Providence Schools

Providence Public School District
Appendix B
3 Year Technology Plan and "Blueprint" Update
Funding Years 2019, 2020, 2021 to June 30, 2022

Creation Date: August, 2012

Revised: February, 2013

Board Presentation: February 25, 2013

Submitted: RIDE March 19, 2013

Revised: September 11, 2013

Updated: November, 2015

Updated: November, 2018

Providence Public School District

Technology Plan Blueprint

July 1, 2019 through June 30, 2022

JHMEDU
Janice Meyers Educational Consulting

About Providence Public Schools

Who We Are

The Providence Public School District (PPSD) serves approximately 24,000 students and their families among 39 schools. Across our district each day, our educators, administrators and staff are dedicated to our students and supporting their paths to success.

As the largest department within the City of Providence, accounting for approximately half of the City's operating budget, PPSD employs more than 3,200 hard-working individuals who support our many schools, including 22 elementary schools, 7 middle schools, and 10 high schools. Of our employees, approximately 2,000 are educators and more than 600 others directly support our students in our schools.

Who We Serve

Our schools are diverse learning communities; approximately 65% of our students are Hispanic, 16% Black, 9% White, 5% Asian, 4% Multi-racial and 1% Native American.

Approximately 31% of students are English Language Learners (ELL) and about 16% of students receive Special Education services. Approximately 55% of students come from homes where English is not the primary language spoken. Combined, students and their families speak 55 different languages and hail from 91 countries of origin.

Vision

The Providence Public School District will be a national leader in educating urban youth.

Mission

The Providence Public School District will prepare all students to succeed in the nation's colleges and universities, and in their chosen professions.

Core Values

Respect
Together, we operate as a team. We respect one another and work collaboratively as a team to support and serve our students and educators.

Equity
We are guided by the conviction that all students can learn and achieve at high levels.

Excellence
We strive for excellence in all that we do and maintain a positive attitude and unwavering focus on results.

Accountability
We share responsibility and accountability for the success of our students and our schools.

Appreciation for our diversity
We are enhanced by the diversity of our school communities and staff; we embrace and celebrate our diversity

Technology Vision

It is the responsibility of the PPSD Technology Department to aid in the design of learning environments that make effective use of today's technology and provide a degree of affordable future proofing of the communications infrastructure for tomorrow's technology.

Teachers are supported by enhanced technological administrative and instructional systems. Technology allows the learning environment to contain the following desirable features:

- Small-group instruction
- Individualized instruction
- "Non-paper" instructional materials
- Collaborative, multi-sensory instruction
- On-demand access to information and resources
- Exploratory, intuitive-based

The general-purpose computer lab has become obsolete. Each classroom has a wireless network capable of handling 1:1 computing. Every student has access to a Google

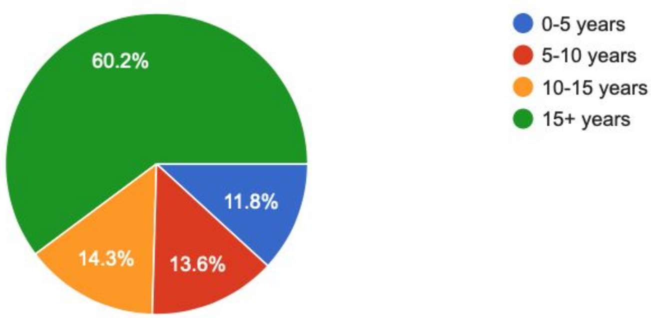
Chromebook or iPad. Teachers have a laptop or desktop that can be connected to a SmartBoard with speakers.

Technology Needs Assessment

Survey Demographics

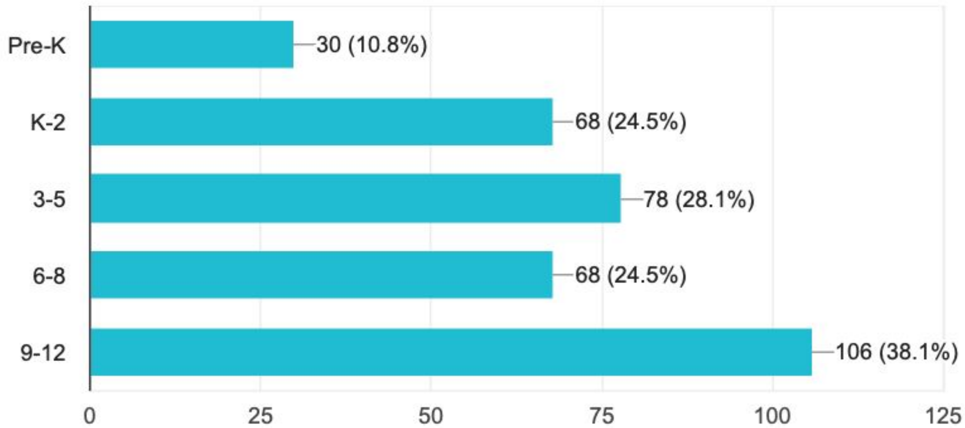
In April of 2019, Janice Meyers Educational Consulting, LLC conducted a survey of educators and administrators working in the Providence Public Schools. We received 558 responses from building-based teachers and staff and from 27 administrators.

558 instructional staff members completed the Technology Survey. 87% of respondents are teachers and the remainder came from all positions including: paraprofessionals, school psychologists, guidance counselors, librarians, instructional coaches, social workers, and special service providers.



The majority of respondents had more than 15 years of experience in education.

Half of respondents specified the grades in which they worked. The majority of staff who responded work in high schools, with the second most common category being upper elementary.



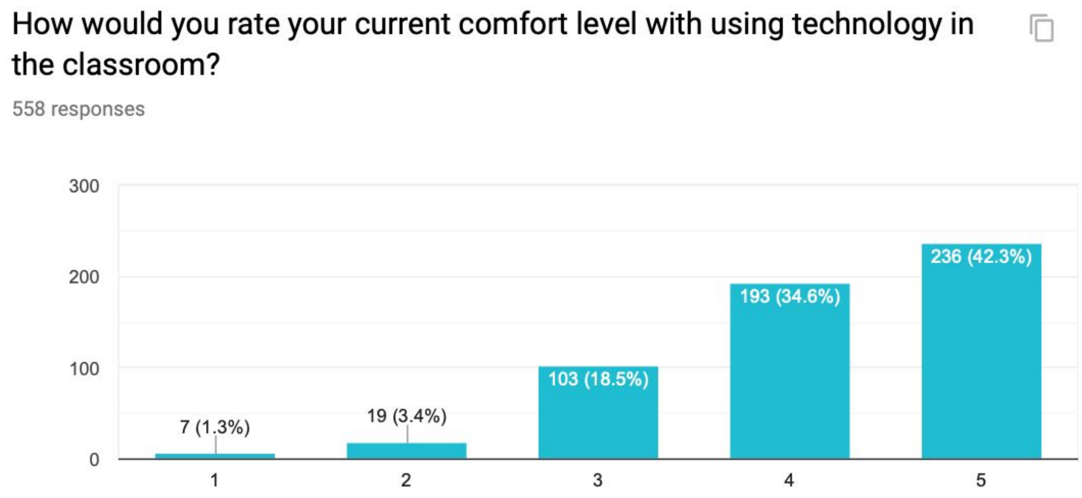
26% percent of respondents are responsible for teaching all subject areas.

The next most popular areas of instruction were English Language Arts, Math, Special Education, and ESL.

Respondents came from a wide-variety of roles within PPSD including: career and technical education, STEM, credit recovery, restorative justice, ROTC and many more.

Current Level of Comfort with Technology

When asked to rate their current level of comfort with technology (1 being “I struggle to integrate technology,” 5 being “I am very comfortable integrating technology”), 77% of staff surveyed rated themselves as a level 4 or 5.
These results indicate that teachers are **more confident** in their abilities than they were when responding to the 2015 CELT survey. At that time 41% of teachers rated themselves as advanced or experts in the use of technology.



Technology Availability

65% of respondents have access to **Chromebooks** and are satisfied with the number available to them. An additional 12% have Chromebooks but would like more; while 10% of staff do not currently have access to Chromebooks but would like to try using them with students.

64% of staff members state that they have an **Interactive Whiteboard.** 18% of teachers do not have access to these boards, but would like to try using one. 29% of teachers indicated a desire to try using **Student Response Systems** with these boards.

Opinions regarding **iPads** in the classroom are split. 24% of staff stated they currently use iPads in the classroom and another 28% would like to try using them. 25% of staff surveyed indicated no need or desire for iPads.

Technology Usage

The Needs Assessment found that PPSD teachers are using technology in a variety of ways. This is cause for celebration. Educators are utilizing technology to:

- Collaborate with students via Google Classroom (65%)
- Assign work/manage student learning portfolios (49%)
- Create lessons for an interactive whiteboard (46%)
- Collaborate with colleagues (64%)
- Communicate with families (71%)

- Create a classroom website (26%)
- Assess student learning in math and literacy (53%)
- Grade student work and complete report cards (80%)
- Access teacher's guides and curriculum planning materials (66%)
- Read E-Books (40%)
- Manage interventions and personalized learning in math (33%) and literacy (45%)
- Manage student behavior (35%)

Professional Growth

PPSD staff are motivated to learn more. Staff indicated interest in a wide-range of uses for technology. The top five areas of interest were:

1. 55% of staff surveyed wanted to learn more about creating lessons for interactive whiteboards.
2. 49% wanted to learn more about creating a classroom website.
3. 44% would like to increase their capacity to assign/manage student work via student learning portfolios.
4. 40% of educators surveyed want to learn more about teaching coding and STEM with technology.
5. 37% would like to grow in their ability to use technology to collaborate and plan with colleagues.

Janice Meyers Educational Consulting, LLC recommends conducting a mandatory survey for all staff in September of 2021. The data from this survey will be used to update this Technology Blueprint.

District Priorities

Five-Year Strategic Plan Alignment:

Implementation of Strategic Goals

The Providence Public Schools have collaborated with stakeholders to identify five major goals that drive the strategic plan

Ensuring Academic Achievement

PPSD has been implementing Summit Learning and other online PLS with the roll out of Chromebooks for students. The PD for teachers was given by the vendors who introduced the program and its features. PPSD needs staff development from vendor neutral professionals to integrate the advantages of these programs into the teacher's routine, and supplement these programs with other lessons. Students need more face time with each other and their teachers to question, give feedback, and interact with each other.

Maximizing Learning Time

PPSD could expand learning time by creating after-school clubs or lunch clubs in which students are asked to solve real-life problems by researching, surveying, and collaborating with off-campus mentors and using online information. The final products could be published online.

Growing a Strong Workforce

We recommend PPSD create an entrepreneurship program for the elementary, middle and high school students. Students could utilize tech resources to create a business that solves real-life problems, helps others, and rewards hard work and creativity. This encourages accountability, critical thinking, collaboration, decision making, public speaking, self-assessment and teamwork.

Providing Improved Service

Students cannot learn when they are in crisis, homeless, hungry, wearing dirty clothes, or afraid. While the depth of this problem exceeds the scope of this plan we suggest collecting information about support for students and families and making it available online. Each school could designate a desktop for family usage to access these resources as well as others, such as job applications.

Allocating Resources Strategically

The homework gap needs to be addressed by expanding the use of the school network after school and allowing students to check out devices and Internet cards. The district working with city and anchor institutions needs to provide expand internet access for all families and students.

Accomplishments

PPSD has coordinated the widespread distribution of Interactive Whiteboards, Google Classroom, Document Cameras, Chromebooks, and iPads. Each school's Internet access bandwidth has been exponentially increased. The IT department has an exemplary record of responding to helpdesk requests. Educators are able to request and access new technology. The team has begun streamlining the printing process to be more cost-effective and reliable.

The district has successfully managed the implementation of Skyward Student Management Suite. Additionally, they have piloted Summit Learning to facilitate personalized learning in the middle grades. Various online programs, such as Lexia, Dreambox, and STAR, have been used for diagnostic purposes and intervention in literacy and math.

Challenges

Over the period covered by this technology plan, the district will face several major challenges as they work to meet the needs of a diverse student body. In order to address these challenges the district will need to invest the appropriate resources.

Recommendations

Technology Protection and Safety Measures

PPSD should continue to make student safety a top priority. The recommendations are:

- Continue pilots with Cisco and Sonitrol for new cameras, NRVs, and cloud monitoring tools.
- Investigate a Network Intrusions Detection Solutions.
- Research the School Violence Prevention Program (SVPP) grant offered by the Department of Justice for 2020.
- Implement GoGuardian for student and teacher devices. GoGuardian (usage and training) was commonly requested by staff members in the write-in section of the technology needs assessment.
- Research student ID badges for HS students to gain entrance in the building, attendance, buy lunch, check out materials form the library/media center, early dismissal.

Standards

We recommend that PPSD formally adopt the **ISTE Standards** for students, teachers, coaches, and administrators.

ISTE stands for the International Society for Technology in Education. ISTE Standards have been adopted by states and districts across the country, including the state of Rhode Island.

After adopting these comprehensive standards, we recommend that PPSD take advantage of the resources ISTE provides, including affordable, online professional development and lesson plans. These resources will scaffold the development of a robust Pre-K - 12 digital learning framework.

The adoption of the ISTE standards will enable teachers to provide students with the technology skills they need to succeed on RICAS.

Curriculum and Learning: English Language Learners

Providence has a large population of English Language Learners. Addressing the linguistic and academic needs of these students is extremely important.

We recommend that administrators, teachers, and district level staff partner to develop a resource guide with links to available software, online programs, and web-based that help scaffold learning for ELLs.

Teachers could access this database to determine what resources the district has purchased or are available for free to meet the needs of their students. This type of clearinghouse could eventually be expanded to other subject areas.

Curriculum and Learning: Social Emotional Learning

During focus groups, 1-1 meetings, and on the technology needs assessment, administrators and teachers expressed their desire to meet the social emotional needs of their students. PPSD has acknowledged the importance of social emotional learning (SEL) with the adoption of these five competencies.

We recommend the district adopt or endorse an SEL program with an online component to be made available to elementary, middle, and high schools. By leveraging the use of technology, programs with an online component make implementation easier for teachers and are often more engaging for students.

This guide to 25 SEL elementary programs was written by Stephanie Jones, an associate professor in human development and urban education at the Harvard Graduate School of Education, and a team of Harvard researchers.

The Collaborative for Academic, Social, and Emotional Learning (CASEL) produced this guide to secondary SEL program in 2015.

Developing Teacher Leaders

The technology needs assessment showed that building-based staff members look forward to greater collaboration with the IT department.

We propose the creation of an Instructional Technology Team at each school. The team would consist of tech support staff, teachers, a building leader, and (at the middle and high school level) at least two students.

We suggest PPSD should budget additional stipends for technology support staff at the building level, ensuring that they are motivated to take on leadership roles and compensated for facilitating professional learning communities.

Instructional Technology Teams would:

- Collaborate with the IT department regarding teacher needs, apps and devices, and staff development initiatives.
- Give feedback to IT on the effectiveness of Integrated Learning Systems.
- Continue to build relationships between tech support staff in the building and at the district level. This would enhance the district's understanding of building level needs and further facilitate full and timely responses.

Professional Development

Survey data confirms that PPSD teachers are motivated and hungry for professional learning opportunities that will increase their capacity to use technology to meet the needs of ALL students.

As previously stated, the top five areas of interest identified by the technology needs assessment were:

1. creating lessons for interactive whiteboards
2. creating a classroom website
3. assigning/managing student work via student learning portfolios.
4. teaching coding and STEM with technology.
5. using technology to collaborate and plan with colleagues.

We recognize that teachers have varied roles within the system and correspondingly, different needs. Furthermore, each group of students has unique strengths and challenges. PPSD must find a way to differentiate learning opportunities while also complying with the requirements set out by the latest updates to the Every Student Succeeds Act (ESSA). The ESSA specifically states that:

“The term ‘professional development’ means activities that... are sustained (not stand-alone, 1-day, or short- term workshops), intensive, collaborative, job-embedded, data-driven, and classroom focused.”
Every Child Succeeds Act S. 1177, Section 8002 Page 295, Paragraph 42

In order to meet the needs of diverse educators and students in the most efficient way possible, we recommend that PPSD utilize flipped professional development and online professional learning opportunities. This article provides a brief overview of the advantages adopting flipped PD.

Whenever possible, this would allow building leaders and individual teachers the autonomy to select courses that align with the needs of the school. Within the traditional model for professional development, logistics limit the amount of courses that can be offered in a given school or district. By combining coaching, professional learning communities (PLCs), and online coursework, PPSD can facilitate the professional growth necessary to fuel student achievement.

Professional Development Solutions

We recommend that the district select and utilize an online professional development solution. A variety of products are available to access ready-to-use courses and/or create new content. Educators are then able to participate in blended or fully online classes. Some products also act as PD trackers. Participants then upload evidence of learning, receive feedback from coaches or other PLC members, and track their progress. Educators can earn PD credits, micro-credentials, and in some cases, university credit.

Technical Staffing

IT Staff has an outstanding record, responding to most helpdesk issues in 24 hours.

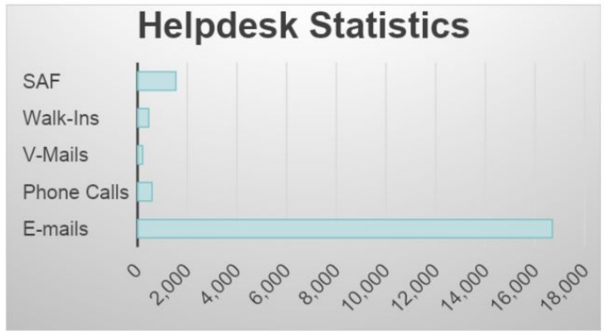
The information in the graphic below (taken from the 2018 IT update for the School Board), highlights the timeliness of the technical staff’s response time.

Providence Schools

Helpdesk Statistics 2017/18

- Total Number of Technical Requests: 19,293

E-Mails	16691
Phone Calls	582
V-Mails	202
Walk Ins	455
SAF	1,542
Total	19.293

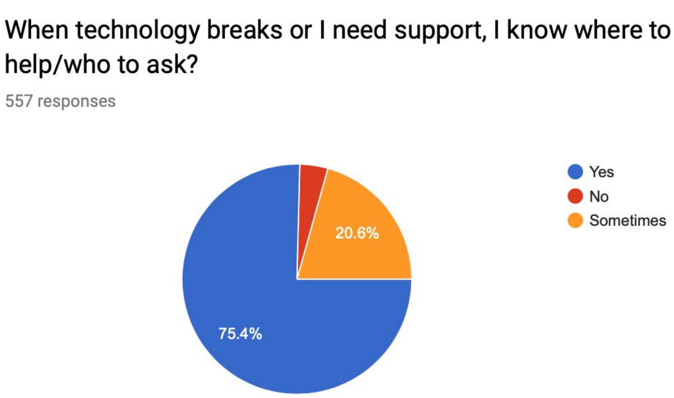


- Average response time: 1 business day
- Average response time to resolution: 8 business days

Survey results show that teachers know where to turn for tech support.

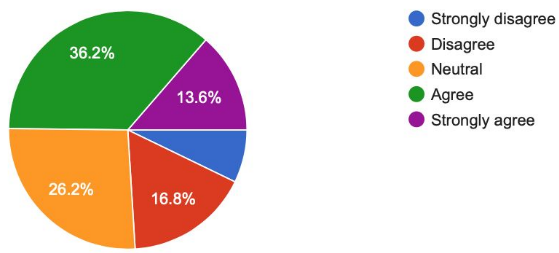
50% of respondents stated they were satisfied with the timeliness of tech support and another 25% were neutral regarding response time.

PPSD staff members are hungry for more learning, with approximately 46% indicating they would like to receive additional training when a new type of technology is introduced.



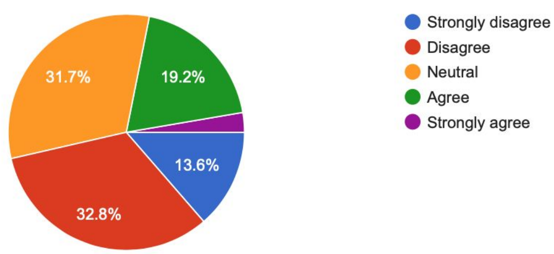
When I have a problem with technology, I am able to get support in a timely matter.

558 responses



When a new type of technology is introduced, I receive adequate training and support.

558 responses



IT Procedures

The IT department has done an outstanding job developing and implementing policy procedures. They have provided a clear pathway for all users to: access the helpdesk, request web-based software subscriptions, new hardware, and other requests.

The IT Department is in the process of transitioning from classroom-based printers to more cost effective centrally located laser printers. This will result in savings for the district and provide more uptime for printer performance. This transition to centrally located printers has caused some complaints from teachers. The goal will be to provide more uptime to the centrally located printer and more cost-saving.

We recommend that all elementary schools have at least one color laser printer. Color is essential when scaffolding instruction for ELLs, students with special needs and our youngest learners.

Budgeting

Janice Meyers Educational Consulting, LLC suggests increased compensation for the 50 plus Tech Support Teachers to lead the school based technology and staff development teams.

PPSD should include in the next budget cycle, money to send a team to the ISTE conference for further staff development and collaboration.

We also recommend that every elementary school have a high end color laser printer for teacher use.

Our budget suggestions will be aligned to district goals and transparent to all stakeholders.

Category	Year 2019-2020
Computer Hardware	$659,128
Telephone	$399,645
Wireless Communications	$116,000
Internet Connectivity	$260,871
Data Processing	$683,149
Information Services	$2,123,456
Computer Software	$421,577

The Providence Public School District IT Department considers this plan to be a working document and will provide updated and new budget information when it is available.

Implementation Strategies and Activities

Goal 1

The Providence Public School District will provide Educators, Administrators, and other staff with the skills and equipment to effectively use educational technology to assist students in achieving the ISTE standards for students, educators, administration, and coaches

1.1. All educators will be trained, supervised, and evaluated as they develop intermediate proficiency levels in utilizing educational technology to enhance student achievement.

Major Activities	Person(s) Responsible	Timelines	Indicators of Success
Authentic assessment tools will be utilized to determine Educator baseline technology proficiency.	Instructional Technology Team Educators	May of each year	Documentation of Educator completion of assessments. Published list of technology literacy proficiencies requiring additional training
Educators will receive instruction/professional development in the incorporation of technology in the curriculum.	Instructional Technology Team Educators	Each August and ongoing.	Records of Educator participation in professional development programs
Building level Technology Committee Educators will assist in the integration of new technology and software into the curriculum	Instructional Technology Team Educators	Ongoing	Technology implementation project plans

1.2. All educators will use technology tools and applications that provide opportunities for authentic, student-centered, project-based learning and will use email and other interactive tools, such as a teacher website, email and text, and/or Google Classroom, to communicate with parents, students and other educators.

Major Activities	Person(s) Responsible	Timelines	Indicators of Success
Select programs and lessons that provide integration of ISTE standards into the district curriculum	Instructional Technology Team Educators Administration	Fall of each year	Usage reports from online applications
Teachers will begin to implement flipped classrooms by creating lesson in blended learning	Instructional Technology Team Educators	October 2020 and Ongoing	Survey
Each school will use Google Classroom to foster communication and collaboration among all Educators, Administrators and Staff.	Instructional Technology Team Educators	Fall 2019 (Collaboration)	Review of posting and survey results

1.3. Teachers and administrators will be able to use technology to enhance their productivity and professional practice.

Major Activities	Person(s) Responsible	Timelines	Indicators of Success
Implement online district portal for lesson sharing and online resources	Instructional Technology Team Educators Administration	May of each year	Documentation of Educator completion of assessments. Survey
Professional development will be available in the online directory	Instructional Technology Team Educators Administration	Ongoing	Records of Educator participation in professional development programs.

1.4. All educators will act responsibly and ethically when obtaining and using on-site and online information resources.

Major Activities	Person(s) Responsible	Timelines	Indicators of Success
Workshops will be held on the meaning and importance of the Acceptable Use Policy	Instructional Technology Team Educators All Staff	September of each year and Ongoing	100% participate in Acceptable Use Policy Workshops. Records of participation.
Acceptable Use Policies will be signed by all staff and collected by school leadership.	Instructional Technology Team Educators All Staff	August and upon hire	100% of signed Acceptable Use Policies on file.

Goal 2

The Providence Public School District will provide students with equal opportunity to access, evaluate, synthesize and communicate information in all formats; thus ensuring that students will attain the educational technology and information literacy skills necessary to achieve the Core Curriculum Content Standards and to succeed in the workplace of the 21st century.

2.1. All students will have regular and equitable access to technology equipment (both desktop and portable) when needed in all learning environments, with a target ratio of one-to-one, with each of these devices connected to the Internet.

Educators will utilize technology in instructional design and in the expansion of the daily lesson design that allows students to use technology as a learning tool	Building level Technology Committee Educators	Ongoing	Lesson Plans, class observations

Teachers will facilitate student use of and exploration of technology for extended research, developing skill deficits, and enhancement of student productivity across content areas.	Building level Technology Committee Educators	Ongoing	Student Work, Lesson Plans, Classroom Observation.

2.2. Students will practice responsible, legal and ethical use of technology systems, information and software.

Major Activities	Person(s) Responsible	Timelines	Indicators of Success
Student acceptable Use Policies will be signed by all guardians and students each September and collected.	Building level Technology Committee Educators	Each September	100% participation documents on file.
Educators will incorporate the responsible, legal and ethical use of technology systems into instructional routines.	Building level Technology Committee Educators	Ongoing	Lesson Plans, Classroom Observation

Appendix A – CIPA Compliance and Internet Safety

Pursuant to Title 47, Chapter 5, Subchapter II, Part II, Paragraph 254, Section (h)(5)(A)(iii), the Providence Public School District has conducted a public hearing to address the Internet safety policy to be adopted by the school district pursuant to the Children's Internet Protection Act (CIPA) during the regularly scheduled Board of Trustees Meeting on February 28, 2011.

It is the policy of the Providence Public School District to: (a) prevent user access over its computer network to, or transmission of, inappropriate material via Internet, electronic mail, or other forms of direct electronic communications; (b) prevent unauthorized access and other unlawful online activity; (c) prevent unauthorized online disclosure, use, or dissemination of personal identification information of minors; and (d) comply with the Children's Internet Protection Act [Pub. L. No. 106-554 and 47 USC 254(h)]

Key Terms are as defined in the Children's Internet Protection Act:

TECHNOLOGY PROTECTION MEASURE. The term "technology protection measure" means a specific technology that blocks or filters Internet access to visual depictions that are:

1. OBSCENE, as that term is defined in section 1460 of title 18, United States Code;

2. CHILD PORNOGRAPHY, as that term is defined in section 2256 of title 18, United States Code;

HARMFUL TO MINORS. The term "harmful to minors" means any picture, image, graphic image file, or other visual depiction that:

1. Taken as a whole and with respect to minors, appeals to a prurient interest in nudity, sex, or excretion;

2. Depicts, describes, or represents, in a patently offensive way with respect to what is suitable for minors, an actual or simulated sexual act or sexual contact, actual or simulated normal or perverted sexual acts, or a lewd exhibition of the genitals; and

3. Taken as a whole, lacks serious literary, artistic, political, or scientific value as to minors.

SEXUAL ACT; SEXUAL CONTACT. The terms "sexual act" and "sexual contact" have the meanings given such terms in section 2246 of title 18, United States Code

To the extent practical, technology protection measures (or "Internet filters") shall be used to block or filter Internet, or other forms of electronic communications, access to inappropriate information.

Specifically, as required by the Children's Internet Protection Act, blocking shall be applied to visual depictions of material deemed obscene or child pornography, or to any material deemed harmful to minors.

Subject to staff supervision, technology protection measures may be disabled or, in the case of minors, minimized only for bona fide research or other lawful purposes.

To the extent practical, steps shall be taken to promote the safety and security of users of the Providence Public School District online computer network when using electronic mail, chat rooms, instant messaging, and other forms of direct electronic communications.

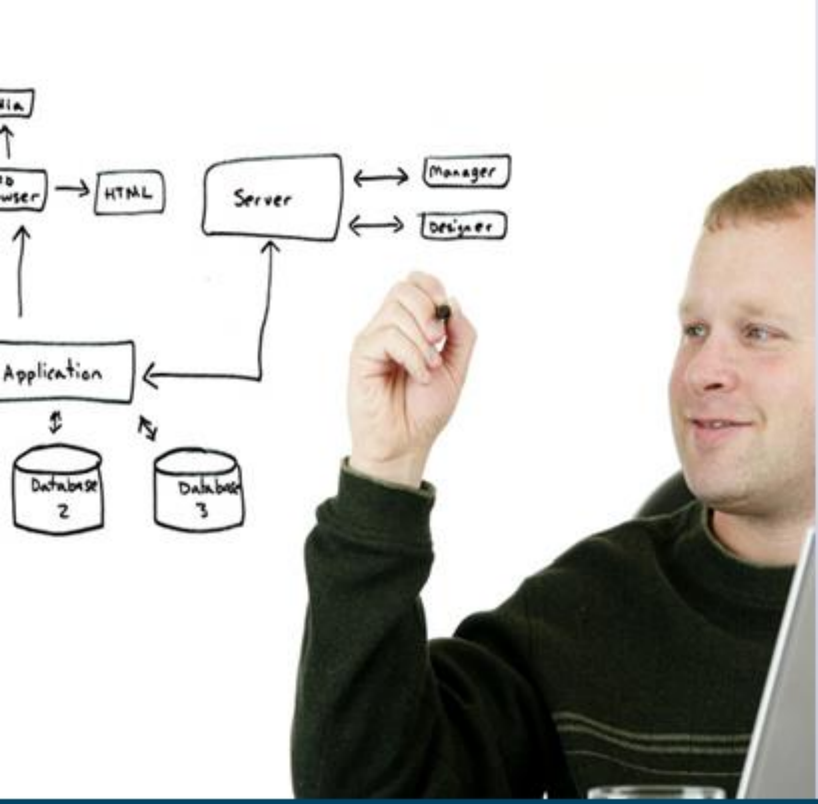
Specifically, as required by the Children's Internet Protection Act, prevention of inappropriate network usage includes: (1) unauthorized access, including so-called 'hacking,' and other unlawful activities; and

(b) unauthorized disclosure, use, and dissemination of personal identification information regarding minors.

It shall be the responsibility of all members of the Providence Public School District staff to educate, supervise and monitor appropriate usage of the online computer network and access to the Internet in accordance with this policy, the Children's Internet Protection Act, the Neighborhood Children's Internet Protection Act, and Protecting Children in the 21st Century Act.

Procedures for the disabling or otherwise modifying any technology protection measures shall be the responsibility of the Technology Coordinator or designated representatives.

To view PPSD Acceptable Use Policy click here.



CELT
Center for Educational Leadership and Technology

Providence Public School District

Appendix A

3-Year Technology Plan and "Blueprint" Update

Funding Years 2016, 2017, 2018 to June 30, 2019

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Creation Date: August, 2012
Revised: February, 2013
Board Presentation: February 25, 2013
Submitted: RIDE March 19, 2013
Revised: September 11, 2013
Updated: November, 2015

Appendix A – Updated Priorities Matrix

Phasing & Prioritizing Matrix
PPSD Recommendations ~ Update

This matrix documents the recommendations in CELT's technology assessment and the resulting *Information Technology Blueprint 2013-2016*. As part of this Technology Plan Update, we have reviewed the recommendations to determine their current status, anticipating that some are complete, some are in process, and some may no longer be priorities.

Since the initial Information Technology Blueprint was developed in the Winter of 2012/2013, Providence Public School District has undergone significant leadership transitions in the top school district administration positions, including Superintendent, Chief of Academics, Chief Operating Officer, and Chief of Human Resources. As a result, many of the top recommendations from the initial Technology Blueprint were not addressed and remain high priorities.

Notes:

1. The following table defines the acronyms used in the tables that follow. The LDR column indicates which department(s) has leadership responsibility for this project. For example:

CURR	Curriculum and Instruction	INST	Instructional Tech
OP	Operations	IT	Information Technology
EXEC	Executive Team	SA	School Administration
HR	Human Resources	SB	School Board
LMS	Library Media Services	SUP	Superintendent

2. The LDR column indicates which department(s) has leadership responsibility for this project.
3. The Priority column identifies the level of priority (**H**igh, **M**edium, **and Low**). This should reflect the **level of importance** of this specific recommendation relative to the other recommendations within this area.
4. The Status options are Complete, In Process, Still Needed, and Not Pursuing.

Top 10 Recommendations from 2013-2016

Top Recommendations	*LDR*	*Priority*	*Status*	*Comments*
1. Develop, implement, and integrate a PK-12 scope and sequence of student technology competencies so that all educators can readily identify and assume responsibility for integrating these competencies into the appropriate content area(s) and/or process skills in a logical and sustained way led by the technology integration specialist.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
2. Transform traditional school library/media centers into Information and Technology Resource Centers and restructure the role of Library Media Specialist to Coordinator of Research, Information, and Technology Services.	LMS INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
3. Adopt a "Learning Enterprise System" approach that will enable PPSD to use student performance data and assessment results to make revisions to the teaching and learning process.	CURR INST IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

4. Create and maintain a standard and flexible technology configuration (for learning environments and offices) and refresh program (annual) for classrooms and offices that define and sustain a critical mass of technology resources in order to attain equitable: ❖ access to, ❖ use of, and ❖ support for school district technology resources for all students, teachers, and administrators.	CURR INST IT	High	In Process	A major refresh is underway for the middle and high schools, recycling devices to the elementary schools and disposing of outdated equipment. PPSD is currently deciding the benefits and risks associated with purchasing Chromebooks as well as staying with a Microsoft platform verses switching to Google Apps. These decisions needs to be part of this recommendation.
5. Increase student access to online learning (anywhere/anytime) including, but not limited to, advanced placement and credit recovery. Consider phasing in a graduation requirement for the satisfactory completion of at least one online course by the end of grade 10.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
6. Develop a web-based school (and division) improvement planning tool for: ❖ Consistent focus on student achievement, ❖ Fidelity of implementation at all levels, and ❖ Alignment with the strategic plan. This tool must be fully integrated, in real time, with PPSD's data system and in collaboration with the planning/project management office.	SUP SA	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
7. Embrace a district-wide data architecture and a standard reporting and query tool for all administrative and instructional systems in conjunction with a comprehensive data governance and management program facilitated by the data stewards/manager.	SUPT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
8. Develop and implement a proficiency-based approach to human resource management and data systems that accommodate alignment of staff proficiencies with: • Learner Needs • Curriculum • Instructional Resources • Assessment • Improvement Plans • Staff Development • Educator Evaluations • Job Portfolio	HR	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
9. Establish a board-level agreement to set aside funds annually to ❖ Implement IT Blueprint/Refresh Program ❖ Assess, update, and adapt the IT Blueprint ❖ Establish a Technology Advisory Committee support PPSD's changing needs as well as emerging uses of information technology.	SB	High	In Process	The 2015 technology plan update is progress on this work, but continuing to strive for board-level agreement to set aside funds annually.
10. Conduct a city-wide summit on "Technology, Learning, and Economic Development" in order to enhance connectivity and learning opportunities for students, families, and the community.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

2.0 Curriculum & Instruction

*The **Curriculum and Instruction*** section focuses on the role technology resources play in to enhancing the delivery of curriculum content and supporting the assessment of student achievement.

Recommendation	*LDR*	*Priority*	*Status*	*Comments*
CA-1.1 Adopt Student Technology Standards Formally adopt and/or adapt the ISTE NETS standards.	CURR	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-1.2 Develop a Scope and Sequence for Technology Skills Develop a PreK-12 scope and sequence to guide the teaching and learning of technology skills that includes multiple opportunities for introduction, practice, demonstration of mastery, and application as appropriate in the content areas. Implement the scope and sequence so that all teachers can readily identify and assume responsibility for integrating these skills into the respective content area or process skills in a logical, progressive way via the Common Core State Standards.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-2.1 Embed Technology Skills into the PPSD Aligned Curriculum Formally and systemically embed technology skills into the aligned curriculum in the IMS to ensure the use of student technology skills for learning after they are developed.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-2.2 Evaluate and Disseminate Current Successful Technology Practices Develop a process to identify and a strategy to store and disseminate the best practices teachers are currently using with technology, collect data on their success (evaluate/vet), and provide professional development for other teachers to replicate these successes.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-3.1 Support Elementary Program Diagnostic and Remediation Tools Support the use of diagnostic software for the district wide elementary reading and math programs with professional development and necessary hardware and the use of it in instruction (Pearson SuccessNet and Envision).	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-3.2 Improve Middle School Student Attainment of 21st Century Technology Skills Monitor student progress in 7th grade EasyTech program through the embedded assessments. Provide professional development on how to use the pretest data to inform instruction, and best practices in how to support student use of the computer-based activities to develop the 21st century skills tested in 8th grade.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CA-4.1 Prepare Teachers to Fully Use the Capabilities of the IMS for Teaching and Learning Set up a system to track teacher preparation for using the IMS and their actual usage to determine where they may need additional support to fully use its capabilities once the	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

aligned curriculum is entered into the IMS and support is provided by the new Technology Support Teachers. See Chapter 12 for the action plan for the single sign on system.				
CA-4.2 Support a Comprehensive Collection of Tools in the IMS Provide tools, support, and professional development for lesson planning, a grade book, data and analytics for decision-making, and benchmark assessments on student progress in meeting the objectives of the aligned curriculum.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

3.0 Teaching and Learning

The **Teaching and Learning Technologies** section focuses on the types of digital teaching and learning resources available to PPSD teachers, students, and community members.

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
TLT-1.1 Digital Content Review, Selection, and Procurement Process Develop, formally endorse, and enforce a comprehensive software review, selection, adoption, and procurement process for instructional resources.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
TLT-1.2 Web-Based Digital Resources Clearinghouse Implement a centralized process/clearinghouse for instructional resource distribution, management, and standardization that is linked to the new IMS and will enable teachers to find standards-based resources quickly.	CURR INST	Medium	Still Needed	This has not been addressed. Keep on the list for 2016-19.
TLT-1.4 Web 2.0 Resources and Cloud-Based Software Services Research the pros and cons of free Web 2.0 resources (including social media) and cloud-based productivity and information management systems such as Google Tools for Education or Microsoft Office 365 for Education.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
TLT-2.1 21st Century Classroom Configurations Determine the appropriate levels, collections, selections of blended learning technologies and peripheral devices that are needed to support 21st Century classrooms across the school district.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
TLT-2.2 Equity Policy and Guidelines Develop, formally endorse, and advance an equity policy and/or guidelines to ensure that all teachers, students, parents, and staff in all schools have equitable access to district technology resources to promote advanced and interactive learning in all classrooms by providing technological tools to engage students.	CURR INST IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
TLT-3.1 Differentiating Instruction for Students with Special Needs Ensure that all special populations (including ELL, special education, gifted and talented, at risk) are provided with the resources and preparation required to achieve adequate yearly progress and reach their full potential. Continue to address the unique needs of special education students, teachers, and	CURR INST	High	Still Needed	High

Recommendations:	LDR	Priority	Status	Comments
schools with adaptive/assistive technology solutions as appropriate.				
TLT-4.1 Library Media Services in Support of 21st Century Skills & ICT Literacy Support the expanded role of library media staff and/or instructional technology specialists as they include emphasis on information literacy skills and Internet safety beginning in the elementary grades.	CURR INST LMS	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

4.0 Learning Environment and School Facilities

The Learning Environments and School Facilities section focuses specifically on the many types of learning environments that can be configured, reconfigured, and moved to achieve ubiquitous access to learning resources for all students.

Recommendations:	LDR	Priority	Status	Comments
LESF-1.1 Minimum Technology Learning Environments Guidelines Define, endorse, support, and advance minimum technology learning environment guidelines to ensure that all teachers and students in all schools have equal access to developmentally appropriate, district technology resources to promote advanced and interactive learning in all classrooms by providing technology tools to engage students. These prototypes should address computing devices, software, file sharing servers, and peripherals (digital cameras, printers, scanners, digital video cameras, projection capacity, whiteboards, etc.).	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
LESF-1.2 Instructional Technology Refresh Program Research, develop, deploy, and maintain a short- and long-term instructional technology refresh program that increases school district inventories of modern computing devices to levels required for integration of technology into daily practice. This refresh program will help to ensure that the technology in PPSD schools supports hands-on, project-based, authentic, and engaged learning.	CURR INST IT	High	In Process	A major refresh is underway for the middle and high schools, recycling devices to the elementary schools and disposing of outdated equipment.
LESF-1.3 Online Learning Opportunities Define the infrastructure, resources, staffing, and skills needed to develop, nurture, and advance online learning opportunities for students and teachers, which will enable them to become more independent learners and participate in global collaboration.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
LESF-3.1 Energy/Building Access/Lighting Controls Review the energy management solution used by the school district. Ensure all schools are locked and maintain a single entry point controlled by the main office. Implement a card entry system with magnetic locks with a real time network link this to the district's HR/Directory system. Install card entry controls at appropriate locations internally to maintain and control building movement. Ensure that lighting is addressed as classrooms are outfitted with LCD or other projection systems. In addition, ensure that classrooms are provided proper room shades as needed for light control.	OP	Medium	Still Needed	This has not been addressed. Keep on the list for 2016-19.

Recommendations:	LDR	Priority	Status	Comments
LESF-3.2 Construction and Renovation Standards Establish minimum technology specifications for new construction and retrofits to school facilities. Use as guidelines when implementing future planning efforts. Utilize the prior multi-phased capital improvement plan as a starting point.	OP	Medium	Still Needed	This has not been addressed. Keep on the list for 2016-19.

5.0 Organizational Structure and Technology Staffing

The Organizational Development and Staffing section focuses on providing PPSD with a staffing and organizational roadmap to meet the demands of implementing this Information Technology Blueprint.

Recommendations:	LDR	Priority	Status	Comments
ODS-1.1 Information, Communication, and Technology Services (ICTS) Department Reorganize the IT Department into the Information, Communication, and Technology Services (ICTS) Department, which will be responsible for infrastructure, data and integration, and instructional technology.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
ODS-1.2 Learning Technology Support Group Create a full-time "Learning Technology" support group at the school district level responsible for providing teachers with integration support on current and emerging classroom technology.	IT	High	In Process	
ODS-1.3 Cyber Security Officer Establish, via a part-time position, altered staff role or external contract, the position of Cyber Security Officer responsible for internet filtering, network security, application tampering, and data integrity.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
ODS-2.1 Job Portfolios for ICTS Staff Revise job descriptions to reflect all job responsibilities, technical proficiencies, qualifications, certifications, and experience required for these positions.	HR	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
ODS-2.2 Career Roadmap for ICTS Staff Develop a formal career track with qualifications, training, and resources to move to the next level. Implementation strategies include a "roadmap" to define each path of the career ladder and the skills, coursework, and experience that are needed to progress.	HR	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
ODS-3.1 Revise the Role of the Library Media Specialists Update the role of library media specialists to Coordinators of Research, Information and Technology Services (RITS) to support the integration of technology into the curriculum.	INST LMS	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
ODS-4.1 Service Level Agreements Create and agree upon service level agreements (SLAs) between the PPSD IT Department and the end users of IT services, including PPSD Departments, Faculty, and Staff, as well as between PPSD and IT vendors.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

6.0 Professional Learning for All Employees

The Professional Learning for All Employees section focuses on the staff development and training needed to support the use of technology by all staff within PPSD.

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
SDHR-2.1 Systemic Technology Professional Development Model the integration of technology in all trainings when appropriate. Explore best practices in the use of social networking and other tools to determine which tools will be used within PPSD to foster professional learning communities (PLCs).	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SDHR-3.1 District-Wide Technology Professional Development Plan Develop a technology professional development plan to ensure that staff at all levels of proficiency has the opportunity to become proficient in using and integrating technology as outlined by the revised job descriptions.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SDHR-4.1 Proficiency-Based Model for Human Resource Management Develop and implement a proficiency-based model for human resource management that is linked to student achievement.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SDHR-5.1 Orientation Program for New Employees Create a formal orientation process for new staff members to introduce them to the varied systems within PPSD and the school districts formal processes and procedures.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SDHR-6.1 Virtual Staff Development Opportunities Offer synchronous and asynchronous online learning opportunities that allow participants to partake anytime in staff development from anywhere.	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

7.0 Standards, Procurement, Maintenance, and Asset Management

The **Standards, Procurement, Maintenance, and Asset Management** section focuses on the need to establish standards. Additionally, it follows up to ensure the business processes of implementing these standards are efficient.

