly distributed, tested on a consistent basis, and updated as needed.

Recommendation:

We recommend that KDE continue to work toward the development of a comprehensive Disaster Recovery Plan. This comprehensive plan should include an overall Disaster Recovery Plan for the KDE, including a specific plan for each of the KDE offices and departments. These individual plans should be reviewed and updated annually as necessary to reflect accurate information related to:

- emergency personnel contacts,
- potential alternative processing sites,

- system descriptions and process requirements,
- backup procedures,
- designation of on-site and off-site storage facilities,
- backup and retention schedules for electronic media,
- procedures to recover data from backup media, and
- planned testing procedures.

Once completed, the comprehensive plan should be distributed to key personnel. Training on the disaster recovery procedures should be provided to these key personnel. Further, annual testing should be performed to ensure that all necessary personnel are aware of their respective roles in the implementation of the plan.

We also recommend that KDE continue to encourage all Kentucky school districts to develop a Disaster Recovery Plan that, at a minimum, addresses the backup and recovery of their MUNIS server. The benefits of the Disaster Recovery Service through MUNIS should be discussed with all school districts that are currently not using this functionality. OET or another central level oversight authority should be assigned to review and approve all school district's contingency plans.

KDE should continue to work toward developing backup procedures for all servers/applications that have been determined to be critical.

KDE Management's Response and Corrective Action Plan:

KDE agrees. KDE Technology Policy Committee has identified Disaster Recovery (DR) as the top priority for needed policy/strategy. As a result, the committee is recommending that a KDE Security Program be formed with representatives from KDE program areas. The KDE Security Program will be charged with developing a KDE Disaster Recovery Plan (DRP) that addresses the needs of each KDE office. At this time, OET is performing Disaster Recovery project discovery work and is gathering current procedure documentation (backups, etc.). DR for MUNIS - Tyler Technologies/MUNIS explains the availability and benefits to the KY Districts during the annual MUNIS User Conference and the KASBO (KY Association for Business Officials) Conference. Currently 25 districts have it in place. Tyler Technology sales representatives will adopt a marketing plan to ensure all Districts know of the service and its emphasis on the overall KDE Disaster Recovery Plan.

KDE will at least annually encourage districts to develop their own comprehensive disaster recovery plan as well as ensuring they are aware of the MUNIS services. While KDE does not have the capacity at this time to establish an annual review and approval service for district disaster recovery plans, KDE will certainly encourage districts to hire a 3rd party independent service to perform this periodic review for them.