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
SPMA-1.1 Standards Committee Create a technology standards committee that is made up of large cross section of the district with the responsibility to maintain and publish technology standards, including the review and approval of technology purchases that do not align with the current published standards. Certain standards can be made at the district level, some at the local school level, and others at the classroom level. The committee is responsible to selecting technology standards that align with instructional goals and with input from other key areas for how technology will support the learning and administrative use process.	IT CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SPMA-1.2 Classroom and Facility Standards The technology standards setting process is currently Ad-Hoc. Most standards are based on adoption of new construction implementations and do not include a regular review and update schedule. Although the school district has done a good job with	IT CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

Recommendations:	LDR	Priority	Status	Comments
standardization of end user devices, the rapid development of technology in the end user device area dictate that the standards should be reviewed and updated more frequently and new devices need to be considered for adoption such as e-readers or low cost disposable technology where there was significant interest found in our data gathering. However, technology is more than computing devices, consider using the facility standards developed and included in the Technology Plan July 1, 2010 – June 30, 2013 as a starting point, but, these must be reviewed, updated and adopted on an annual or otherwise agreed basis by the Standards Committee. These adopted standards should be aligned with construction documents that are included with all facility construction and renovation projects.				
SPMA-2.1 Streamlined Standards Purchasing Review the purchase coding system used and assure technology purchases are clearly aligned to current and approved technology standards. In addition, where there is technology purchases that do not align, these purchases must be reviewed and approved by the technology standards committee.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SPMA-2.2 Web Purchasing Site Expand the current IT procurement catalog to include all technology products and services adopted by the standards committee. Establish a district website where standard technology products can be purchased via an online shopping experience and approvals can be obtained quicker and electronically. Assure this system has integration with the Lawson financial system. Establish a process where technology items can be submitted to the technology committee for review and adoption by the district. The web shopping cart should list "pre approved" items making procurement streamlined for people to obtain standard technology. Include products and services, for example, if an interactive whiteboard is purchased, include standard installation.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SPMA-3.1 Desktop Image Maintenance Develop a long-term maintenance plan that includes how Providence will maintain the desktop image to include a new and supported Windows operating system. To better service customers, when a machine is reimaged, install the software that was approved, licensed, and installed on a machine by IT. The reimage process should include a step or steps to create a list and reinstall previously approved licensed and installed end user software. Providence is considering a virtual desktop solution to extend the life of the aging desktop inventory and provide for simplified maintenance of the desktop. However, in this environment how long will Windows XP be supported even in support of the vision of a VDI environment and what can older machines run effectively? The Total Cost of Ownership (TCO) of maintaining old, inefficient, and power-hungry machines against replacement with modern and lower cost devices should be understood even in a VDI environment. In other words the real driver for VDI may be maintenance and other applications such as bring your own device. For example, small form factor, sub $200 desktops may provide improved stability and speed and lower TCO and short Return On Investment.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
SPMA-4.1 Service Management Program	IT	High	Still	This has not been

Recommendations:	LDR	Priority	Status	Comments
Adopt a service management program like the Information Technology Infrastructure Library (ITIL) as a framework for IT organizational improvement. The depth and breadth of service management adoption will require careful planning and integration into the organizations process.			Needed	addressed. Keep on the list for 2016-19.
SPMA-4.2 Capital Asset Management Create a complete program for management of all technology assets and include an upgrade/refresh program.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

8.0 Policies, Procedures, and Security

The purpose of the **Policies, Procedures, and Security** section is to describe opportunities, needs, and proposed action plans in these topical areas.

Recommendations:	LDR	Priority	Status	Comments
PPSS-1.1 Standards to Define Access, Use, and User Level Attainment Develop and obtain board approval for a policy (set of policies) defining access, use, and levels of user attainment across the district.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
PPSS-1.2 District Equity Policy Develop a plan and obtain board approval for a Technology Equity Policy.	EXEC CURR IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
PPSS-2.1 On-Board Policy for New Staff Members Establish a policy and procedure to "on-board" and orient new staff members around using technology in the school district.	HR	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
PPSS-2.2 Bring Your Own Device Policy and Procedure Develop and obtain board approval for a policy to govern staff members bringing devices to their schools, and a procedure to provide access and use in classrooms.	EXEC IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
PPSS-3.1 Data Security Policy Develop a PPSD network and data security policy, and set of procedures to assure all sensitive data is protected and maintained by the school district.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
PPSS-3.2 Security System Policy Establish a policy and procedure to govern the way school security systems (cameras and monitors) are used, including outlining responsibilities for reviewing incidents after they occur.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

9.0 District-, School-, and Program-level Planning

The **District-, School-, and Program-level Planning** section of the *Information Technology Blueprint* focuses on a coordinated approach to district, school, and program-level planning.

Recommendations:	LDR	Priority	Status	Comments

Recommendations:	LDR	Priority	Status	Comments
DSPP-1.1 Technology as a Strategic Priority Ensure that technology is a strategic consideration in all school district planning and that the planning of technology initiatives is in alignment with school district goals. Identify ways to harvest the full value of existing technology investments so that systems are utilized fully and new systems are not purchased to fill a need that can be addressed by existing systems. All school development plans should include a professional development plan.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSPP-2.1 Updated School (and Division) Improvement Plans Revise the district-created template used for school improvement plans (SIP) and divisions to include technology goals.	EXEC SA	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSPP-3.1 Technology Steering Committee Establish a committee of instructional staff to approve projects, help prioritize the work, and institute needed policy changes.	CURR INST IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSPP-4.1 Balanced Scorecard Process Embrace a Balanced Scorecard process in which goals are broken into measurable objectives, performance indicators are defined, and progress is tracked using baseline, actual, and target data.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSPP-5.1 Project Management Office Define a process for project management oversight so that all major projects can be sponsored and reviewed by a group of executive staff who can address issues when they arise.	EXEC	High	In Process	The district hired a position for project management.

10.0 Administrative and Productivity Systems

The purpose of the **Administrative and Productivity Systems** section is to describe the present administrative uses of technology and identify opportunities for improving processes and practices.

Recommendations:	LDR	Priority	Status	Comments
APS-1.1 Enterprise Approach for Procuring and Implementing Administrative Systems Include all existing and planned administrative and productivity systems in subsequent technology plans, describing how data will be shared and integrated across platforms and products.	EXEC IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
APS-2.1 Examination of Current Business Systems to Determine Effectiveness Include an in-depth study of used, un-used, and necessary components for the system to determine effectiveness and changes needed.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
APS-2.2 Maximizing the Use of Business Systems through Targeted User Training Ensure that all users of the system are fully trained to effectively and efficiently complete all job functions related to the business management system.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
APS-3.1 Student Information System Use Case Model Establish a model to define SIS user needs, components of use (current and future), expectations for user attainment, and interoperability framework with SIS included components as well	CURR INST	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

Recommendations:	LDR	Priority	Status	Comments
as disparate system components existing in the district.				

11.0 Decision Support Systems

The Decision Support and Accountability Systems section provides the framework to make informed decisions across an organization, and specifically, to analyze programs, expand accountability, and to use data to identify specific target areas that will help improve student learning.

Recommendations:	LDR	Priority	Status	Comments
DSAS-1.1 Data Governance Board Establish and empower a Data Governance board with district-wide authority. Their first task should be to establish a district-wide data governance and management policy.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-1.2 Creation of a Data Dictionary Create a data dictionary that contains all sources of data with definitions, business rules etc.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-1.3 Establishment of Data Standards Establish a set of data standards.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-1.4 Data Ownership and Consistency Identify the appropriate data owner or steward for each data element. Decisions are only as good as the information derived from the data on which they are based, and data ownership and consistency is imperative to ensuring quality data and information.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-2.1 Instructional Data Working Group Establish a working group to assess and document data needs for teaching and learning support.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-3.1 Strategic Plan for District Wide Data Warehouse (LDS) Create a strategic plan to procure and implement a district wide data warehouse. Establish a Data Warehouse steering committee. Charge the committee with determining the prerequisites, timeline, and staff development needs in the architecture and Data Warehouse implementation. Create a Data Manager position or expansion of an existing position to include a data manager responsible for instituting a data governance and management process that includes developing a data dictionary, developing data standards, and adopting processes and procedures for ensuring complete and accurate data.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-3.2 Data Integration Plan Develop a plan for ongoing administrative and teacher professional development and coaching on the capabilities and use of the data warehouse. After the Data Governance Board is formed, focus on their strategies to improve the accuracy of data and then define the requirements for a district-wide data warehouse.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
DSAS-4.1 Content Management Explore investing in a content management system that can	EXEC	High	Still Needed	This has not been addressed. Keep on the

Recommendations:	LDR	Priority	Status	Comments
provide tools to effectively manage and distribute documents and instructional material content while, at the same time, reducing costs.				list for 2016-19.
DSAS-5.1 Applications Catalog Publish and maintain a catalog of PPSD-supported applications and reports available for user decision support.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

12.0 Communications and Network Infrastructure

The **Communications and Network Infrastructure** section of the Information Technology Blueprint focuses on continued enhancement and expansion of advanced infrastructure systems for communication, computing, and networking throughout the district.

Recommendations:	LDR	Priority	Status	Comments
CNI-1.1 Convergence Committee Providence should form a committee that will be responsible for network convergence. The committee primary role will be to develop a long term plan for network convergence, including capacity forecasting and RFP development for network capacity and management upgrades. In addition, as part of a change management process, the convergence committee should review, plan for the addition of, and sign off on any network impacting services that are being added to the network. These include such services as VoIP, facility management/controls, video surveillance, and video broadcast/distribution. Consider including stakeholders from administration and academics as part of the committee.	EXEC	High	High	
CNI-2.1 Home/School Portal Identify the requirement for a portal strategy and develop an RFP seeking a solution for implementation. Consider filing E-rate Priority 1 funding for this service.	CURR IT	High	Completed	PPSD is using the parent portal component of their Student Information System (SIS): Skyward.
CNI-2.2 Comprehensive Wireless Develop an RFP aligned with a 470 posting seeking internal connections E-Rate application seeking wireless networks expansion. Regardless of E-Rate support, Providence must understand and build upon a standard foundational wireless network architecture supporting full access in all campuses under a full load of 1 to 1 --- regardless of BYOD adoption. The State of Rhode Island recently signed into law a “Technology Bond” to expand wireless coverage throughout all schools in the State, consider this funding along with the E-rate to further build out the future wireless network infrastructure. In addition, the comprehensive wireless should explore how Providence can extend into a community-wide wireless network providing equitable access in support of the district.				
CNI-2.3 Comprehensive VoIP Conduct a TCO of the current telephone solution district-wide. Based on the outcome of the TCO, develop a RFP for migration of the districts voice solution for all campus locations. Conduct initial assessment of the ROI for upgrading the telephone solution. Assure the solution is applied for under E-rate priority-2 along with the Wireless expansion and cabling augmentation.				

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
Assure the RFP includes any necessary switch upgrades or additions to support required PoE devices.				
CNI-2.4 Video Streaming and Surveillance Working through the convergence committee, sponsor a project to develop and plan for a single video distribution and storage strategy (this includes all content created, downloaded and stored via all systems/users and how these will be stored/distributed/viewed by all stakeholders). As part of this process, conduct a total cost of ownership (TCO) of the current video surveillance systems used district-wide. Based on the results from the TCO as well as the convergence committee's recommendation, conduct a project to upgrade/standardize the video surveillance solution. In concert with the video surveillance, assure the district adopts a single video delivery strategy/platform for streaming content internally/externally, including distance learning/video conferencing and any other requirements such as live/stored digital broadcast.				
CNI-3.1 Cable and Network Switch Infrastructure Review and augment the cabling and switch infrastructure to support the recommended VoIP CNI-2.3 and Wireless expansion CNI-2.2 projects. Develop a RFP and post a E-rate form 470 for the purpose of contracting with a network cable and switch integration vendor. Develop and formally adopt a network standard, including wireless network capacity/coverage. As part of the cabling augmentation project, bring all classrooms and school facilities network cabling up to a minimum configuration standard.				
CNI-4.1 Cell Phone Device and Management Review the current cell phone policy to understand the how the policy supports the districts operational needs. Consider the legal and security aspects of staff using a personal device that may or may not contain protected data. The district currently does not have the capability remotely manage the cell phone devices including basic services such as remote wipe. A mobile device management solution coupled with a reworked cell phone policy is needed.				
CNI-5.1 Identity Management / Single Sign-On Develop an Identity Management / Single Sign-On plan and assure it is implemented as part of the portal plan and rollout CNI-2.1.				
CNI-6.1 Network and Information Security Plan The district must develop and adopt a plan to assure the safety and security for access to the network and more importantly the safe handling and protection of the data and information. The district should hire a consulting firm to conduct regular network penetration tests and review security policies and adherence to these by the users.	IT	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

13.0 Parent and Community Uses of Technology

***The Parent and Community Uses of Technology** section* focuses on the connection between PPSD and the community

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
CAP-1.1 Parent Portal Select and implement a single, district-wide parent portal solution.	CURR IT	High	In Process	PPSD is using the parent portal component of Skyward but it only provides access to data within the student information system.
CAP-1.2 Kiosks for Public Internet Access Expand Internet access to other areas around the city, including community centers and public libraries, by ensuring that technology resources with broadband connection are deployed in these facilities. This additional access will provide services to community members who may not have web access from home.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CAP-4.1 Annual Student Technology Fair Plan and host a student technology fair to highlight successful practices at the school level and the strategic direction in which the district is heading. This event can be sponsored by vendors and holds the potential to increase public/business interest in PPSD technology pursuits.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
CAP-4.2 School Website Refresh Develop a comprehensive school-based website strategy that includes realistic, viable, and manageable options for both the school website and individual pages for classes, teachers, and departments.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

14.0 Monitoring and Evaluation Plan

The Monitoring and Evaluation section of the *Information Technology Blueprint* focuses on the processes, structures, and tools for monitoring the implementation of the plan and evaluating its impact in terms of quality and effectiveness.

Recommendations:	*LDR*	*Priority*	*Status*	*Comments*
MEPI-1.1 Technology Advisory Committee Establish a technology steering committee and executive leadership team to monitor status of all technology initiatives, including the Technology Blueprint and School Improvement Plans, on a regular basis. This will be a standard process for district-wide use. This committee will be responsible for creating a standard technology planning template for schools, which must be submitted, approved, and followed in order for the schools to spend their technology funds. This will be part of the Project Management Office (PMO) described in Chapter 9.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
MEPI-1.2 IT Blueprint Update Establish a School Board-level agreement to set aside funds to audit, update, and adapt the IT Blueprint at least annually to meet changing needs of the school district.	EXEC	High	In Process	The 2015 technology plan update is progress on this work, but continuing to strive for board-level agreement to set aside funds annually.

Recommendations:	***LDR***	***Priority***	***Status***	***Comments***
MEPI-2.1 Project Evaluations Define a process for monitoring and evaluating the effectiveness of all major initiatives.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.
MEPI-3.1 Reporting Status Develop and implement a dashboard reporting system to display the ongoing progress of major school district initiatives. Consider a website, newsletter or other methods.	EXEC	High	Still Needed	This has not been addressed. Keep on the list for 2016-19.

CELT
Center for Educational Leadership and Technology

Providence Schools

Prepared for:

Providence Public Schools

Executive Briefing

PPSD Long-Range Technology Plan (Update)

Thursday, November 19, 2015

ers

Table of Contents

Background and Study Update Methodology

PPSD Strategic Mission

Prepare all students to succeed in the nation’s colleges and universities and in their chosen professions.

Background

- In the 2012-2013 school year, CELT developed a comprehensive Information Technology Blueprint for the Providence Public Schools in compliance with the federal e-Rate requirements. (Note: A technology plan is no longer required to obtain e-Rate funding.)
- In 2015, CELT returned to PPSD to update the recommendations, which have been in place for approximately 18 months due to the e-Rate cycle.
- Appendix A documents the current status of each recommendation from the 2013-2016 plan as well as any additions to recommendations.
- Appendix B is the Executive Briefing that CELT provided to the School Board in February of 2013.

Project Update - Planning and Milestones

Milestone	Date
Project Kick-off	May 2015
Extensive Needs Assessment (Document Review, Focus Groups, Key Stakeholder Interviews, Site Visits, Online Survey)	May – August 2015
Key Findings and Preliminary Recommendations	September – October 2015
Executive Briefing and Public Presentation of Information Technology Blueprint	November 2015

Providence Schools

Project Update - Study Participants

Over 1050 PPSD constituents were involved in the project update including:

- Students
- Teachers and Support Staff
- School and District Administrators
- School and District Technology Staff

via interviews, focus groups, school site visits, and an online survey.

Planning Update

Commendations

Providence Schools

Project Update - Commendations

1. PPSD successfully implemented Skyward, its new Student Information System which was led by the IT Department.
2. PPSD deployed a significant amount of student devices at the middle and high schools, with older devices moved into the elementary schools.
3. The number of instructional staff responding to the online survey increased significantly, from 643 respondents in 2013 to 1031 in 2015.
4. PPSD continues to work on its network infrastructure, which is the backbone to future district initiatives.
5. PPSD has moved forward in its BYOD initiative by redesigning wireless access at many of its facilities.

Project Update - Recommendations

Top 10 Recommendations Update

Update on Major Recommendations

Since the initial Information Technology Blueprint was developed in the Winter of 2012/2013, Providence Public School District has undergone significant leadership transitions in the top school district administration positions, including Superintendent, Chief of Academics, Chief Operating Officer, and Chief of Human Resources. The Chief Financial Officer and IT Director have remained constants and continue to have a strong working relationship and extensive institutional knowledge.

As a result of the other transitions at the highest level of the organization , many of the top recommendations from the initial Technology Blueprint were not addressed. However, based on the updated needs analysis, they remain PPSD's highest priorities.

Update on Major Recommendations (cont'd)

Top Recommendations	Leadership	Comments
1. Develop, implement, and integrate a PK-12 scope and sequence of student technology competencies so that all educators can readily identify and assume responsibility for integrating these competencies into the appropriate content area(s) and/or process skills in a logical and sustained way led by the technology integration specialist.	• Curriculum and Instruction • Instructional Technology	This has not been addressed. Keep on the list for 2016-19.
2. Transform traditional school library/media centers into Information and Technology Resource Centers and restructure the role of Library Media Specialist to Coordinator of Research, Information, and Technology Services.	• Library Media Services • Instructional Technology	This has not been addressed. Keep on the list for 2016-19.

Providence Schools

Update on Major Recommendations (cont’d)

Top Recommendations	Leadership	Comments
3. Adopt a “Learning Enterprise System” approach that will enable PPSD to use student performance data and assessment results to make revisions to the teaching and learning process.	• Curriculum and Instruction • Instructional Technology • Information Technology	This has not been addressed. Keep on the list for 2016-19.
4. Create and maintain a standard and flexible technology configuration (for learning environments and offices) and refresh program (annual) for classrooms and offices that define and sustain a critical mass of technology resources in order to attain equitable: ❖ access to, ❖ use of, and ❖ support for school district technology resources for all students, teachers, and administrators.	• Curriculum and Instruction • Instructional Technology • Information Technology	A major refresh is underway for the middle and high schools, recycling devices to the elementary schools and disposing of outdated equipment. PPSD is currently deciding the benefits and risks associated with purchasing Chromebooks as well as staying with a Microsoft platform verses switching to Google Apps. These decisions needs to be part of this recommendation.

Update on Major Recommendations (cont'd)

Top Recommendations	Leadership	Comments
5. Increase student access to online learning (anywhere/anytime) including, but not limited to, advanced placement and credit recovery. Consider phasing in a graduation requirement for the satisfactory completion of at least one online course by the end of grade 10.	• Curriculum and Instruction • Instructional Technology	This has not been addressed. Keep on the list for 2016-19.
6. Develop a web-based school (and division) improvement planning tool for: ❖ Consistent focus on student achievement, ❖ Fidelity of implementation at all levels, and ❖ Alignment with the strategic plan. This tool must be fully integrated, in real time, with PPSD's data system and in collaboration with the planning/project management office.	• Superintendent • School Administration	This has not been addressed. Keep on the list for 2016-19.

Update on Major Recommendations (cont'd)

Top Recommendations	Leadership	Comments
7. Embrace a district-wide data architecture and a standard reporting and query tool for all administrative and instructional systems in conjunction with a comprehensive data governance and management program facilitated by the data stewards/manager.	• Superintendent	This has not been addressed. Keep on the list for 2016-19.
8. Develop and implement a proficiency-based approach to human resource management and data systems that accommodate alignment of staff proficiencies with: • Learner Needs • Curriculum • Instructional Resources • Assessment • Improvement Plans • Staff Development • Educator Evaluations • Job Portfolio	• Human Resources	This has not been addressed. Keep on the list for 2016-19.

Update on Major Recommendations (cont'd)

Top Recommendations	Leadership	Comments
9. Establish a board-level agreement to set aside funds annually to ❖ Implement IT Blueprint/Refresh Program ❖ Assess, update, and adapt the IT Blueprint ❖ Establish a Technology Advisory Committee support PPSD's changing needs as well as emerging uses of information technology.	• School Board	The 2015 technology plan update is progress on this work, but continuing to strive for board-level agreement to set aside funds annually.
10. Conduct a city-wide summit on "Technology, Learning, and Economic Development" in order to enhance connectivity and learning opportunities for students, families, and the community.	• Executive Team	This has not been addressed. Keep on the list for 2016-19.

Project Update – Staff Survey

Instructional Staff Survey
2015

2015 Survey Demographics

- PPSD disseminated an online survey to approximately 2700 PK-12 instructional staff. The survey was accessible from June 17 – 26, 2015.
- A total of 1031 instructional staff or 38% participated in the survey. This represents a significant increase over the 643 staff participation from a similar online survey conducted in 2013.
- Staff from all schools and every grade responded to the 2015 survey.

Distribution of Grade Levels Instructed (n=1031) Total > 100% as respondents were able to select all grade levels that apply					
PK	K-2	3-5	6-8	9-12	ungraded
4%	21%	25%	25%	34%	3%

2015 Survey Demographics (cont'd)

- Both the 2013 and 2015 sample included: teachers, library media specialists, nurses, reading coaches, consulting teachers, counselors, psychologists, and support specialists (speech, LTSP, OT, etc.).
- In the 2015 sample, teaching experience ranged from 1 to 44 years, with an average of 16.5 years and a median of 16 years. Just over half (56%) of the instructional staff spent all of their career in PPSD.

2015 Distribution of Teaching Experience				
5 or less	6-10	11-15	16-20	21 +
14%	13%	19%	22%	31%

2013 and 2015 Comparative Findings

- More teachers in 2015 use technology in their classroom and assist others in doing so than in 2013. This increased from 27% in 2013 to 39% in 2015.
  - In 2015 61% of teachers reported using technology in classroom lessons *daily* while only 38% used it daily in 2013. This represents an increase of 23%.
  - In 2015 32% of teachers allowed students to use technology daily as an option for learning while only 12% used it daily in 2015. This represents nearly a 3 fold increase.
  - In 2015, 46% of students were allowed to bring in devices from home, compared to 30% in 2013. The increase in students using technology daily at school in 2015 may be correlated to students bringing their own devices from home..
- Teachers' daily use of email to communicate with colleagues, parents, and students remained exactly the same: 99%, 11%, and 6% respectively.
  - Despite the fact that teachers use email daily, communication from teachers to parents and teachers to students remained the same. Perhaps this is due to teachers' time being exhausted.

2013 and 2015 Comparative Findings (cont'd)

- Teachers use of basic productivity tools, such as word processing, spreadsheets, and presentations, for classroom needs and/or lessons remained similar from 2013-2015.

Ability to Use Productivity Tool & Assist Others	2013	2015
Word Processing	40%	45%
Spreadsheet	25%	23%
Presentation	25%	27%

Providence Schools

2013 and 2015 Comparative Findings (cont'd)

- In both 2013 and 2015, respondents rated their technology proficiency similarly. When analyzed with years of experience, the range of all categories contained both experienced and new teachers.
  - Fewer teachers rated themselves as advanced or expert, 44% in 2013 compared to 41% in 2015.

Distribution of Technology Proficiency			
Level	Description	2013	2015
Beginner	Use email & basic productivity tools, go online	13%	9%
Intermediate	Use some technology with students, use technology for lesson planning and research	43%	50%
Advanced	Integrate technology into my classes, can create a multimedia presentation, troubleshoot problems, share ideas with colleagues	35%	34%
Expert	Integrate evolving technologies into instruction, comfortable creating/teaching a technology course	9%	7%

Providence Schools

2015 Survey Findings

In a 2013 PBS national teacher survey*, half of the respondents said they were "comfortable experimenting with new technology."

- Almost a third (30%) of PPSD respondents are proficient in collaborating with students via Google docs or Dropbox.
- Over half (58%) of PPSD respondents are proficient in communicating via social networking.
- A quarter (25%) of PPSD respondents are proficient in creating videos with students.
- Half (51%) of PPSD respondents are proficient in using an interactive whiteboard for instruction.

* http://www.edweek.org/media/teachertechusagesurveyresults.pdf

2015 Survey Findings (cont'd)

Seventy percent (71%) of instructional staff expressed a desire for more classroom technology as compared to a 2013 PBS national teacher survey where 68% of all teachers and 75% of teachers in low-income schools wanted more technology.

When analyzed by grade level:

- Pre-K respondents were almost equally divided by having "just enough" and "not enough" technology.
- Seventy-seven percent (77%) of K-2 respondents, eighty-one percent (81%) of 3-5 respondents, and seventy-three percent (73%) of 6-8 respondents said "not enough" technology.
- Over one third (37%) of 9-12 respondents said "just right."

2015 Selected Teacher Comments

Open-ended Teacher Comments

Request for additional technology*

- "Technology has become an important part of the teaching day. It is frustrating to not have enough technology to successfully use technology on a daily basis."
- "There is little to no access for students to use technology in the classroom. One teacher computer in my classroom and one printer does not allow for any kind of quality time for students to interact with technology."
- "The students do not have enough access to computers. They should be able to have regular access to computers to write English and history papers all through the year. While PARCC testing occurs, students do not have access. This is a big problem."
- "The middle schools have very little technology and need significant influx of access for both teachers and students. This is an equity issue."

* Note: The request for additional technology was also a reoccurring theme in the 2013 Teacher Comments.

2015 Selected Teacher Comments (cont'd)

Open-ended Teacher Comments

Technology Professional Development

- "At our school, teachers need training with basic programs such as Word, Excel, Outlook, etc."
- "While I have been assigned an iPad, I have not been provided with clear instruction on its use."
- "I need help learning how to use the technology I have. I wish we could be offered classes on how to use and implement technology depending on our needs. Classes offered at different levels would be very helpful. ... I would be willing to go to classes offered on my own without getting paid just so I could learn."
- "I would like to see more Professional Development on technology."

The comments above correlate with the 2015 survey data where nearly 70% of teachers stated the PPSD profession development related to the integration of technology tools and resources for teaching and learning are <u>not</u> meeting their needs.

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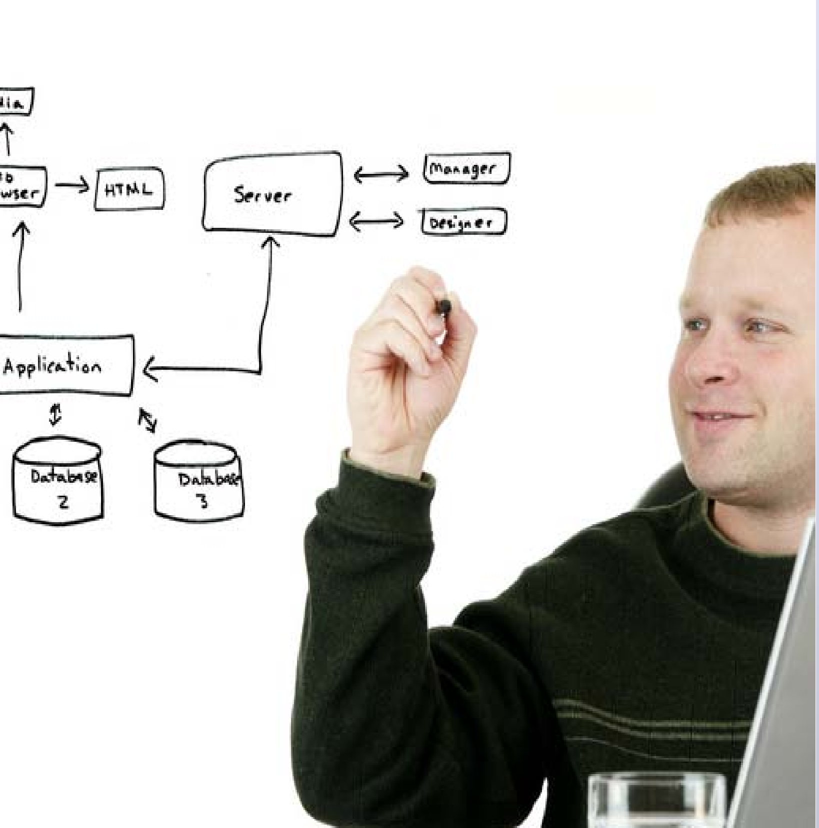
About CELT

For over two decades, CELT has helped education leaders align their use of information technology with improved student learning. CELT works collaboratively with educational organizations to support and transform 21st century teaching, learning, and administrative processes. In order to ensure widespread and productive use of technology, our strategies include staffing plans and professional development programs, as well as maintenance and support activities.

CELT is one of the largest and most comprehensive providers of research and planning services for schools, education service agencies, and departments of education. CELT's mission is to help learning organizations attain their vision, mission, and goals by integrating high-quality, mission critical technology programs and services with the organization's people and processes in the most timely, efficient, and cost-effective way possible.



CELT
Center for Educational Leadership and Technology

Providence Public School District

3-Year Technology Plan and "Blueprint"

Funding 2013, 2014, 2015 to June 30, 2016

Submitted by:

Center for Educational Leadership and Technology (CELT)
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Creation Date: August, 2012
Revised: February, 2013
Board Presentation: February 25, 2013
Submitted: RIDE, March 19, 2013
Revised: September 11, 2013

Chapter 1: Introduction

Table of Contents

1.0 INTRODUCTION

> *"If we take time to reflect together on who we are and who we choose to become, we will be led to territory where change originates."*
>
> —Margaret Wheatley, Myron Kellner-Rogers

Providence Public School District (PPSD) is in the process of implementing improvements to both the school district's instructional practice, as well as its facilities. To meet PPSD's instructional improvement objectives, network infrastructure and hardware along with information technology equipment and access to and use of web-based materials is essential. The first step in the improvement process is to conduct a technology audit to determine current use and effectiveness. Based on the audit information, a three-year blueprint designed to harvest increasing value from information technology investments needs to be developed. PPSD has requested assistance with assessing the current use of information technology throughout the school district and identifying ways to use information technology to improve operational effectiveness and student achievement. The information collected during the development of the comprehensive technology blueprint will assist PPSD in developing a plan that supports the educational mission of the school district through technology.

The *Information Technology Blueprint* is particularly relevant since lifelong learning will be a critical survival skill for 21st century learners who must be able to access, analyze, and communicate information in a fast-paced and constantly changing world.

1.1 Planning and Research for a Purpose

The Center for Educational Technology (CELT) in conjunction with Superintendent Dr. Susan Lusi and the leadership team of the Providence Public School District (PPSD) has begun the process of creating an integrated and comprehensive information technology environment that supports all aspects of the strategic goals and system-wide initiatives articulated in the school district's mission, vision, and goals. To this end, the school district has commissioned an assessment of teaching and learning, education preparation and staff development, administration and support services, and infrastructure and technology. This study includes a performance review, gap analysis, and recommendations for improvement and provides the basis for the updating of the school district's technology plan. PPSD envisions a high-performing learning organization in which all students achieve proficiency with rigorous standards of intellectual thought and knowledge. Access to information in PPSD for improved teaching, learning, and management will require a comprehensive technology infrastructure that provides voice, video, and data resources to every classroom and office, as well as to learning environments at home and in the community. In addition to information access, students will need teachers who are able to use technology applications to help them reach high levels of performance.

The purpose of technology planning is to produce RESULTS rather than a plan. These results include:

- Improve student learning
- Build constituency support
- Establish learning communities
- Support economic development
- Increase operational efficiency

The overall objective for the study is to develop recommendations and strategies for using technology to improve student learning and staff productivity in a cost-effective manner. In order to achieve this objective, the study has been divided into three stages. During the first stage, the Center for Educational Leadership and Technology (CELT) team performed comprehensive information gathering that focuses on the diverse needs of learners and decision makers throughout the PPSD. Using site visitations, focus groups, key stakeholder interviews, online survey, document reviews, and other strategies, CELT has been developing an accurate profile of the current status and impact of technology in schools. The second stage addresses key findings derived from the information gathered and offers research and experience-based recommendations that deal with important learning and administrative issues. The final stage of the planning process will focus on the development of an information technology blueprint that offers guidelines in such areas as curriculum integration, professional development, communications and network infrastructure, decision support, staffing, security, maintenance, implementation, and funding.

This assessment effort will assist school district staff in identifying new ways to help schools provide every student with the most appropriate learning technology resources and contemporary learning opportunities. It will also assist the school board leadership in making timely, informed, student-centered decisions. The outcomes of the project will underscore the major benefits of information technology for students, parents, and teachers as well as document the potential impact of 21st century technology skills on economic development.

1.2 Demographics

Providence Public School District (PPSD) is the largest school district in the state of Rhode Island. PPSD operates 39 schools serving approximately 23,904 students and their families, approximately 16% of all public school students in Rhode Island. The district is comprised of twenty-two elementary schools, seven middle schools, ten high schools, two charter schools, and one center serving students with disabilities. In recent years, PPSD has experienced changing demographics and a slight decrease in enrollment. The current enrollment breakdown submitted to RIDE on October 1, 2012 by instructional level follows:

- PK through grade 5 – 12,151 students
- Grade 6 through 8 – 4,817 students
- Grade 9 through 12 – 6,936 students

Our schools are diverse learning communities with approximately:

- 63% of students are Hispanic
- 19% of students are Black
- 9% of students are White
- 5% of students are Asian
- 3% of students are multi-racial
- 1% of students are Native American

PPSD also serves a high concentration of students with special needs with approximately:

- 16% of students are English language learners
- 16% of students have a disability
- nearly 60% of students come from homes where English is not the primary language spoken
- approximately 89% of students qualified for free or reduced-price meals during the 2011-12 school year

The following demographic information comparing PPSD to Rhode Island state averages is taken from the report, *Raising the Achievement of English Learners in the Providence Public Schools*:

- the proportion of Hispanic students in Providence is three times that of the state
- the proportion of Black students is twice that of the state
- the proportion of Asian American students, 1.6 times that of the state

- the percentage of ELLs in the Providence Schools population (referred to as LEP students on Rhode Island data tables) is three times that of the state
- the percentage of students who are eligible for the National School Lunch Program (NSLP) (85.5%) nearly twice the state percentage (43%)
- the percentage of Providence Schools students with special needs (those who have an Individualized Education Plan or IEP) is 1.5 times that of the state

Providence, Rhode Island is the third-largest city in New England with roughly 180,000 residents. With its increasingly diverse population, Providence serves as a rich cultural center in the northeast. It was one of the first cities established in the United States, and industry and manufacturing flourished in the capital city during the 20th century. Now, like many post-industrial cities, the city is working to strengthen the local economy. Providence was recently rebranded as the “creative capital” due to an emphasis on its arts community and educational institutions. Providence is also a city of significant contrasts and serves as home to several elite colleges and universities. Despite the city’s recent efforts to revitalize the region, according to 2010 United States Census data, 26% of residents live below the poverty line and just 72% of persons over the age of 25 have graduated from high school. This context affects our schools and must inform our strategies for educating a diverse and talented student population.

The total cost per pupil averages $16,818 /student, with the average teacher to pupil ratio of 1 teacher for every 26 students. PPSD students have the option to enroll in honors courses, dual enrollment, and advanced placement courses as well as a number of career and technical education programs to prepare for post-secondary jobs or education.

2.0 BLUEPRINT STUDY DESIGN

The PPSD *Information Technology Blueprint* is the result of a comprehensive study design that ensures that the perspectives and voices of all stakeholders are incorporated into the resulting recommendations and plans of action. This approach acknowledges the need to validate the needs, experiences, and concerns of all stakeholders within PPSD. The study designs described include:

- Organizational Structure for the Project
- Information Planning Model
- Research Methodology
- Information Technology Blueprint Structure

2.1 Organizational Structure for the Project

CELT, in collaboration with PPSD personnel, developed the following organizational design to conduct this project.

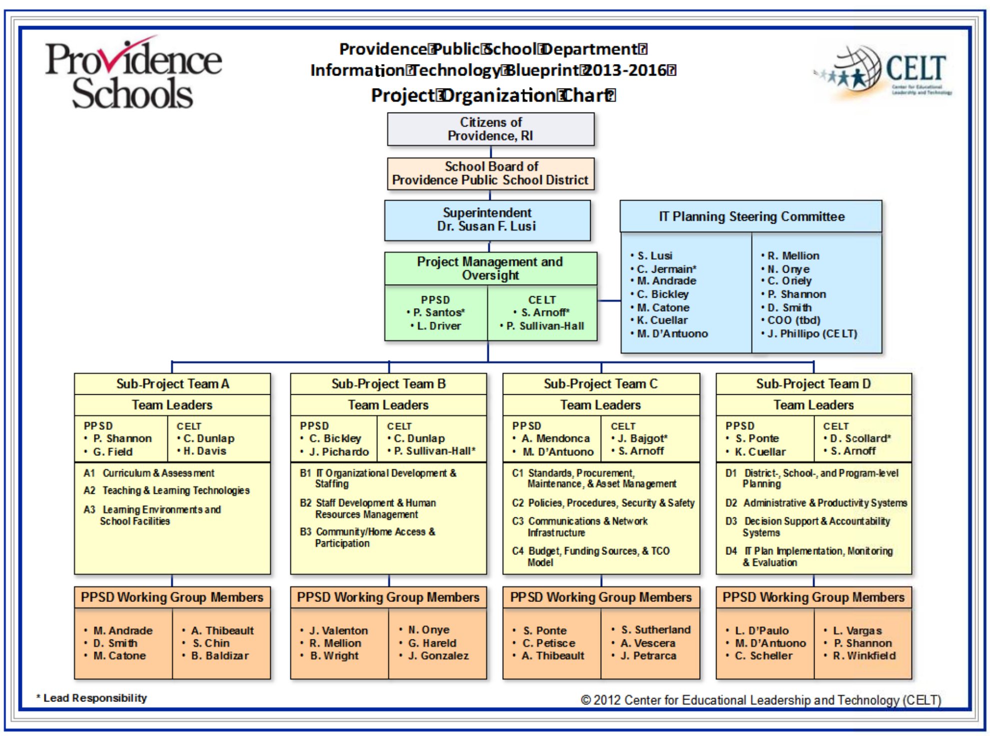


Figure 1: IT Blueprint/Plan Project Organizational Structure

2.2 Information Planning Model

CELT uses a planning model validated by the United States Department of Education. The planning process entails a set of integrated data collection and analysis techniques that enable CELT to present information and findings systematically and validate them through interactive processes with key stakeholders. Figure 2 below displays the flow of the planning process from initial stages of technology audit and needs analysis through installation and training:

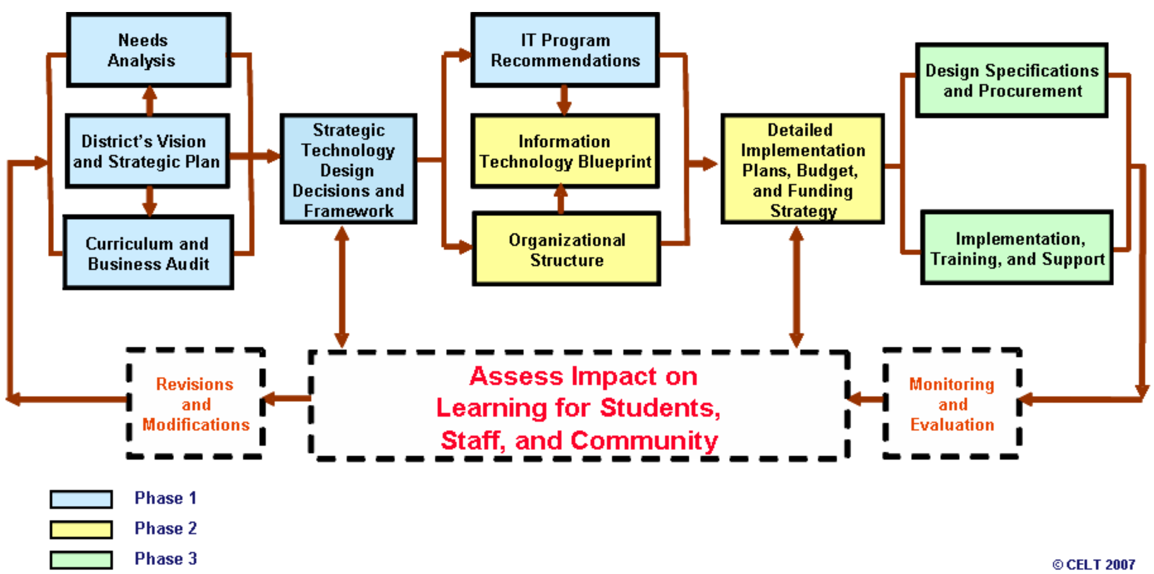


Figure 2.2: IT Architectural Approach from Planning to Implementation Results

2.3 Research Methodology

Overview

CELT subscribes to a methodological approach that combines both qualitative and quantitative elements. By synthesizing the two, CELT conducted an assessment of the information technology needs in PPSD that was comprehensive in both breadth and depth. The breadth was attained through quantitative measures designed to gain a generalized understanding of information technology across the school district. Depth was achieved through a variety of qualitative methods that included conducting focus-group sessions, interviewing key stakeholders, reviewing PPSD documents, and performing site visitations. These components serve to provide a detailed view of the information technology needs of certain individuals, groups, schools, and departments. The combination of these methodologies provided a broad overview of information technology needs while offering an understanding of the diversity of individual voices within the school district.

Quantitative Methods

The quantitative portion of the audit consisted primarily of document and inventory review, analysis of previous planning documents, and results from recent school district surveys.

Document and Inventory Review – Numerous existing documents were obtained from the school district to provide recent background on the availability and use of technology. The CELT team reviewed these documents to provide additional data as well as clarification on current status. (See Appendix A)

Upon collection, an analysis of quantitative data resulted in the generation of an extensive set of descriptive data.

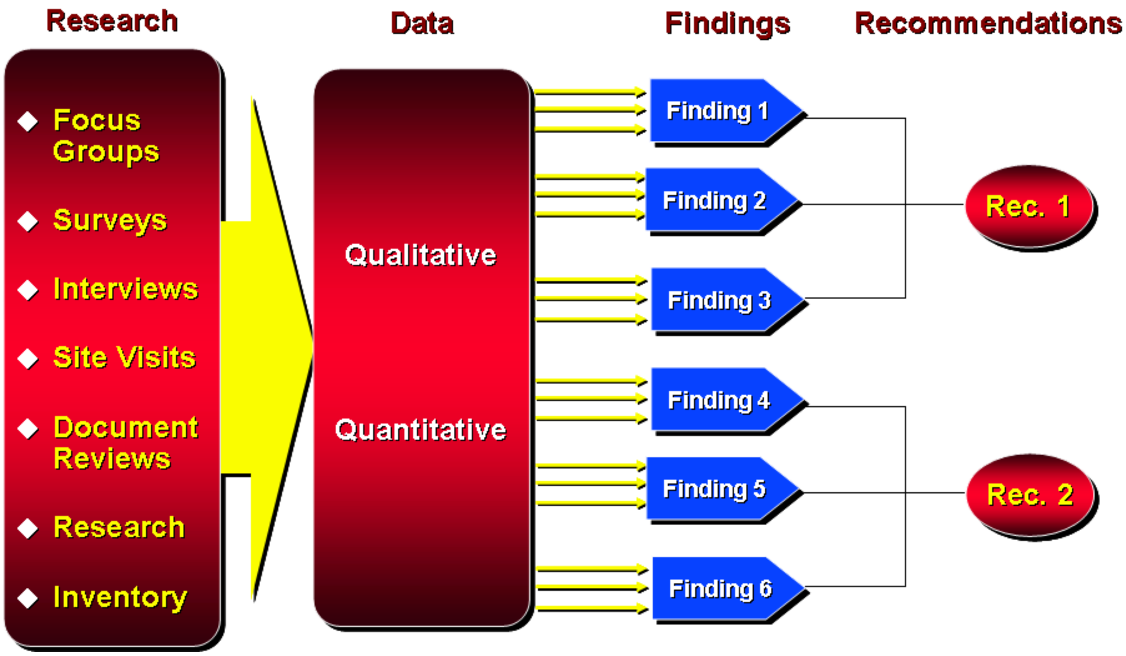
Qualitative Methods

Qualitative data were gathered using a variety of approaches listed below:

Key Stakeholder Interviews—Over sixteen in-depth interviews were conducted with numerous leaders in the PPSD education community, including board members, the superintendent, chiefs, directors, and department heads. Interviewees responsible for areas such as school district administration, human resources, professional development, finance, curriculum and assessment, school improvement, board members, management, and technology support services responded to questions as they related to their specific roles within the school district. These interviews allowed further identification and understanding of each individual's opinion regarding the implementation and use of technology.

Focus Groups— Eight topical focus groups allowed members of the school community to offer their views on numerous issues and topics. In each of the sessions, twelve-to-twenty educators gathered to provide perspectives on the current status of technology and future objectives based upon their own unique experiences. Included in focus groups were principals, technology support staff, counselors, student support personnel, teachers from various grade levels, clerical and support staff, administrators, central office staff, and parents.

Site Visits—Ten site visits were conducted in elementary, middle, and high schools across the district in all three zones. These inquiry-based visits were designed to generate information from several perspectives regarding the use of administrative applications and communications infrastructure in the main office, schools, and classrooms. Investigators collected information from each building on available technology, network response time, and administrative uses of technology, staff development, and technical support.



This extensive collection of qualitative data offered valuable information from a wide sampling of both individuals and groups of individuals who have a stake in PPSD's technology decision making. Although the quantitative data obtained from audit reports and other sources uncover patterns that initiate the formulation of recommendations, the extensive qualitative data provide a critical perspective for CELT staff, ensuring that forthcoming recommendations and implementation approaches are both applicable and useful to all.

2.4 Information Technology Blueprint Structure

The *Information Technology Blueprint* is organized into fifteen major chapters:

Chapter 1: Introduction

Chapter 1: The introduction to the *Information Technology Blueprint* provides an overview of changes in educational environments in the Digital Age, describes the plan revision process, and presents school district technology vision, planning goals, and guiding principles. It also includes a summary of current school district demographics.

Chapter 2: Curriculum and Assessment

Chapter 2: Curriculum and Assessment of the *Information Technology Blueprint* focuses on the role of technology resources to enhance the delivery of curriculum content and support the assessment of student achievement. The topics presented in this chapter are:

- Student Technology Standards
- Curriculum and Technology Integration
- Student Assessment, Reporting, and Evaluation
- Curriculum Development and Instructional Management

Chapter 3: Teaching and Learning Technologies

Chapter 3: Teaching and Learning Technologies of the *Information Technology Blueprint* focuses on the types of technology-based teaching and learning resources that will be made available to PPSD teachers, students, and community members. The topics presented in this chapter are:

- Instructional Applications and Digital Content
- Technology Utilization
- Special Populations
- Information and Technology Resources Centers (Libraries/ Media Centers)

Chapter 4: Learning Environments and School Facilities

Chapter 4: Learning Environments and School Facilities of the *Information Technology Blueprint* focuses specifically on the types of learning environments that can be configured, reconfigured, and positioned to achieve ubiquitous access to learning resources for all students. Additionally, the standards for facilities technology infrastructure are addressed to ensure that all schools have the ability and flexibility to create a wide variety of exciting and engaging learning environments. The topics presented in this chapter are:

- Technology-Enhanced Learning Environments
- School and District Administrative Management Environments
- School Facilities

Chapter 5: IT Organizational Development and Staffing

Chapter 5: IT Organizational Development and Staffing of the *Information Technology Blueprint* focuses on providing PPSD with a staffing and organization roadmap to meet the demands of implementing this *Information Technology Blueprint*. The topics presented in this chapter are:

- Organization and Staffing
- IT Career and Program Development
- Technical and End-User Support Model

- Staffing for Operational, Technical, and End-User Support

Chapter 6: Staff Development and Human Resource Management

Chapter 6: Staff Development and Human Resource Management of the *Information Technology Blueprint* is designed to focus on the staff development and training needed to support the use of technology within the PPSD. Staff development promotes continuous learning and improvement among teachers and other school staff. Ideally, professional development includes education, training, and support for using technologies. The use of technological tools in the recruitment, selection, and retention of staff is described. The topics presented in this chapter are:

- Staff Proficiencies
- Staff Development Programs
- Staff Development Planning
- Proficiency-Based Approach to Staff Development and Human Resources Management
- Recruitment, Selection, and Retention of Highly Qualified Staff
- Technology in Support of Staff Development Programs

Chapter 7: Standards, Procurement, Maintenance, and Asset Management

Chapter 7: Standards, Procurement, Maintenance, and Asset Management of the *Information Technology Blueprint* focuses on improving the school districts processes in these areas and recommending how technology could be used to support improvements. The topics presented in this chapter are:

- Technology Standards
- Procurement Guidelines
- Maintenance Procedures
- Asset Management

Chapter 8: Policies, Procedures, Security, and Safety

Chapter 8: Policies, Procedures, and Security of the *Information Technology Blueprint* focuses on those parts of the organization that communicate strategic direction and formalize organizational practice. The topics presented in this chapter are:

- Technology and Information Policies
- Technology and Information Procedures
- Security Policies and Systems

Chapter 9: District, School, and Program-Level Planning

Chapter 9: District-, School-, and Program-Level Planning Process of the *Information Technology Blueprint* focuses on a coordinated approach to district, school, and program-level planning. This chapter addresses the ways in which technology resources can support and enhance the planning efforts in PPSD. It further describes processes and procedures to track the effects of planning and to monitor success. The topics within this chapter include:

- District-Level Planning
- School Improvement Planning
- Department/Unit-Level Planning
- Balanced Scorecard Process
- Project Management Oversight

Chapter 10: Administrative and Productivity Systems

Chapter 10: Administrative Computing and Productivity Systems of the *Information Technology Blueprint* focuses on enhancing the functional capabilities and efficiencies of administrative and decision support systems to support school district operations. By developing new strategies to enhance user operational capabilities with associated improvement in service delivery it will be possible to better serve present needs and provide the foundation for advanced administrative support and decision support capabilities in the future. The topics presented in this chapter are:

- Information Systems Strategies
- Business Management Systems
- Student Information Systems

Chapter 11: Decision Support and Accountability Systems

Chapter 11: Decision Support and Accountability Systems of the *Information Technology Blueprint* focuses on information systems with the specialized purpose of storing and processing data to be use to support decision making and accountability in the school district, in departments, and in the schools. Systems are comprised of hardware and software to store and manage the data, report generators to configure the data into useful forms, and the processes associated with data-driven decision-making. Decision support and accountability systems are supporting technologies in that they provide the means to increase capacity and effectiveness rather than act as the foundation for core processes. The topics within this chapter include:

- Data Management
- Decision Support Framework

- Data Warehouse Implementation
- Enterprise Content Management System
- Performance/ Accountability Systems

Chapter 12: Communications and Network Infrastructure

Chapter 12: Communications and Network Infrastructure of the *Information Technology Blueprint* focuses on continued enhancement and expansion of advanced infrastructure systems for communication, computing, and networking throughout the school district. The topics presented in this chapter are:

- Strategic Issues
- Emerging Issues
- Network Transport Infrastructure
- Data and Services Infrastructure
- Management and Supporting Computing Infrastructure
- Network and Information Security

Chapter 13: Community/Home Access and Participation

Chapter 13: Community/Home Access and Participation of the *Information Technology Blueprint* focuses on needs of the PPSD community to participate in life-long learning experiences from home, school, and other locations; to better connect school and the world of work; and to access the information they need to make informed educational choices and decisions. The topics presented in this chapter are:

- Home/ School/ Community Connection
- School-to-Career Connection
- Board of Education
- Public Information and Awareness
- Community Involvement

Chapter 14: IT Monitoring, Evaluation Programs, and Implementation Management

Chapter 14: IT Monitoring, Evaluation Programs, and Implementation Management of the *Information Technology Blueprint* focuses on the processes, structures, and tools for monitoring the implementation of the plan and evaluating its impact in terms of quality and effectiveness. The topics presented in this chapter are:

- Plan Monitoring

- Plan Evaluation
- Implementation Strategies
- Reporting Outcomes to Stakeholders

Chapter 15: Budget, Funding, and Total Cost of Ownership

Chapter 15: Budget, Funding Sources, and Total Cost of Ownership (TCO) of the *Information Technology Blueprint* focuses on planning for and funding technology expenditures. The topics presented in this chapter are:

- Budget
- Funding Sources
- Total Cost of Ownership (TCO)

3.0 STRATEGIC FRAMEWORK

The *Information Technology Blueprint* is not an end unto itself, but rather a means to achieve the school district's highest priorities, mission, vision, goals, and objectives. This chapter of the blueprint highlights the school district's guiding principles in the following sections:

- PPSD Strategic Mission, Vision, and Goals
- Technology Mission, Vision, and Goals
- Technology Design Decisions

3.1 PPSD Strategic Mission, Vision, and Goals

PPSD Mission Statement

Providence Public School District will prepare all students to succeed in the nation's colleges and universities and in their chosen professions.

PPSD Vision Statement

Providence Public School District will be a national leader in educating urban youth.

PPSD Core Values

The district's mission and vision will continue to guide our work at the highest level and allow us to collaborate with a shared sense of direction and a common purpose in mind. Our core values describe how we – as educators, staff, family, and community members – will approach our daily work with the best interest of students in mind.

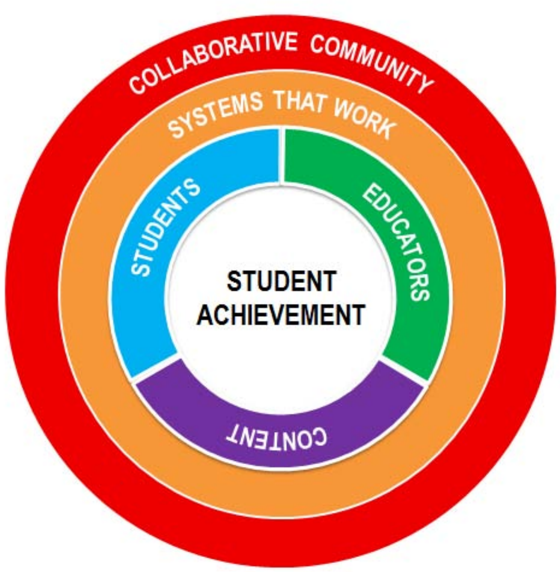
1. Respect. Together, we operate as a team. We respect one another and work collaboratively as a team to support and serve our students and educators.
2. Equity. We are guided by the conviction that all students can learn and achieve at high levels.
3. Excellence. We strive for excellence in all that we do and maintain a positive attitude and relentless focus on results when presented with barriers and obstacles.
4. Accountability. We share responsibility and accountability for the success of our students and our schools.
5. Appreciation for our diversity. We are enhanced by the diversity of our school communities and staff; we embrace and celebrate our diversity.

PPSD Strategic Goals

- All children will enter kindergarten ready to learn and prepared for school
- All children will have access to a portfolio of high-quality schools, teachers, and district supports
- All children will be supported socially, intellectually, and emotionally
- All children will succeed academically and graduate ready for college, career, and/or credential
- All youth will obtain a post-secondary degree or credential and enter a career

PPSD Focus Areas

1. **Engaged Students and Families**. Provide all students and families with access to excellent schools and prepare all students for success in their post-secondary endeavors.
2. **Highly-Effective Educators**. Promote high expectations and support the growth and development of teachers, leaders, and staff.
3. **Rigorous and Aligned Content**. Implement a rigorous and engaging curriculum and provide rich learning opportunities at all grade levels and in all content areas.
4. **Systems that Work**. Build, refine, and create systems that support high-quality teaching and learning.
5. **Collaborative Community**. Foster rich and meaningful partnerships with members of district community promoting a shared investment in Providence's youth.



3.2 Technology Mission, Vision, and Goals

Technology Mission

"To prepare the Department's young men and women for the challenges of tomorrow and to become productive citizens in an evolving world, Providence School Department will plan, design, implement and utilize technology to enhance the curriculum and improve instruction in classrooms and improve educational decision making by the effective use of data. Information technology will be used facilitate the implementation of the new Teaching and Learning Model put forth by the Technology Plan's Central Premise and to assist students think, learn, and develop the ability to access, analyze, and communicate information. Technology should also increase the student's responsibility for his or her own learning and empower them to be agents for their own education, enhance cooperative learning and critical thinking while facilitating administrative tasks and classroom management. The Department is committed to providing equitable student and staff access to technology and to the extensive staff support and development necessary to accomplish this mission."

Technology Vision

It is the responsibility of the PPSD Technology Department to aid in the design of learning environments that make effective use of today's technology and provide a degree of affordable future proofing of the communications infrastructure for tomorrow's technology.

The following discussion addresses, for the architect's design team, the impact of future technologies in education and desired changes in learning styles and methods on facilities design. Some of the major considerations are:

- The existing classroom environment will continue, but with the teacher being supported by enhanced technological administrative and instructional systems. Technology will allow the learning environment to contain the following desirable features:
    - Small-group instruction
    - Individualized instruction
    - "Non-paper" instructional materials
    - Collaborative, multi-sensory instruction
    - On-demand access to information and resources
    - Exploratory, intuitive-based
- The general-purpose computer lab will become decreasingly necessary. Each classroom will have the capability of being or becoming a computer lab, as each student has his or her own small laptop or other type of individual computer

device connected via wireless to the hard-wired school-wide data communications infrastructure.

- The design and layout of classrooms and all other learning areas must change to accommodate new teaching and learning environments.
- The media center (information resource center) will continue to function as the technology distribution center of the school, housing the main head end room for voice, video and data, large group presentation area(s), open access mini computer labs (electronic cafes), digital media production facilities, and student research and information access workstations.
- One-to-One E-Learning environments will be supported by a hybrid hard-wired and wireless communications infrastructure, utilizing a combination of traditional telecommunications room and fiber optic based "collapsed backbone" topology to provide each school with seamless data connectivity.

The technologies expected to play an important part in facilitating this new learning environment are:

- Large-screen wall presentation of video-display systems with interactive whiteboards and sound enhancement systems
- Individual laptop or other personal computer devices for all students
- Wireless network communications within the classroom
- Advanced interactive software
- Distance learning capabilities in multiple learning areas
- The instant availability of student data to assist instructional decision making and management of the individual students learning process.

Technology can link teachers to curriculum sources. Teachers can use a computer to access a central location to gather a list of resources and activities for the lesson being taught. They can join other creative teachers on a network to share and field-test lesson plans, adjusting them as necessary for their students. With these tools, teachers can create and present content lessons in a multi-media format designed to explore "what if..." questions.

In summary, the significance of these computer trends are that they allow teachers to: (1) better address higher order thinking skills; (2) meet the individual needs of a more diverse student population; and (3) change their role from an information dispenser to an instructional facilitator.

It is envisioned that each student will someday be assigned a personal notebook or other type of computing device to use both in school and at home. The computer will have: (1) wireless transmission capabilities for networking to local file servers; (2) the capability of attaching to any building-wide digitized two-way distributed video outlet; (3) a miniaturized CD-ROM type-high volume multi-media device; (4) two-way voice recognition communications capabilities; and (4) use data in the decision making process.

The student will carry his/her personal computing device from class to class and have the capability of wireless communication connectivity with any file server in the building. The student can use his/her computing device from a desk, small discussion group, the media center, other instructional support facilities, or home. The student can obtain (download) software or send (upload) performance data to the local classroom file server.

Technology Goals

The following 10 goals have been identified as milestones that will enable administrators, teachers, students, and community to migrate towards the new Teaching and Learning Model and the Data-driven Decision Making Model:

Goal 1: Continue to upgrade the existing communications infrastructure and networks in all schools to provide advanced digital wireless, video distribution and telephone services and support all aspects of the Technology Plan.

Goal 2: Upgrade the AV presentation capabilities in all classrooms in non-demonstration schools to support electronic whiteboards which will increase the instructional strategies available to teachers.

Goal 3: Utilize the new PCTA High School and the new Bishop Middle School as a demonstration schools to support Teaching and Learning Model described in the central premise. Identify, select, design and implement an elementary school for a demonstration center that models the complete learning environment defined by the central premise. It is anticipated that demonstration schools will become breeding grounds for the innovative and effective direct applications of integrated technology in the teaching and learning process. The schools will should also serve as professional development centers to which teachers can come to observe, try and learning about technology applications. It is further anticipated that these schools will develop the process of change necessary for effective transportability of proven applications of technology.

Goal 4: Review, modify, edit and adapt standards to ensure that all modernized and new schools meet the Communications Infrastructure criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) described in Chapter 4.

Goal 5: Define, develop and implement both the process and data processing support for a district-wide data-driven decision making systems that can be used for instructional decision making and accountability. This classroom assessment and instructional management system that will allow teachers to become efficient managers of every student's learning plan. This system must include significant staff development and necessary resources for the integration of existing separate and independent data information systems.

Goal 6: Create an environment and provide the resources that will allow all teachers to attain the skills necessary to become effective managers and facilitators of instruction.

Goal 7: Engage parents and community in the planning, design and operation of the learning environment defined by the central premise.

Goal 8: Provide resources necessary for a plan to provide the technology staffing support necessary to implement the technology based Teaching and Learning Model put forth in the central premise.

Goal 9: Develop technology fluent school and central office administrators.

Goal 10: Create technology standards and policies that will aid the school system in implementing the goals set forth in the Technology Plan.

3.3 Technology Design Decisions

Given the rapid change in developing and emerging technologies in the field of education, PPSD is committed to a re-visioning process on a regular basis to determine needed adjustments. Results from these regular evaluations of the technology implementation will form an important data source for the re-visioning process. The *Information Technology Blueprint* establishes and maintains technical standards to ensure compatibility of hardware, software, and training/support with the school district's established mission, goals, and objectives while providing schools adequate flexibility to meet the unique needs of the students, faculty, staff, administration, and community. PPSD will engage in planning, designing, and implementing an enterprise-wide approach to information technology that is based on these principles.

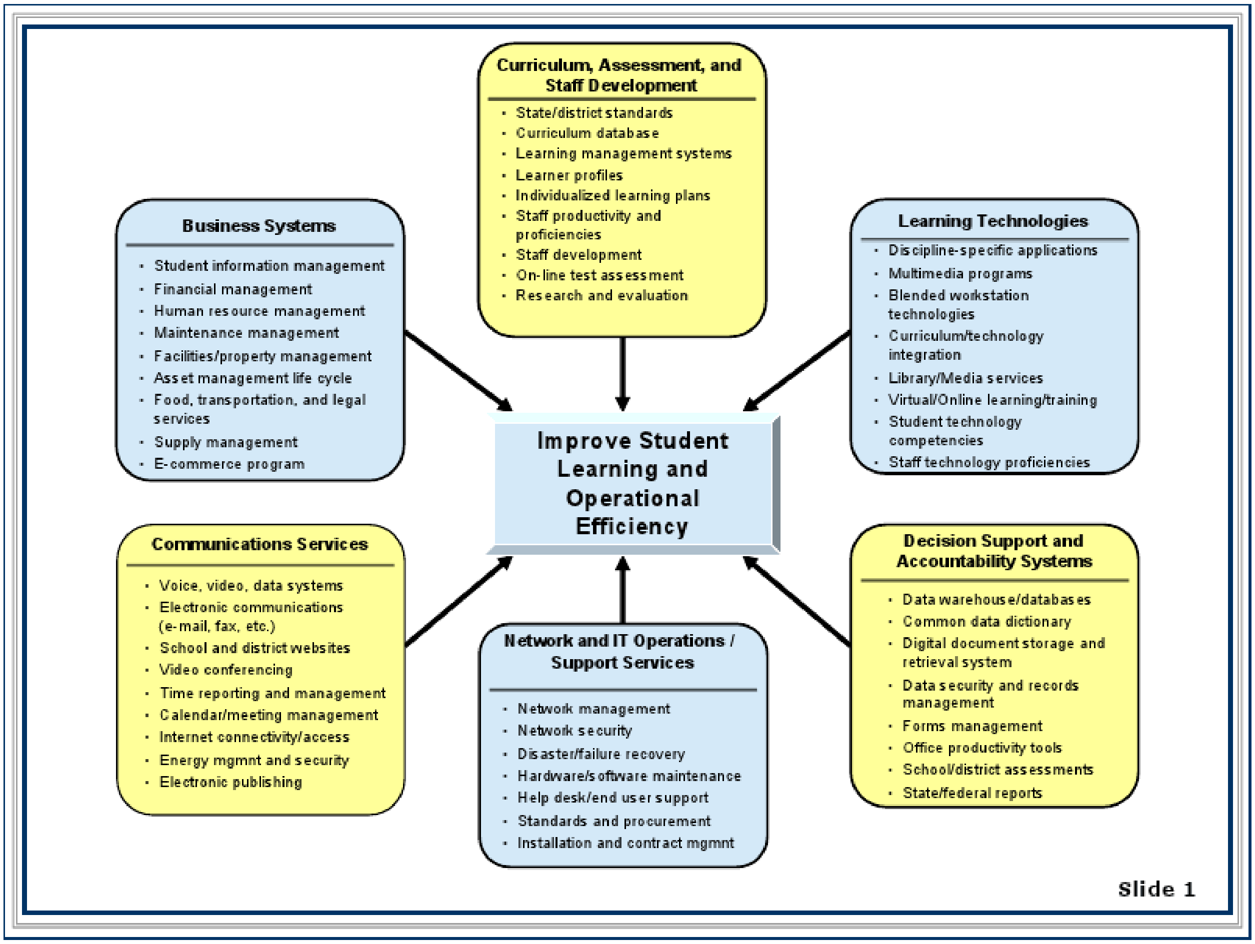


Figure 3: Enterprise-Wide Approach to Information Technology

Further, the following technology design decisions should be used to guide the procurement and design of the district-wide information technology system:

- encourage students to use technology to direct, assess, and manage their own learning make PPSD educational technology resources available (with appropriate security) for access from home, public libraries, and museums on a 24x7 basis in support of community learning and economic development
- create an enterprise-wide information technology system that supports all business services as well as teaching and learning opportunities for everyone within PPSD
- establish increased student achievement and greater business efficiency as the driving force for all IT decisions
- adopt and maintain a consistent vendor-independent standards and procurement specifications for all IT components

- ensure that technology applications are web-based so they support myriad instructional applications and productivity tools and devices
- capture information once online and validate it at the source
- import relevant data from all learning and business applications into the data warehouse to support data-driven decision making
- adopt an IT architectural approach to the research, planning, integration, and monitoring of a comprehensive information technology infrastructure
- focus all decision support system projects on getting accurate, timely, and mission-critical information to staff, teachers, students, and parents
- integrate voice, video, data, security, and energy management into a single, reliable network system
- create an “Information and Technology Resource Center” within each school

4.0 CRITICAL SUCCESS FACTORS

Among the many factors essential to successful design and implementation of the *Information Technology Blueprint*, experience indicates that five are particularly decisive:

- enlightened leadership
- a critical mass of resources focused on high priority initiatives
- committed, competent, and empowered faculty and staff
- efficient organizational structures and processes
- a culture of continuous improvement

Addressing this highly interdependent portfolio of factors will significantly enhance the achievement of the *Information Technology Blueprint's* goals and objectives.

4.1 Leadership

Leadership is the most critical factor affecting the successful integration of technology into the curriculum. Similarly, enlightened leadership is essential for the success of the *Information Technology Blueprint*. District and school leaders will bring everyone in the school district to a shared vision of how technology will support the strategic plan, focus attention on priorities, empower administrators, teachers, and staff, and enhance accountability for highly valued outcomes.

Six leadership functions are particularly important to the realization of the school district's technology goals and objectives:

- **Establishing direction:** Effective leaders bring everyone in the organization to a shared vision of how technology will support the school district's goals and objectives. Leaders guide the organization in translating that vision into strategic initiatives with highly valued and measurable outcomes.
- **Lead through results:** Effective leaders focus attention on those outcomes and indicators that decision-makers expect, accept, and respect regarding the achievement of those outcomes. They encourage innovation and entrepreneurial behavior in achieving those results, document successes and failures, and drive that knowledge throughout the system to support decisions regarding improvement and redesign.
- **Allocate resources:** Effective leaders identify and organize a critical mass of resources for each strategic technology initiative. They ensure equity of access to technology resources across schools and classrooms.

- **Empower staff:** Effective leaders ensure that all members of the learning community are committed, competent, and empowered to address the strategic technology initiatives. This requires, "a robust operating process, centered on an operating plan that links strategy and people to results" [1] These leaders encourage innovation in order to produce new understandings.
- **Accountability:** Effective leaders ensure that the organization is capable of providing timely and relevant information on student, program, and organizational performance to all decision makers. They focus on results and the key enabling objectives that lead to those results. They train all program directors to gather and use data about the results they are responsible for achieving.
- **Knowledge management:** Effective leaders help their organizations to know what they know. They invest in systems for documenting and sharing knowledge about what works–and doesn't work–and drive that learning throughout the system to inform decisions about ongoing improvement and redesign.

4.2 Critical Mass of All Variables

Achieving the technology objectives will require that the school district configure all of the essential components and elements into a coherent system. Such a system includes not only sufficient technology resources, but also committed, competent, and empowered teachers and well-designed student learning opportunities and learning environments. Experience indicates that many of the most important variables are intangibles–leadership, strategic thinking, and entrepreneurial behavior–what some experts have defined as "intellectual capital." Tangible or intangible, all of these variables will be aligned and focused systemically to support each of the strategic technology initiatives.

4.3 Empowerment and Change Management

The *Information Technology Blueprint* requires many substantial and complex changes. Ensuring their successful implementation is a major challenge, requiring attention to establishing a culture of change, providing adequate staff development, empowering all members of the learning community, encouraging risk-taking, focusing on results, and communication and sharing successes and shortfalls.

However compelling the change, its implementation is hardly ever successful without balanced attention to both the technical and human dimensions. Crafting and implementing change strategies and tactics requires as much attention and energy as that for formulating the strategic technology initiatives themselves.

[1] Bossidy, L. & Charan. R.The Discipline of Getting Things Done. 2002, p. 226.

4.4 Business Processes Reengineering

The success of PPSD technology initiatives will be determined not only by the quality of its designs and plans but also by the quality and effectiveness of their execution in schools and classrooms. Successful execution requires effective work structures and processes--smart work. The school district will achieve a level of innovation in its work structures and processes that is commensurate with that for the proposed technology initiatives themselves. The school district will substantially improve efficiency and effectiveness in optimally using limited resources in the service of it students.

4.5 Focus on Continuous Improvement

Continuous improvement is the hallmark of a learning community, where watching performance, identifying successes and shortfalls, and continually adjusting programs and practices constitute core organizational processes. Such activities result in a steady stream of minor and sometimes major adjustments.

Continuous improvement requires the clear specification of key enabling objectives and their relationships to the desired outcomes/results. Continuous improvement also requires timely, relevant, and accurate information about the implementation of those key enabling objectives. The Sterling Plan-Do-Study-Act cycle will serve as a framework for continuous improvement. Performance information will be integrated into each phase of the cycle, together with knowledge and wisdom obtained from the staff members' experience.

The Sterling Action Research and the Plan-Do-Study-Act cycle also provides a framework for transforming what we learn into a new way of working, not merely correcting the problem at hand, but fundamentally altering the processes and structures that contributed to that problem. Such continuous improvement is as much a cultural as a technical issue, requiring that all staff members share ownership of the desired outcomes and are encouraged to identify and evaluate alternatives to prevailing practice.

5.0 BUSINESS PROCESS REDESIGN

Business process redesign focuses on the factors required to make all business transactions more efficient, effective, useful, and accessible for all users of the administrative applications suite. It also focuses on the reduction of redundant data entry, automatic updating across related applications and the minimization of technical support needs. The topics addressed in this section include:

- Accountability
- Knowledge Management
- Decision-Making
- Systems Thinking

5.1 Accountability

Systems for gathering, organizing, analyzing, and reporting performance information can inform decisions regarding ongoing improvement and redesign. Such performance information systems constitute an essential school district function, not an appendage to a specific project or program. The school district will strengthen its organizational mindfulness about the gap between expectations and current performance. Information about gaps between expectations and reality will be viewed as opportunities for learning and adjusting. The school district will employ systems for assessing progress in implementing each strategic initiative and use that information to refine or redesign change strategies and tactics. Such information about progress will be integrated into each phase of the Plan-Do-Study-Act cycle.

Accountability requires the development of a strategic management system for monitoring key tasks, activities, and milestones as well as for judging the quality, effectiveness, and efficiency of the entire educational technology system. The system will require ongoing data collection regarding selected performance measures, timely communication of data and analyses to key decision makers, and periodic reports that address both implementation progress and impact assessment. Accountability requires that successes and shortfalls are identified and that the learning is disseminated to all staff in order to facilitate careful replication throughout the school district. Information is communicated to all stakeholders as well.

5.2 Knowledge Management

The school district will develop much improved systems for organizing and sharing what we know. Knowledge is information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decisions and actions."[2] Communication and sharing what works and what does not work is essential to success. People need to be supported in sharing that information.

5.3 Decision-Making

The school district will enhance its ability to make decisions using performance data as well as the knowledge and wisdom of its staff. Education, training, and support services will help program managers enhance their decision-making knowledge and skills.

5.4 Systems Thinking

The school district will align key processes and people and ensure that the many technology initiatives increase synergy. Successful learning organizations have flexible organizational structures and adjust their deployment of staff, time, and other resources to accommodate new learning. These organizations use technology tools to increase efficiency and effectiveness of these core operations.

[2] Davenport, TH, DW DeLong and MC Beers. 1998. "Successful knowledge management projects." *Sloan Management Review* (Winter): 43-57

6.0 MANAGING AND IMPLEMENTING CHANGE

Insightful students of individual and organizational change have emphasized the essential role of facilitation as well as management. Facilitating change requires developing a shared and explicit vision of the results required and encouraging and empowering principals, teachers, and staff to figure out how to obtain those results.

Effective leaders devote considerable energy to establishing a strong culture for change. Such a culture may only be possible within a true learning community. In such a community, the changes are owned by the community rather than by external forces. Change becomes organic and ongoing rather than imposed and episodic. This culture focuses on ends rather than means, attends to the human dimensions of change, and builds and organizational capacity for responding nimbly and quickly to ever-changing needs and circumstances. Change leaders encourage risk taking and entrepreneurial behavior, learning from “smart” mistakes.[3] They balance attention to compliance with encouraging mindfulness in creating variations that accomplish the outcomes.

Effective change leaders communicate clearly and frequently about the changes the successful implementation of each strategic initiative requires and what valued outcomes it will accomplish. They focus on results by negotiating a shared vision and specific results for the organization. Once this consensus is achieved, and indicators and measures are established, the learning community can then look for many ways of accomplishing those results. Leaders focus on ends and encourage creativity and innovation with respect to means.

Change is a collaborative process. Innovations change as they are adapted by staff members to local situations. When focused on the desired outcomes, these changes represent important learning that is documented and shared.

Leading change is ultimately about empowering people, less a technical challenge than a social and organizational one. Empowering people to change require careful attention to incentives, particularly intrinsic ones. Change leaders help staff members to understand and negotiate the transitions between old and new ways of doing things.

[3] Farson, R. and Keyes, R. *Whoever Makes the Most Mistakes Wins: The Paradox of Innovation*, 2002.

APPENDICES

Appendix A
Documents Reviewed

The following list is an overview of the over 90 Providence Public School District documents reviewed during the Information Technology Blueprint study.

2009 Dell Providence Specification Sheet

2011 Elementary School Results

2011 High School Results

2011 Middle School Results

2011 Revised Ride Textbooks, Aug 2012

2011 Software Inventory from Tech Report, Aug 2012

2011-12 Summary Report 21st Century Skills and Assessment, July 2012

2011-12 Survey Report Providence 21st CLS, May 2012

2012 PPSD Price List

2012-13 Assessment Calendar, Aug 2012

2012-13 Budget Development Calendar, Dec 2011

2012-13 Elementary School Professional Development Guide

2012-13 FY Professional Development Calendar

2012-13 High School Professional Development Guide

2012-13 Middle School Professional Development Guide

2012-13 Professional Development Project Plan

470 PPSD_13 Schools and Libraries Universal Service Description of Services Requested and Certification Form

470 PPSD_14 Schools and Libraries Universal Service Description of Services Requested and Certification Form

470 PPSD_15 Schools and Libraries Universal Service Description of Services Requested and Certification Form

A Curriculum Management Audit of the Providence School Department

Basement Security Camera Plan, A-1

Chief Academic Officer Organizational Chart

Chief Communications Officer Organizational Chart

Chief Financial Officer Organizational Chart

Chief Operating Officer Organizational Chart

Community/ Home Assess and Participation

Contract Work- flow

Curriculum Management Plan – Draft

Director of Facilities Organizational Chart

Director of Operations Organizational Chart

Director of Student Placement Organizational Chart

E-Rate Product and Services (2010 - 2011)

E-Rate Product and Services (2011 - 2012)

Elementary School Refresh Results

Esek Hopkins Cameras

Faculty by Location (Including Charter Schools)

First Floor Security Camera Plan, A-2

First Floor Security Camera Plan, A-5

First Floor Security Camera Plan, A-9

Ground Floor Security Camera Plan, A-8

High School Refresh Results

HR Organizational Chart

Improving Special Education Services in the Providence Public School District

Job Descriptions from Tech Plan

Local Budget 5 year Revenue Expenses

Local Budget 5-Year Revenue Expenses

Media Contact List

Media List

Microsoft Enrollment for Education Solutions

Middle School Refresh Results

Middle School to Middle College Concept

Multiple Pathways and CTE Glossary of Terms

PPSD 797 Network Scook, June 2010

PPSD 797 Network, June 2010

PPSD Backup

PPSD Backup Rotation

PPSD Internet Acceptable Use Policy – DRAFT

PPSD Topology, Aug 2009

PPSD Topology, Aug 31, 2009

Print Media – English

Providence Media

Providence Media Contact List

Providence School Network, May 2012

Providence Special Education Report

Purchase Order Information

Radio Media – Mainstream

Raising the Achievement of English Language Learners in the Providence Schools

Response from Teaching and Learning for Chapter 2 and 3

Revised RIDE Textbook List

RIDE Grant Pleasant View Elementary School, Providence

RIDE Grant Pleasant View ES Providence

SCCM Server Updates

Second Floor Security Camera Plan, A-10

Second Floor Security Camera Plan, A-3

Second Floor Security Camera Plan, A-6

Security Cameras – Phase II

Software Inventory from Tech Report, Oct 2011

Staff Development Plan, Mar 2012

Staff Development Policy – DRAFT

Student Totals

Superintendent Organizational Chart

Tech Budget 3-Year

Tech Team Evaluation

Technical Project Requirements Document v2

Technology Organizational Chart

Third Floor Security Camera Plan, A-11

Third Floor Security Camera Plan, A-4

Third Floor Security Camera Plan, A-7

TV News

WAN interface Report for PPS

Chapter 2:
Curriculum and Assessment

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Learning is not the product of Teaching. Learning is the product of the Activity of learners."*
>
> —John Holt

The **Curriculum and Assessment** chapter focuses on the role of technology resources to enhance the delivery of curriculum content, facilitate the attainment of student learning outcomes, and support assessment of student achievement. The integration of scientifically researched teaching and learning technologies into the curriculum enables students and teachers to learn in ways not available without these resources. To maximize the potential of these resources, all students must attain and demonstrate mastery of prescribed technology standards. The introduction, practice, and mastery of these standards must be woven throughout the grade levels and across all disciplines.

Technology resources will be deployed to assist teachers with the development and delivery of assessments, the organization and analysis of daily, formative assessment data, and the delivery of instruction that matches the learning needs of aggregated and disaggregated groups of learners. Instructional management tools are required to link content and standards with assessments, student academic achievement, and teaching and learning resources.

The subtopics within this chapter include:

- Student Technology Standards
- Curriculum and Technology Integration
- Student Assessment, Reporting, and Evaluation
- Curriculum Development and Learning Management

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September and October of 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Curriculum and Assessment* section of the *Key Findings and Recommendations* final report.

2.1 Student Technology Standards

Over the past three years, the Providence Public School District (PPSD) developed an aligned curriculum with strong partners and teacher leaders from across the district. These are excellent resources for teachers in implementing effective practices in the Common Core State Standards (CCSS). Global Scholar is currently entering the curriculum into the state-provided Instructional Management System (IMS), where it will be made accessible to teachers and administrators.

Although the Rhode Island Department of Education (RIDE) had adopted the ISTE NETS standards (http://www.iste.org/standards), PPSD has not. Both 8th grade technology assessment test results and teacher perception indicate that PPSD students are not being adequately prepared for 21st century learning and work.

The key findings for **Student Technology Standards** include:

- The district has not formally adopted technology competencies for students, teachers, or administrators. The Rhode Island Department of Education recommends the use of the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) for determining what students, teachers, and administrators should know and be able to do in order to effectively use technology within the schools. Providence teachers also identified the need for a clear set of skills to prepare students for future study and work.
- Seventh graders are required to take a technology class in preparation for the 8th grade 21st Century Skills Assessment. Eighth grade students did not reach proficiency overall or in any single area in 2011-2012, nor in any individual school.
- The PPSD aligned curriculum is currently being entered into the state Instructional Management System (IMS) by Global Scholar. Technology can be integrated and technology standards referenced in this system.

2.2 Curriculum and Technology Integration

The aligned curriculum has some references to the use of technology but a scope and sequence of technology skills has not been formally or comprehensively integrated.

Although technology resources, technology integration into the curriculum, and professional development are not consistent in schools, many teachers report they are integrating technology where they can, for deepening student understanding, research assignments, and projects. In focus groups, they report that at least three-quarters of their colleagues would be interested in using technology if they had equipment, training, and support.

The key findings for **Curriculum and Technology Integration** include:

- Although technology resources are unevenly available within and across schools in the district, 40% of the teachers report that they incorporate technology into instruction where appropriate.
- Some professional development targeting technology tools for learning has been provided, such as for TI nSpire calculator and Navigator systems for middle school math teachers, 8th grade technology teachers, K-3 teachers using iPads for reading assessment, and CTE teachers. In 2012-13, Building-based Technology Support Teachers are being hired and trained to support the IMS implementation, facilitate training, provide guided practice to classroom teachers, and troubleshoot hardware and software issues.
- Teachers are interested in using technology for learning. In focus groups, 70-90% of teachers report that their colleagues would be interested in using technology if they had equipment, training, and support. Some teachers are already using technology; 51% reported they use technology to deepen student understanding, 36% include internet-based research assignments to extend student learning, and 17% require students to create technology-related projects.

2.3 Student Assessment, Reporting, and Evaluation

District leadership is aware of the required PARCC assessment in 2014. Department heads report they have been working on content and skill preparation, but do not envision how assessments can be administered online with existing technology resources. Some district assessments that employ technology resources are in place district wide.

The key findings for **Student Assessment, Reporting, and Evaluation** include:

- Some technology-supported assessments are used district wide including the DIBELS reading assessment in grades K-3, the 7th grade EasyTech computer literacy program built in assessments, and the 8th grade 21st Century Skills Assessment. Elementary schools have Pearson SuccessNet and Envision for diagnostic and remediation work but do not have sufficient or capable computers to support their use. Only 22% of teaches surveyed report using technology-based assessments.

- Department heads have been working with their staffs to understand the content and requirements of the PARCC testing and prepare their students to be successful.
- High school programs are using Certiport (http://www.certiport.com) for Cisco certification this year. They also offer MS Office certification and are currently training staff to teach Adobe applications. The Adobe suite includes online assessments.

2.4 Curriculum Development and Learning Management

The adoption of the RIDE IMS inclusion of the PPSD Aligned Curriculum will provide teachers and administrators with online access to the entire curriculum in one system. To ensure a single sign-on, the district is exploring adding a grade book, analytics, benchmark assessments, and the RTI model for interventions to this system. (Some of this functionality could also be added to a Student Information System.) In addition, PPSD is in the process of preparing a Request for Proposals (RFP) for replacing the existing REG student information (SIS). This SIS would be an upgrade from the current system that still requires manual entry of data from paper records.

The key findings for **Curriculum Development and Instructional Management** include:

- Training for the Technology Support Teachers on the RIDE IMS system is being scheduled. The IMS system will have a single sign-on. The curriculum office is looking into adding a grade book, analytics, and benchmark assessments into IMS system to provide data on progress in the curriculum that is not currently available.
- The school district is using the REG system for tracking students. At the elementary level, clerks enter student data from paper records. A new SIS bid is planned to replace this system.
- Within the new IMS and SIS, the Teaching and Learning Department is planning to use the Exceed RTI model. Exceed RTI is produced by SpectrumK12 which is now owned by Global Scholar, who also produces the IMS that RIDE has secured so Exceed RtI should have the capacity to be part of the IMS/single sign-on.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Curriculum and Assessment* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., CA for Chapter 2) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 2, Curriculum and Assessment, section 3.1, Student Technology Standards, would be numbered CA-1.1, the second recommendation in this same section would be CA-1.2.

3.1 Student Technology Standards

CA-1.1 Adopt Student Technology Standards

Formally adopt and/or adapt the ISTE NETS standards.

CA-1.2 Develop a Scope and Sequence for Technology Skills

Develop a PreK-12 scope and sequence to guide the teaching and learning of technology skills that includes multiple opportunities for introduction, practice, demonstration of mastery, and application as appropriate in the content areas. Implement the scope and sequence so that all teachers can readily identify and assume responsibility for integrating these skills into the respective content area or process skills in a logical, progressive way via the Common Core State Standards.

3.2 Curriculum and Technology Integration

CA-2.1 Embed Technology Skills into the PPSD Aligned Curriculum

Formally and systemically embed technology skills into the aligned curriculum in the IMS to ensure the use of student technology skills for learning after they are developed.

CA-2.2 Evaluate and Disseminate Current Successful Technology Practices

Develop a process to identify and a strategy to store and disseminate the best practices teachers are currently using with technology, collect data on their success (evaluate/vet), and provide professional development for other teachers to replicate these successes.

3.3 Student Assessment, Reporting, and Evaluation

CA-3.1 Support Elementary Program Diagnostic and Remediation Tools

Support the use of diagnostic software for the district wide elementary reading and math programs with professional development and necessary hardware and the use of it in instruction (Pearson SuccessNet and Envision).

CA-3.2 Improve Middle School Student Attainment of 21st Century Technology Skills

Monitor student progress in 7th grade EasyTech program through the embedded assessments. Provide professional development on how to use the pretest data to inform instruction, and best practices in how to support student use of the computer-based activities to develop the 21st century skills tested in 8th grade.

3.4 Curriculum Development and Learning Management

CA-4.1 Prepare Teachers to Fully Use the Capabilities of the IMS for Teaching and Learning

Set up a system to track teacher preparation for using the IMS and their actual usage to determine where they may need additional support to fully use its capabilities once the aligned curriculum is entered into the IMS and support is provided by the new Technology Support Teachers. See Chapter 12 for the action plan for the single sign on system.

CA-4.2 Support a Comprehensive Collection of Tools in the IMS

Provide tools, support, and professional development for lesson planning, a grade book, data and analytics for decision-making, and benchmark assessments on student progress in meeting the objectives of the aligned curriculum.

4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists on best practices in using technology to improve teaching, learning, and school management, and this body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online to remain abreast of emerging issues. In addition, they present at and attend local, national, and international conferences focusing on educational technologies. Feedback from clients during the implementation of their technology blueprint initiatives provides CELT with an experiential knowledge base as well. CELT has been building this collective knowledge base continually for the past seventeen years while working with departments of education, school districts large and small, and a variety of public and private organizations, many of which are national in scope.

In addition to nationally researched approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with Providence Public School District. The following pages highlight the research and best practices that most closely relate to the needs and goals of the Providence Public School District.

The ability of teachers, students, and administrators to become effective users of technology to teach, learn, and manage their daily tasks and schedules is dependent on multiple factors that must all function in harmony. These factors include robust connectivity, modern resources, ongoing support, and time for collaboration and exploration.

In addition, to effectively integrate technology skills and technology resources into the curriculum, teachers must have: 1) clear guidelines in the form of student technology scope and sequence; 2) professional expectations in terms of staff technology competencies; 3) training and time for professional development to master required skills; and, 4) consistent access to quality resources that are aligned to state and district curriculum standards.

Throughout PPSD, the network infrastructure that serves classrooms, libraries, offices, and public spaces must consistently present sufficient bandwidth to support multiple users engaging in multiple tasks at all hours of the day. This network infrastructure needs to be monitored and upgraded as needed to provide the invisible and seamless access to information and resources that all users require and expect.

The teaching, learning, and management technology resources distributed in PPSD classrooms and instructional spaces will need to be updated and maintained to retain their functionality from year to year. These resources include computers (desktop, laptop, and handheld), software (productivity, management, and content specific), peripherals (printers, cameras, probes/meters), and projection capacity (monitors, digital projectors, document cameras).

Ongoing support to keep teachers abreast of technology integration techniques and digital teaching resources, support to keep computing resources in good working order, and support to maintain the vitality of the network infrastructure are all critical in encouraging the PPSD teaching force to invest in and rely on digital content to improve teaching and learning.

Perhaps one of the most elusive factors within any educational institution, TIME to learn, to explore, to experiment, and ultimately to master and then mentor will be necessary for all learners (students, teachers, and administrators) to become productive, independent, and successful citizens in the PPSD learning community.

Careful planning, budgeting, and implementation will be required to ensure that these factors are established and maintained to support the integration of 21st Century technologies to advance curriculum and assessment initiatives in support of student achievement.

Student Technology Standards

The National Educational Technology Standards for Students, developed by ISTE, presents research-based curriculum/technology-integration approaches that align student technology standards with content standards and process skills. Released initially in June of 1999 and updated most recently in 2007, these standards were developed by the International Society for Technology in Education (ISTE) and multiple partners. The student technology standards were the first of the projects. The revised standards address six foundation areas:

- Creativity and Innovation
- Communication and Collaboration
- Research and Information Fluency
- Critical Thinking, Problem Solving, and Decision Making
- Digital Citizenship
- Technology Operations and Concepts

Standards for teachers (NETS•T), administrators (NETS•A), and Educational Technology Support Standards are also core components of the project. All of these resources are available at the ISTE website: http://www.iste.org under the Standards tab.

Curriculum and Technology Integration

Technology Integration Across the Disciplines

Regardless of age, the 21st Century learner experiences multiple roles. On any given day the learner may assume the role of writer, mathematician, scientist, musician, artist, researcher, producer, publisher, entrepreneur, and/or inventor. It is the responsibility of school-district leadership to provide developmentally appropriate and challenging learning environments to support the work of its learner population in the many roles it is likely to assume during the course of its learning experience. Learning environments with the capacity to address such diversity must be flexible, adaptable, powerful, and sophisticated, yet intuitive enough for an intended audience to use with ease. The following provides examples of the ways in which technology resources support the multiple roles of the 21st Century learner.

Mathematician

The world of the mathematician includes mastery of basic computation skills; practice with gathering, manipulating, and interpreting numerical quantities; contexts to write and communicate mathematical ideas; and real-world opportunities to apply his/her skills. Quality applications can provide review, reinforcement, and remediation. Numeric/graphing calculators and Internet data gathering projects offer easy means to collect data for manipulation. Spreadsheets, charts, and graphs present information in multiple formats that enhance both interpretation and analysis.

Scientist

The scientist learns early on to ask questions, theorize, develop hypotheses, and conduct experiments in an attempt to support/refute ideas. The ability to access research data in his/her field of studies; consult with local, national, and global experts; collect, store, and manipulate findings for analysis; and present findings in a logical and understandable format is greatly enhanced by technology resources. The use of simulations to rehearse or conduct experiments too dangerous for the school environment makes the work of student scientists safe and practical.

Explorer/Researcher

As Internet access spreads and bandwidth continues to increase, international borders seemingly disappear and our world appears to grow ever smaller. Whether the topic of their investigations includes the study of history, geography, government, or economics, the student researcher of the 21st Century must master navigation, selection, evaluation, discrimination, and documentation skills. In addition to on-line information, many electronic collections are available which include animated graphics, video footage, sound, charts, graphs, and diagrams. The use of simulations allows the researcher to “step back in time” and assume the role of decision-maker in a variety of historical events.

Writer/Publisher/Presenter

From the creation and publication of a child’s first story to the production of a high school yearbook, writing and publishing tools have infiltrated educational learning environments across the nation. Publishing houses in elementary schools are busy laminating stories written and illustrated with easy-to-use word processing programs. The process is frequently supplemented with mobile computing devices and the help of parent volunteers. Middle-school students regularly produce and publish weekly or monthly school newsletters. At the high-school level, students are engaged in professional quality desktop publishing and graphic design activities for community businesses and organizations.

Creator/Communicator

The study of fine arts, composition of musical arrangements, and creation of artistic works can all be enhanced and supported with learning environments rich in music and art peripheral devices and applications. The primary learner begins with easy to use, yet powerful point and click applications, while middle and high school students frequently have access to nearly commercial quality graphic design and MIDI resources.

Global Citizen

The concepts of personal wellness and individual participation in a global community begin in the earliest grades and are reinforced throughout the school years. Beginning with a basic knowledge of food groups and nutrition to a complex understanding of body functions, chemistry, and systems, multiple technologies support health and physical education programs. The ability to communicate (online and via teleconference) with global friends, pen pals, and audiences via the Web significantly enhances our understanding of other cultures and nations. Programs such as ePals and TakingITGlobal make it safe and easy for teachers to engage their students with students from around the world, working collaboratively on projects that matter.

Entrepreneur/Inventor/Engineer

The popularity of national programs such as Olympics of the Mind (OM), Destination Imagination (DI), FIRST Lego League (FLL) and the FIRST Robotics (FRC) competitions, coupled with school-based Invention Conventions, highlight the power and potential of technology resources to create, test, and refine inventions; design, develop, produce, and market products; or identify, and solve problems.

Lifelong Learner

Gifted or challenged, young or old, novice or expert, we are all travelers on a lifelong learning journey. One minute we might be determining our own individual needs and the next assisting another through personal challenges toward the attainment of their goals. We pursue goals for both profit and pleasure; in either case, the ways in which we seek information and ideas are similar. The abundance of current and rapidly emerging technology resources provides a means for all travelers on this endless journey. The appropriate use of and access to technology resources gives individuals in all stages of life, all occupations, and interest levels vast information resources, powerful productivity tools, easy communication channels, easy-to-use organizers, and exciting methods of expression.

Over time, the successful alignment of curriculum and technology and the thoughtful deployment of technology-based teaching and learning resources will bring about observable changes in teaching and learning environments along with increased student achievement.

Student Assessment, Reporting, and Evaluation

Digital Portfolio Assessment

A portfolio is a collection of individual student work completed over a period of time. It not only allows students to demonstrate progress toward curriculum goals, but enables them to present their best work and creative thinking.

Given advances in classroom technology, portfolios are now being digitized to serve as part of the student's permanent record of schooling. All information about a student's work products can be stored in an online portfolio. It tracks assignments, submission of work (date), and the assessment of student work. The online portfolio links directly to examples of each child's work product.

Portfolios include a variety of assignments and projects from the overall curriculum. Portfolios should display student thinking, connections across academic disciplines, growth over time, views of oneself as a learner, and problem solving ability. Portfolios may contain different types of evidence of ability, including:

- Problems constructed by the student
- Teacher-completed checklists
- Notes from an interview with a teacher
- A report on a group project
- A photo or sketch made by the student
- Awards and prizes
- Video, audio, and computer-generated examples of student work
- Draft and final compositions

The key to developing a comprehensive and effective portfolio is to keep the contents rich and diverse with achievements of which the student can be proud. Often, students keep both a working and an assessment portfolio that contains only their best work. One of the main advantages of portfolios is that they provide a more complete picture of the student's achievement of learner goals than is possible with test data alone. They also provide an opportunity for conversations between students and teachers.

Curriculum Development and Instructional Management

Centralized Curriculum and Learning Management System

A curriculum development and learning management system assists educators in managing the teaching and learning process by linking curriculum/ instruction, assessment strategies, instructional resources, student data, and staff resources as illustrated below.

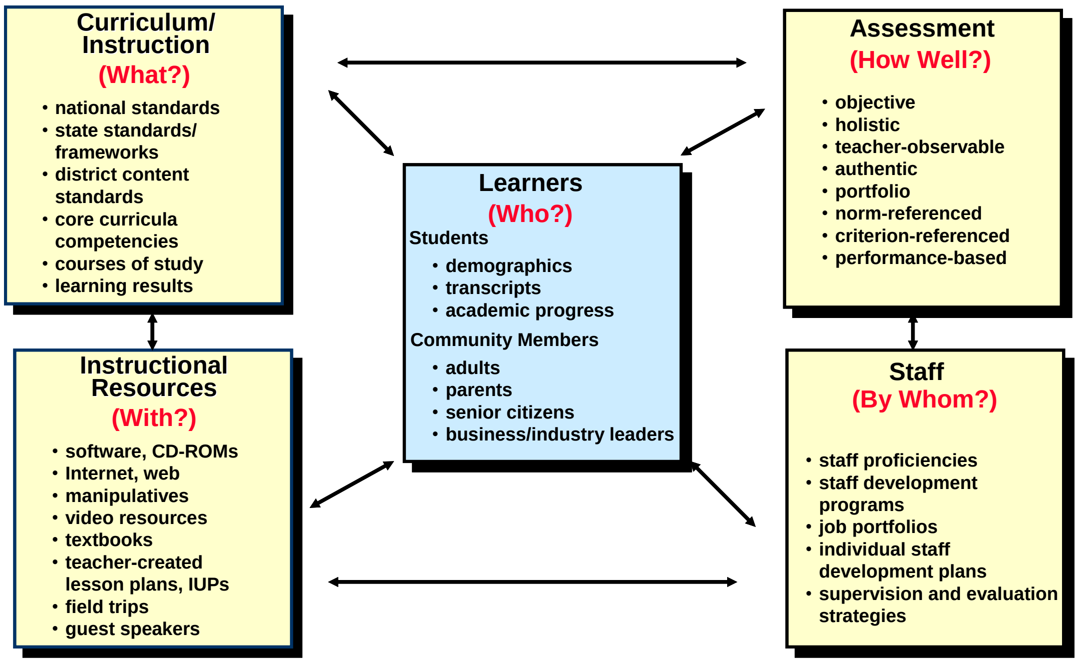


Figure 1. Technology in Support of Curriculum Development and Instructional Management

Districts across the nation are using open source products such as Moodle and SAKAI or commercial entities including, but not limited to, BlackBoard and Global Scholar, to address content and instructional management processes. Many of these systems are separate silos within the district environment of information databases and present challenges for seamless data integration. National efforts aligned with federal Race to the Top funding, private not-for-profit, and commercial investments in enterprise-wide systems hold the potential in the near future to address many of the compatibility issues.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., CA for Chapter 2) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 2, Curriculum and Assessment, section 5.1, Student Technology Standards, would be numbered CA-1.1, and the second Action Plan in this same section would be CA-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year time frame. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Student Technology Standards**

  CA-1.1 Adopt Student Technology Standards

  CA-1.2 Develop a Scope and Sequence for Technology Skills

- **Curriculum and Technology Integration**

  CA-2.1 Embed Technology Skills into the PPSD Aligned Curriculum

  CA-2.2 Evaluate and Disseminate Current Successful Technology Practices

- **Student Assessment, Reporting, and Evaluation**

  CA-3.1 Support Elementary Program Diagnostic and Remediation Tools

CA-3.2 Improve Middle School Student Attainment of 21st Century Technology Skills

- **Curriculum Development and Instructional Management**

  CA-4.1 Prepare Teachers to Fully Use the Capabilities of the IMS for Teaching and Learning

  CA-4.2 Support a Comprehensive Collection of Tools in the IMS

5.1 Student Technology Standards

Initiative: Adopt Student Technology Standards			
Recommendation:	CA– 1.1 Formally adopt and/or adapt the ISTE NETS standards.	**Key Performance Indicator(s):**	1. Adopted PPSD student technology standards
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Create a team of PK-12 technology leadership, instructional technology staff, and educators to review ISTE NETS•S, 21st Century skills adopted by RIDE. Revise and/or refine standards as desired to meet unique district requirements or preferences. Secure external support for Teaching and Learning leadership as necessary to complete this task.	X		
2. Use PPSD staff demonstrating best practice and in-district expertise initially to begin the process.		X	X
3. Disseminate this draft to teachers and provide opportunities for students to practice the standards.	X	X	X
4. Design and deploy awareness/professional development strategies to share these standards and their importance with all staff. Provide teachers at all grade levels with the professional development and support necessary to weave this into current practice.	X	X	X

Interdependencies:	**Estimated Cost:**	• Year 1: $ 25,000 • Year 2: $ 20,000 • Year 3: $ 20,000 **Total: $65,000**	**Potential Funding Source(s):**

Initiative: Develop a Scope and Sequence for Technology Skills			
Recommendation:	CA– 1.2 Develop a PK-12 scope and sequence to guide the teaching and learning of technology skills that includes multiple opportunities for introduction, practice, demonstration of mastery, and application as appropriate in the content areas. Implement the scope and sequence so that all teachers can readily identify and assume responsibility for integrating these skills into the respective content area or process skills in a logical, progressive way via the Common Core State Standards (CCSS).	**Key Performance Indicator(s):**	1. Adopted PK-12 Scope and Sequence for Technology Skills
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Form a team of instructional and technology leaders and teachers to review various Technology Skill Scope and Sequences based on the NET*S, such as http://www.azed.gov/standards-practices/2009-technology-standard/.	X		
2. Draft a Technology Skill Scope and Sequence that is embedded in the Content Curriculum Frameworks (MA, ELA, SC, SS, CTE PE/Health, Fine Arts, World Languages, etc).	X		
3. Ask grade level and subject matter teacher and administrative representatives to review, provide input, and critique the draft Technology Skill Scope and Sequence.	X		
4. Revise Technology Skill Scope and Sequence based on reviews and scheduled revisions.	X		
5. Provide opportunities for teachers to readily identify the skills and integrate the skills into the logical, progressive way via the CCSS.	X	X	X
6. Publish and disseminate the PPSD Technology Skill Scope and Sequence on the IMS and website	X		

Interdependencies: CA-1.1, CAP-1.1, CAP-4.2	**Estimated Cost:**	• Year 1: $ 60,000	**Potential Funding Source(s):**

Initiative: Develop a Scope and Sequence for Technology Skills			
Recommendation:	CA– 1.2 Develop a PK-12 scope and sequence to guide the teaching and learning of technology skills that includes multiple opportunities for introduction, practice, demonstration of mastery, and application as appropriate in the content areas. Implement the scope and sequence so that all teachers can readily identify and assume responsibility for integrating these skills into the respective content area or process skills in a logical, progressive way via the Common Core State Standards (CCSS).	**Key Performance Indicator(s):**	1. Adopted PK-12 Scope and Sequence for Technology Skills
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership

Action Steps ***Denotes that step has already started.**		**Timeline** Year 1 13/14	Year 2 14/15	Year 3 15/16
	• Year 2: $ 30,000 • Year 3: $ 30,000 **Total: $120,000**			

5.2 Curriculum and Technology Integration

<table>
<tr><th colspan="4">Initiative: Embed Technology Skills into the PPSD Aligned Curriculum</th></tr>
<tr><td>Recommendation:</td><td>CA– 2.1 Formally and systemically embed technology skills into the aligned curriculum in the IMS to ensure the use of student technology skills for learning after they are developed.</td><td>Key Performance Indicator(s):</td><td>1. Technology skills embedded in PPSD aligned curriculum in at least 50% the content.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Highly Effective Educators
Rigorous and Aligned Content
Systems that Work</td><td>Leadership Responsibility:</td><td>Teaching and Learning Leadership
Instructional Technology Leadership</td></tr>
</table>

<table>
<tr><th rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td>1. Create cross-divisional teams that include curriculum and instructional technology staff from elementary (PK-5), middle, and high school levels to lead the process of embedding the updated (see CA-1.1) student technology standards into district aligned curriculum.</td><td></td><td></td><td>X</td></tr>
<tr><td>2. Consider including students as members of this "embedding team," at the very least creating a student review and feedback component in middle and high schools</td><td></td><td>X</td><td>X</td></tr>
<tr><td>3. Include strategies for integrating these skills into daily instruction by grade level that offer opportunities for introducing, practicing, and/or mastering the skills.</td><td></td><td>X</td><td>X</td></tr>
<tr><td>4. Develop a consistent strategy, could be an icon, color coding, and/or numbering scheme, that allows students and teachers to see the correlation and progression of technology skills and content objectives.</td><td></td><td>X</td><td>X</td></tr>
</table>

<table>
<tr><td>Interdependencies: CA 1.1, CA-1.2</td><td>Estimated Cost:</td><td>• Year 1:
• Year 2: $ 10,000
• Year 3: $ 5,000
Total: $15,000</td><td>Potential Funding Source(s):</td></tr>
</table>

Initiative: Evaluate and Disseminate Current Successful Technology Practices within the School District

Recommendation:	CA– 2.2 Develop a process to identify and a strategy to store and disseminate the best practices teachers are currently using with technology, collect data on their success (evaluate/vet), and provide professional development for other teachers to replicate these successes.	**Key Performance Indicator(s):**	1. Creation of a technology best practices process. 2. Access to collection of PPSD technology best practices. 3. Percentage of teachers who access and replicate PPSD technology best practices.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Collaborative Community	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership Technology Support Teachers

Action Steps *Denotes that step has already started.	Timeline		
	Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Develop a process to identify the best practices teachers are currently using with technology during the principal walkthroughs, supplemented with a nomination process in which teachers can nominate other teachers, or teachers can nominate themselves.	X		
2. Evaluate the use of the best practices by asking teachers to describe what they do, why and how. Add information or resources that support their work. Consider video documentation along with additional relevant required information.		X	X
3. Consider collaborating with aspiring teachers from local colleges and universities to work with a designated teacher(s) to document best practices. Teachers in training benefit from documenting model lessons while existing teachers are relieved from the burden of documenting the process.		X	X
4. Determine the best method to archive and access the strategies.		X	X
5. Form a team of educators to review and provide feedback on the submissions.		X	X
6. Provide professional development for other teachers to access and thereby replicate these successes.		X	X

Interdependencies: CA-1.1, ODS-1.2, LESF-1.1	**Estimated Cost:** • Year 1: $ 11,500 • Year 2: $ 11,500 • Year 3: $ 11,500	**Potential Funding Source(s):**

<table>
<tr><td colspan="6">Initiative: Evaluate and Disseminate Current Successful Technology Practices within the School District</td></tr>
<tr><td>Recommendation:</td><td colspan="2">CA– 2.2 Develop a process to identify and a strategy to store and disseminate the best practices teachers are currently using with technology, collect data on their success (evaluate/vet), and provide professional development for other teachers to replicate these successes.</td><td>Key Performance Indicator(s):</td><td colspan="2">1. Creation of a technology best practices process.
2. Access to collection of PPSD technology best practices.
3. Percentage of teachers who access and replicate PPSD technology best practices.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td colspan="2">Highly Effective Educators
Collaborative Community</td><td>Leadership Responsibility:</td><td colspan="2">Teaching and Learning Leadership
Instructional Technology Leadership
Technology Support Teachers</td></tr>
<tr><td colspan="3" rowspan="2">Action Steps
*Denotes that step has already started.</td><td colspan="3">Timeline</td></tr>
<tr><td>Year 1
13/14</td><td>Year 2
14/15</td><td>Year 3
15/16</td></tr>
<tr><td></td><td colspan="2">Total: $34,500</td><td colspan="3"></td></tr>
</table>

5.3 Student Assessment, Reporting, and Evaluation

Initiative: Support Elementary Program Diagnostic and Remediation Tools			
Recommendation:	CA– 3.1 Support the use of reading and math diagnostic software for the district wide elementary reading and math programs with professional development and necessary hardware and the use of it in instruction (Pearson SuccessNet and Envision).	**Key Performance Indicator(s):**	1. Percentage of teachers who participate in professional development aimed at reading and math diagnostic tools.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership Technology Support Teachers Reading Specialists

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Use district hardware inventory to identify and provide the technology needed to support the Pearson SuccessNet and Envision diagnostic and remediation software that elementary teachers already have.	X		
2. From the teachers that have the appropriate technology and are using the software, identify and share best practices they are using.	X		
3. Develop and provide professional development, including the best practices of PPSD teachers.	X	X	X

Interdependencies: LESF-1.1, CA-2.3	**Estimated Cost:**	• Year 1: $ 10,000 • Year 2: $ 10,000 • Year 3: $10,000 **Total: $30,000**	**Potential Funding Source(s):**

Initiative: Improve Middle School Student Attainment of 21st Century Technology Skills			
Recommendation:	CA– 3.2 Monitor student progress in 7th grade EasyTech program through the embedded assessments. Provide professional development on how to use the pretest data to inform instruction, and best practices in how to support student use of the computer-based activities to develop the 21st century skills tested in 8th grade.	**Key Performance Indicator(s):**	1. Percentage of students who master the skills on the 8th grade 21st Century Skills Assessment.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership 7th Grade Technology Teachers

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Collect data from the pretest and embedded assessments in the 7th grade EasyTech program to identify areas of strengths and weaknesses in student skill.	X		
2. Identify best practices for using EasyTech or supplementing it to support student skill development in areas where students are weak. Seek support from EasyTech and have tech teachers review the data and develop ways to support the students in learning the skills.	X		
3. Provide professional development on best practices for the 7th grade technology teachers.	X	X	X
4. Continue to monitor how well students are learning the technology skills in both the 7th grade EasyTech assessments and on the 8th grade 21st Century Skills Assessment.	X	X	X

Interdependencies:	**Estimated Cost:**	• Year 1: \$ 10,000 • Year 2: \$ 10,000 • Year 3: \$ 10,000 **Total: \$30,000**	**Potential Funding Source(s):**

5.4 Curriculum Development and Instructional Management

Initiative: Prepare Teachers to Fully Use the Capabilities of the IMS for Teaching and Learning			
Recommendation:	CA– 4.1 Set up a system to monitor teacher preparation for using the IMS and their actual usage to determine where they may need additional support to fully use its capabilities once the aligned curriculum is entered into the IMS and support is provided by the new Technology Support Teachers.	**Key Performance Indicator(s):**	1. Percentage of teachers who complete professional development on IMS and their use of the IMS.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership Technology Support Teachers

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Have Technology Support Teachers provide professional development on the IMS for the teachers specifically focused on how they can use it to enhance teaching and learning.	X	X	X
2. Set up a system to track teacher preparation for using the IMS, and their actual use of the system to determine where they may need additional support to fully use its capabilities.		X	X
3. Continue to monitor the use of the IMS and teacher confidence and skill in using it to provide further professional development and support.		X	X

Interdependencies: ODS-1.2, CNI-5.1	**Estimated Cost:**	• Year 1: $ • Year 2: $ 10,000 • Year 3: $ 5,000 **Total: $ 15,000**	**Potential Funding Source(s):**

Initiative: Support a Comprehensive Collection of Tools in the IMS			
Recommendation:	CA– 4.2 Provide tools, support, and professional development for lesson planning, data and analytics for decision-making, and benchmark assessments on student progress in meeting the objectives of the aligned curriculum.	**Key Performance Indicator(s):**	1. Percentage of teachers who complete professional development on IMS 2. Metrics to monitor teacher use of IMS
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Teaching and Learning Leadership Instructional Technology Leadership Technology Support Teachers

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Provide professional development in how to use the IMS related tools effectively to improve teaching and learning.		X	
2. Provide on-site, embedded support for using these tools (Technology Support Teachers).		X	
3. Integrate the IMS with the home/school portal. Create a set of comprehensive specifications.		X	X
4. Make teachers accountable for using these tools in the evaluation process.			X
5. Track the use of these tools by teachers to target professional development and supervision.			X

Interdependencies: CA-4.1, ODS-1.2, CAP-1.1, CA-1.1	**Estimated Cost:**	• Year 1: $ * • Year 2: $ * • Year 3: $ * **Total: ***	**Potential Funding Source(s):** *** Costs associated with SDHR-1.2**

Chapter 3:
Teaching and Learning Technologies

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Teachers and students are transforming what can be done in schools by using technology to access primary resources, expose our students to a variety of perspectives, and enhance the overall learning experience through multimedia, simulations, and interactive software."*
>
> —Introductory letter by Rod Paige, Secretary, U.S. Department of Education in:
> *Toward a New Golden Age in American Education*, *National Education Technology Plan 2004*

The **Teaching and Learning Technologies** chapter focuses on the types of technology-based teaching and learning resources available to Providence Public School District (PPSD) teachers, students, and community members. Specifically, instructional software applications and subscription services available throughout the school district are reviewed. The issues of access and equity are also analyzed from the perspective of technology-based solutions to provide equitable access to teaching and learning resources for all PPSD students. The role and potential of information and technology resource centers (library/media) is also reviewed. The role and potential of information and technology resource centers (library media) in providing current research resources and developing information and communication technology skills is also included.

The subtopics within this section include:

- Instructional Applications and Digital Content
- Technology Utilization
- Special Populations
- Information and Technology Resource Centers (Libraries/Media Resource Centers)

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September – October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Teaching and Learning Technologies* section of the *Key Findings and Recommendations* final report.

2.1 Instructional Applications and Digital Content

PPSD has begun to identify and secure core instructional applications and online resources that align with, complement, and support core curriculum. The deployment of these resources is not consistent due to the great diversity of, and insufficient classroom computers, mobile labs, and stationary computer lab resources. PPSD will not realize the full potential of current and available resources without first addressing instructional computer access and infrastructure needs.

The key findings for **Instructional Applications** include:

- Slightly more than half of the teachers responding to the teacher survey use technology to deepen student understanding; only a third include internet-based research assignments to extend student learning.
- Regarding the use of social media tools for learning, 67% of teachers do not use any social media, only 13% have a teacher blog, and less than 3% use student blogs, Facebook groups for students, Twitter, or video hosting site for student produced videos.
- Only 27% of teachers allow students to type homework and 22% of teachers use technology-based assessments. This is not providing students with the preparation they will require to take the high performance annual assessments in an online format.

2.2 Technology Utilization

Technology utilization in PPSD will increase with regard to both frequency and usage for more engaged and robust learning when the following factors are addressed: 1) contemporary computing resources are secured and access to digital content is provided, 2) on-going, on-demand, and differentiated professional development on effective uses of technology for teaching and learning for teachers, library media staff, and specialists is offered, 3) students are well versed in ICT literacy skills, and 4) policies and guidelines around appropriate and responsible technology use become part of the PPSD culture.

The key findings for **Technology Utilization** include:

- It is evident from the teacher focus groups conducted that most teachers would like more and better quality technology tools and resources for teaching and learning.
- Survey results indicated that 61% of teachers are dissatisfied or highly dissatisfied regarding access to digital curriculum/content resources.
- Many PPSD students do not have access to the internet from home, the specific percentage with and without access has not been formally assessed.
- The PPSD Internet Acceptable User Policy for students approved in August of 2002 is readily available in a number of locations on the district website. The PPSD IAUP, Internet Acceptable Use Policy was recently updated and approved by the School Board. The final page of both the old and new PPSD AUP is an annual sign off form for students and parents. It is unclear how schools maintain and monitor annual AUP policy acceptance. The parent consent form in available in both English and Spanish.

2.3 Special Populations

PPSD provided the CELT team with a report titled, "Improving Special Education Services in the Providence Public School District" published in the summer of 2011. Section D. Support for Teaching and Learning addresses the Use of Technology and Data to provide effective special education services. This report notes current challenges in the areas of data migration, reports generation, compliance timeliness, and records storage.

The key findings for **Special Populations** include:

- With the exception of the teacher iPads in grades K-3, special education classrooms visited appear to have the same or similar level of technology resources consistent with the rest of the school in which they reside.
- Providence implemented a research-based, multi-tiered RTI Framework that includes the following assessment, placement, and intervention strategies:
    - Wireless Generation's MClass is used to provide early literacy assessment through the use of palm pilots that allow input and analysis of Dynamic Indicators of Dynamic Indicators of Basic Early Literacy Skills (DIBELS) benchmarking data for every child in grades K-3. The system is also used for students in grades four and five who are involved with RTI for benchmarking and progress monitoring.
    - The Group Reading Assessment and Diagnostic Evaluation (GRADE) is used as a universal screener in reading and is administered three times during the year for all students in grades 4 through 12, except for students receiving special education and who are English Language Learners and meet exemption criteria. GRADE results are considered along with other

measures, including NECAP results, to identify students needing tier 2 or tier 3 supports.

- Intervention programs, such as Language! and Direct Instruction, are also used and include progress monitoring data and analysis.
- The school district has not yet identified a universal screener for math. Currently, NECAP math results are used along with program assessments for placement and progress-monitoring purposes. In the absence of a math screening tool(s), the special education office, in collaboration with the math department, began to pilot the tool, Monitoring Basic Skills Progress, at three elementary schools. The use of the tool as a universal screening device has been challenging, however, since schools chose to begin implementing it in one grade only.

2.4 Information and Technology Resource Centers (Libraries/Media Centers)

Current PPSD library media staff do not have the same level of technology expertise or knowledge of Information, Communication, and Technology (ICT) literacy skills. The American Association of School Librarians (www.ala.org) has developed guiding principles for school library programs that focus on building flexible learning environments with the goal of producing successful learners skilled in multiple literacies. PPSD should embrace this 21st Century Learner focus for grades K-12.

The key findings for **Information and Technology Resource Centers** include:

- Most all LMC have certified library media specialists (LMS); some elementary schools may share and some larger high schools may have more than one.
- It was estimated that 35% of the library media staff support the use of technology by both students and teachers.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Teaching and Learning Technologies* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., TLT for Chapter 3) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 3, Teaching and Learning Technologies, section 3.1, Instructional Applications, would be numbered TLT-1.1, the second recommendation in this same section would be TLT-1.2.

3.1 Instructional Applications and Digital Content

TLT-1.1 Digital Content Review, Selection, and Procurement Process

Develop, formally endorse, and enforce a comprehensive software review, selection, adoption, and procurement process for instructional resources.

TLT-1.2 Web-Based Digital Resources Clearinghouse

Implement a centralized process/clearinghouse for instructional resource distribution, management, and standardization that is linked to the new IMS and will enable teachers to find standards-based resources quickly.

TLT-1.3 Computer Compatibility Updates (No Action Plan)

To reduce the frustration of users with various versions of Microsoft Office and applications such as Adobe Flash and Adobe Reader, install compatibility modules on and/or upgrade the utility applications on all computers. Establish a long-term plan and remote management strategies for maintaining updates regularly as feasible.

TLT-1.4 Web 2.0 Resources and Cloud-Based Software Services

Research the pros and cons of free Web 2.0 resources (including social media) and cloud-based productivity and information management systems such as Google Tools for Education or Microsoft Office 365 for Education.

3.2 Technology Utilization

TLT-2.1 21st Century Classroom Configurations

Determine the appropriate levels, collections, selections of blended learning technologies and peripheral devices that are needed to support 21st Century classrooms across the school district.

TLT-2.2 Equity Policy and Guidelines

Develop, formally endorse, and advance an equity policy and/or guidelines to ensure that all teachers, students, parents, and staff in all schools have equitable access to district technology resources to promote advanced and interactive learning in all classrooms by providing technological tools to engage students.

3.3 Special Populations

TLT-3.1 Differentiating Instruction for Students with Special Needs

Ensure that all special populations (including ELL, special education, gifted and talented, at risk) are provided with the resources and preparation required to achieve adequate yearly progress and reach their full potential. Continue to address the unique needs of special education students, teachers, and schools with adaptive/assistive technology solutions as appropriate.

3.4 Information and Technology Resource Centers (Libraries/Media Centers)

TLT-4.1 Library Media Services in Support of 21st Century Skills & ICT Literacy

Support the expanded role of library media staff and/or instructional technology specialists as they include emphasis on information literacy skills and Internet safety beginning in the elementary grades.

TLT-4.2 Online Subscription Services (No Action Plan)

Investigate and subscribe to a few core **online reference databases** for upper elementary, middle, and high school research projects and multi-grade level, cross-discipline, **Web-based content services** appropriate for K-12 students and teachers beyond those currently offered by RIDE.

4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists on best practices in using technology to improve teaching, learning, and school management, and this body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online to remain abreast of emerging issues. In addition, they present at and attend local, national, and international conferences focusing on educational technologies. Feedback from clients during the implementation of their technology blueprint initiatives provides CELT with an experiential knowledge base as well. CELT has been building this collective knowledge base continually for the past seventeen years while working with departments of education, school districts large and small, and a variety of public and private organizations, many of which are national in scope.

In addition to nationally researched approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with Providence Public Schools. The following pages highlight the research and best practices that most closely relate to the needs and goals of the Providence Public Schools.

The current infrastructure, resources, and staff expertise are unable to support the full usage of online learning opportunities at all district schools. Providence Public Schools requires a comprehensive plan for equitable access, use, and support of information technology throughout the district.

To ensure that appropriate, effective, and proven strategies are employed to support student achievement, PPSD should establish a clearinghouse of curriculum-based resources that represent the most successful strategies currently used across the district.

It is essential for the PPSD *Technology Blueprint* to remain a living document. This will only occur if district leadership identifies monitoring and assessment approaches to evaluate the implementation and effectiveness of select strategies as well as projects initiated through the *Technology Blueprint*.

4.1 Instructional Applications and Digital Content

Instructional Resources Selection Acquisition Guidelines

To assist PPSD leadership with the identification, review, and purchase of instructional digital content, the following steps are recommended at the district level:

- Identify and select developmentally appropriate applications for grades PreK-12 that align with the current curriculum documents while supporting and enhancing the current productivity application.
- Research, review, and analyze best-practice strategies and accompanying applications.

- Determine which digital, instructional resources, beyond the productivity suite, are desired by most PPSD schools (differentiated by primary, elementary, middle, high school, and adult audiences).
- Formulate guidelines and processes for individual schools to investigate and implement alternative software solutions for specific audiences/needs/learning groups.
- Coordinate vendor demonstrations of instructional technology applications at convenient sites throughout the district.
- Negotiate high volume purchasing agreements (district/school site-licenses, lab pack discounts, and multi-user subscriptions) with those vendors who distribute desired learning resources.
- Develop dissemination strategies for making teachers aware of these resources and their intended use.
- Distribute procedures for securing applications/subscriptions at these prices to all schools.
- Disseminate to all schools links of free digital content available on the Web that aligns with district curriculum standards.

4.2 Technology Utilization

Instructional Resources Configuration, Selection, and Management

The developmental needs of primary, elementary, middle, and high school students differ. Thus, the instructional application selected for each group should address these differences. The goals for successfully implementing a variety of teaching and learning technologies throughout the district are to:

- attain school, district, and state curriculum standards;
- individualize learning to address multiple styles and developmental stages;
- provide authentic and meaningful learning experiences;
- promote effective problem solving and decision making;
- improve communication, cooperation, and collaboration skills;

PPSD needs to ensure that the process for selecting technology-based curriculum resources is followed. A standardized process will improve the consistency of the availability of curriculum resources in all schools. This supports equity across the district, provided that all classrooms have access to these curriculum resources. The identification of suites of technology-based resources for differentiated audiences across the district will also enable the district to leverage its size for cost savings through bulk and/or site license purchasing.

PPSD leadership teams must consider the following developmental needs of the learner populations within the district when selecting the standard suites of software applications for primary, elementary, middle, secondary, and adult learning environments.

Primary (PreK to grade 2)

For the primary learner, his/her world must be rich with letters, sounds, words, numbers, patterns, colors, creatures, community, creativity, and cooperation. Unlike early computer applications, an abundant selection of programs exists that “drill” and “thrill” (rather than “drill and kill”) while practicing and reinforcing emerging reading and math literacy skills. The graphical user interface (GUI) of both the MAC OS and Windows operating systems, combined with quality sound capacity on all modern computers, allows even the youngest user to explore and experiment independently in electronic environments. Graphical representation of real-world experiences begins the process of building bridges from the concrete to the abstract for the early learner.

Instructional applications selected for the primary learner will include:

- CD-ROM interactive storybooks;
- creativity and exploratory applications rich with graphics and sound;
- beginning keyboard activities;
- paint and draw programs;
- graphically based data-manipulation applications;
- introductory writing application, rich with graphics;
- concept mapping applications;
- simulations.

Elementary (grades 3 to 5)

Now a master of basic reading and math concepts, the elementary learner seeks multiple opportunities to practice and apply these skills. He/she is ready to explore more complex topics, consider multiple opinions, research new information, and draw his/her own conclusions. The occasion to produce/publish for a younger audience presents situations designed to build self-confidence and independence.

Instructional applications selected for the elementary learner will include:

- keyboard applications;
- productivity suite (word processing, database, spreadsheet);

- production tools (Web design, video production, multimedia, presentation development);
- graphically based data manipulation applications;
- concept mapping applications;
- differentiated applications to reinforce and/or review specific curriculum topics;
- simulations and micro-world applications;
- communication applications (e-mail, Web browser).

Middle School (grades 6 to 8)

Many middle school students across our nation have already sailed past the technology skills level of educators within our schools. They send e-mail with ease, instant message (IM), and chat on line – frequently all at the same time. They know how to use search engines and strategies to find information readily on the Web. Many have created and maintain Web pages for family and friends. Unfortunately, this is a critical time when the disparity between the “haves” and “have nots” becomes most evident. Students with access to computer technology beyond the school day are able to create reports using word processors, movies with digital production applications, songs and music with midi-resources, and generate professional quality desktop publishing products, while students without access continue to submit handwritten papers. Multimedia presentations, websites, and video production projects are also within reach of the middle school child with access to the Internet, camcorders, digital cameras, and video production equipment. Emerging higher-order thinking skills need to be honed and challenged for all learners within the school environment. PPSD will need to seek multiple strategies to level the playing field for the middle school student.

Instructional applications selected for the middle school learner will include:

- keyboard applications;
- productivity suite (word processing, database, spreadsheet);
- production tools (desktop publishing, Web design, video production, multimedia, presentation development);
- data collection tools, probes, meters;
- graphically based data manipulation applications;
- concept mapping applications;
- differentiated applications to reinforce and/or review specific curriculum topics;

- note taking, citation generating, and research resources;
- simulations and micro-world applications;
- communication applications (e-mail, Web browser, groupware for peer review).

Secondary (grades 9 to 12)

The world of work is a reality in one fashion or another for most high school students either through part-time jobs, volunteer activities, or internships. Some have already identified career paths, others seek to further their education through degree or certification programs, and some decide to leave the school environment prior to receiving their diploma. PPSD seeks strategies to improve student attendance and reduce dropout rates among the secondary student population. All high school students will require the competitive edge, allowing them to compete in an increasingly sophisticated, global economy and workplace. Secondary-school environments strive to meet the needs of all these audiences: prepare students with workplace competencies which allow them to enter the job market and succeed immediately, provide pathways to positive higher-education experiences, and engage the disinterested with meaningful experiences and opportunities advancing toward the attainment of their diploma. All secondary learning environments must promote skills fostering high levels of learning, engaging higher-order thinking, and encouraging collaboration, teamwork, and sense of citizenship. The infusion of a diverse array of technology resources throughout secondary school facilities provides the potential to meet the disparate needs of this audience. This section provides an overview of teaching and learning technology resources for the secondary school student.

Instructional applications selected for the high school learner will include:

- productivity suite (word processing, database, spreadsheet);
- production tools (desktop publishing, Web design, video production, photography/multimedia, presentation development);
- data collection tools, probes, meters;
- data manipulation applications;
- concept mapping applications;
- differentiated applications to reinforce and/or review specific curriculum topics;
- note taking, citation generating, and research resources;
- CAD/CAM development resources (applications and equipment);
- test preparatory applications;

- communication applications (e-mail, Web browser, groupware for peer review);
- computer-science programming languages.

4.3 Special Populations

Adaptive and Assistive Technology Resources

Adaptive and assistive technology resources continue to play a significant role in helping to equalize learning environments for special education students. Some of the technologies used to aid the educationally challenged student in the classroom include:

- text-to-speech programs that use a digital voice and read text aloud from software applications, e-books, or Web-delivered content;
- individual and classroom auditory enhancement systems
- word prediction applications that present up to nine different possibilities once the writer begins to type;
- portable keyboards, alternative keyboards, and switches to simplify the mechanics of the writing process;
- concept-mapping software that presents information, both in graphic and in outline format;
- electronic manipulatives that are digital versions of objects used to demonstrate math concepts such as tangram blocks to create a design or dice to solve a probability problem.

It has been demonstrated that students with learning challenges benefit when using technology-integrated strategies and resources as illustrated below:

- Students with attention deficit/hyperactivity disorder (ADHD) benefit from using multimedia, desktop publishing, outlining (such as Inspiration® or Kidspiration®), and word-prediction software to allow for divergent thinking while providing a resource to organize their thinking.
- It has been observed in students with behavior disorders that computer-based activities often provide motivation and tend to lessen acting-out behavior patterns. Word processing and word-prediction programs also tend to reduce stress and frustration levels during writing tasks in this student population.
- Students with oppositional defiance disorder and autism respond positively to the creation of micro-environments or mini-societies and movie production within the special education classroom.
- The student with autism may benefit from being allowed to tape presentations instead of having to present them in front of a live audience.

Keyboarding or taping to reduce the stress of touching pencils is also a successful strategy with this population. Text-to-speech and color-adjustment features may prove beneficial as well as including computer-generated illustrations for presenting complex concepts. The use of interactive whiteboards is also providing positive interactions with students on the autism spectrum.

- To help the hearing or visually impaired student compensate, assistive listening devices to increase volume and clarity as well as low-vision devices, such as big screens, text-to-speech, and large keyboards are available. Color and volume settings on the computer can be adjusted for higher contrast and louder sound output.
- Students diagnosed with emotional/behavior disorder (EDC) find that using word processing to write and revise written work helps to prevent outbursts. Graphic organizers may also reduce stress in the learning environment. Allowing these students to "discover" the wonder of software applications and content on the Internet can produce significant rewards.
- Strategies that focus on the ergonomics of the learning environment help the special-needs student with significant development delay (SDD). These strategies include positioning the computer low enough for the student's feet to touch the ground, placing the monitor at eye level, using a timer to practice sharing, providing headphones to eliminate distractions, adjusting control-panel settings for the mouse and keyboard, and securing larger keyboards for easier typing.
- Current Macintosh, Microsoft, and Linux operating systems are designed with control features for the visual display, audio feedback, and text-to-speech that in the past needed to be purchased as add-on applications. These accessibility options are generally grouped into the following categories, solutions for: 1) visual impairments, 2) hearing impairments and, 3) mobility impairments.

Many school districts across the nation are embracing the universal access/universal design (UDL) model that employs a proactive strategy to making print and digital content more readily accessible to special-education students and any other students experiencing learning challenges. CAST, Center for Applied Special Technology, at http://www.cast.org, is the nation's leader with respect to UDL.

Before a formal special needs evaluation has been conducted, the universal access/universal design model provides educators with a number of interventions that can be tried immediately with any student experiencing learning difficulties and in some cases may provide all the remediation needed for that student to be successful.

Many resources are now available for developing instructional materials and Web sites that embrace the universal design concept and include the following:

- CAST, Center for Applied Special Technology at http://www.cast.org

- Bobby, get your website "Bobby Approved" at http://ww.cast.org/udl/Bobby215.cfm
- Web Content Accessibility Guidelines 2.0 0 at http://www.w3.org/TR/WCAG20
- Section 508 of the US Rehabilitation Act at http://www.section508.gov

4.4 Information and Technology Resource Centers

Library and Information Management

Usually located centrally within the school, the Information and Technology Resource Center combines the roles of today's library services, audio visual/media departments, and technology center into one information and technology resource center for teachers and students. Four specific environments are incorporated to the conventional library media area:

- technology research station(s) ;
- student workstations;
- technology lending center ;
- video control room.

All computers in this area would be connected to the school and district-wide network, providing access to printers, the Internet, data files created in other classes, and network applications and devices.

Centralized library management systems are Web-based, allowing access to the entire district collection from any district computer on the network with a current Web browser. Centralized solutions reduce redundancy, are easier to maintain, increase reporting capacity, and provide easier access to data that compares usage of collections across a district. The current industry leaders in centralized systems share many of these common Web-based characteristics, requiring only a Web browser for accessing the LMS.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., TLT for Chapter 3) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 3, Teaching and Learning Technologies, section 5.1, Instructional Applications, would be numbered TLT-1.1, the second Action Plan in this same section would be TLT-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- Instructional Applications and Digital Content

  TLT-1.1 Digital Content Review, Selection, and Procurement Process

  TLT-1.2 Web-Based Digital Resources Clearinghouse

  TLT-1.3 Computer Compatibility Updates (No Action Plan)

  TLT-1.4 Web 2.0 Resources and Cloud-Based Software Services

- Technology Utilization

  TLT-2.1 21st Century Classroom Configurations

TLT-2.2 Equity Policy and Guidelines

- Special Populations

TLT-3.1 Differentiating Instruction for Students with Special Needs

- Information and Technology Resource Centers (Libraries/Media Center)

TLT-4.1 Library Media Services in Support of 21st Century Skills & ICT Literacy

TLT-4.2 Online Subscription Services (No Action Plan)

5.1 Instructional Applications and Digital Content

Initiative: Digital Content Review, Selection, and Procurement Process

Recommendation:	TLT – 1.1 Develop, formally endorse, and enforce a comprehensive software review, selection, adoption, and procurement process for instructional resources.	**Key Performance Indicator(s):**	1. A comprehensive software review, selection, adoption, and procurement process and/clearing house is established. 2. A purchasing rubric consistent with district curriculum and technology standards to leverage buying power is designed and implemented. 3. The enforcement of software selection guidelines reduces the occurrence of incompatibility issues and technical support requirements.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Teaching and Learning IT Department

Action Steps *Denotes that step has already started.	Timeline		
	Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Refine software selection guidelines and process for district-, school-, grade-, and/or discipline-wide instructional technology resources purchases for use with all students including special populations.	X		
2. Include criteria for purchasing educational software at the school level and a feedback loop to the teachers. Publish and disseminate broadly procedures to all audiences, including standards for purchasing appropriate materials in areas where it is not clear.	X		
3. Explore licensing options for district-, site-, network-, and concurrent user licenses to garner maximum value for dollars spent. Seek expanded licensing arrangements for home access when applicable and available.		X	
4. Target reduction of support requirements for software maintenance while still maintaining the flexibility required to ensure appropriate learning environments for all learning communities.		X	
5. Develop an annually review technology-purchasing rubric consistent with district curriculum and technology standards to ensure maximum utilization by end-users. Offer schools choices within the rubric to leverage the buying power of the district in the procurement of educational software and other technologies.	X	X	X

Initiative: Digital Content Review, Selection, and Procurement Process

Recommendation:	TLT – 1.1 Develop, formally endorse, and enforce a comprehensive software review, selection, adoption, and procurement process for instructional resources.	**Key Performance Indicator(s):**	1. A comprehensive software review, selection, adoption, and procurement process and/clearing house is established. 2. A purchasing rubric consistent with district curriculum and technology standards to leverage buying power is designed and implemented. 3. The enforcement of software selection guidelines reduces the occurrence of incompatibility issues and technical support requirements.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Teaching and Learning IT Department

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	 Year 2 14/15	 Year 3 15/16

Interdependencies: CA-1.1, CA-1.2, LESF-1.1	**Estimated Cost:**	Year 1: $ 5,000 Year 2: $ Year 3: $ **Total: $5,000**	**Potential Funding Source(s):**

Initiative: Web-Based Digital Resources Clearinghouse			
Recommendation:	TLT – 1.2 Implement a centralized process/ clearinghouse for instructional resource distribution, management, and standardization that is linked to the new IMS and will enable teachers to find standards-based resources quickly.	**Key Performance Indicator(s):**	1. A centralized process for software distribution, management, and standardization is selected and implemented. 2. Guidelines for download and installation are established and their use is monitored.
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Teaching and Learning IT Department Professional Development Department

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Convene a committee or team to research, select, and implement a searchable Web-based system of technology resources with the ability to: search by multiple variables (title, grade level, subject area), add comments (when a resource is most effective, issues, learning style), track free Web-based tools that are not blocked by the district Web filters to offer resources for both teachers and administrators, and assist vertical teams in planning efforts.	X		
2. Determine if this capacity is a component of the IMS (Global Scholar) provided by RIDE and/or an additional module that is available for adding to RIDE components.	X		
3. Assemble a team including instructional leaders, principals, teachers, and students to begin to identify, classify/tag, and organize available (currently owned by PPSD and available for free on the Web) instructional resources for grades PK-12 in all disciplines.	X		
4. Ensure that for all resources entered into the system, software compatibility is clearly identified by platform and operating system (Mac or Windows). Clearly identify Web-based and free resources, including a notation that they are approved (not blocked) by the district Web filter.	X		
5. Explore licensing options for district-, site-, network-, and concurrent user licenses to determine appropriate download procedures.	X		
6. Create a section for teacher-created instructional resources catalogued by grade and content area.		X	
7. Create a portal to the website so that authorized users can download selected software to user computers.		X	
8. Implement a tracking system to monitor who is downloading what to which systems, thereby enabling accurate		X	X

Initiative: Web-Based Digital Resources Clearinghouse			
Recommendation:	TLT – 1.2 Implement a centralized process/ clearinghouse for instructional resource distribution, management, and standardization that is linked to the new IMS and will enable teachers to find standards-based resources quickly.	**Key Performance Indicator(s):**	1. A centralized process for software distribution, management, and standardization is selected and implemented. 2. Guidelines for download and installation are established and their use is monitored.
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Teaching and Learning IT Department Professional Development Department

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Timeline Year 2 14/15	Timeline Year 3 15/16
inventory of what software is being downloaded and also providing data on the titles that are most popular.			

Interdependencies: CA-4.2	**Estimated Cost:**	Year 1: $ 40,000 Year 2: $ 250,000* Year 3: $ 50,000 **Total: $340,000**	**Potential Funding Source(s):** ***may be included in current state bid**

Initiative: Web 2.0 Resources and Cloud-Based Software Services

Recommendation:	TLT – 1.4 Research the pros and cons of free Web 2.0 resources (including social media) and cloud-based productivity and information management systems such as Google Tools for Education or Microsoft Office 365 for Education.	**Key Performance Indicator(s):**	1. Web 2.0 resources (including social media tools) have been vetted, aligned to learning strategies, and made available on the network. 2. A cloud-based productivity suite has been identified, piloted, and implemented.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work Collaborative Community	**Leadership Responsibility:**	Department of Teaching and Learning School Administrators Educators

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Develop a district-wide team to investigate Web 2.0 resources and their practical application within the classroom, including sharing best practices and teacher and student resources. Include those resources in the digital resources clearinghouse (see TLT-1.2).		X	
2. Develop a process for teachers to recommend resources to be included in this listing of free resources and to ensure that the district filters do not block them.		X	
3. Compare cloud-based productivity suites for alignment to existing resources and select one for district-wide implementation as network enhancements are made and contemporary computing resources secured.			X
4. Disseminate findings to teachers throughout the school district and support with professional development offerings.		X	X
5. Develop or incorporate into a revised Acceptable Use Policy (AUP) for students and teachers, guidelines, responsibilities, and expectations for using Web 2.0 interactive tools and resources.		X	X
6. Phase this implementation over time as outdated computers are replaced with computing devices with the capacity to function quickly and easily on the Web via the district networks.		X	X

Interdependencies: LESF-1.1, LESF-1.2, ODS-1.2,	**Estimated Cost:** Year 1: $ Year 2: $ 240,000 Year 3: $ 240,000 **Total: $ 480,000**	**Potential Funding Source(s):**

5.2 Technology Utilization

<table>
<tr><th colspan="4">Initiative: 21st Century Classroom Configurations</th></tr>
<tr><td>Recommendation:</td><td>TLT – 2.1 Determine the appropriate levels, collections, selections of blended learning technologies and peripheral devices that are needed to support 21st Century classrooms across the school district.</td><td>Key Performance Indicator(s):</td><td>1. Minimum instructional technology configurations and equitable distribution strategies for all instructional spaces are developed, endorsed, disseminated, and funded.
2. Productivity suites versions across the district are standardized.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Engaged Students and Family
Rigorous and Aligned Content
Systems that Work</td><td>Leadership Responsibility:</td><td>Teaching and Learning
Instructional Technology
Educators</td></tr>
</table>

<table>
<tr><th rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td>1. Convene a team to research and identify minimum instructional technology configurations and equitable distribution strategies for all instructional spaces including:
• instructional levels (PK–2, 3-5, 6–8, and 9–12)
• content area and curriculum area
• specialty configurations such as art, music, physical education, science labs, world language labs, business education labs, engineering labs, and video production studios
• adaptive assistive environments
• environments that embrace the Universal Design for Learning features
• library/media facilities</td><td>X</td><td></td><td></td></tr>
<tr><td>2. Develop, formally endorse, and advance an equity policy and/or guidelines to ensure that all teachers, students, parents, and staff in all schools have equitable access to district technology resources to promote advanced and interactive learning in all classrooms by providing technological tools to engage students.</td><td>X</td><td></td><td></td></tr>
<tr><td>3. Review and analyze the existing funding strategies employed to attain and maintain a specified level or critical mass of instructional technology learning tools over time. Ensure that the plan provides for continual upgrades after the critical mass targets are reached. Investigate alternative funding strategies targeted specifically toward equity.</td><td>X</td><td>X</td><td>X</td></tr>
</table>

Initiative: 21st Century Classroom Configurations

Recommendation:	TLT – 2.1 Determine the appropriate levels, collections, selections of blended learning technologies and peripheral devices that are needed to support 21st Century classrooms across the school district.	**Key Performance Indicator(s):**	1. Minimum instructional technology configurations and *equitable* distribution strategies for all instructional spaces are developed, endorsed, disseminated, and funded. 2. Productivity suites versions across the district are standardized.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Teaching and Learning Instructional Technology Educators

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
4. Consider funding district-level purchases of online resources to guarantee equity, make training and support easier, and secure best volume pricing.	X	X	X
5. Develop a long term strategy to maintain standardized productivity suites versions across the district for Mac and Windows platforms for instructional and administrative systems.	X		
6. Continue to retire and recycle aging computer resources, as in many cases no level of improvement to the WAN or LAN will increase network access speeds for some of the district's oldest computers. In some cases, these old devices may slow the capacity of the network for other faster computing devices.	X	X	X
7. Consider repurposing computers that meet specific criteria and would function well in a thin client environment.	X	X	X

Interdependencies: LESF-1.1, CA-1.1, CA-1.2, PPS-1.2	**Estimated Cost:** Year 1: $ 5,000 Year 2: $ 5,000 Year 3: $ 5,000 **Total: $15,000**	**Potential Funding Source(s):**

<table>
<tr><th colspan="7">Initiative: Develop and Endorse Equity Policy and Guidelines</th></tr>
<tr><td>Recommendation:</td><td colspan="2">TLT – 2.2 Develop, formally endorse, and advance an equity policy and/or guidelines to ensure that all teachers, students, parents, and staff in all schools have equitable access to district technology resources to promote advanced and interactive learning in all classrooms by providing technological tools to engage students.</td><td>Key Performance Indicator(s):</td><td colspan="3">1. An equity policy and/or guidelines are developed and formally endorsed by district leadership.
2. Funding strategies are developed and supported to attain equity milestones.
3. Monitoring strategies are in place to gauge the attainment and maintenance of equity targets.</td></tr>
<tr><td>Alignment to District/ Superintendent’s Goal(s):</td><td colspan="2">Engaged Students and Family
Highly Effective Educators
Systems that Work</td><td>Leadership Responsibility:</td><td colspan="3">Department of Instruction
IT Department
Superintendent</td></tr>
<tr><th colspan="4" rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td colspan="4">1. Review and analyze the existing funding strategies employed to attain and maintain a specified level or critical mass of instructional technology learning tools over time. Ensure that the plan provides for continual upgrades after the critical mass targets are reached.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="4">2. Investigate alternative funding strategies targeted specifically toward equity.</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="4">3. Continue to fund district-level purchases of online resources to guarantee equity, make training and support easier, and secure best volume pricing.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="4">4. Standardize productivity suites versions across the district. Systems should be standardized for PC and Mac platforms for instructional and administrative systems.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="4">5. Include in the capital plan provisions for infrastructure development, resources procurement, and long-term funding strategies that address total cost of ownership (TCO) issues for maintaining instructional technology resources in new and existing facilities.</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="2">Interdependencies: PPS-1.2, LESF-1.1</td><td colspan="2">Estimated Cost: Year 1: $ *
Year 2: $ *
Year 3: $ *
Total: *</td><td colspan="3">Potential Funding Source(s):

* Costs associated with PPS-1.2</td></tr>
</table>

5.3 Special Populations

Initiative: Differentiating Instruction for Special Populations			
Recommendation:	TLT – 3.1 Ensure that all special populations (including ELL, special education, gifted and talented, at risk, CTE) are provided with the resources and preparation required to achieve adequate yearly progress and reach their full potential. Continue to address the unique needs of special populations, teachers, and schools with adaptive/assistive technology solutions as appropriate.	**Key Performance Indicator(s):**	1. Section 508 compatibility for universal design and Web content accessibility guidelines are met. 2. Students with exceptional needs have appropriate technology tools for learning as outlined by individual learning plans.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content	**Leadership Responsibility:**	Special Education Leaders and Educators Gifted and Talented Leaders and Educators English Language Learners Leaders and Educators Instructional Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Continue to consider equity in computer access for all students (including those with special accommodations), ensuring that Section 508 compatibility for universal design and Web content accessibility guidelines are followed.	X	X	X
2. Develop strategies for reviewing resources for special populations by committees that include teachers with knowledge of and expertise with these unique learners. Analyze assessment data to identify student disaggregate groups not achieving AYP and expand the use of instructional technologies, along with adaptive and assistive technology solutions to assist them in attaining AYP.	X	X	X
3. Develop a strategy to disseminate knowledge of, and expand best practice strategies, identified for special audiences including the Universal Design for Learning (UDL). Link this strategy to the redesign of district internal website.	X	X	X
4. Pursue grants as well as alliances with organizations, such as CAST (Center for Applied Special Technology, http://www.cast.org).	X	X	X
5. Ensure that purchases for special populations, including those with funds from grants and PTAs, follow district procurement guidelines to help ensure compatibility with existing resources.	X	X	X

Initiative: Differentiating Instruction for Special Populations

Recommendation:	TLT – 3.1 Ensure that all special populations (including ELL, special education, gifted and talented, at risk, CTE) are provided with the resources and preparation required to achieve adequate yearly progress and reach their full potential. Continue to address the unique needs of special populations, teachers, and schools with adaptive/assistive technology solutions as appropriate.	**Key Performance Indicator(s):**	1. Section 508 compatibility for universal design and Web content accessibility guidelines are met. 2. Students with exceptional needs have appropriate technology tools for learning as outlined by individual learning plans.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content	**Leadership Responsibility:**	Special Education Leaders and Educators Gifted and Talented Leaders and Educators English Language Learners Leaders and Educators Instructional Technology

Action Steps *Denotes that step has already started.	Timeline		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
6. Continue to implement applications, accommodations, and adaptive/assistive devices on a student-by-student basis as warranted in Individual Education Plans (IEPs).	X	X	X

Interdependencies: ODS-1.2	**Estimated Cost:** Year 1: $ 5,000 Year 2: $ 5,000 Year 3: $ 5,000 **Total: $15,000**	**Potential Funding Source(s):**

5.4 Information and Technology Resource Centers (Libraries/Media Centers)

Initiative: Library Media Services in Support of 21st Century Skills & ICT Literacy

Recommendation:	TLT – 4.1 Support the expanded role of library media specialists as they include emphasis on information literacy skills and Internet safety beginning in the elementary grades.	**Key Performance Indicator(s):**	1. ITC skills are integrated into library research curriculum starting at the elementary level. 2. Middle and high school students demonstration ICT literacy skills in daily practice.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content	**Leadership Responsibility:**	Teaching and Learning Library Media Leadership and Educators

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Identify potential low or no cost information literacy skills and Internet safety curriculum appropriate for elementary age students.	X		
2. Define the infrastructure and technology resources necessary for library media specialists to promote Information, Communication, and Technology (ICT) literacy skills for students and support building teachers.	X	X	X
3. While strengthening the skills of the library media specialist group as a whole, pay special attention to developing a minimum baseline set of skills for all elementary specialists (art, music, physical education).	X	X	X
4. Develop elementary rotations, such that all students receive ICT literacy instruction annually.	X	X	X
5. Provide learning activities and regular opportunities for middle and high school students to demonstrate ICT literacy, internet safety, and research skills.	X	X	X

Interdependencies:	**Estimated Cost:** Year 1: $ 50,000 Year 2: $ 50,000 Year 3: $ 50,000 **Total: $150,000**	**Potential Funding Source(s):**

Chapter 4:
Learning Environments and School Facilities

Table of Contents

1.0 INTRODUCTION AND RATIONALE

"The technology that has so dramatically changed the world outside our schools is not changing the learning and teaching environment within them."

—Executive Summary in *Toward a New Golden Age in American Education*
National Education Technology Plan 2004

The **Learning Environments and School Facilities** chapter focuses on the many types of learning environments that can be configured, reconfigured, and moved to achieve ubiquitous access to learning resources for all students. These environments address the needs of teachers, school-based administrators, students, and even community members via remote access and virtual learning environments. The second topic included in this chapter addresses the technology support systems within the school facilities that ensure clean, safe, and environmentally friendly buildings in which teaching and learning can take place. With growth in the district, the issues associated with new construction and school retrofits are also addressed.

The subtopics within this section include:

- Technology-Enhanced Learning Environments
- School and District Administrative Management Environments
- School Facilities

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September – October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Learning Environments and School Facilities* section of the *Key Findings and Recommendations* final report.

2.1 Technology-Enhanced Learning Environments

Not unlike many mid-size, urban school districts across the nation, PPSD has a diverse and aging collection of technology, computers, projection devices, and printers. This collection includes computers that are no longer meeting either instructional or administrative needs as well as new tablet computing devices and computers that are less than a year old. PPSD is primarily a Windows-based district with a few exceptions in specific schools and programs. A mixture of computer labs, classroom computer clusters, teacher presentation stations, and mobile units were observed, but they are not systemically deployed across grade ranges or schools.

The key findings for **Technology-Enhanced Learning Environments** include:

- The most significant observation regarding classroom technology configurations is the large collection of older Dell Windows desktop computers, the vast majority of which have long outlived their functional capacity. Other than this large collection of outdated desktop computers, there is no formal standard technology configuration defined for PPSD for elementary, middle, or high school levels. As discussed else in the IT BP, there are standards for individual hardware components, such as desktops, digital whiteboards, etc.
- The availability and vintage of computer lab environments also varies significantly across the district. These labs include both fixed classroom labs and mobile labs. They may consist of desktops, laptops, netbooks, or tablet computing devices. The number of devices also ranges from approximately 15 devices to over 30. While primarily Windows based, there are also a few Macintosh labs, used mainly for graphic design or photography courses.
- Teachers and administrators need to master the skills of online learning such that they can model and support these critical life skills in students. Other than the 7th grade computer literacy course, PPSD students do not currently have the opportunity to participate in online courses. Teachers and principals have access to limited online professional development.

2.2 School and District Administrative Management Environments

Similar to the status of instructional technology resources, there exists significant diversity across the spectrum of administrative and teacher computing resources. Most district and school level administrators and their respective support staff have Windows desktops running the XP operating system. Teacher computers represent a much more diverse collection of computers, ranging from many that are over seven years old to a few newer computers. Both administrators and teachers would like the option to use their own laptops with secure permissions to connect to the PPSD network. Many would also like to choose between Mac and Windows platforms. Discrepancies in versions of Microsoft Office, especially the .doc versus .docx formats present challenges with file sharing across the district.

The key findings for **School and District Administrative Management Environments** include:

- Most all district-level office computers are running Microsoft OS and have Microsoft Office installed with most running Windows XP and a few running Windows 7. The version of MS Office installed varies.
- Most all office and school computers are running Microsoft OS and have Microsoft Office installed, but the version of these systems varies significantly both across the district, within individual schools, and even within individual classrooms. Some computers are running MS Office 2003 while others have the most recent version causing compatibility and file sharing issues.
- Most, but not all, teachers have at minimum a desktop computer assigned to them, but many are very old and some are not functioning.

2.3 School Facilities

As a urban school district, Providence wrestles with an aging population of school facilities. The district has done a good job maintaining the facilities, however, the collision of a rapidly changing technology options against and aged facilities infrastructure often requires more retrofitting and renovations then new construction Unfortunately those districts who have expanding populations and can grow into new facilities with new and contemporary facilities, fixtures and equipment. This challenge is common and an aggressive facilities plan aides technology infrastructure, but, technology alone is not the driver. So, the challenge (and often what blocks progress) is when to invest in new technology enhanced environments in older school facilities. Of particular concern is how long these investments will be realized and provide benefits to the stakeholders?

he key findings for **School Facilities** include:

- Most schools have adequate cabling to support the current computing environments. This cabling is based on Category 5e and for most schools was completed as part of the E-rate program.

- Some schools in the district do not have adequate electrical power to support existing technology. Over time this challenge has lessened due to the efficiency and lower power requirements of mobile and modern computing devices.
- There is evidence of building automation and control for the HVAC systems being implemented. The IT department has defined a VLAN to support Building Automation Systems (BAS). It is unclear if a standard has been established.
- Most classrooms are not air-conditioned. In the past computer labs needed separate AC systems to support the heat output, but modern computing systems have a reduced heat footprint and are more energy efficient, thus AC is not required in well ventilated rooms.
- Most, if not all, schools had locked external doors that require controlled entry via the front office. The office has a camera to monitor the front door and a switch to allow entry for visitors. There is no automated card or fob entry systems implemented in most schools.
- Lighting controls varied from classroom to classroom. There exists evidence that lighting was not considered and changed as LCD projectors were installed. Manual switches control most room lighting.
- Classrooms are not provided with cable TV or live feeds to broadcast TV systems.
- There is inconsistency across the district with regards to school facilities in general and their ability to support flexible, blended technology enhanced learning environments.
- A multi-phased Capital Improvement plan was undertaken and at some point this was not continued.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Teaching and Learning Technologies* were identified during the comprehensive information technology assessment conducted September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., LESF for Chapter 4) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 4, Learning Environments and School Facilities, section 3.1, Technology-Enhanced Learning Environments, would be numbered LESF-1.1, the second recommendation in this same section would be LESF-1.2.

3.1 Technology-Enhanced Learning Environments

LESF-1.1 Minimum Technology Learning Environments Guidelines

Define, endorse, support, and advance minimum technology learning environment guidelines to ensure that all teachers and students in all schools have equal access to developmentally appropriate, district technology resources to promote advanced and interactive learning in all classrooms by providing technology tools to engage students. These prototypes should address computing devices, software, file sharing servers, and peripherals (digital cameras, printers, scanners, digital video cameras, projection capacity, whiteboards, etc.).

LESF-1.2 Instructional Technology Refresh Program

Research, develop, deploy, and maintain a short- and long-term instructional technology refresh program that increases school district inventories of modern computing devices to levels required for integration of technology into daily practice. This refresh program will help to ensure that the technology in PPSD schools supports hands-on, project-based, authentic, and engaged learning.

LESF-1.3 Online Learning Opportunities

Define the infrastructure, resources, staffing, and skills needed to develop, nurture, and advance online learning opportunities for students and teachers, which will enable them to become more independent learners and participate in global collaboration.

3.2 School and District Administrative Management Environments

LESF-2.1 Application Standardization (No Action Plan Required)

Standardize administrative productivity software and OS to ensure that district and school computers for administrators and support staff and teacher computers have the latest updates and versions to facilitate document compatibility across the district. Develop and deploy a refresh policy with respect to computing resources (desktops/laptops/tablets) for school district-level and school-based administrators and support staff along with teachers and specialists. Identify/obtain a funding stream to support this policy over time. Include a Bring Your Own Device (BYOD) strategy for school staff that allows them full and secure, role-based access to the PPSC network.

3.3 School Facilities

LESF-3.1 Energy/Building Access/Lighting Controls

Review the energy management solution used by the school district. Ensure all schools are locked and maintain a single entry point controlled by the main office. Implement a card entry system with magnetic locks with a real time network link this to the district's HR/Directory system. Install card entry controls at appropriate locations internally to maintain and control building movement. Ensure that lighting is addressed as classrooms are outfitted with LCD or other projection systems. In addition, ensure that classrooms are provided proper room shades as needed for light control.

LESF-3.2 Construction and Renovation Standards

Establish minimum technology specifications for new construction and retrofits to school facilities. Use as guidelines when implementing future planning efforts. Utilize the prior multi-phased capital improvement plan as a starting point.

4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists on best practices in using technology to improve teaching, learning, and school management. This body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online formats to remain abreast of emerging issues. In addition, these individuals present at and attend local, national, and international conferences focusing on educational technologies. Feedback from clients during the implementation of their technology blueprint initiatives provides CELT with an experiential knowledge base. CELT has been building this collective knowledge base continually for the past 20 years while working with departments of education, large and small school districts, and a variety of public and private organizations, many of which are national in scope.

In addition to nationally-researched approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with PPSD. The following pages highlight the research and best practices that most closely relate to the recommendations proposed for PPSD in the section 3.0.

Technology-Enriched Learning Environments

PPSD seeks to develop prototypes for best practice, scientifically-researched learning environment modules to assist schools and teachers in developing multiple strategies for building environments that best support their curriculum approaches. Learning environments will be designed to support a range of instructional activities appropriate to meet the developmental needs of the learners, staff competencies, school initiatives, and specific technology applications. These learning environments will include:

- teacher workstations with projection capacity and control system;
- individually networked (wired and wireless as appropriate) classroom computers with task-specific peripherals;
- individual, portable computing devices for every child, such as text processors, tablets, netbooks, smart phones, ereaders, and graphing calculators for content-specific activities;
- mobile computer labs on recharging carts with wireless network connectivity (carts are available for 15-30 laptop computers);
- instructional technology and vocational laboratories of 12-30 computer workstations;
- information and technology resource centers with print and digital content and access to online subscription services;
- distance or virtual learning centers.

School personnel will need to consider how to deploy appropriate resources (e.g., hardware, software, technology, support services) effectively in order to maximize the benefits of the entire technology system. The equitable distribution of the technology resources throughout the schools will enable all students, teachers, and administrators to function more effectively.

Accessibility and mobility of resources is critical. Teachers should ideally be able to provide 1:1 student to computing resource ratios as needed by requesting and reconfiguring existing technologies. These blended technologies learning environments may include desktop and laptop computers, numeric and graphing calculators, handheld computing devices, portable word processing devices, peripherals (e.g., color printers, scanners, digital and digital video cameras), tablets, netbooks, ereaders, and sufficient consumable resources to maximize the potential of these devices. The goal is for each classroom to have nearly on-demand access to these resources with minimal difficulty.

Technology-enhanced learning environments are usually, but not always, designed to incorporate one or more computers. The capacity, location, size, mobility, versatility, peripheral devices, and accompanying software applications help to define the functional capacity and intent of specific learning environments. Most school environments will implement variations on one of six model configurations: 1) classroom computer (generally the teacher station); 2) computer clusters (three to six computers); 3) computer classrooms (15 to 30 computers); 4) individual computing devices (1:1 device to child ratio); 5) information and technology resource center technology resources; and 6) virtual/eLearning/distance learning classroom. These technology-enhanced learning environments are intended to be dynamic models that encourage the creation of hybrids and variations to meet the specific needs of the students.

Classroom Technology Configurations

To achieve new teaching and learning environments, a 21st Century classroom is proposed that includes technology enhanced teaching tools that will dramatically appeal to students' eyes and ears. These classrooms include:

- a teacher computer (laptops are generally preferred);
- student computers or mobile computing devices;
- projection capacity (projector, Smartboard, and/or document camera);
- accompanying age-appropriate software;
- on-demand access to mobile computing resources and peripherals .

Universal Design for Learning (UDL)

The Universal Design for Learning model offers the district a wide variety of proactive strategies to use with the struggling learner. This model supports the inclusion of a specific suite of technology-support resources installed on computers throughout the district based on the current percentages of identified special education and at-risk learners. These district-wide resources allow this population of learners to communicate and compete on a level playing field supported by the integration of universal access and design technologies in multiple locations throughout PPSD schools. In addition, all students with varying learning styles can benefit from universal access and design features available on workstations located throughout the school campuses.

Computer Lab Technology Configurations

The instructional technology classroom, or computer lab, provides a 1:1 student-to-computer ratio by locating approximately 15 to 30 networked computers in one instructional area. Specific functions of these classrooms may require access to one or more file servers. School-wide network connectivity of these systems will provide access to printers, Internet access, library media center resources, and DVD devices. The ability to project an image of the computer screen to a large group using a projection device significantly increases the quality of large-group instruction. A permanent, ceiling-mounted projection device is generally the preferred projection solution in this environment. The inclusion of an interactive whiteboard for efficiently capturing and downloading brainstormed ideas, diagrams, charts, and other board notes is recommended.

Specialty areas in PPSD schools may include one or more computer labs with approximately 30 computers or an information and technology resource center with 15 to 30 computers for student and teacher use. Computer labs are currently available in both stationary (desktop systems) and mobile varieties (comprised of laptops and a printer in a recharging cart with wheels). Stationary computer labs are generally hard-wired to the network and provide the wide bandwidth required for accessing and distributing video. Mobile labs use wireless technology to connect to the network, and are well suited to accessing the Web, sharing files, and connecting to printers. Thin client configurations are feasible and recommended for some applications.

Computer lab configurations may serve the following purposes:

- Writing and research lab;
- Instructional integration activities;
- CAD/CAM and Engineering courses;
- Business applications center;
- Personal productivity centers;
- Computer literacy/programming/computer science;
- Assessment and managed learning environments.

Impact & Effectiveness of Ubiquitous Access & Peripheral Devices on Teaching & Learning

The lack of definitive research supporting the integration of instructional technologies to improve student academic performance has been a challenge for school districts across the nation. Finally, a few large-scale projects that have been carefully and closely monitored and evaluated are offering definitive results. In the fall of 2007, the Maine one-to-one laptop program, launched in 2002, announced improved scores on writing skills assessment. "The first in a series of studies aimed at evaluating Maine's pioneering laptop program, *Maine's Middle School Laptop Program: Creating Better Writers* concludes that the use of laptops improves scores on writing skills assessments, that more frequent use is linked to higher scores, and that writing skills of laptop users transfer to writing without a laptop." The full text of this article titled, *A research study from the University of Southern Maine shows that the state's one-to-one laptop program improves scores on writing skills assessments*, by Mary Axelson can be found at: http://www.k12blueprint.com/k12/blueprint/story_good_news_from_maine_about_the_impact_of_laptops_on_writing_skills.php.

The full research report by the Maine Education Policy Research Institute (MEPRI) at the University of Southern Maine.is located at: http://www.usm.maine.edu/cepare.

Library Media Center Prototypes

Located centrally within most PPSD schools, the information and technology resource center combines the roles of today's library services, audio visual and media departments, and technology center into one information and technology resource center for teachers, students, and community members. The library media area includes the following incorporated areas:

- technology research station(s) ;
- student workstations;
- technology lending center ;
- video control room;
- checkout desk;
- online card catalog;
- workroom and office space.

All computing devices in this area would be connected (wired or wireless) to the school and district-wide network, providing access to printers, the Internet, data files created in other classes, and network applications and devices.

The library media area is defined by its multiple purposes. Given the combined functions of providing access to information, as well as a place to process the information, the information and technology resource center offers students and teachers an arena for extensive research and production opportunities. While this configuration is the least suited for formal large-group presentations, it serves as a resource-rich facility where independent and small-group learning are encouraged.

In some schools, the distance learning or online learning classroom is located in the library media area, frequently with a glass wall enclosure to allow for passive monitoring of these independent learners by library or media staff or paraprofessionals.

School and District Administrative Management Environments

The computer resource in school districts with the greatest potential for implementing change and creating change agents is the *teacher computer*. This is the computer assigned to an individual teacher to assist with teaching, learning, and management of daily classroom functions. Whether it is a full-size desktop system or a portable model, the acknowledgment that educators require tools at least equivalent to those used by students is critical to the successful integration of all other technology-enriched learning environments.

In addition to learning technologies needs, school administrators and support staff will require sufficient technology resources to manage their work and meet the district goal of becoming an efficient and effective organization.

District- and School-Level Administrative Suites

Administrative computing resources within each PPSD school will include modern workstations, printers, and telephones equipped with voicemail capacity.

To support school instructional technology services, several building-level systems must be in place. These systems include a private branch exchange (PBX) telephone system with voicemail, network servers (Web, fileserver), Ethernet switches to interconnect workstations and servers, and a router that connects the school to the district network as well as the Internet and district applications and an uninterruptible power supply (UPS).

Upon installation of both learning technologies and administrative management technology resources, school leadership should require configuration, set up, and testing of all computer systems prior to acceptance.

Teacher Computing Resources

To manage the emerging diversity of today's classroom, the individual teacher configuration should provide confidentiality and portability with video-out and large-group projection capabilities, telecommunication access, and network connectivity. This system should be compact enough to travel with the teacher who provides instruction in a variety of classrooms and into the homes of all educators. Access to the school network allows for flexibility in lesson planning, preparation, resources selection, and reporting purposes.

The teacher workstation area normally is located toward the front of the room in proximity to the teacher's desk. The exact location needs to be determined on a room-by-room basis. Access to voice, video, and data communications should be available at this location. Thus, two voice and data cables and one video drop cable should be brought to this area. This allows access to a telephone, the Internet, and the video programming distributed throughout the school.

A highly-effective approach to enabling teachers to improve productivity in their professional tasks as well as in their instructional delivery is to provide them with portable computers for use in the classroom and at home. Voluminous research has indicated that the staffs that use computers in their daily lives or profession are highly likely to use them effectively with their students.

Teacher Workroom Resources

Faculty planning offices and workrooms should be established within each learning area of the campus. Learning areas might be determined by grade, wing, building level (first or second floor), or department. These spaces should support effective teaching practices, encourage sharing of resources (technology- and non-technology-based), and offer adequate room for team meeting and discussions.

At approximately 375 square feet, some of the technology resources that would be housed in the teacher workrooms or faculty planning offices include:

- Scanner
- Printer
- Digital and video cameras
- Wireless and wired network access
- Telephone and facsimile
- Projection capacity
- Laptops, desktops, tablets

The teacher workroom should be sound-attenuated to ensure quiet conditions for lesson preparation, personal telephone conferences, etc. The area would be wired for voice and data retrieval and transmittal, and should have enough outlets to provide for portable electronic equipment. The materials preparation center should include large worktables, large-volume copying machine, a laminating machine, paper cutters, wall-mounted monitor with DVD capabilities, secure materials supply closet, intercom, and telephone.

School Facilities

Lighting

Lighting in schools should provide a learning environment that enhances the learning process. Lighting should allow students and teachers to perform visual tasks quickly and comfortably.

Electrical Power

Electrical Receptacles: The National Electric Codes (NEC) recommends that each instructional space should have six general-purpose duplex receptacles and one duplex receptacle for each computer and should allow flexibility in their placement.

Line Conditions: Schools should be surveyed about power failures, their electrical needs, and the current electrical power, if this information is not already available.

Critical Design Installation and Utilization Challenges

Potential safety issues in the current and future learning environments must be identified, including a careful inspection of the added electrical power, the location of PVC cable, and the location of cables on floors. All potential safety hazards in the current learning environments must be corrected. Periodic inspections of learning environments will be scheduled for safety hazards created by added electrical power, inappropriate location of PVC cable, and location of cables on floors.

In addition, there are installation and utilization challenges, such as working around sprinkler heads and installing power and wiring to ceiling mounted projection units because of the ceiling and wall construction techniques in facilities of different ages.

Strategies for Physical Security and Student Safety

Security issues cover three major areas: physical security of facilities (e.g., intruder alarms); physical security of technology components (e.g., theft of components); and, data/network security (e.g., protection against hackers).

Ongoing risk assessment will be performed that will identify assets and threats. Security is not absolute and comes at a cost. Cost can be measured in dollars for hardware, software, and staff time; it can also be assessed in terms of loss from ease of use. The cost of guarding against a potential threat must be weighed against the cost of recovering from it.

Schools may improve the security of technology by:

- installing theft-deterrent devices on computers in classrooms;
- expanding intrusion alarm systems with more zones and adding links to central security staff/control;
- ensuring that video surveillance covers all areas in which newly acquired technology is concentrated, and that surveillance video is monitored.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- District's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., LESF for Chapter 4) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 4, Learning Environments and School Facilities, section 5.1, Technology-Enhanced Learning Environments, would be numbered LESF-1.1, the second Action Plan in this same section would be LESF-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- **Technology-Enhanced Learning Environments**

  LESF-1.1 Minimum Technology Learning Environments Guidelines

  LESF-1.2 Instructional Technology Refresh Program

  LESF-1.3 Online Learning Opportunities

- **School and District Administrative Management Environments**

  LESF-2.1 Application Standardization (No Action Plan Required)

- **School Facilities**

  LESF-3.1 Energy/Building Access/ Lighting Controls

  LESF-3.2 Construction and Renovation Standards

5.1 Technology-Enhanced Learning Environments

Initiative: Minimum Technology Learning Environments Guidelines			
Recommendation:	LESF– 1.1 Define, endorse, support, and advance minimum technology learning environment guidelines to ensure that all teachers and students in all schools have equal access to developmentally appropriate, district technology resources to promote advanced and interactive learning in all classrooms by providing technology tools to engage students.	**Key Performance Indicator(s):**	1. Minimum technology learning environment guidelines are defined for all grades and content areas. 2. Developmentally appropriate, technology-enhanced learning environment prototypes for all grades and content areas are created.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	IT Department Teaching and Learning School Administrators Office of Research, Planning, and Accountability Educators

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Research and define minimum technology learning environments by instructional level (PreK-2, 3-5, 6-8, 9-12) for classroom computers (desktop, laptop, and/or handheld); computer lab environments (stationary or mobile); peripheral devices (scanners, digital/video cameras, MP3 players); production resources (including video-production, broadcasting, and podcasting capacity); content specific devices (such as digital probes/sensors/microscopes and graphing calculators); distance learning, e-learning, and/or online learning opportunities; projection capacity (digital whiteboard technology, TV/monitors, document cameras,) for classrooms, instructional areas, and common areas where large groups can meet (library, cafeterias, auditoriums); and printer access (black and white, color, networked, high-speed). See sample guidelines for different types of teaching at http://iss.unm.edu/PCD/docs/Guidelines_Standards/0-LEDG-v.1.0-120224.pdf	X		
2. Create developmentally appropriate, technology-enhanced learning environment prototypes for each school facility type (elementary (PK-5), middle, high school) that address computing devices, software, file sharing servers, and peripherals (digital cameras, printers, scanners, digital video cameras, projection capacity, whiteboards, etc.). See discussion of this at: http://www.k12hsn.org/files/research/Technology/le_white_paper-1.pdf	X		
3. Include prototypes for specialist spaces (art, physical education, music), library media centers, and large group areas (cafeteria, auditorium, and conference rooms). These prototypes should incorporate "models of flexibility" for the technology in each configuration.	X		

Initiative: Minimum Technology Learning Environments Guidelines

Recommendation:	LESF– 1.1 Define, endorse, support, and advance minimum technology learning environment guidelines to ensure that all teachers and students in all schools have equal access to developmentally appropriate, district technology resources to promote advanced and interactive learning in all classrooms by providing technology tools to engage students.	**Key Performance Indicator(s):**	1. Minimum technology learning environment guidelines are defined for all grades and content areas. 2. Developmentally appropriate, technology-enhanced learning environment prototypes for all grades and content areas are created.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	IT Department Teaching and Learning School Administrators Office of Research, Planning, and Accountability Educators

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
4. Include Universal Design for Learning (UDL) principles when developing computer configurations at all instructional levels. Consider options for sound enhancement; touch screen capacity; and magnification strategies.	X		
5. Address teacher computing needs by investigating and analyzing the benefits and challenges of replacing teacher desktop computers with laptops/tablets(mobile computing device), which provide teachers the capability to access administrative systems and school files from home.	X		
6. Integrate minimum technology learning environments with the proposed technology scope and sequence document (See Chapter 2).		X	X
7. Formally endorse standards that ensure that all teachers, students, and parents in all schools have equal access to district technology resources to support student achievement in all classrooms. Include training for teachers on the effective use and integration of these technologies. Develop a process, procedures, and a plan to acquire and equitably distribute these to schools.		X	
8. Create, publish, and disseminate these minimum technology learning environment standards to school leadership teams so that individual schools can review and design the learning environments with the resources included in the guidelines to address the technology scope and sequence, support ICT literacy skills requirements and address specific school needs.		X	
9. Develop funding strategies using school, district, grants, and other available sources to create developmentally appropriate, minimum technology learning environments in all schools.		X	X
10. Incorporate refresh plan strategies to keep these resources current over the long term.		X	X

Initiative: Minimum Technology Learning Environments Guidelines			
Recommendation:	LESF– 1.1 Define, endorse, support, and advance minimum technology learning environment guidelines to ensure that all teachers and students in all schools have equal access to developmentally appropriate, district technology resources to promote advanced and interactive learning in all classrooms by providing technology tools to engage students.	**Key Performance Indicator(s):**	1. Minimum technology learning environment guidelines are defined for all grades and content areas. 2. Developmentally appropriate, technology-enhanced learning environment prototypes for all grades and content areas are created.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	IT Department Teaching and Learning School Administrators Office of Research, Planning, and Accountability Educators

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**

Interdependencies:	**Estimated Cost:**	**Potential Funding Source(s):**
	• Year 1: $ 5,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $15,000**	

Initiative: Instructional Technology Refresh Program			
Recommendation:	LESF– 1.2 Research, develop, deploy, and maintain a short- and long-term instructional technology refresh program that increases school district inventories of modern computing devices to levels required for integration of technology into daily practice.	**Key Performance Indicator(s):**	1. Short- and long-term instructional technology refresh program is developed, funded, and deployed 2. Teachers and students integrate technology tools into daily practice.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Systems that Work Collaborative Community	**Leadership Responsibility:**	Superintendent School Board IT Department Schools

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1 13/14**	 **Year 2 14/15**	 **Year 3 15/16**
1. Research, develop, and formally adopt short- and long-term instructional technology refresh program.	X		
2. Include in refresh plans strategies to reach a critical mass of modern technology resources in all schools.	X		
3. Determine refresh cycles of instructional technology resource and develop funding streams to refresh computers, peripherals, and network infrastructure in alignment with industry standards.		X	
4. Secure district leadership and community commitment to provide technical support to maintain and upgrade resources that meet the supported standard.		X	
5. Secure instructional technology resources to achieve critical mass levels in all schools.		X	X

Interdependencies: LESF-1.1	**Estimated Cost:**	• Year 1: $ 3.5 million* • Year 2: $ 3.5 million* • Year 3: $ 3.5 million* **Total: 10.5 million***	**Potential Funding Source(s):** *** subject to change depending on target ratios selected by PPSD**

Initiative: Online Learning Opportunities

Recommendation:	LESF– 1.3 Define the infrastructure, resources, staffing, and skills needed to develop, nurture, and advance online learning opportunities for students and teachers, which will enable them to become more independent learners and participate in global collaboration.	**Key Performance Indicator(s):**	1. Online learning opportunities are available to students and education professionals. 2. Online course is required for high school graduation.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	IT Department Department of Instruction Superintendent School Board Schools

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Utilize a team of teachers, principals, district administrators, and other stakeholders to research and explore districts across the nation that are including online course competencies and completion as a graduation requirement.	X		
2. Identify infrastructure, resources, staffing, and skills needed to develop, nurture, and advance online learning opportunities.	X		
3. Recruit, hire, and/or train teachers to instruct students on how to successfully participate in online learning programs.		X	
4. Set milestones and targets that align with district priorities for advancing online course competencies as well as the completion of courses for graduation requirements.	X		
5. Promote virtual learning opportunities through the dissemination of information and parent/student outreach focused on virtual/online learning opportunities for students.		X	X
6. Develop a long-term strategy to ensure that all facilities are prepared to receive and/or offer distance and virtual learning opportunities.		X	X
7. Modify the secondary graduation requirements to include students to take one online course by the end of grade 10 to meet high school graduation requirements. Begin planning in year 1, piloting in year 2, and phasing in district-wide in year 3.	X	X	X

Interdependencies: ODS-1.2	**Estimated Cost:** • Year 1: $ 105,000 • Year 2: $ 105,000 • Year 3: $ 105,000 **Total: $ 315,000**	**Potential Funding Source(s):**

5.2 School and District Administrative Management Environments

No Action Plans Required.

5.3 School Facilities

Initiative: Energy/Building Access/Lighting Controls

Recommendation:	LESF– 3.1 Review the energy management solution used by the school district.	**Key Performance Indicator(s):**	1. New Building Security System installed. 2. New Energy Management solution installed and ROI demonstrated.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	CFO Facilities

Action Steps *Denotes that step has already started.	Timeline: Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Meet with the Convergence committee (Chapter 12) to review options for energy, security, cooling, heating, and lighting controls.	X		
2. Conduct an assessment/energy audit of the current energy management and lighting control and realize opportunities to implement a new system.		X	
3. Review current building security system and opportunities for new solution. Ensure all schools are locked and maintain a single entry point controlled by the main office. Implement a card entry system with magnetic locks with a real time network link this to the district's HR/Directory system. Install card entry controls at appropriate locations internally to maintain and control building movement.		X	
4. Ensure that lighting is addressed as classrooms are outfitted with LCD or other projection systems. In addition, ensure that classrooms are provided proper room shades as needed for light control.		X	
5. Develop return on investment (ROI) model for investment in an energy management and light control system considering reduced telecommunications costs and energy savings. Include value equation of improved performance and occupant comfort.		X	
6. Collect baseline data and establish measurement metrics to assist in determining impact of the program.		X	
7. Conduct request for proposals (RFP) to obtain new energy management and lighting control system.		X	X
8. Implement new system and monitor effectiveness.			X

Interdependencies: CNI-12.1	**Estimated Cost:** • Year 1: $ 0 • Year 2: $180,000 • Year 3: $180,000	**Potential Funding Source(s):** **Energy Grant, Local funds**

Initiative: Energy/Building Access/Lighting Controls					
Recommendation:	LESF– 3.1 Review the energy management solution used by the school district.	**Key Performance Indicator(s):**	1. New Building Security System installed. 2. New Energy Management solution installed and ROI demonstrated.		
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	CFO Facilities		
Action Steps ***Denotes that step has already started.**			**Timeline**		
			Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
	Total: $360,000				

Initiative: Construction and Renovation Standards			
Recommendation:	LESF– 3.2 Establish minimum technology specifications for new construction and retrofits to school facilities. Use as guidelines when implementing future planning efforts.	**Key Performance Indicator(s):**	1. Standards adopted 2. Gap analysis created
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators	**Leadership Responsibility:**	CFO Facilities Teaching and Learning IT Department

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Collect and review the learning environment infrastructure standards developed particularly in LESF-1.1 and LESF-1.2.	X		
2. Review current construction and retrofit standard and bid packages to align with technology systems delivery. Incorporate Infrastructure Standards into the construction and retrofit bid package and also assure that all facilities are brought up to this standard.	X		
3. Perform a gap analysis across the district to examine all facilities bringing them up to the minimum standard.	X		
4. Develop plans and project the costs to address the standards for facilities.	X		
5. Assess the district's ability to meet the new Infrastructure Standards and launch a program and accompanying funding strategy to meet minimum standards.	X	X	X

Interdependencies: LESF 1.1, LESF 1.2	**Estimated Cost:** • Year 1: $ 138,000 • Year 2: $ 276,000 • Year 3: $ 276,000 **Total: $ 690,000**	**Potential Funding Source(s): Bond**

Chapter 5: IT Organizational Development and Staffing

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Concentration on technology to the exclusion of human factors is a prescription for failure under the conditions of innovation diffusion."*
>
> —Kim Dooley

The **IT Organizational Development and Staffing** chapter focuses on IT organizational effectiveness. It includes leadership, governance, business alignment, staff proficiencies, and the leveraging of all IT human resources across the school district. It is important to set district-wide guidelines and identify funding strategies to ensure that all instructional, administrative, and support staff, as well as the students they serve, are provided with reliable support services to utilize, maintain, and repair technology resources as well as coordinate upgrades and procurement. Reliable technology support services are essential if all teachers and instructional staff are to incorporate appropriate technology resources into the teaching and learning process.

The subtopics within this section include:

- Organization and Staffing
- IT Career and Program Development
- Technical and End-User Support Model
- Staffing for Operational, Technical, and End-User Support

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September – October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *IT Organizational Development and Staffing* section of the *Key Findings and Recommendations* final report.

2.1 Organization and Staffing

The Providence Public School District (PPSD) Information Technology Department is headed by an Information Technology Officer who reports directly to the Chief of Staff Performance and Technology. In prior years, the IT Officer reported to the Chief Financial Officer. Services are centrally coordinated to help eliminate any work redundancies. Although no one in the department is currently charged with providing technology integration support, there is discussion of creating a school-based technology integration position who could help with these responsibilities while unrolling the new state-wide Instructional Management System (IMS).

The Information Technology Department consists of the following:

- Technical Support/Data Center
- Network Communications/Services
- Data Systems/DSS Group

Appendix A illustrates a graphic representation of the current PPSD IT organizational structure, including 3 vacancies: 2 field service specialist and 1 technology services expeditor. The chart also shows contracted services for the student information system and some network services. Of particular note is the lack of personnel assigned to cyber security.

The IT Department has high standards and serves a total of more than 25,000 users, including students, teachers, and staff, attempts to implement applications and support at the level that is needed to address the diverse needs of that audience.

The key findings for **Organization and Staffing** include:

- The IT organization is made up of 17 PPSD positions, three of which are vacant. Consultants are contracted to work on the student information system and network services. Given the number of projects currently underway and the age of the existing hardware, everyone is expected to carry a heavy load.
- PPSD does not have devoted personnel to address cyber security issues and concerns.

- No one in the IT Department, or anywhere else in the school district, is responsible for providing teachers with technology integration support.

2.2 IT Career and Program Development

Job descriptions for IT staff are only updated in response to hiring needs. Descriptions are not routinely updated and do not include serving as a liaison between IT and the school district's many departments. Additionally, IT staff do not have a clearly defined career path for advancement.

While the IT staff appear to be competent and current on the school district's technology infrastructure, this is due to their personal sense of professionalism rather than any formal professional development plan. As a result, as new technologies become available and best practices become recognized, staff may not be aware of them. Often times, IT staff are not included in the training activities when new instructional software or hardware resources are unveiled to teachers.

The key findings for **IT Career and Program Development** include:

- Job responsibilities are provided for each position within the Technology department, but are not regularly revised. Additionally, no one is charged with providing a direct link between the many PPSD departments and IT.
- The need for training has been identified as a priority for technology staff. Staff skill levels vary greatly.
- To date, there has not been a career path within the PPSD Technology Department.

2.3 Technical and End-User Support Model

PPSD has used "Track-It!" for its Help Desk system for many years. The process involves end users emailing their issue to a generic help desk account. Someone at the help desk then enters the issue into TrackIt, which is then used to record, assign, and monitor tickets. The technology department establishes and measures goals related to the help desk such as lowering the time of open tickets and decreasing the time it takes to work on a ticket.

Approximately three years ago, the IT Department put into place a remote network management system, which allows technicians to perform desktop management and reimaging. Only IT staff who physically staff the Help Desk use this resources, which allows issues to be resolved without entering the actual school building.

Overall, end users expressed satisfaction with the Help Desk, although they are dismayed with the outdated technology within many of their classrooms. Help Desk services are only available during the standard business hours of Monday through Friday from 8:30 a.m. to 4:30 p.m.

There is no on-site support at the school level for technical support, staff development, or instructional technology integration. In the past and now unofficially, many staff reach out to the school-based library media specialists for level 1 and integration support.

The key findings for **Technical and End-User Support Model** include:

- The IT Department uses "Track-IT!" to manage its Help Desk. Users currently email their issues to a generic account, rather than entering tickets directly into the system.
- The Help Desk is available from 8:30 a.m. to 4:30 p.m. Monday through Friday. An emergency telephone number is not provided for issues that arise during evenings, nights, or weekends.
- Many library media specialists unofficially provide some level 1 support to building staff.

2.4 Staffing for Operational, Technical, and End-User Support

With the exception of new computers, which are purchased with a three year warranty, PPSD staff members are responsible for end-user support. Consultants are used for the Student Information System as well as some network services. IT staff are part of a union.

Service-level agreements with internal departments and/or external vendors are not in place to set expectations for level of service and delivery.

The key findings for **Staffing for Operational, Technical, and End-User Support** include:

- Service level agreements are not currently in place between the technology department and schools or departments within PPSD.
- PPSD outsources services for which they do not have the internal resources, such as the Student Information System and some network services.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *IT Organizational Development and Staffing* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., ODS for Chapter 5) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 5, IT Organizational Development and Staffing, section 3.1, Organization and Staffing would be numbered ODS-1.1. The second recommendation in this same section would be ODS-1.2.

3.1 Organization and Staffing

ODS-1.1 Information, Communication, and Technology Services (ICTS) Department

Reorganize the IT Department into the Information, Communication, and Technology Services (ICTS) Department, which will be responsible for infrastructure, data and integration, and instructional technology. See Appendices B, C, and D.

ODS-1.2 Learning Technology Support Group

Create a full-time "Learning Technology" support group at the school district level responsible for providing teachers with integration support on current and emerging classroom technology.

ODS-1.3 Cyber Security Officer

Establish, via a part-time position, altered staff role or external contract, the position of Cyber Security Officer responsible for internet filtering, network security, application tampering, and data integrity. (See Chapter 12.)

3.2 IT Career and Program Development

ODS-2.1 Job Portfolios for ICTS Staff

Revise job descriptions to reflect all job responsibilities, technical proficiencies, qualifications, certifications, and experience required for these positions.

ODS-2.2 Career Roadmap for ICTS Staff

Develop a formal career track with qualifications, training, and resources to move to the next level. Implementation strategies include a "roadmap" to define each path of the career ladder and the skills, coursework, and experience that are needed to progress.

3.3 Technical and End-User Support

ODS-3.1 Revise the Role of the Library Media Specialists

Update the role of library media specialists to Coordinators of Research, Information and Technology Services (RITS) to support the integration of technology into the curriculum. See Appendix B and C.

ODS-3.2 Expanded Use of Track-IT!

Explore additional time-saving and communication features of Track-IT!, including end-users directly entering online issues into the system. **(No action plan required.)**

Staffing for Operational, Technical, and End-User Support

ODS-4.1 Service Level Agreements

Create and agree upon service level agreements (SLAs) between the PPSD IT Department and the end users of IT services, including PPSD Departments, Faculty, and Staff, as well as between PPSD and IT vendors.

ODS-4.2 Extended Hours for Service Desk

Staff or outsourcing the help desk until later in the evening and in the weekend to support users who are working remotely or for Level 1 emergencies. **(No action plan required.)**

4.0 RESEARCH AND BEST PRACTICES

Placing the appropriate number of people with the right skills, knowledge, and experiences in the right place at the right time is the key to the success of both implementation and operation of a comprehensive information technology system. Educators within PPSD are poised to enter a new era of technologically enriched learning environments not only in schools, but also in the home and in the community. In order for technology to be a successful enabler of improved student learning, new organizational structures and corresponding roles and responsibilities must be deployed.

Target Staffing Levels

It is difficult to assign a ratio of technology staff to computers. The number of computers that one technology specialist can support varies based on the age and quality of the computers, the rigor with which they are maintained and upgraded; the level of triage that occurs through the Help Desk, knowledge base, and the level of teacher intervention prior to calling the support staff. While staffing targets have been proposed at one technician per 500 computers, or one technician per 350 computers, these are often unattainable for school districts.

Technical Support Model at the School Level

Historically, most school districts and industries respond to technology by creating new positions to manage it. To manage books, we have librarians; to manage media, we have media specialists; to manage infrastructure, we have network managers. Figure 1 shows some of the positions that have been created within education to respond to specific technologies.

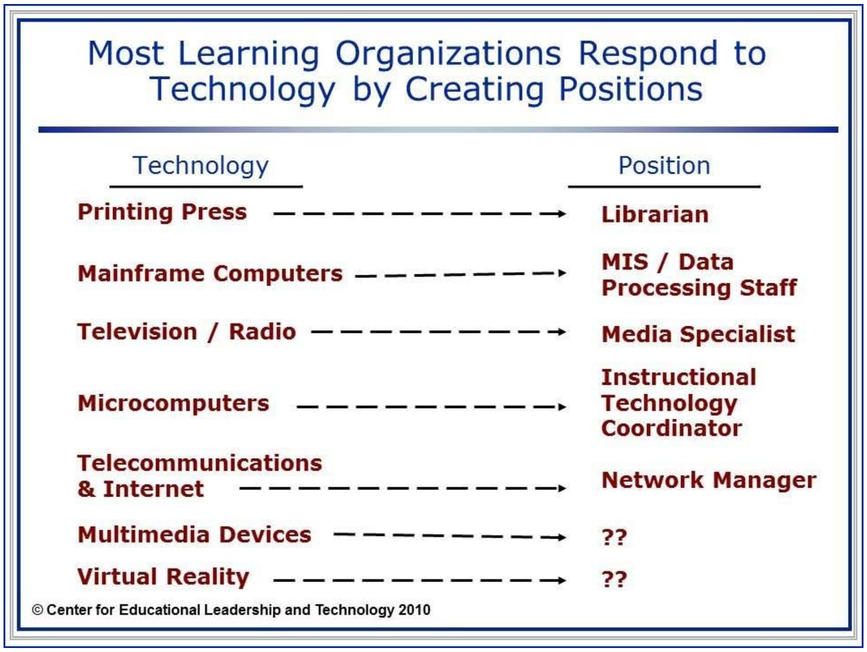


Figure 1: Industry Response to Technology

In many cases, the responsibilities of these positions overlap and, as a result, it becomes unclear who should actually assume certain roles. With the convergence of library, media, and technology services, and these challenging economic times, it is often possible to consolidate these roles into a single position. PPSD will achieve significant gains by streamlining the delivery of these complementary services. As library media staff already take the lead at the school level for staff development and information literacy skills training, to endorse and support this at the district level will empower them to work with classroom teachers on curriculum integration and strategies for integrating technology competencies. To do so, the following criteria must be in place:

- Designate the Library/Media Specialist as the single point of contact in each school site for all technology and information functions. The leader should be called the Coordinator of Research, Information, and Technology Services (RITS). A job description is provided in the Appendix.
- The Coordinator of RITS will work closely with the Communications, Information and Technology Services (CITF) team to disseminate and implement a common vision for instructional technology throughout the district. Overall, the number of contacts outside the school would be diminished and the first line of support would be within the school from this team.

Operational Efficiency

In an effort to maximize support while minimizing extra staff, a series of technology-based support strategies must be fully implemented. While some schools are fully implementing these strategies, they must be widespread to have optimal impact on the school district. These cannot replace “people support,” but can greatly assist in the overall issues of technical support. One of these strategies addresses standardization issues. Other strategies include:

- All technology users must become proficient in the use of embedded “help” features, online assistance, and vendor-provided telephone support as the first level of technical support.
- All users should receive training in identifying and solving frequently encountered problems on the equipment they most commonly use, including basic operation, proper care, and troubleshooting.
- Training will be a shared responsibility of the school area teams and the district ICTS staff.

The proposed organizational change at the school site will create a unit unlike any existing ones currently in the schools. There will be staff members with a variety of skills and abilities with technology but they will have very different job titles and functions within the school. As a new organization, they will need to find ways and strategies to work well together, to assist each other, and to maximize their impact on the key mission of the school. The leader of the group, who will be the Library/Media Specialist, will need to work with people who are non-instructional but who are technology-savvy. It may be that some staff development or other “team building” exercises will be necessary to optimize the way these individuals work together and share information and work. Exercises in “thinking outside the box” might also be useful to see just how creative this group can be at their site. Each member of this team needs to feel valued and to be making important contributions.

Job Portfolio

In the traditional form, a job description is often a static document detailing the duties and tasks for a defined role in an organization. As described in Bridges’ “The End of the Job,”[1] in a rapidly changing environment, job descriptions are rigid, ineffective solutions to an elastic problem. In today’s world, many of us work on a set of tasks or projects, either in series or in combination, and when asked to describe their job, the list of what an employee does becomes long and diverse. Sometimes these tasks seem unrelated to the purpose for which the individual was hired, but are more a function of the skills and proficiencies that person represents. Figure 2 shows a graphical depiction of a job portfolio.

[1] Bridges, W. The end of the job. *Fortune*, 130(6), 62-64, 68, 72, 74.

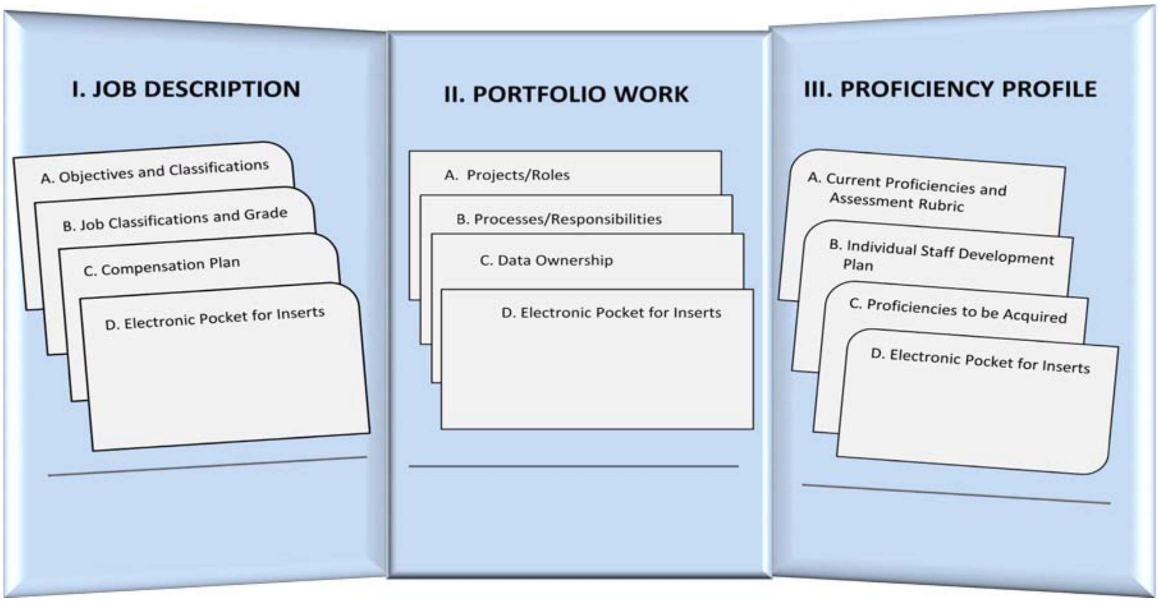


Figure 2: Job Portfolio Model

Proficiency-based job descriptions use a job portfolio model to cluster the additional functions, tasks, and proficiencies into logical groupings. The job portfolio is a series of modular, competency- and function-based job matrices that may be combined in different ways to define dynamic organizational roles. Job portfolios are based on the work that needs to be done, the proficiencies required to fulfill the work, and the proficiencies possessed by the organization. The "job description" becomes a "job portfolio," consisting of core functions and proficiencies and domain/function-specific proficiencies.

Once function-based proficiencies, as well as their associated performance measures and rubrics, have been identified, an analysis of acquired versus required proficiencies can be used for effective staff development planning.

5.0 IMPLEMENTATION STRATEGIES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., ODS for Chapter 5) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 5, IT Organizational Development and Staffing, Section 5.1, Organization and Staffing, would be numbered ODS-1.1, the second Action Plan in this same section would be ODS-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- **Organization and Staffing**

  ODS-1.1 Information, Communication, and Technology Services (ICTS) Department

  ODS-1.2 "Learning Technology" Support Group

  ODS-1.3 Cyber Security Officer (Action Plan provided in Chapter 12)

- **IT Career and Program Development**

  ODS-2.1 Job Portfolios for ICTS Staff

  ODS-2.2 Career Roadmap for ICTS Staff

- **Technical and End-User Support**

  ODS-3.1 Revise the Role of the Library Media Specialists

  ODS-3.2 Expanded Use of Track-IT! (No Action Plan Required.)

- **Staffing for Operational, Technical, and End-User Support**

  ODS-4.1 Service Level Agreements

  ODS-4.2 Extended Hours for Service Desk (No Action Plan Required.)

5.1 Organizational Development and Staffing

Initiative: Information, Communication, and Technology Services (ICTS) Department			
Recommendation:	ODS – 1.1 Reorganize IT into the ICTS Department, which will be responsible for infrastructure, data, integration, and instructional technology.	**Key Performance Indicator(s):**	1. Restructured IT Department, which includes Library Media and Instructional Technology 2. School-based research, information, communications, and technology teams
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Superintendent Chief Financial Officer HR Director Chief Academic Officer Information Technology Officer

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Reorganize the IT Department into the Information, Communication, and Technology Services (ICTS) Department, which will be responsible for infrastructure, data, integration, and instructional technology.	X		
2. Define the services to be provided by ICTS as dictated by an assessment of how IT services can help others meet the goals contained within the school improvement plan.	X		
3. Review and revise position of Database Administrator to monitor the student database, design and maintain tables and reports, support the integration of data systems, and provide ongoing training to district and school staff.	X		
4. Identify the staffing needs based on the updated IT services as well as the contemporary requirements for the IT positions and skills needed to do the job.	X		
5. Create a full-time "Learning Technology" support group responsible for professional development planning and implementation, curriculum integration, and selecting technologies appropriate for PPSD.	X		
6. Ensure the technology staff is at a ratio of one FTE per 500 computers, including technical support staff, repair technicians, network support staff, and Help Desk staff.	X	X	X
7. Develop and disseminate a hierarchy of the ICTS Department so that district staff members are aware of the roles, responsibilities, and linkages of the members of the IT Department.	X		
8. Move the Library Media staff into this group to assist with the coordination of instructional technology, media	X		

Initiative: Information, Communication, and Technology Services (ICTS) Department

Recommendation:	ODS – 1.1 Reorganize IT into the ICTS Department, which will be responsible for infrastructure, data, integration, and instructional technology.	**Key Performance Indicator(s):**	1. Restructured IT Department, which includes Library Media and Instructional Technology 2. School-based research, information, communications, and technology teams
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Superintendent Chief Financial Officer HR Director Chief Academic Officer Information Technology Officer

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
arts, and information resources and support the integration of information technology literacy skills and technology competencies in to the curriculum.			
9. Within each school, establish a research, information, communications, and technology team that consists of the principal, Library/Media Specialist (or designed), technical support staff, classroom teacher, and one or two other school-based staff. The committee will serve as the liaison between the school and ICTS and will oversee the strategic technology decisions for the school.		X	
10. Consider bringing the Communications department into this group – include the website, it is the current link to ITCS - the team in the school would be responsible for the school website content. This team would drive the tech decisions within the school.		X	

Interdependencies:	**Estimated Cost:** Year 1: $ 90,000 Year 2: $86,000 Year 3: $86,000 **Total: $268,000**	**Potential Funding Source(s):**

Initiative: "Learning Technology" Support Group

Recommendation:	ODS – 1.2 Create a full-time "Learning Technology" support group at the school district level responsible for providing teachers with integration support on current and emerging classroom technology.	**Key Performance Indicator(s):**	1. Creation of "Learning Technology" support group who work closely with teachers on technology integration.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	HR Director Information Technology Officer Chief Academic Officer

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	 Year 2 14/15	 Year 3 15/16
1. Create and staff a full-time "Learning Technology" support group responsible for professional development planning and implementation, curriculum integration, and selecting technologies appropriate for PPSD. The team will reside within the Technology Department, but have a dotted line from Chief Academic Officer.	X	X	X
2. Define the mission, vision, and goals of the Learning Technology support group.	X		
3. Identify organizational and staffing needs.	X		
4. Determine the staff proficiencies required to perform functional requirements.	X		
5. Write job descriptions, and recruit accordingly.	X		
6. Define the role of each team member of the district-level Learning Technology team, focusing on technology teacher support and classroom integration.	X		
7. Define a service level agreement between the Learning Technology team and what schools and teachers can expect for support and professional development.	X		
8. Maintain open communication to ensure that all roles are represented in decision-making and planning.	X		

Interdependencies: ODS – 1.1	**Estimated Cost:** Year 1: $ 172,000 Year 2: $172,000 Year 3: $172,000 **Total: $516,000**	**Potential Funding Source(s):**

5.2 IT Career and Program Development

Initiative: Job Portfolios for ICTS Staff			
Recommendation:	ODS – 2.1 Revise job descriptions to reflect all job responsibilities, technical proficiencies, qualifications, certifications, and experience required for these positions.	**Key Performance Indicator(s):**	1. Updated IT job descriptions with a review cycle. 2. Updated IT staff evaluation process.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	ICTS Director H/R Director

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Revise job descriptions to reflect all job responsibilities, technical proficiencies, qualifications, certifications, and experience required for these positions.		X	
2. Identify the proficiencies (skills, knowledge, and behavioral attributes) required for all employment tasks for each IT staff member.		X	
3. Update the IT staff evaluation process/criteria based on predetermined rubrics aligned to each of the staff proficiencies.		X	
4. Provide in-house training, as in "lunch and learn" sessions, so that individual staff members can share their expertise and all team members will benefit from cross-training.	X	X	X
5. Include ICTS staff in training for new technologies unveiled to the teaching staff.	X	X	X
6. Provide vendor training for IT staff on new products that are being introduced to users so that they can respond to typical questions in a timely fashion.	X	X	X
7. As technologies are updated, such as changing to a different network operating system, job descriptions or requirements should be revised accordingly. Schedule and conduct regular reviews and updates of job descriptions.		X	X

Interdependencies: ODS – 1.1	**Estimated Cost:**	Year 1: $ 3,000 Year 2: $15,000 Year 3: $3,000 **Total: $21,000**	**Potential Funding Source(s):**

Initiative: Career Roadmap for ICTS Staff

Recommendation:	ODS – 2.2 Develop a formal career track with qualifications, training, and resources to move to the next level. Implementation strategies include a “roadmap” to define each path of the career ladder and the skills, coursework, and experience that are needed to progress.	**Key Performance Indicator(s):**	1. Formal career path for IT Staff
Alignment to District/ Superintendent’s Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	ICTS Director H/R Director

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Determine the overlap and interrelationship of all technical support, network and systems administration, media, data administration, and other technology positions within PPSD.			X
2. Flow-chart the qualifications, relationship, and career paths of these positions within PPSD.			X
3. Define the skills, knowledge, and attitudes needed to do these jobs successfully.			X
4. Develop and provide “in-house” and “virtual” training programs to grow and develop IT, library, and media staff.			X
5. Publish a “roadmap” to define each path of the career ladder and the skills, coursework, and experience that are needed to progress.			X

Interdependencies: ODS – 2.1	**Estimated Cost:** Year 1: $ Year 2: $ Year 3: $ 5,000 **Total: $5,000**	**Potential Funding Source(s):**

5.3 Technology and End-User Support

Initiative: Revise the Role of the Library Media Specialists			
Recommendation:	ODS – 3.1 Update the role of library media specialists to Facilitators of Research, Information and Technology to support the integration of technology into the curriculum.	**Key Performance Indicator(s):**	1. Updated job descriptions for Coordinators of Research, Information, and Technology Services 2. Instructional resources "tool kit" for each grade level.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	ICTS Director H/R Director

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Timeline Year 2 14/15	Timeline Year 3 15/16
1. While working with the Providence Teachers' Union, revise the job description for library media specialists as Coordinators of Research, Information, and Technology Services. The new job description will formalize many of the responsibilities that the library media specialists currently perform.	X	X	
2. Conduct a series of transitional sessions with this group to review expectations and ensure that all have the training needed to do this.		X	X
3. Plan a bi-weekly session with the Coordinator of Professional Development, Teaching and Learning, and Technology for training and teambuilding.		X	X
4. Identify a subset of this group to work on strategies for integrating technology competencies and information literacy skills in the curriculum. Disseminate this at the training sessions.		X	X
5. Identify instructional resources to include in the "toolkit" for each grade level. Make available through the Library Media Centers.		X	X
6. Identify a location to store the resources. Investigate the practicality of storing within the IMS.		X	X

Interdependencies: ODS – 1.2, CA-2.2, CA-2.3	**Estimated Cost:** Year 1: $ 2,500 Year 2: $5,000 Year 3: $5,000 **Total: $12,500**	**Potential Funding Source(s):**

5.4 Staffing for Operational, Technical, and End-User Support

Initiative: Service Level Agreements

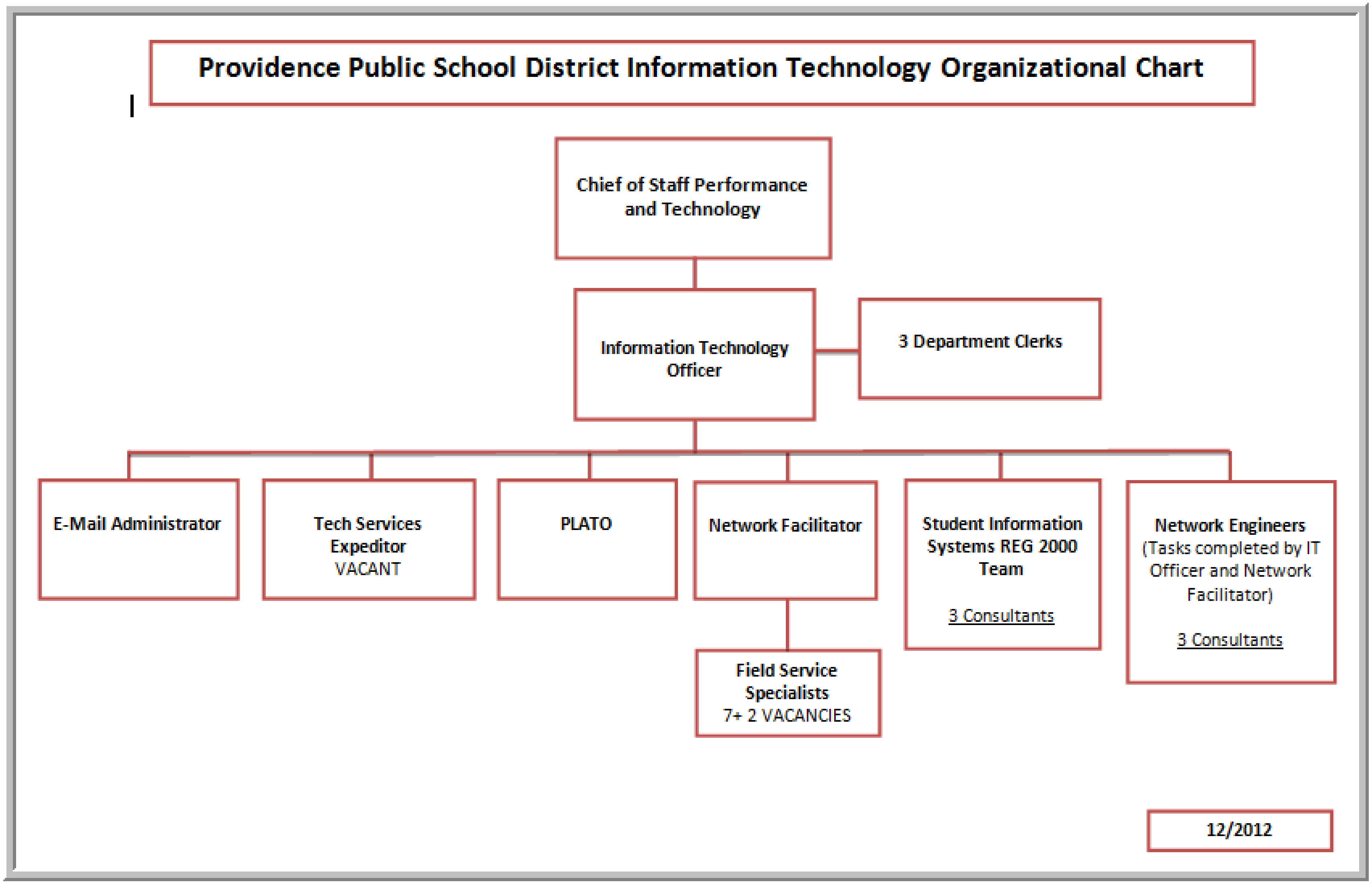
Recommendation:	ODS – 4.1 Create and agree upon service level agreements (SLAs) between the PPSD IT Department and the end users its services, including PPSD Departments, Schools, Faculty, and Staff.	**Key Performance Indicator(s):**	1. SLAs in place between the PPSD IT Department and the end users is serves.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Information Technology Officer

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Determine the list of end users supported by the PPSD IT Department. The list will include schools, staff, and departments.	X		
2. Define service level agreements between the IT Department and end users defining the services provided by IT and expected response times and resolution of issues.	X		
3. Include in the SLA the information that must be provided by users in order to facilitate the processes.	X		
4. Agree upon the SLA with the respective groups and disseminate.	X		
5. Monitor the SLAs to determine effectiveness and to improve practice and share results.	X		
6. Schedule periodic reviews of the SLA to ensure they are meeting end user needs.	X	X	X

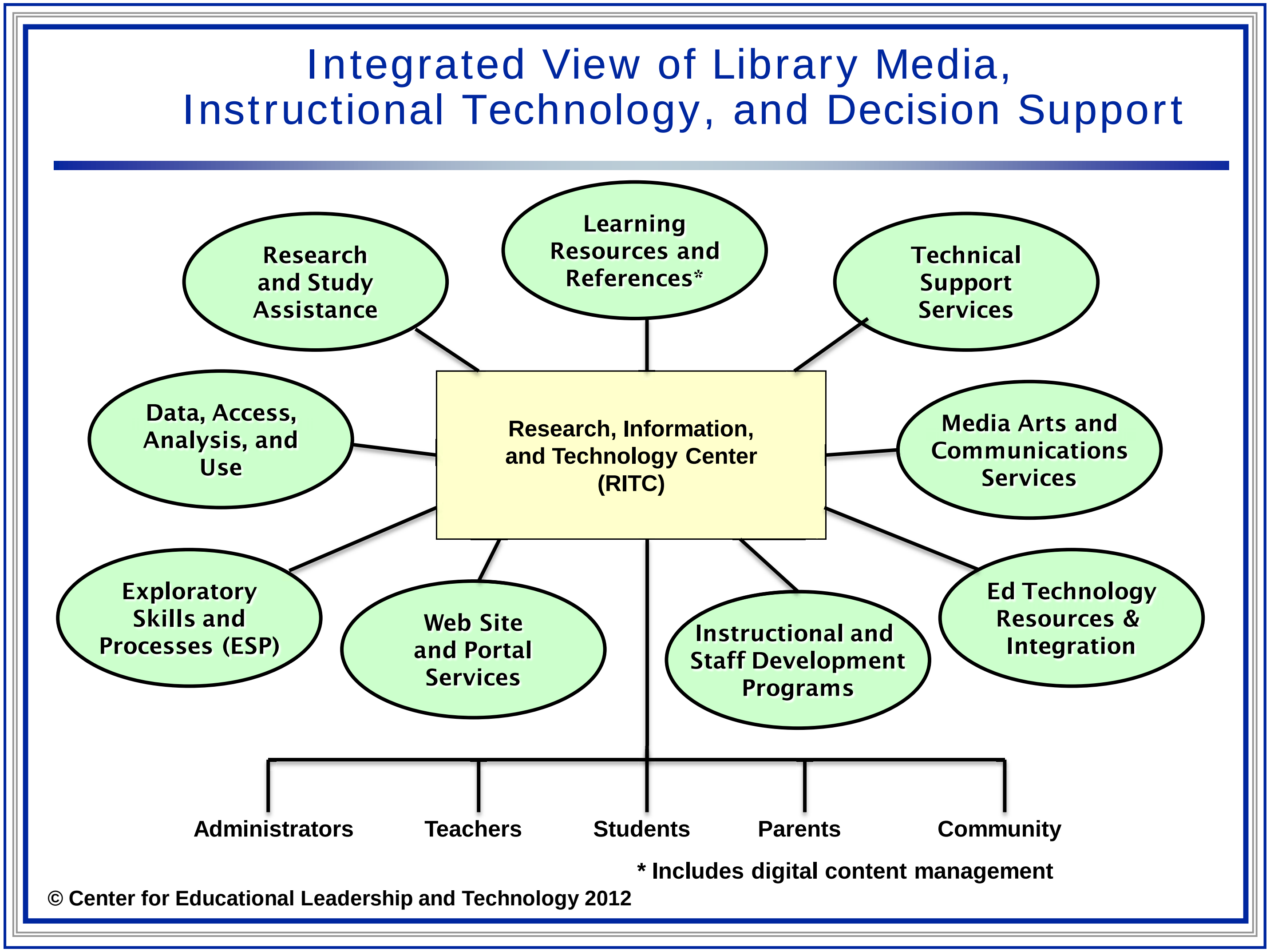
Interdependencies:	**Estimated Cost:**	**Potential Funding Source(s):**
	Year 1: $7,500 Year 2: $1,000 Year 3: $1,000 **Total: $9,500**	

Appendices

Appendix A


Providence Public School District Information Technology Organizational Chart
Chief of Staff Performance and Technology
Information Technology Officer
3 Department Clerks
E-Mail Administrator
Tech Services Expeditor VACANT
PLATO
Network Facilitator
Student Information Systems REG 2000 Team
3 Consultants
Network Engineers (Tasks completed by IT Officer and Network Facilitator)
3 Consultants
Field Service Specialists 7+ 2 VACANCIES
12/2012

Appendix B


Integrated View of Library Media, Instructional Technology, and Decision Support
Research and Study Assistance
Learning Resources and References*
Technical Support Services
Data, Access, Analysis, and Use
Research, Information, and Technology Center (RITC)
Media Arts and Communications Services
Exploratory Skills and Processes (ESP)
Web Site and Portal Services
Instructional and Staff Development Programs
Ed Technology Resources & Integration
Administrators
Teachers
Students
Parents
Community
* Includes digital content management
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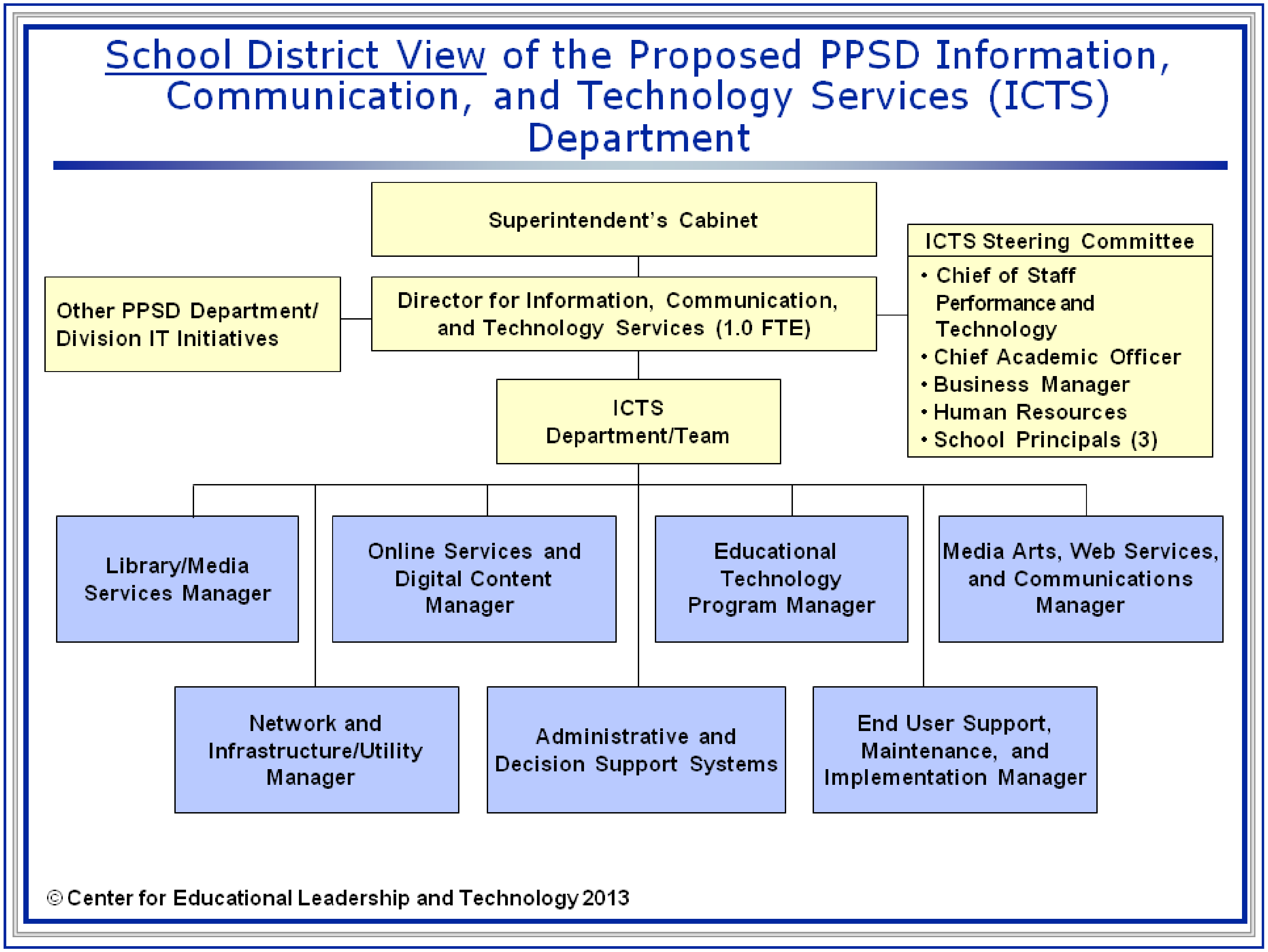
Appendix C


School District View of the Proposed PPSD Information, Communication, and Technology Services (ICTS) Department
Superintendent's Cabinet
Other PPSD Department/ Division IT Initiatives
Director for Information, Communication, and Technology Services (1.0 FTE)
ICTS Steering Committee
• Chief of Staff Performance and Technology
• Chief Academic Officer
• Business Manager
• Human Resources
• School Principals (3)
ICTS Department/Team
Library/Media Services Manager
Online Services and Digital Content Manager
Educational Technology Program Manager
Media Arts, Web Services, and Communications Manager
Network and Infrastructure/Utility Manager
Administrative and Decision Support Systems
End User Support, Maintenance, and Implementation Manager
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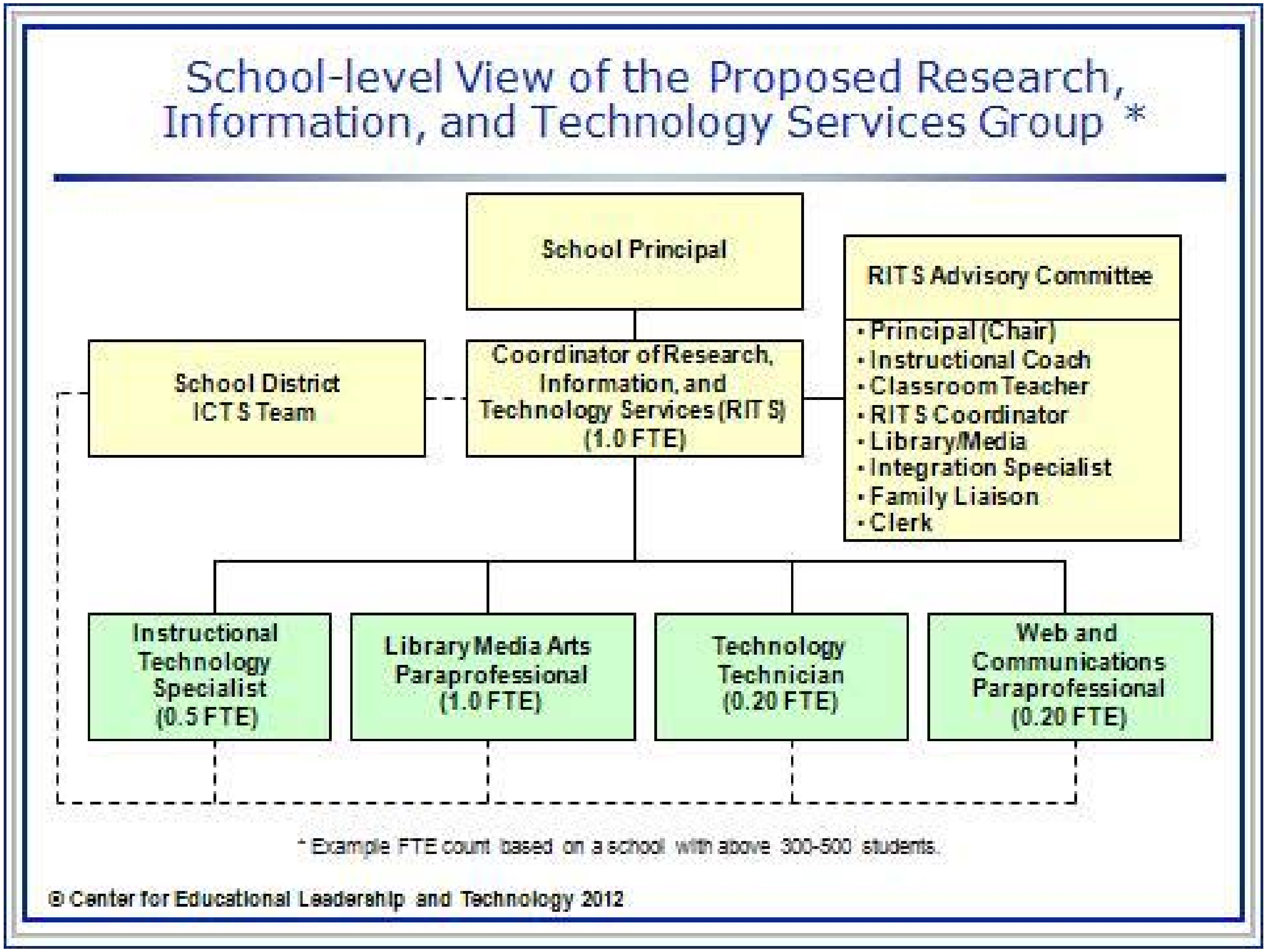
Appendix D


School-level View of the Proposed Research, Information, and Technology Services Group *
School Principal
RITS Advisory Committee
• Principal (Chair)
• Instructional Coach
• Classroom Teacher
• RITS Coordinator
• Library/Media
• Integration Specialist
• Family Liaison
• Clerk
School District ICTS Team
Coordinator of Research, Information, and Technology Services (RITS) (1.0 FTE)
Instructional Technology Specialist (0.5 FTE)
Library Media Arts Paraprofessional (1.0 FTE)
Technology Technician (0.20 FTE)
Web and Communications Paraprofessional (0.20 FTE)
* Example FTE count based on a school with above 300-500 students.
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Chapter 6:
Staff Development and Human Resources Management

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Knowing is not enough; we must apply. Willing is not enough; we must do. "*
>
> —Goethe

The **Staff Development and Human Resources Management** chapter focuses on the technology proficiencies that are desirable by several different groups of employees. This includes instructional staff (i.e., teachers, media specialists, and school-site administrators), non-instructional support staff (i.e., administrative assistants, secretaries, clerks), other individuals who help with the operations side of the district. Additionally, technical staff members, who are charged with maintaining state-of-the art technology systems and support of the educational and support functions in each part of the district are considered. Once proficiencies for each audience have been established, staff development needs to be in place to continuously improve these skills and proficiencies.

The effective management of technology-enhanced learning environments requires that teachers be provided with training and ongoing support to select and utilize artfully the technology resources that can best address the state learning standards, critical mandates, and individual learning needs of their students. Administrators, library/media specialists, and clerical support staff also need training to integrate technology effectively into their daily functions. Thus, increased student achievement must be the driving force for **all** IT decisions in the district.

The subtopics within this section include:

- Staff Proficiencies
- Staff Development Programs
- Staff Development Planning
- Proficiency-based Approach to Staff Development and Human Resources Management
- Recruitment, Selection, and Retention of Highly Qualified Staff
- Technology in Support of Staff Development Programs

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September – October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Staff Development and Human Resources Management* section of the *Key Findings and Recommendations* final report.

2.1 Staff Proficiencies

PPSD has not formally adopted a set of technology standards for teachers, administrators, or instructional staff, nor has proficiency been mandated. Mastery levels vary based on the interest of the individual and the priorities of the principal. The Rhode Island Department of Education (RIDE) has adopted the National Educational Technology Standards for Teachers (NETS•T) and Administrators (NETS•A).

Technology integration skills for teachers are also inconsistent throughout the district. Many of the younger teachers are technology savvy, but these new teachers still need to learn the pedagogy of teaching and learning using 21st century tools and strategies. Furthermore, many teachers, especially elementary teachers, lack access to current technology resources.

Job descriptions for most staff do not clearly define responsibilities or the competencies and certifications that are required to perform them. Teacher job descriptions highlight qualifications, specifically, "Excellent technology skills, including

- familiarity with communication, presentation, and data management tools and applications in desktop, web-based, and mobile environments
- willingness and ability to model information, communication, technology, and media literacy for students, colleagues, parents, and community
- willingness and ability to continuously develop and evolve new skills and support colleagues in the development of their skills."

Teachers are not required to provide evidence of the required technology qualification. Additionally, administrator job descriptions do not include any technology qualifications.

The key findings for **Staff Proficiencies** include:

- PPSD has not formally adopted a set of technology standards, such as the (NETS•T) or (NETS•A), for teachers, administrators, or other staff.
- In general, technology competencies are not included in job descriptions.
- Technology integration skills for teachers are inconsistent throughout the district.

2.2 Staff Development Programs

PPSD uses My Learning Plan (MLP) for managing professional development throughout the district. MLP is used to publish the professional development catalogs, register for offerings, and track payment. All professional development is coordinated under the single umbrella of the Director of Professional Learning. The person responsible for managing MLP has not received any formal MLP training which may be one reason that PPSD is not using the full capability of MLP. MLP does not communicate with other PPSD data systems. Staff information is manually entered and deleted for new hires and those who leave the school district.

Training for technology skills and integration strategies is ad hoc as no one is responsible for providing this service. Minimal integration of technology tools or resources is embedded within content courses.

The key findings for **Staff Development Programs** include:

- The PPSD offerings provide few opportunities to integrate technology into the curriculum.
- MLP is not fully implemented in PPSD, nor had the program manager engaged in formal training.
- MLP is a data silo that does not communicate with other PPSD data systems.

2.3 Staff Development Planning

The Director of Professional Learning is responsible for staff development within PPSD. MLP stores an individual profile for each teacher but this profile does not include their professional development plan. Through MLP teachers can register for courses connected to their professional development plan. Technology goals are infrequently and not consistently included in individual professional development plans.

Teachers and administrators throughout the school district are required to attend specific trainings related to their field. These required offerings are attended during district-professional development days or sometimes during the summer months. Other professional development occurs throughout the year.

The key findings for **Staff Development Planning** include:

- MLP stores each teacher's individual profile, but not their professional development plan.
- Technology goals are often not included in professional development plans.

2.4 Proficiency-Based Approach to Staff Development and Human Resources Management

Human resource management, payroll, and employee benefits tracking are processed through Lawson, a service that is a shared resource with the city of Providence. Many district end-users find that the software does not meet their needs. This deficit may be the result of training issues or lack of necessary software modules. (See Chapter 10 for additional information.)

The district does not have a proficiency-based approach to Human Resources Management. Additionally, the compensation structure is not tied to performance and proficiencies. There is no system in place to track proficiencies for any staff member.

The key findings for **Proficiency-Based Approach to Staff Development and Human Resources Management** include:

- The district does not take a proficiency-based approach to Human Resources Management, thus does not define or align proficiencies with job descriptions, compensation, and advancement.

2.5 Recruitment, Selection, and Retention of Highly Qualified Staff

Open positions are posted on the school district's website and on various job posting sites, such as SchoolSpring and EdWeek. Applicants complete the online application via the PPSD website and post applications, transcripts, references, and other supporting documents. School-based hiring teams have access to the applicant information and select from a predefined list of questions during the interview process. Technology proficiencies are not formally assessed. It is at the hiring team's discretion to ask about technology use. Once a hiring selection is made, the school hiring team recommends the candidate for employment.

A formal orientation process for new staff is not conducted, frequently resulting in frustration by new employees. The estimated 50 new annual teachers are informally assisted by other teachers in their building on topics that include how to get an email account and entering student attendance.

The key findings for **Recruitment, Selection, and Retention of Highly Qualified Staff** include:

- New staff, especially teachers, report frustration over the lack of a new employee orientation.
- School-based hiring teams are responsible for employment decisions.

2.6 Technology in Support of Staff Development Programs

PPSD uses My Learning Plan (MLP) to manage professional development throughout the district. MLP is used to publish the professional development catalogs, register for offerings, and track payment online. MLP is not used to provide ongoing support and follow-up for professional development activities or monitor and evaluate progress and growth of staff proficiencies.

Professional development offerings are primarily offered face-to-face, with few synchronous or asynchronous online opportunities. The recent TeachScape online learning opportunities were well received.

The key findings for **Technology in Support of Staff Development Programs** include:

- MLP is not used to provide ongoing support and follow-up for professional development activities.
- Staff development offerings are almost exclusively offered face-to-face.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Staff Development and Human Resources Management* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

3.1 Staff Proficiencies

SDHR-1.1 Technology Proficiencies for All Staff

Convene a stakeholder group to define and adopt technology proficiencies for all staff, including paraprofessionals and clerical staff, as determined by productivity and/or instructional needs. Revise job descriptions to reflect the changes and include in evaluation process.

SDHR-1.2 Rigorous Technology Professional Development

Offer staff development selections that provide rigorous technology professional development for all teachers. Each course or mini-course should include a minimum of 10 hours of training that includes skills taught in context with follow-up activities that are directly related to the teacher's content area. Offer classroom mentoring and modeling as needed.

3.2 Staff Development Programs

SDHR-2.1 Systemic Technology Professional Development

Model the integration of technology in all trainings when appropriate. Explore best practices in the use of social networking and other tools to determine which tools will be used within PPSD to foster professional learning communities (PLCs).

SDHR-2.2 Harvest Increasing Value from MyLearningPlan (No Action Plan Required.)

Obtain the full value of MLP by offering formal training to MLP staff and determine which currently unused software capabilities are beneficial for PPSD to implement. Explore the option of including non-PPSD offered professional development into the system so that it can serve as the single repository for all activities completed by someone.

3.3 Staff Development Planning

SDHR-3.1 District-Wide Technology Professional Development Plan

Develop a technology professional development plan to ensure that staff at all levels of proficiency has the opportunity to become proficient in using and integrating technology as outlined by the revised job descriptions.

3.4 Proficiency-Based Approach to Staff Development and Human Resources Management

SDHR-4.1 Proficiency-Based Model for Human Resource Management

Develop and implement a proficiency-based model for human resource management that is linked to student achievement.

3.5 Recruitment, Selection, and Retention of Highly Qualified Staff

SDHR-5.1 Orientation Program for New Employees

Create a formal orientation process for new staff members to introduce them to the varied systems within PPSD and the school districts formal processes and procedures.

3.6 Technology in Support of Staff Development Programs

SDHR-6.1 Virtual Staff Development Opportunities

Offer synchronous and asynchronous online learning opportunities that allow participants to partake anytime in staff development from anywhere.

4.0 RESEARCH AND BEST PRACTICES

Staff development is one of the primary considerations to the success of any technology implementation and its cost should be factored into the total cost of any project. A successful staff development program depends on adequate staffing, technical and financial support, and a commitment from the central administration that the training goals are important. All of these factors must be present in order to ensure the success of the staff development program.

In a district such as Providence Public Schools, it is critical to establish a baseline of technology competencies for all staff. Just as in classroom teaching, if training on any topic is offered to an audience whose level of experience varies widely, there will be some participants who are at the mastery level and some who do not even have the skills to begin. If only the needs of those at the bottom are addressed, those at the top often lose interest before the content is presented. If their needs are ignored, that group may not benefit at all from the presentation. Ideally, the standard deviation would be narrower. This occurrence can be ensured by raising the minimum proficiency level of all staff, which requires a significant effort in targeted training and a district mandate to guarantee the participation and support on the part of teachers, administrators, and staff. In addition to administrative support, staff development depends on adequate staffing to provide training for all audiences and adequate technical support so that presentations are not interrupted or delayed by technical difficulties.

The staff development that is based on the vision and goals of the district will be sustainable over time by ensuring that there are sufficient resources for implementation so that trained staff have the opportunity to use the skills they have learned. Through long-term planning and appointing “go to” people for each area, the district can be sure that the program will be a success.

Technology Staff Development

Staff development related to computer technology skills and potential applications in the classroom will result in learning outcomes that evolve to meet the needs of educators and their students. Staff development has no meaning unless one accepts the assumption that educators can and will continue to develop their skills and proficiencies beyond those demonstrated at the start of employment. People cannot survive in rapidly changing organizations if they are not provided with new learning experiences.

Because staff development is geared to an adult audience, here are some things to consider when providing staff development:

- The integration of new strategies and/or tools into an environment requires the inclusion of staff development to ensure successful results. In the area of technology and curriculum integration, the staff development offered has a direct impact on the success of implementation.
- These development opportunities will address the following areas:
  – technical understanding of the use of the application and/or device

- pedagogical understanding of when and how to integrate the new strategy or device into a content area in order to address content standards
- practical understanding of the use of the strategy or device to make the management of one's work easier
- knowledge of ways to manage proper use and care of the application and/or device to ensure that it stays in good condition for the next user

The methods in which technology staff development and training are delivered vary in their approach and desired outcome. Each staff development and training session should be structured and customized to meet the needs, skill level, and interests of its target audience, addressing what can be accomplished given the computer technology resources available. In addition, staff development and training can capitalize on the expansion of the technology field to provide the most advanced, participant-oriented learning opportunities possible. The availability of Web 2.0 tools expands and extends opportunities for professional development so that teachers and staff can participate at their convenience.

Proficiency-Based Model for Staff Development Planning and Management

According to Peter Senge, continuous learning is the basis of sustainable growth and organizational success. Staff development is the formal process by which an organization cultivates and nurtures the continuous learning and improvement of its personnel. As organizations move away from a focus on training to a focus on improving performance, they require a systematic way to align performance with strategic outcomes and goals, the most critical of which in education is improved student learning. The synergy of staff knowledge, skills, attitudes, and aptitudes, known as proficiencies, is an organization's primary asset. Proficiencies are the cornerstones of an effective, integrated human resources management structure, in which staff development is a critical building block.

The proficiency-based approach to staff development is based upon three core beliefs:

- Every adult has the capacity to be a self-directed, lifelong learner when provided with quality development information and resources.
- Every adult has the capacity to design and implement effective individual development plans that address growth and improvement priorities and that are aligned with district and department/school strategic goals.
- Continual, systemic improvement is directly linked to the ongoing learning of all individuals and groups and is focused on strategic, high-leverage priorities of the district, department/school, team, and individual.

Proficiency-based Human Resources Management/Staff Development has its foundation in the strategic framework of the organization it supports as well as its mission, vision, goals, and functions. This conceptual model uses this framework and the education organization's student learning objectives as the basis for identifying required staff proficiencies organization-wide.

In rethinking staff development, supervision, and evaluation from the proficiency-based perspective, educators have a rich opportunity for reconfiguring standard human resource management processes into opportunities for learning. Since, in a continuous improvement cycle, such as the *Sterling Model*, planning, implementation, and evaluative events are designed to be participatory and ongoing, the human resource management/staff development functions frame a multi-dimensional process of collective dialogue, learning, and improvement. The paradigm shifts from one of sole accountability to one that recognizes important organizational interdependencies.

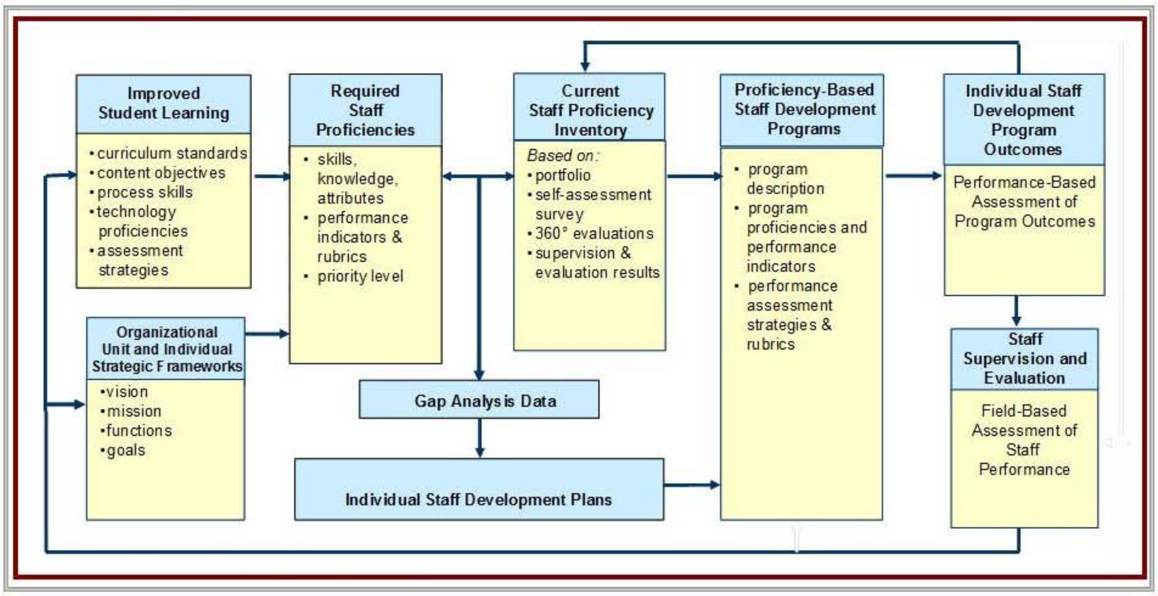


Figure 1: Model for Using Technology to Develop and Support a Proficiency-Based Approach to Staff Development

Once function-based proficiencies – as well as their associated performance measures and rubrics – have been identified, an analysis of acquired versus required proficiencies can be used for effective staff development planning. As with students, staff performance should be evaluated according to multi-level inputs ranging from self-assessment, to peer review, to work portfolios, to dialogues with supervisors and colleagues. Individual staff development plans may be created to address proficiency development needs. In turn, the outcomes of staff development efforts provide an important and necessary input to the supervision/evaluation process. Because this model is predicated on effective decision support tools, adjustments can be made in real time, with real data, as organizational and individual needs and circumstances require.

To implement this model effectively, it is useful for educators to develop school improvement plans electronically so that information about mission, vision, and goals is readily accessible. Likewise, it is imperative to link the Human Resources Management/Staff Development system with an integrated student management and document storage/retrieval system so important student learning data can be accessed, analyzed, and shared readily and efficiently by all staff members. Finally, the successful implementation of this model requires a definition of all key components and an understanding by all staff members about the purpose and desired outcomes of the proficiency-based Human Resources Management/Staff Development approach.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation approaches included in this chapter incorporate the following factors:

- District's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., CA for Chapter II) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 6 – Staff Development and Human Resources Management, section 2.1 Staff Proficiencies would be numbered SDHR-1.1, the second Action Plan in this same section would be SDHR-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- Staff Proficiencies

  SDHR-1.1 Technology Proficiencies for All Staff

  SDHR-1.2 Rigorous Technology Professional Development

- Staff Development Programs

  SDHR-2.1 Systemic Technology Professional Development

  SDHR-2.2 Harvest Increasing Value from MyLearningPlan (No Action Plan Required)

- Staff Development Planning

  SDHR-3.1 District-Wide Technology Professional Development Plan

- Proficiency-Based Approach to Staff Development and Human Resources Management

  SDHR-4.1 Proficiency-Based Model for Human Resource Management

- Recruitment, Selection, and Retention of Highly Qualified Staff

  SDHR-5.1 Orientation Program for New Employees

- Technology in Support of Staff Development Programs

  SDHR-6.1 Virtual Staff Development Opportunities

5.1 Staff Proficiencies

Initiative: Technology Proficiencies for All Staff			
Recommendation:	SDHR– 1.1 Convene a stakeholder group to define and adopt technology proficiencies for all staff, including paraprofessionals and clerical staff, as determined by productivity and/or instructional needs. Revise job descriptions to reflect these and include in evaluation process.	**Key Performance Indicator(s):**	1. Adopted technology proficiencies for all staff. 2. Revised job descriptions for all staff reflecting technology proficiencies.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	H/R Director Director of Professional Learning Technology Director

Action Steps *Denotes that step has already started.	Timeline:		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Convene a stakeholder group to define and adopt technology proficiencies for all staff as determined by productivity and/or instructional needs. Consider starting with proficiencies based on the National Educational Technology Standards for Teachers (NETS•T) standards.		X	
2. Revise and align job descriptions with the technology competencies that have been defined for all positions. Revise job descriptions to reflect all job responsibilities, technical proficiencies, qualifications, certifications, and experience required for these positions. Institute a review and vetting process to ensure that all negotiating bodies accept the revised job descriptions.		X	
3. Create and administer an annual online survey consisting of a subset of technology skills. Ensure that new teachers participate in this survey.		X	
4. A supporting tracking system within the human resource management tool may assist in determining staff acquisition of PPSD technology proficiencies based on the National Educational Technology Standards for Teachers (NETS•T) standards.		X	X
5. Develop a gap analysis based on the results of the survey and the competencies required for specific jobs.		X	X
6. Define a professional development strategy for targeting gaps in competencies for individual staff members.		X	X

Initiative: Technology Proficiencies for All Staff			
Recommendation:	SDHR– 1.1 Convene a stakeholder group to define and adopt technology proficiencies for all staff, including paraprofessionals and clerical staff, as determined by productivity and/or instructional needs. Revise job descriptions to reflect these and include in evaluation process.	**Key Performance Indicator(s):**	1. Adopted technology proficiencies for all staff. 2. Revised job descriptions for all staff reflecting technology proficiencies.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	H/R Director Director of Professional Learning Technology Director

Action Steps ***Denotes that step has already started.**	**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
7. Explore vehicles for delivering effective, high-quality professional development including workshops, mentoring, online learning, streamed video, podcasting, and other models, ensuring that the infrastructure and culture is in place to support these efforts.		X	X
8. Continue to update MLP as new PD opportunities become available.		X	X

Interdependencies: CA-1.1, CA-1.2, LESF-1.1, ODS-1.2, ODS-2.1, ODS-3.1	**Estimated Cost:** • Year 1: $ • Year 2: $50,000 • Year 3: $20,000 **Total: $70,000**	**Potential Funding Source(s):**

Initiative: Rigorous Technology Professional Development			
Recommendation:	SDHR– 1.2 Offer staff development selections that provide rigorous technology professional development for all teachers and embrace a culture of lifelong learning.	**Key Performance Indicator(s):**	1. Staff Development Offerings for Teachers to Gain Technology Proficiencies
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	H/R Director Director of Professional Learning Technology Director

Action Steps ***Denotes that step has already started.**	**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Identify top goals for technology professional development. These should be defined in the technology professional development plan and focus on needs such as technology integration and embed the important concept of lifelong learning.		X	
2. Create an online survey consisting of a subset of technology skills. Ensure that new teachers participate in this survey. Build a gap analysis report defining each individual's developmental needs.		X	
3. Each course or mini-course should include a minimum of 10 hours of training that includes skills taught in context with follow-up activities that are directly related to the teacher's content area.		X	X
4. District instructional technology staff provide opportunities for in school modeling, coaching, mentoring, and professional learning communities using a "model, co-teach, observe" strategy.		X	X
5. Working with manageable sized groups assign the early groups to serve as technology advocates within their schools as subsequent sessions bring in additional teachers.		X	X

Interdependencies: SDHR– 1.1, ODS-1.2	**Estimated Cost:**	• Year 1: $ • Year 2: $650,000 • Year 3: $650,000 **Total: $1,300,000**	**Potential Funding Source(s):**

5.2 Staff Development Programs

Initiative: Systemic Technology Professional Development			
Recommendation:	SDHR– 2.1 Model the integration of technology in all training when appropriate. Explore best practices in the use of social networking and other tools to determine which tools will be used within PPSD to foster professional learning communities (PLCs).	**Key Performance Indicator(s):**	1. Percentage of staff development offerings that integrate technology into delivery and content.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	Director of Professional Learning Learning Support Team

Action Steps *Denotes that step has already started.	Timeline: Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Model the use of technology in training when appropriate. For example, when curriculum specialists work with teachers on instructional strategies, they should demonstrate appropriate integration of technology resources, activities, and assessment strategies.	X	X	X
2. Encourage principals to model the use of technology tools during staff meetings and other opportunities.		X	X
3. Work with curriculum specialists and other departments to ensure that technology is used as a vehicle in all professional development where appropriate.		X	X
4. Explore best practices in the use of social networking and determine which tools will be used within PPSD to foster professional learning communities (PLCs), opportunities for collaborative inquiry into a specific topic or area of interest. Include this goal in the technology professional development plan.		X	X
5. Consider implementing building level technology teams to assist with support and professional development delivery by drawing upon expertise of current staff members.		X	X

Interdependencies: ODS-1.2	Estimated Cost:	Potential Funding Source(s):
	• Year 1: • Year 2: $ 7,500 • Year 3: $32,500 **Total: $40,000**	

5.3 Staff Development Planning

Initiative: District-Wide Technology Professional Development Plan			
Recommendation:	SDHR– 3.1 Develop a technology professional development plan to ensure that staff at all levels of proficiency has the opportunity to become proficient in using and integrating technology.	**Key Performance Indicator(s):**	1. District Technology Professional Development Plan
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Director of Professional Learning Technology Officer Chief Academic Officer

Action Steps ***Denotes that step has already started.**	**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Develop a technology professional development plan to ensure that staff at all levels of proficiency has the opportunity to become proficient in using and integrating technology.	X	X	X
2. As part of the technology professional development plan/calendar, design and offer a series of technology-related PD activities in the formats most preferred by the district staff. In addition, explore optional vehicles for delivering effective, high-quality professional development including online learning, webinars, streamed video, podcasting, and other models, ensuring that the infrastructure and culture is in place to support these efforts. Include training as a component in the rollout of all new initiatives.	X	X	X
3. Research, develop, and implement a model for tracking individualized professional development plans based upon teacher and administrator proficiencies, including technology competencies. Adopt a process of linking professional development trainings, proficiencies, and evaluations into one report to assist in guiding the staff member along their unique PD plan.	X	X	X
4. As service providers, Help Desk staff should be invited to training for all technology-related initiatives, including that which is instructionally focused.	X	X	X

Interdependencies: LESF-1.1, LESF-1.3	Estimated Cost:	Potential Funding Source(s):
	• Year 1: $ 5,000 • Year 2: $5,000 • Year 3: $5,000 **Total: $15,000**	

5.4 Proficiency-Based Approach to Staff Development and Human Resources Management

Initiative: Proficiency-Based Model for Human Resource Management			
Recommendation:	SDHR– 4.1 Develop and implement a proficiency-based model for human resource management that is linked to student achievement.	**Key Performance Indicator(s):**	1. Revised job descriptions detailing proficiencies. 2. Updated evaluation process reflecting proficiencies.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	H/R Director Chief Financial Officer

Action Steps ***Denotes that step has already started.**	**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Examine the mission, vision, and strategic goals of each department across the school district.		X	X
2. Identify additional organizational and staffing needs. Update/add key functions and tasks.		X	X
3. Determine the staff proficiencies required to perform functional requirements.		X	X
4. Identify performance measures for staff proficiency.		X	X
5. Align/cluster staff proficiencies into proficiency-based job descriptions with related roles/responsibilities.		X	X
6. Align revised job descriptions with PPSD' supervision and evaluation process. Link educator evaluations to a comprehensive proficiency-based approach to HRM in order to align performance with student achievement.		X	X
7. Adopt, implement, or develop an automated system for tracking staff proficiencies.			X
8. Update the organizational chart and reporting relationships.		X	X
9. Review and update the proposed organization structure, key functions, tasks, and proficiencies annually.			X

Interdependencies:	**Estimated Cost:**	• Year 1: $ • Year 2: $30,000	**Potential Funding Source(s):**

Initiative: Proficiency-Based Model for Human Resource Management			
Recommendation:	SDHR– 4.1 Develop and implement a proficiency-based model for human resource management that is linked to student achievement.	**Key Performance Indicator(s):**	1. Revised job descriptions detailing proficiencies. 2. Updated evaluation process reflecting proficiencies.
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators	**Leadership Responsibility:**	H/R Director Chief Financial Officer

Action Steps ***Denotes that step has already started.**		**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
	• Year 3: $20,000 **Total: $50,000**			

5.5 Recruitment, Selection, and Retention of Highly Qualified Staff

Initiative: Orientation Program for New Employees			
Recommendation:	SDHR– 5.1 Create a formal orientation process for new staff members to introduce them to the varied systems within PPSD and the school district's formal processes and procedures.	**Key Performance Indicator(s):**	1. Formal orientation process for new staff members
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	H/R Director

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Create a cross-departmental team to identify the myriad of needs to address within the orientation process, including needs for all employees (including benefits, payroll, email, obtaining a computer login) and those specified by job title (educator, principal, etc.)	X		
2. Examine orientation programs in practice elsewhere, including models used at Bryant University and the PAR program initiation process.	X	X	
3. Develop the PPSD orientation process and schedule periodic reviews of the practices. (See PPSS-2.1)	X	X	X
4. Consider offering online, just-in-time training options for employees who begin mid-year.		X	X

Interdependencies: PPSS-2.1	**Estimated Cost:**	• Year 1: • Year 2: $ 10,000 • Year 3: $ 15,000 **Total: $25,000**	**Potential Funding Source(s):**

5.6 Technology in Support of Staff Development Programs

Initiative: Virtual Staff Development Opportunities			
Recommendation:	SDHR– 6.1 Offer synchronous and asynchronous online learning opportunities that allow participants to partake anytime in staff development from anywhere.	**Key Performance Indicator(s):**	1. Number of learning opportunities offered online and number of participants enrolled
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Director of Professional Learning

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. As new professional development is planned for the school district, consider the total cost of ownership of creating online learning opportunities, including both synchronous and asynchronous options.		X	X
2. Review existing professional development opportunities and identify ones that are suitable to migration to an online format.		X	X
3. Review existing online learning opportunities from vendors to add to the repertoire of PPSD sponsored professional development.	X		
4. Disseminate the online opportunities and implement the necessary support structures to make the offering successful.	X	X	X

Interdependencies: ODS-1.2, SDHR-1.2, SDHR-2.1, SDHR-3.1	**Estimated Cost:**	• Year 1: $ • Year 2: $ • Year 3: $ **Total:**	**Potential Funding Source(s):**

Chapter 7:
Standards, Procurement, Maintenance, and Asset Management

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"The art of progress is to preserve order amid change, and to preserve change amid order. Life refuses to be embalmed alive."*
>
> —Alfred North Whitehead

The **Standards, Procurement, Maintenance, and Asset Management** chapter focuses on the standards that are needed as enterprises grow and become more complex to ensure consistency of purpose and quality outcomes. In the area of technology, standards must be set to minimize purchase, maintenance, and support costs, as well as ensure interoperability among networks and systems. In the classroom, technology standards are needed to ensure consistent and effective delivery of instruction.

In establishing standards, the Providence Public School District (PPSD) must first decide what areas require technology standards. Then, each standard must be defined such that it can become part of the purchasing process. Finally, technology standards must be enforced or they are meaningless. Yet, the process for purchasing preferred items should not be onerous. To ensure that people will use the standard, the best approach is to make standard items and configurations easier to purchase than non-standard items.

The subtopics within this chapter include:

- Technology Standards
- Procurement Guidelines
- Maintenance Procedures
- Asset Management

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Standards, Procurement, Maintenance, and Asset Management* section of the *Key Findings and Recommendations* final report.

2.1 Technology Standards

Providence has done a good job in general with adherence to standards. The environment can be difficult for success in standards as much local autonomy exists in the individual schools which can sometimes result in technology being acquired that may not be in agreement with the standards the district wishes to support. However, there is always room for improvement and in this case Providence can benefit by having an open process for standards which includes representatives across the district. The question about "best for Providence" vs. "best for me" can be addressed as a standards adoption process. In addition, standard products should be easier for schools to obtain than non-standard items.

The key findings for **Technology Standards** include:

- Providence Public School District (PPSD) has done a good job of standardizing on the technology being purchased; however, it is unclear how these standards align with instructional plans for the use of technology. Most schools' technology is aligned to the IT departments published standards. The school district selects equipment manufactured or sourced from Dell and is offered off the Rhode Island state contract. Regardless of the quantity of computers purchased, all Dell orders include a nominal installation fee per unit. Additionally there are other devices such as some K-3 iPads that are purchased through the Research and Accountability department for the DIBELS assessments that are not part of a standard platform.
- Most computers are purchased by schools using school funds; this has created some inconsistency and inequity across the school district in the quantity and age of technology due to the principals' purchasing decisions. The IT department encourages principals to institute a technology refresh program, however this has not been as effective due to priorities for the school funds.

  Additionally school district Title I funds were used to purchased technology for middle and high schools while a city bond purchased technology for newer schools.
- Technology standards setting is ad-hoc (new schools) and is not part of a systemic process. New schools are being constructed with model classrooms

including interactive whiteboards, audio enhancement systems, document cameras, and LCD projection systems. There is no plan to retrofit all classrooms across the school district to this standard.

2.2 Procurement Guidelines

Generally, the majority of technology purchases make their way up to the IT department at some point. This helps in the processes necessary for deployment and support. However, the current process appears tactical in nature with disconnected flows, i.e. the data does not follow from procurement to maintenance to asset management and ultimately to disposal.

The key findings for **Procurement Guidelines** include:

- Technology purchases are reviewed and approved as part of the purchase order prior to a purchase being processed. A review of the purchase order process did not uncover how decisions are made regarding what is acceptable.

  PPSD reports that there is a UCOA structure for coding technology purchases. This specifies school, reason, and technology, which is tied to funding source, and requires prior approval.

  There are many manual steps that the purchasing department needs to take in order to procure new equipment.
- It is important that the school district maximize E-Rate funding and has done a good job leveraging E-rate internal connections to fund wireless and servers in eligible schools.

2.3 Maintenance Procedures

The procedures for maintenance of the technology have not undergone change in alignment with the industry. The processes to deploy and maintain are inefficient and investment is needed in the tools and training to reap the productivity gains, management improvements and support capacity available. Much of this will be realized through Chapter 12, Network and Endpoint Management Solution, however, these tools may not extend to support and maintenance needs for other assets, cloud services and software.

The key findings for **Maintenance Procedures** include:

- The IT department's resources are stretched very thin. The IT department is doing an excellent job regarding maintenance of the school district's aging end user devices. The school district recently adopted Microsoft System Center Configuration Manager (SCCM) and implemented processes around device management. Some staff expressed a desire to have more control over the desktop and application installation.

In addition, IT is responsible for implement new technology while maintaining the continual operations of the current network infrastructure. It is apparent that most constituents understand the demands on the limited technology staff.

- The current desktop and laptop standard image is based on Windows XP. The XP operating system has been stable.
- IT created a process to manage the acquisition and installation of software on desktops and laptops. Although this process has helped IT with maintenance and asset management of the assets, including software licenses, some users report the software environments are not saved following a re-image process at the beginning of the school year.

2.4 Asset Management

Providence must consider setting an “end-of-life for technology” policy. The lifecycle, or useful life, of IT assets is drastically lower than other capital expenditures. The district has done a good job bringing desktop devices under asset management and was able to produce an accurate inventory of end user computing devices. Overall, management of the assets was well done and the district’s focus now should be to expand on the delivery of services and how it manages, monitors, and supports the services that depend on the individual configuration items (assets) that make the services up. In the end, services are what the users consume.

Continue to maintain the asset inventory of network components and where necessary (such as E-rate) make certain the asset details needed to meet PIA and E-rate rules are maintained. For example if equipment is moved from one building to another, note the change of location. The school district must develop a capital plan to refresh the network including wireless and hardwired switches and servers with the understanding that E-rate may not be available to provide this support. Answer the question of how long will the current network infrastructure be viable and what PPSD investments need to be when the refresh is necessary? Include the network infrastructure refresh as part of the school district’s capital plan for school facilities

The key findings for **Asset Management** include:

- The IT department has not adopted a service management as a framework for organizational adoption. For example there are no service level agreements (SLAs) found between the IT department and stakeholders. Additionally, IT key performance indicators are not developed for service delivery.
- The school district works well at asset tagging and management of the assets. It also appears the network components that were purchased through E-rate subsidies have been properly asset tagged. The school district should maintain an inventory of E-rate purchased network components by time period, vendor, location, Funding Request Number (FRN), and amount to assist in any E-rate Program Integrity Audits. In addition, all technology capital equipment such as

interactive white boards, projectors and document cameras should be tracked and be part of an upgrade/refresh program based on asset life expectancy.

- The school district IT department asset tags all computers and laptops (end user devices) even though these items may not be tagged by the purchasing/property department. This tagging process is supported by the new System Center Configuration Manager (SCCM) tool as well as the vendor/partner providing the standard technology solutions for the district end user devices.
- The school district does not support a central technology refresh program, resulting in assets that have become old and end of life. The school district is exploring and deploying work around maintaining outdated end user devices.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Standards, Procurement, Maintenance, and Asset Management* were identified during the comprehensive information technology assessment conducted in the September -October, 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., SPMA for Chapter 7) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 7, Standards, Procurement, Maintenance, and Asset Management, section 3.1, Technology Standards, would be numbered SPMA -1.1, the second recommendation in this same section would be SPMA -1.2.

3.1 Technology Standards

SPMA-1.1 Standards Committee

Create a technology standards committee that is made up of large cross section of the district with the responsibility to maintain and publish technology standards, including the review and approval of technology purchases that do not align with the current published standards. Certain standards can be made at the district level, some at the local school level, and others at the classroom level. The committee is responsible to selecting technology standards that align with instructional goals and with input from other key areas for how technology will support the learning and administrative use process.

SPMA-1.2 Classroom and Facility Standards

The technology standards setting process is currently Ad-Hoc. Most standards are based on adoption of new construction implementations and do not include a regular review and update schedule. Although the school district has done a good job with standardization of end user devices, the rapid development of technology in the end user device area dictate that the standards should be reviewed and updated more frequently and new devices need to be considered for adoption such as e-readers or low cost disposable technology where there was significant interest found in our data gathering. However, technology is more than computing devices, consider using the facility standards developed and included in the Technology Plan July 1, 2010 – June 30, 2013 as a starting point, but, these must be reviewed, updated and adopted on an annual or otherwise agreed basis by the Standards Committee. These adopted standards should be aligned with construction documents that are included with all facility construction and renovation projects

See Chapter 4 Learning Environment and School Facilities for additional information on standard classroom technology configurations.

3.2 Procurement Guidelines

SPMA-2.1 Streamlined Standards Purchasing

Review the purchase coding system used and assure technology purchases are clearly aligned to current and approved technology standards. In addition, where there is technology purchases that do not align, these purchases must be reviewed and approved by the technology standards committee.

SPMA-2.2 Web Purchasing Site

Expand the current IT procurement catalog to include all technology products and services adopted by the standards committee. Establish a district website where standard technology products can be purchased via an online shopping experience and approvals can be obtained quicker and electronically. Assure this system has integration with the Lawson financial system. Establish a process where technology items can be submitted to the technology committee for review and adoption by the district. The web shopping cart should list “pre approved” items making procurement streamlined for people to obtain standard technology. Include products and services, for example, if an interactive whiteboard is purchased, include standard installation.

3.3 Maintenance Procedures

SPMA-3.1 Desktop Image Maintenance

Develop a long-term maintenance plan that includes how Providence will maintain the desktop image to include a new and supported Windows operating system. To better service customers, when a machine is reimaged, install the software that was approved, licensed, and installed on a machine by IT. The reimage process should include a step or steps to create a list and reinstall previously approved licensed and installed end user software.

Providence is considering a virtual desktop solution to extend the life of the aging desktop inventory and provide for simplified maintenance of the desktop. However, in this environment how long will Windows XP be supported even in support of the vision of a VDI environment and what can older machines run effectively? The Total Cost of Ownership (TCO) of maintaining old, inefficient, and power-hungry machines against replacement with modern and lower cost devices should be understood even in a VDI environment. In other words the real driver for VDI may be maintenance and other applications such as bring your own device. For example, small form factor, sub $200 desktops may provide improved stability and speed and lower TCO and short Return On Investment.

3.4 Asset Management

SPMA-4.1 Service Management Program

Adopt a service management program like the Information Technology Infrastructure Library (ITIL) as a framework for IT organizational improvement. The depth and breadth of service management adoption will require careful planning and integration into the organizations process.

SPMA-4.2 Capital Asset Management

Create a complete program for management of all technology assets and include an upgrade/refresh program.

4.0 RESEARCH AND BEST PRACTICES

Information technology follows a life cycle encompassing the development of technical standards, procurement of technology, and maintenance of that technology throughout its useful life (see Figure 2.1). To create the best educational outcomes and generate the highest level of return on investment, each of these steps must be effectively addressed in a coherent manner. This section addresses each of these elements.

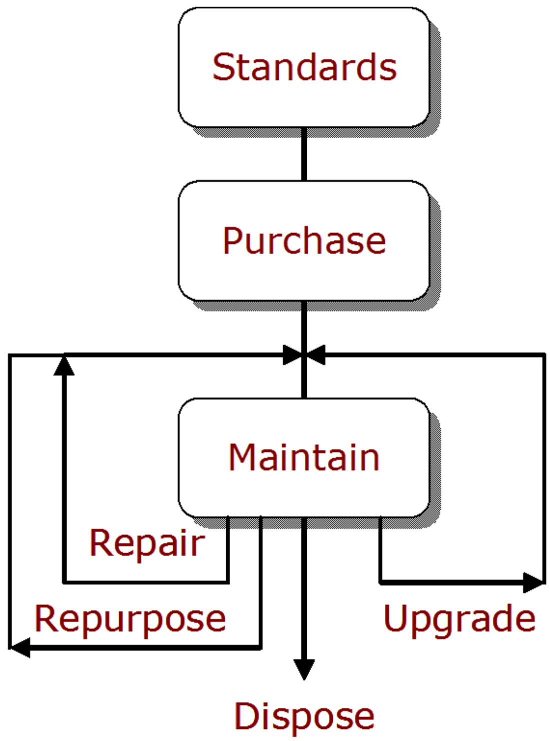


Figure 2.1: Technology Life Cycle

4.1 Technology Standards

Standards establish criteria for making effective management decisions about the acquisition and deployment of hardware, software, and networks, as well as the implementation of support infrastructure such as help desks, training programs, technical services and IT policy for users and providers. Standards are the foundation for controlling information technology costs; making efficient and productive use of scarce resources; supporting robust communications among students, faculty and staff; and assuring maximum operating efficiency in administering and coordinating academic, financial and business functions. Standards are established through district policies and procedures that provide incentives and encourage cooperation.

The following definitions help the reader to better understand standards as well as provide a system for categorizing standards:

Definitions

1. **Standard –** a product specification, protocol, or format that is designated for use for a specific function.
2. **Core Standard –** a standard that is in effect and is to be applied to meet current functional requirements.
3. **Declining Core Standard** - a standard that is in effect and will be supported but is no longer to be applied to meet future functional requirements.
4. **Emerging Standard** – a standard that is under evaluation and may become a core standard.
5. **Specialized Standard** – a standard set for specific (and usually very narrow) functional requirements.

Today, learning organizations have a great variety of technology products and services in their operations. Product standards establish qualities or requirements for a product (or related group of products) to assure that it serves its purpose effectively. In order to simplify the process of establishing standards, a classification structure is presented below.

2.1.1 Classifications of Standards

Service Standards

Service standards, such as for repairing a computer, establish requirements to be met in order to achieve the designated purpose effectively. Services may be provided through an outside company or provided by district staff. Services include:

- Wide Area Network
- Local and Long Distance Telephone
- Cellular Telephone and mobile communications
- Internet access
- Network security
- Hardware and Software maintenance and support
- Helpdesk

Infrastructure and Product Standards

The infrastructure category includes the equipment which constitutes the data and video networks located in schools and facilities. This includes the equipment for:

- Wired Local Area Network Equipment
- Wireless Local Area Network Equipment
- Telephone systems
- Cabling
- Servers
- Wide Area Network Equipment
- Video Distribution Equipment

End-user Equipment Standards

All end-user equipment is subject to standards control unless it falls outside the value for purchase limits established by the committee. This includes:

- Printers
- Workstations
- Cameras
- Laptops
- Handheld and portable devices
- Videoconference Equipment
- Television
- E-Readers
- Tablets

Software Standards

For the purposes of simplifying classification, software products fall into two categories:

- Operating system software is defined as a software system that manages the basic operations of a computer system.

- Applications software, for standards process classification, is defined as any software that is not operating system software.

Currently, operating system software falls under the standard of the computer it accompanies; and application software is not totally under standards control.

Data Standards

Data standards establish how the learning organization data must be entered, stored, maintained and archived. This is closely related to policy and procedures, and includes:

- Data element and file formats

- Storage locations and archives

- Encryption and protection

2.1.2 Technology Standards Requirements/Criteria

When standards are established, the process of establishing the standards usually addresses some or all of the following criteria:

Adherence to Standards

When there are industry or government standards addressing an item covered by district standards, such standards are included in the requirements of the standard item wherever feasible.

Total Cost of Ownership

The standard setting process includes an analysis to identify the total cost of ownership of the standard. The standard selection is made such that the total cost of ownership is minimized while meeting the minimum requirements of the users.

Flexibility

The users of technology usually have varying needs for a technology item and generally like as much flexibility as possible in selecting the best product for each need. Whenever possible, the criteria for selecting standards provides as much flexibility to the user as possible. When such flexibility is insufficient to meet the user's need, the technology standards procedures allows a waiver process so that the user may purchase a non-standard item.

Expandability

Wherever appropriate, standards will allow a standard item the capability of expansion in order to meet growth. If the expansion requires the purchase of additional items, these items also fall under the standards process control.

Support for Existing Resources

Standards consider interoperability and compatibility with the existing infrastructure, as well as the ease and availability of support. Where possible, qualification testing will be required to assure interoperability.

Reliability/Availability

For hardware items, the standard includes minimum acceptable reliability and availability requirements.

Security

Standards include specifications for ensuring network security, whenever applicable. Proliferation of wireless telephones and wireless computers poses security risks that require their being under standards process control.

Performance

Standards specify parameters for minimum acceptable performance in order to ensure the user requirements.

2.1.3 Technology Standards Selection/Adoption Process

An Information Technology Standards committee is the key to establishing standards. This committee identifies topics and/or receives recommendations for topics that should be addressed by system-wide standards or best practices. They develop proposals for standards or best practices. They make recommendations to the CIO/IT Director who reviews the recommendations with senior staff. Recommendations supported by the CIO/IT Director with be recommended to executive management to make a final decision as to whether the recommended standard or best practice should be adopted.

The statement of a standard or best practice addresses, at a minimum, the following:

Applicability: To whom does the standard or practice apply?

Implementation strategy: Will the standard or practice be phased in, implemented as of a specific date, or implemented according to some other strategy?

Implementation timeline: By when will specific implementation stages be reached? When will the standard or practice be fully implemented?

Compliance expectations: Is compliance required (mandatory), recommended (with or without incentives for compliance or disincentives for non-compliance), advisory, or no longer required (obsolete)? Are there any circumstances or processes for considering exceptions?

Anticipated costs and financial responsibility

Anticipated benefits

Standards should be reviewed and updated on a regular basis so that departments and schools will have the most current information. In addition, a process will be put in place to ensure compliance.

4.2 Procurement Strategies

A set of clearly defined policies and procedures for the purchasing of technology is the next step in ensuring a cost-effective and maintainable technology infrastructure. These policies and procedures are required for an organization to adhere to the standards that are established. The task of developing procurement guidelines requires the following activities:

- o assess and address current and anticipated procurement requirements and needs
- o develop criteria and metrics for the evaluation of procurement options based on defined standards, purchasing methods, acquisition options, and technology alternatives

The World Bank has defined a set of processes and procurement documents for the acquisition of IT products and services. These best practices are outlined below and should be considered as an example for how the organizations might approach IT procurement. [1]

Identify Procurement Guideline Requirements

Large information technology and systems contracts are among the most challenging to procure because:

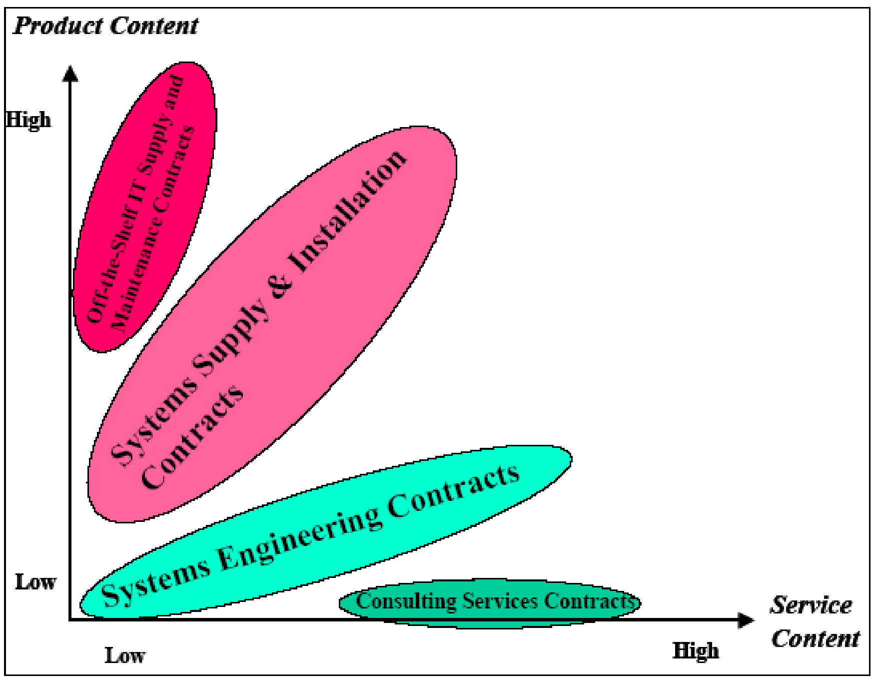
- their technical content is divers and difficult to define;

[1] The World Bank IT Procurement Guidance Note 8, Selecting a Standard Bidding Document for IT Procurement.

- they are highly affected by changing business objectives, organizational politics, and institutional capacity of the end user;
- they are subject to rapid technological change of the project life-cycle; and
- they entail mixtures of professional engineering services and supply of diverse hard and soft technologies.

Procurement Types

Most IT procurements encompass both supply of products and provision of services, albeit in different mixtures. Those procurements that do not are either straightforward consulting contracts or supply-only procurements without installation or maintenance services, which are most often rare. The four most important types of IT procurement are characterized in the figure below.



Product and Service Content of Various IT Procurement Contracts

The coexistence of product and service components is a key characteristic of IT procurement which determines the need for a flexible procurement document that can be tailored to a variety of product/service combinations. The table below summarizes the types of procurements and key aspects of each.

OBJECT OF PROCUREMENT	*Consulting Services*	*Off-The-Shelf Supply & Maintenance of IT Products*	*Supply and Installation of Systems Facilities*	*Systems Engineering*
Design Risk: (the solution does not fit the problem)	• Client	• Purchaser	• Supplier	• Contractor • Client
Implementation Risk: (schedule slips, costs overrun, acceptance tests fail)	• Client	• Supplier	• Supplier	• Contractor • Client
Critical Success Factors	• Clarity of client's needs • Consultant's knowledge and expertise	• Quality of specifications • Bidder's delivery capacity	• Quality of requirements • Quality of design. • Supplier's professional expertise • Supplier's process management skills	• Quality of requirements • Contractor's professional expertise • Quality of communications • Clients contract management skills
Bidders Qualification Criteria	• Prior experience • Credentials	• Financial, logistical capacity • Prior experience	• Prior experience • Financial and operational capacity	• Prior experience • Individuals credentials
Ranking of bid evaluation criteria	1. Track record 2. Credentials 3. Quality of proposal 4. Cost	1. Cost 2. Non-price factors	1. Cost 2. Track record 3. Quality of proposal	2. Track record 3. Credentials 4. Quality of proposal 5. cost
Basis for payment	• Effort over time • Incidental expenses	• Operationally accepted components • Time & effort (for services)	• Completed milestones • Time & effort (for services)	• Completed milestones • Time & effort • Incidental expenses

The types of procurements above are explained below in two categories: straightforward and complex IT procurements.

Straightforward IT Procurements

Pure Consulting Services: Quality and Cost Based Selection

In this type of procurement the client takes the design risk and most of the implementation risk. Consultants are expected to provide intellectual services according to the highest professional standards. However, if they do not meet the expectations, the district will bear the contractual consequences. Examples of procurements in this area include: strategic information systems planning; developing bidding documents; and providing management support services for an IT project.

Off-the-Shelf Supply and Maintenance of IT Products

This is a straightforward IT equipment supply and maintenance procurement. The technical risk is assumed by the district who defines the required product and service specifications. Maintenance services are usually procured concurrently because of importance and specialization and because doing so allows for more realistic life-cycle cost evaluation of the products. Technologies involved are commercial, off-the-shelf (COTS) and the market is highly competitive with the exception of the products enjoying de facto monopolies.

The key aspects of evaluation are compliance with technical specifications (set by the standards of the district), ability to deliver per schedule, price and sometimes technical merit (non-price aspects). Price is usually the primary selection criterion.

Pre-qualification is not normally used for straightforward IT supply procurements. One exception in equipment supply may occur when the size of the procurement, the timetable for deployment and the maintenance service requirements reduce the potential bidders to a group definable through pre-qualification criteria. Other exception is related to application software procurement, when the number of providers for a specialized application package is small and easy to characterize.

Examples of straightforward IT supply and maintenance procurements are:

- Local area networks;
- Assorted products (such as file servers, workstations, printers, and UPSs) even if procured in large numbers, that require similar installation and simple interconnection;
- Supply, and installation and maintenance of wide area network;

- off-the-shelf hardware and software licenses for a particular business process;
- A license for commercial data base management system.

These types of procurements are typically referred to as request for bids (RFB)

Complex IT Procurements

Supply and Installation of Information Systems

Two key features distinguish Supply and Installation from straightforward goods procurements namely, increased suppliers' risk and complex service requirements. Together these two features increase significantly the complexity and risk of the procurement and require different evaluation and contracting terms.

In Supply and Install procurements, the Supplier assumes responsibility for the design, supply and installation of a solution defined by the district, mainly in terms of performance specifications. Therefore, the Supplier's responsibility goes beyond the supply of whatever products or services the district requests, and extends to the provision of any other products or services required to make the solution perform to specification.

IT Supply and Install procurements require therefore a degree of professional judgment and expertise from suppliers that is commensurate with the higher degree of risk they are called to assume. This results in large and complex service components for this type of procurement.

System Engineering or System Integration Contracts

Contracts in this category are inherently complex since they combine aspects of engineering contracts, consulting services and supply of goods. Typical contracts include:

Complex business applications, (e.g. mission-critical finance systems);

Complex custom software development services;

Integration of off-the-shelf with custom software and hardware components where the bidder is responsible for overall system compliance with business requirements;

Systems engineering projects involving extensive technical services for design, development, customization, installation, training, operations and technical support;

Build-operate contracts to outsource IT-intensive functions.

Deployment of complex business applications, for example, will usually require substantial reengineering of business processes within the district's organization. As a result, even comprehensive technical specifications change frequently during implementation. Furthermore, the full impact of the new system on business processes is often understood only at system implementation time and the district will need to defer payments and tie them to milestones that represent tangible business value. As a result, the Supplier shares a large part of the design and implementation risk.

Similar high risks are shared by both parties in other types of procurements to the point that outsourcing contracts are considered really "partnership procurements" where the district is looking for a long-term strategic partner, rather than merely a supplier.

Single Stage or Two Stage Complex Procurement

The World Bank recommends complex procurements be conducted in a Single Stage or Two Stage process. The main difference between these is that the terms of single stage procurements are defined by the Purchaser (district), and with two-stage procurements, the Purchaser is asking for proposals from the Providers in the delivery of a set of technical specifications. These procurements are often referred to as a Request for Proposals or (RFP). In addition, in the two stage process, it may be considered synonymous with the Request for Information (RFI) followed by the RFP process.

Single Stage Procurement

These are appropriate when the purchase is based on technical products or services specifications. A good example would be the procurement of a large wide-area computing network with a variety of office support and application services, extensive operational acceptance testing requirements and centralized network management where the basis for the bidding is a set of well-defined technical specifications and consequently the design risk is borne by the district. Even when functional or performance specifications are developed by the district this type of procurement is likely to be met only by established products in the market. In this case Suppliers have no real design discretion and the district will not-likely benefit from technical solutions not already widely known or available in the market.

Complex single-stage procurements may emphasize extensive bidder conferencing and clarification processes based on written communications and full disclosure to all bidders of questions and answers.

Two-stage Procurement

These are appropriate when a complex supply and installation procurement is based primarily on business or performance requirements rather than on technical specifications. In these cases the district will be interested in evaluating different technical solutions instead of engaging expert consultants to design and specify a particular solution for single-stage procurement. These are also appropriate when project management, staffing or deployment strategies, instead of technical specifications, are left for bidders to propose.

An example would be a wide-area network specified through a set of business requirements rather than precise technical specifications. Business requirements, for example, may be the number and functionality of workstations, the availability and response time of office and application services, the flexibility of communications options, the extent and reliability of centralized network management and security functions, etc. In this case there may be different technical solutions proposed by bidders (for example, one may propose that workstations need not be a microcomputer, but rather a computer terminal or equivalent connected to a local server)

This presumes that the district is willing to consider and evaluate on their merits different technical solutions. This involves development of functional specifications, assessment of first-stage proposals and specifications of needed technical adjustments and evaluation of second-stage bids against functional specifications regardless of their technical differences.

Complex supply and installation and complex systems engineering procurements are good candidates for two-stage procurements. In Supply and Installation for example, the Supplier bears much of the design risk since it undertakes the responsibility to design and build a system that reaches operational acceptance. The district, at the same time, lacking the specialized knowledge to design the ideal technical solution, wants to minimize risks by letting experts propose and then defend various solutions. Both the supplier and the district reduce their risk considerably through the first stage clarifications meetings which ensure that solutions proposed, pus changes requested, will meet the district's requirements.

Two-stage purchasing denotes a deliberate decision to consider several feasible solutions to a large problem, and implies and evaluation method that does not hinge on compliance with specific technical specifications, but rather on fulfillment, by whatever reasonable means, of specified business or performance requirements.

Any complex procurement for which defining precise technical specifications for single-stage procurement is too difficult or where the technical and IT project management strategies of potential bidders are a major and decisive factor is a candidate for two-stage procurement.

Procurement Options

With the application of the technology procurement types i.e. Consulting Services, Off-The-Shelf Supply & Maintenance of IT Products, Supply and Installation of Systems Facilities and Systems Engineering with the technology procurement options, i.e. Straightforward or Complex, UAE will develop the foundation for procurement best practice. Procurements can be further defined in more common categories such as Software, Hardware and Voice, Video and Data. Within these categories we will find the application of all types and options of the technology procurement process.

Software Procurement

It is important that the learning organizations develop a software license-procurement strategy that uses all appropriate license alternatives as well as leveraging their buying power. This includes following procurement guidelines for straightforward procurements for Commercial Off The Shelf (COTS) products such as user software productivity tools that have been standardized as well as complex two stage procurement for the Supply and Installation of a portal solution. The job of managing software licenses has grown increasingly more complex over time. The use of asset management tools like license management software will not only make the management of software assets easier but will also improve the productivity of network administrators.

Usage-reporting software will allow learning organizations to review the trends of a software product to detect declines in usage and avoid payment of fees by reducing the number of licenses. These reports can also identify "abandoned" software on which the district or individual schools could still be paying periodic update and support fees.

Software purchases will be covered by standards under the establishment of the technology standards committee, thus requiring adherence to standards for purchases of software products. Some of the important categories of software for which standards can be developed are listed below.

- portals
- integrated learning systems
- academic software tools and programs
- productivity tools
- network and systems management and monitoring
- student/school management
- administrative and financial management

Hardware Procurement

Hardware purchasing and the tracking and documentation of technology equipment, is a critical element of any enterprise. Given the decreasing lifetime utility of technology hardware in recent years as the collective body of the computing technology has rapidly evolved, it is even more important that a well documented system be in place for the provisioning of hardware and its post-purchase tracking via an asset/inventory management system. Once hardware standards are in place, the complexity of the procurement process is greatly reduced and opens up several avenues to achieve economies of scale with special volume pricing programs offered by manufacturers and resellers.

The updating of standards and subsequent refresh of procurement strategies will align districts along the path of technology enablement as new computing trends and technologies emerge. Technology must be kept current, within available resources, and replaced, upgraded, or repurposed based upon a life-cycle process.

Voice, Video, Data Procurement

A technically-robust enterprise network is one that integrates voice, video, and data communications systems. Sound procurement processes strategically aligned to integrate an organizations communications systems will prove cost-effective for support and maintenance and TCO. Standards, procurement and centralized management of these systems will ensure a foundation for enabling technology implementation and advancement for long-term success in Information Technology.

The assortment of voice, video, and data equipment essential to productivity include the following:

- telephone and voice communications systems
- televisions, video cameras and recorders
- voice and cell based response/management systems
- automatic dialing systems
- video capturing, broadcast, receiving, and distribution systems
- videoconferencing systems
- radio and mobile wireless systems
- office copier, imaging, and document management systems

- paging systems
- intercom systems
- facsimile systems

E-Commerce/E-Procurement

For relatively low-cost, low-dollar volume items, such as supply items and add-on items, the district should develop an online e-procurement capability which will allow users to order such items directly from supplier Web sites, based on a contractual agreement between the district and selected suppliers. This will lower the overall cost of the items based on volume and assist in the support of standards implementation.

4.3 Maintenance Program

The establishment of a centralized preventative maintenance program and life-cycle process enables a strong support organization. This proactive approach for the systematic tracking of technology equipment performance and maintenance history pays dividends in the long run. This information will be critical for future decisions regarding technology purchase decisions and total cost of ownership.

Software Application License and Maintenance

A centralized network based solution to perform software license management and maintenance is critical to the successful management and maintenance of large numbers of end user devices. For such a system to function properly, all technology components should be networked and centrally managed. With this approach the distribution of critical software updates can be controlled. This is extremely important for the security and safety of the network as well as for the asset management of one of the most costly components of the infrastructure, the software. This same system can be used for the proactive monitoring and asset management of the underlying hardware.

Hardware Maintenance

Maintenance and support for technology items, particularly computers, within the warranty period are completed as part of the contract with the vendor. Computers are generally purchased with a multi-year warranty which may include additional services such as product setup and onsite repair. A streamlined hardware maintenance program is critical to sustain a well run and reliable infrastructure. A support structure should be in place that clearly defines for all users of technology how they can receive maintenance and support for technology items. This support structure should include published and clear understanding of expectations under service level agreements (SLA) with the end user and the provider of the maintenance. In addition, metrics should be established and monitored to assure the SLA parameters are being met. With clear metrics, goals for continuous improvement in the delivery of technology resources to the end user can be established and assured.

Network Maintenance and Support Contracts

Refer to networks and communications section

4.4 Asset Management Systems

Asset management is a series of policies, procedures and practices for keeping track of technology assets (hardware and software) by location, ownership, usage, configuration and maintenance.[2]

IT asset management in the recent past involved acquiring hardware and software and little attention was paid to managing assets through their life cycle. Today, IT asset managers can count on two certainties when looking to the future: increased configuration complexity and expanded management responsibilities. The costs to maintain IT assets in operational mode (including hardware, software and support services) represent 40 percent to 60 percent of the overall IT operations budget.[3] In the face of mounting marketplace pressures, organizations expect IT asset managers to seek opportunities that create competitive advantage and make positive contributions to the business' bottom line. Numerous factors compound this challenge, including:

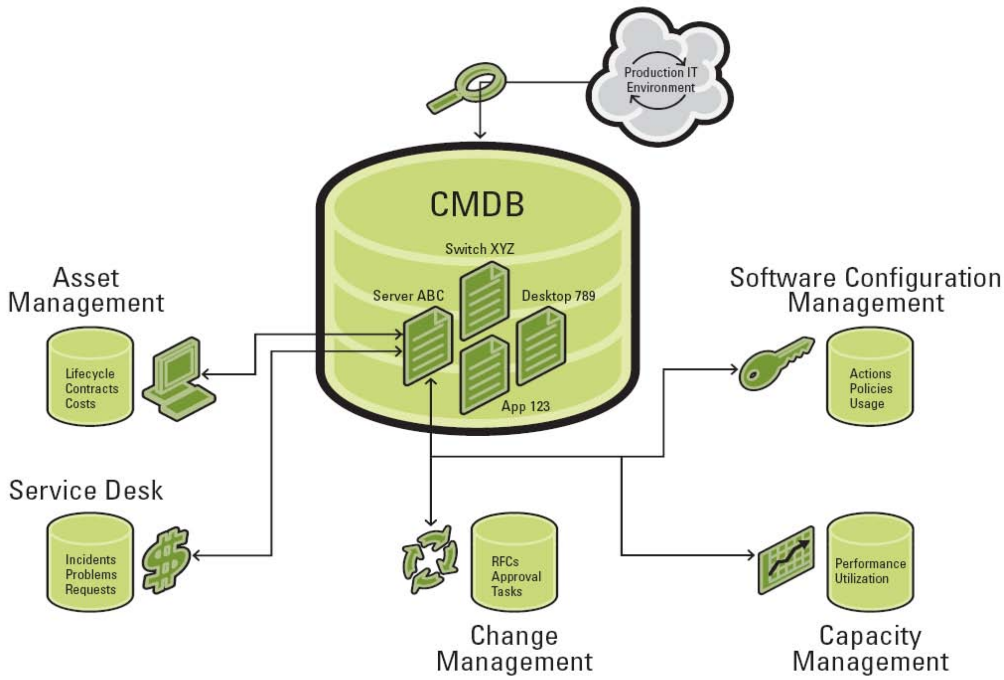
- Evolving licensing models
- Changes in workforce structures and how individuals use technology
- Changes in the supplier landscape

Asset management has strong ties to change and configuration management as well as capacity and infrastructure planning, operations, helpdesk, engineering and other support needs in IT and the enterprise. Asset management cannot be viewed in a vacuum, but as a cornerstone with complex sets of interdependencies. The complex problems associated with Asset management within the environment of constant change is difficult.

The IT Infrastructure Library (ITIL) defines a set of best practices for IT asset management built around the use of the ITIL's Configuration Management Database (CMDB). The ITIL's focus on process interdependencies is embodied in

[2] How to conduct the IT Asset Management Needs Assessment, as downloaded from http://www.ittoolkit.com/cgi-bin/itmember/itmember.cgi/reg/ITBE-ok
[3] Seize IT Asset Management Best Practices to Conquer Complexity, Alvin Park, November 2007, as downloaded from http://www.gartner.com/DisplayDocument?doc_cd=127753

its development of the Configuration Management Database. According to the ITIL, the CMDB should "hold the relationships between all system components including incidents, problems, known errors, changes and releases". It also contains information about employees, locations, suppliers and business units. Automated processes to load and update the Configuration Management Database should be developed where possible so as to reduce errors and reduce costs. Discovery tools, inventory and audit tools, enterprise systems and network management tools can be interfaced with the CMDB. These tools can be used initially to populate the CMDB, and subsequently to compare the actual 'live' configuration with the records stored in the CMDB."



"Server ABC" in the CMDB, acts as a common reference point for multiple tools to share their federated management data.[4]

Hardware Asset Data

This includes all technology assets including computing devices, projectors, network devices, etc. Below is a sample of the data that an asset management system will include.

- model and manufacturer
- software versions and patch level including bios and integrated components

[4] Asset Management, ITIL, and the CMDB: Connecting the Dots between IT Operations and the Bottom Line, bmcsoftware Best Practices Whitepaper, as downloaded from http://documents.bmc.com/products/documents/80/45/58045/58045.pdf

- physical location
- status ("in" or "out of use")

Configuration Data

- Configuration CPU, memory, setup, peripherals, installed software, etc.
- Standardized vs. non-standardized configurations.

Acquisition Data

- Original Cost
- Supplier
- Date Purchased
- Maintenance Records
- Warranty Information and contacts for support
- Licenses and Registrations

Software Asset Data

Software Asset Management (SAM) is all of the infrastructure and processes necessary for the effective management, control and protection of the software assets within an organization, throughout all stages of the software's lifecycle. In general there are significant interrelationships between hardware and software asset management and it is of great benefit to combine both under a single solution. Since most software has no "physical" attributes to be discovered on a network, it is critical that the processes for procurement, assignment and maintenance of these assets is clearly defined and in place. In addition the assurance of licensing compliance is an extremely challenging and current issue facing many organizations including. Examples of licensing:

- Enterprise
- Concurrent Users
- Per server or Processor
- Client/Server access (CAL)
- Evaluation

- Site
- Volume/Floating
- Run-time
- Appliance
- Node locked
- Named user
- OEM

Contract Asset Management

Contracts are assets and must be tracked as well. Contracts typically link with assets such as Hardware or Software and in some cases multiple contracts will like to a particular asset. The contracts asset management system should also include the ability to monitor purchases against the terms of the contract, alert you when maintenance renewals are due. Examples of contracts include:

- Service Level Agreements (SLA)
- Maintenance Agreements
- Outsource Services
- Systems, networks and telecommunications services
- Lease Agreements
- Support Agreements
- Purchase Agreements
- License Agreements
- Services Agreements

Accounting Information - Asset Costs

Understanding all aspects of an asset's cost, or Total Cost of Ownership (TCO), includes not only the purchase and installation costs, but the maintenance and operational support (such as Help Desk Support) and the costs of changes to maintain an asset. ITIL configuration and change management processes have requirements for cost assessments for determining maintenance and operational overhead in order to properly plan and provide resources for a required or anticipated change to an asset. This information is vital to an organization and is provided through implementation of asset management cost tracking.

Objectives for Asset Management

Following are the objectives to be accomplished from the successful selection and implementation of the systems and asset management software:

- Improve desktop support services. Through the use of remote diagnostic tools, remote update capabilities and automated software upgrades an organization can provide much more responsive and reliable service with existing staff.

- Reduce risk and exposure to viruses and outages. Through the use of automated detection tools, the district can proactively identify where there are security and virus risks and correct these with automated patch and virus update deliveries.

- Ensure software licensing compliance. By using the automated inventory tools an organization can ensure that only licensed software is being used.

- Reduce wasted end-user time. By providing more responsive and reliable service to the remote workstations through automated management services, the users will spend less of their time trying to resolve workstation problems.

- Provide reliable budgeting. With an accurate count of software licenses and workstations, an organization can provide more accurate figures for budgeting, compliance, and support and replacement costs.

- Increase network security. Through the use of automated detection tools, the district can proactively identify where there are security risks and correct these with automated patch deliveries.

- Identify hidden cost savings. Inventory tools can flag underutilized licenses and use this information to reduce software licensing costs.

Not adequately managing technology assets is a risky and costly strategy in many ways:

- Software vendors have been randomly auditing customers – particularly those customers that cannot track their software licenses. It is not uncommon for an organization to receive large fines for license breaches.

- Poorly managed license use can result in over-spending for license purchases.

- Viruses are a constant threat to organizations. Large scale system outages can and have resulted from poorly protected systems.

- An accurate asset inventory (of both hardware and software) is very important for negotiations with vendors to get the best pricing for purchases, accurate planning for upcoming projects, and for identifying and recovering hidden potential asset savings.

- Manually supporting these devices is a huge labor cost, and the skilled staffs required are expensive and sometimes difficult to hire and retain.

Lifecycle for workstations, servers and network equipment that apply to Asset Mgmt

- Procurement
- Order generation
- Order fulfillment
- Licensing
- Deployment
- Image loading
- Asset logging
- Scheduling (for installation)
- Software installation
- Data migration
- Configuration testing
- Field Services and Support
- OS Updates
- Configuration control
- S/W and H/W upgrades/patches
- S/W troubleshooting and fixes
- Problem resolution

- Trending and analysis
- Administration
- License management
- Asset tracking
- Forecasting
- Integration testing
- Image management
- Retirement
- Software licensing re-use
- Update asset database

Automated distribution of software and desktop management

The high-level requirements for the automated software distribution and remote desktop management software include the following functions and capabilities:

- Remote control
- Patch management (to include anti-virus Management)
- Software distribution (application and operating system)
- Software packaging capabilities
- Asset management
- Profile migration
- License monitoring
- Software metering
- Policy management
- Self service options
- Minimized network footprint

- Low bandwidth support (for dial-up users or users with congested network)
- Desktop management
- Desktop image restoration
- Cross-platform capabilities
- Active directory integration and authentication
- Configuration development
- Peripheral and driver support and upgrade
- Self-healing systems, reliability, security
- Active workstation security
- Software audit and inventory
- Reporting
- Identify and track unauthorized software and usage

5.0 IMPLEMENTATION STRATEGIES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- District's and superintendent's goals
- *Key Findings and Recommendations report*
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., SPMA for Chapter 7) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 7, Standards, Procurement, Maintenance, and Asset Management, section 5.1, Technology Standards, would be numbered SPMA-1.1, the second Action Plan in this same section would be SPMA -1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- **Technology Standards**

  SPMA-1.1 Standards Committee

  SPMA-1.2 Classroom and Facility Standards

- **Procurement Guidelines**

  SPMA-2.1 Streamlined Standards Purchasing

  SPMA-2.2 Web Purchasing Site

- **Maintenance Procedures**

  SPMA-3.1 Desktop Image Maintenance

- **Asset Management**

  SPMA-4.1 Service Management Program

  SPMA-4.2 Capital Asset Management

5.1 Technology Standards

<table>
<tr><th colspan="4">Initiative: Technology Standards Committee</th></tr>
<tr><td>Recommendation:</td><td>SPMA – 1.1 Create a technology standards committee composed of a diverse set of stakeholders</td><td>Key Performance Indicator(s):</td><td>1. Committee formed and meets regularly
2. Standards review process defined</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Engaged Students and Family
Highly Effective Educators
Systems that Work</td><td>Leadership Responsibility:</td><td>Department of Technology</td></tr>
</table>

<table>
<tr><th rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td>1. Establish the standards organization with sponsor and committee members.</td><td>X</td><td></td><td></td></tr>
<tr><td>2. Agree on the charter, method of operating, and frequency of meetings.</td><td>X</td><td></td><td></td></tr>
<tr><td>3. Define the processes for what standards are needed, how often to publish to staff and vendors, how exceptions are handled and how enforcement is handled.</td><td>X</td><td></td><td></td></tr>
<tr><td>4. Conduct regular meetings and publish minutes</td><td></td><td>X</td><td>X</td></tr>
<tr><td>5. Publish, disseminate, and review as appropriate.</td><td></td><td>X</td><td>X</td></tr>
</table>

<table>
<tr><td>Interdependencies:LESF-1.1</td><td>Estimated Cost:</td><td>• Year 1: $ 5,000
• Year 2: $ 5,000
• Year 3: $ 5,000
Total: $15,000</td><td>Potential Funding Source(s):</td></tr>
</table>

Initiative: Classroom and Facility Standards

Recommendation:	SPMA – 1.2 Review and update standards more frequently and consider new devices for adoption such as e-readers or low cost disposable technology where there was significant interest found in our data gathering.	**Key Performance Indicator(s):**	1. Adopted IT Classroom Standard 2. Low Cost Disposable Device Identified and Adopted
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators	**Leadership Responsibility:**	Teaching and Learning Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Establish a working group under the standards committee that will define the classroom and facility standards. Assure strong representation of principals and instructional staff.	X		
2. Plan and conduct a full day summit meeting to define the required technology environment(s) to support instruction. Assure environment identifies professional development.	X		
3. Define timeline/plan and process for standards adoption for necessary components.	X		
4. Conduct procurement processes necessary to establish streamlined product acquisition and implementation.	X	X	
5. Develop plan for full adoption district-wide (see Chapter 4).		X	
6. Establish pilot locations/classrooms for standards adoption.		X	X
7. Publish, disseminate, and review as appropriate.		X	X

Interdependencies: LESF-1.1	**Estimated Cost:** • Year 1: $ 5,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $15,000**	**Potential Funding Source(s):**

5.2 Procurement Guidelines

Initiative: Streamlined Standards Purchasing			
Recommendation:	SPMA – 2.1 Review the coding system used and assure technology purchases are clearly aligned to current and approve technology standards. In addition, where there is technology purchases that do not align, these purchases must be reviewed and approval by the technology standards committee.	**Key Performance Indicator(s):**	1. Purchasing has clear guidelines on pre-approved standard IT purchases 2. Review process for non-standard purchases in place
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Review the current process used for approved technology purchasing.	X		
2. Align procurement process with standards, assure that coding system is in place to identify and align technology purchases that are pre-approved standard items.		X	X
3. Develop review and approval process by technology standards committee for non-standard purchases.		X	X
4. Publish, disseminate, and review as appropriate.		X	X

Interdependencies: CNI 1.1, CNI 1.2, SPMA-1.1	**Estimated Cost:**	• Year 1: $ 5,000 • Year 2: $5,000 • Year 3: $5,000 **Total: $15,000**	**Potential Funding Source(s): Local**

<table>
<tr><th colspan="6">Initiative: Web Purchasing Site</th></tr>
<tr><td>Recommendation:</td><td>SPMA – 2.2 Expand the current IT procurement catalog to include all technology products and services adopted by the standards committee. Establish a district website where standard technology products can be purchased via an online shopping experience and approvals can be obtained quicker and electronically.</td><td>Key Performance Indicator(s):</td><td colspan="3">1. IT Standards catalog in place
2. Internal website for placing standards orders</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Systems that Work</td><td>Leadership Responsibility:</td><td colspan="3">Department of Technology
Procurement</td></tr>
<tr><td colspan="3" rowspan="2">Action Steps
*Denotes that step has already started.</td><td colspan="3">Timeline</td></tr>
<tr><td>Year 1
13/14</td><td>Year 2
14/15</td><td>Year 3
15/16</td></tr>
<tr><td colspan="3">1. Establish catalog for IT Standard Products and Services.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="3">2. Assure catalog is integrated with online ordering system.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="3">3. Assure online ordering system is integrated with Lawson to streamline order processing.</td><td></td><td>X</td><td>X</td></tr>
<tr><td colspan="3">4. Create digital approval process where necessary.</td><td></td><td></td><td>X</td></tr>
<tr><td colspan="3">5. Determine incentives/training to get staff to use the existing resources around procurement.</td><td></td><td></td><td>X</td></tr>
<tr><td colspan="3">6. Publish, disseminate, and review the catalog as appropriate.</td><td></td><td></td><td>X</td></tr>
<tr><td>Interdependencies: LESF-1.1</td><td>Estimated Cost:</td><td>• Year 1: $ 5,000
• Year 2: $ 5,000
• Year 3: $ 5,000
Total: $15,000</td><td colspan="3">Potential Funding Source(s): Local</td></tr>
</table>

5.3 Maintenance Procedures

Initiative: Desktop Image Maintenance

Recommendation:	SPMA – 3.1 Develop a long-term maintenance plan that includes how Providence will maintain the desktop image to include a new and supported Windows operating system.	**Key Performance Indicator(s):**	1. Clear understanding of direction for maintenance and reimaging of desktops 2. TCO/ROI of maintaining aging desktop understood
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Timeline Year 2 14/15	Timeline Year 3 15/16
1. Review long term desktop image plan in light of Virtual Desktop and Microsoft support for Windows XP.	X	X	
2. Review process for image management when deploying and maintaining software installed on local machine.	X	X	
3. To better service customers, when a machine is reimaged, install the software that was approved, licensed, and installed on a machine by IT.	X	X	X
4. Conduct TCO of older desktop machines followed by ROI of leveraging these older machines versus simply replacing with low-cost desktops.	X	X	
5. Make decision on direction for providing and maintaining the desktop.			X

Interdependencies:	**Estimated Cost:**	• Year 1: $25,000 • Year 2: $5,000 • Year 3: $200,000 **Total: $230,000**	**Potential Funding Source(s):**

5.4 Asset Management

Initiative: Service Management Program			
Recommendation:	SPMA – 4.1 Adopt a service management program like the Information Technology Infrastructure Library (ITIL) as a framework for IT organizational improvement.	**Key Performance Indicator(s):**	1. Staff Trained on ITIL 2. Key performance indicators aligned to ITIL
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	**Timeline** **Year 2** **14/15**	**Timeline** **Year 3** **15/16**
1. Adopt a service management program such as the Information Technology Infrastructure Library (ITIL).	X		
2. Develop a training program for staff and obtain base certifications.		X	
3. Identify entry point for ITIL adoption, such as service catalog and key performance measures for service delivery including adoption of service level agreements for external and internal services.		X	
4. Develop helpdesk into service desk and modify reporting to align with service level agreement indicators.		X	X
5. The depth and breadth of service management adoption will require careful planning and integration into the organization's process.			X

Interdependencies: ODS-4.1	**Estimated Cost:** • Year 1: $ 50,000 • Year 2: $ 50,000 • Year 3: $25,000 **Total: $125,000**	**Potential Funding Source(s): Local**

Initiative: Capital Asset Management

Recommendation:	SPMA – 4.2 Create a complete program for management all technology assets and include an upgrade/refresh program.	**Key Performance Indicator(s):**	1. Capital management plan in place
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology Chief Financial Officer

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Working with finance office, develop asset management program that includes lifecycle management of IT assets.		X	
2. Publish capital asset management budget for adoption and funding.		X	
3. Seek funding sources to maintain IT capital including identified refresh schedule.			X
4. Publish, disseminate, and review as appropriate.			X

Interdependencies: LESF-1.1, LESF-1.2	**Estimated Cost:**	• Year 1: $ • Year 2: $ • Year 3: $ **Total: See Chapter 15: Budget**	**Potential Funding Source(s): TBD**

Chapter 8:
Policies, Procedures, Security, and Safety

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"The art of progress is to preserve order amid change, and to preserve change amid order."*
>
> —Alfred North Whitehead

The **Policies, Procedures, Security, and Safety** chapter focuses on the myriad of information technology related policies, procedures, and security measures that are needed to implement a broadscale IT program. There are many non-technology related policies and procedures that may prevent effective and optimal use of the school district's costly technology resources. In addition, the varying degree of IT policy implementation significantly impacts the appropriate and equitable use of technology. Although today's schools need to be concerned about the physical security of their students and staff, they also must respond to the digital security of information related to their students and staff members. Moreover, the schools must focus on the loss of this information due to natural or man-made disasters. Also, clear criteria need to be established regarding what is core school district-level IT policy, what IT policy can or should be set by the area, and what policy guidelines can be made and implemented at the school level.

The subtopics within this chapter include:

- Technology and Information Policies
- Technology and Information Procedures
- Security Policies and Systems

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September – October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Community Access and Participation* section of the *Key Findings and Recommendations* final report.

The importance of efficient management of technology and information resources grows as systems, networks, and applications become more complex. Management of heterogeneous distributed systems calls for a new methodology to replace explicit control and reactive management with effective, automated, and proactive management. Policies that define characteristics and function of systems and operations have been recognized as a concept to support this complex management task by specifying means that enable the definition and enforcement of necessary principles.

Enterprise-oriented technology and information policies and procedures drive an organization by providing:

- a strong foundation of data governance to manage all aspects of data, storage, security, cleanliness, and use
- objectives for utilization and benefit of technology and information resources
- definition of protocols, industry standards, and functional requirements
- equity of use, access, and support
- a blue print for “on-boarding” new staff members and terminating accounts for departing staff members
- a process for securing all district assets, physical and application (data)

The district has a comprehensive, published Technology Plan, July 1, 2010 – June 30, 2013. While the plan includes chapters featuring a vision for technology, an Acceptable Use Policy, technology utilization, facility design for technology, technology systems design, and technology implementation planning, in general, policies and procedures do not appear to match district technology implementation, current status, and use. Notable omissions include a standard set of policies to govern access, user expectations, training, and support. In addition, there are no policies or procedures in place for “on-boarding” new staff nor providing technology equity among users and between schools.

In the area of Data Governance, currently there are no policies in place to manage the flow, use, and security of data. Whether the district is managing a current data system, or adding a new system such as a SIS, without a set of clear policies established for everyday use, backups and disaster recovery, the organization is vulnerable to inconsistent user practice and/or security issues should there be an outside penetration or catastrophic failure.

2.1 Technology and Information Policies

In order to be meaningful, policies must be turned into actions; and as such they provide the district with agreed guidance for these actions. Technology policies necessarily will support other overall district policies needed to run the school district.

Within the district, policies fit within a formal hierarchy as noted below:

Strategic

Goal and Mission

Strategy

Policy

Management Procedures and Processes

Technology and Information Systems and Services

There appears to be only one technology policy in the board list of policies. This is the 'acceptable use policy.'

The key findings for **Technology and Information Policies** include:

- There are very few documented procedures on how to use and access technology resources in the school district. According the Providence Public School Department (PPSD) 2010-2013 Technology Plan, "schools vary in how and when staff and students may access and utilize technology. Much like the process of how an individual school budget is spent, policies outlining procedures for student access to computers around the facility at different times are created and enforced by the administration and staff at each individual facility."
- There is no formal equity policy in the school district to govern hardware, software, access, support, or use. Some classrooms observed had 4 computers, others had one or zero. Software packages were inconsistent as teachers described adding software on a room by room basis. Additionally, access varied in buildings and classrooms based on available hardware to access the Internet wirelessly or through hard-wired drops.
- While there is a newly implemented electronic Help Desk system (TrackIT!), there is no formal policy, nor publicized access for all staff members to utilize this system and report issues needing technology support.
- The school district has a school board approved and published Acceptable Use Policy (AUP), which is posted on the technology page of the Providence Public Schools website. The AUP is stamped Rev. 6 2012.

2.2 Technology and Information Procedures

Procedures are the life blood of the IT organization and document 'how to' implement and perform a task or process. Investment in this area to develop consistent and repeatable processes will provide returns to the district in efficiency, consistency and breadth of support. This is especially true in understaffed IT departments where when one resource is out, the backup resource needs to be able to fill in.

The key findings for **Technology and Information Procedures** include:

- There is no policy or procedure for "on-boarding" new teachers and staff members. Principals and teachers report that all on-boarding is done by teachers helping other teachers. This includes how to use their classroom computers, take attendance, use email and the phone system, utilize the student information system, where applicable, access the grade book where applicable, etc…
- K-3 teachers reported that iPads were given to them to use for student assessments around DIBELS. However, teachers reported that there were no training sessions provided for users that have never utilized an iPad. There was specific application training for use with DIBELS but there was an absence of "basic training" for teachers without experience.
- Staff members in focus groups and site visits reported being discouraged from bringing in their own technology devices (laptops, iPads, etc…) from home to use, specifically when they felt they had a lack of technology for instruction or personal productivity in their classrooms. They further reported that they did not have access to the wireless access points unless they were using school offered hardware.

2.3 Security Policies and Systems

The district must ensure that the confidentiality, integrity, and availability of all systems and data are adequate and protected, including those in departments and schools.

In general there are inconsistent practices at the schools within the district for access, safety and security.

The key findings for **Security Policies and Systems** include:

- <u>Infrastructure security</u>: While the wiring closets and patch panels located in each observed school building were primarily neat, access to each closet and panel were unobstructed and unlocked. In most instances, network gear, servers, routers, and switches were easily accessible to anyone walking in the building. All observed electrical panels were unlocked. Some had locks on them, but they were not in use in any instance of observation.

- Data security: While most internal passwords are the same to get into the main systems (REG SIS for example), there is no data security policy nor set of procedures to assure all sensitive and protected information is properly maintained by the school district.
- Physical building security: Access control, intrusion detection, and video surveillance systems are installed in most, if not all, of the buildings across the school district. However, there are no positions dedicated to observing and retrieving video footage, nor is there a protocol to do so. Flat screen monitors are located in common areas (offices) in each building and the Principal has access to the system to review video maintained in 30 day increments.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Community Access and Participation* were identified during the comprehensive information technology assessment conducted in September - October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., PPSS for Chapter 8) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 8, Policies, Procedures, Security, and Safety, section 3.1, Technology and Information Policies, would be numbered PPSS-1.1, the second recommendation in this same section would be PPSS-1.2.

3.1 Technology and Information Policies

PPSS-1.1 Standards to Define Access, Use, and User Level Attainment

Develop and obtain board approval for a policy (set of policies) defining access, use, and levels of user attainment across the district.

PPSS-1.2 District Equity Policy

Develop a plan and obtain board approval for a Technology Equity Policy.

PPSS-1.3 Implement a Help Desk/Support solution where all district staff can make requests electronically. (No Action Plan Required)

Develop and obtain board approval for a policy that defines user support, the chain of communication, and include a Service Level Agreement to govern and define user expectations.

3.2 Technology and Information Procedures

PPSS-2.1 On-Board Policy for New Staff Members

Establish a policy and procedure to "on-board" and orient new staff members around using technology in the school district.

PPSS-2.2 Bring Your Own Device Policy and Procedure

Develop and obtain board approval for a policy to govern staff members bringing devices to their schools, and a procedure to provide access and use in classrooms.

PPSS-2.3 Implement a procedure for teachers to demonstrate a basic level of attainment when new technology devices are introduced to the district. (No Action Plan Required)

Develop and implement a procedure for teachers to receive basic training and demonstrate levels of attainment on technology devices introduced to the district.

3.3 Security Policies and Systems

PPSS-3.1 Data Security Policy

Develop a PPSD network and data security policy, and set of procedures to assure all sensitive data is protected and maintained by the school district.

PPSS-3.2 Security System Policy

Establish a policy and procedure to govern the way school security systems (cameras and monitors) are used, including outlining responsibilities for reviewing incidents after they occur.

PPSS-3.3 Implement a policy to secure all infrastructure equipment by locking all wiring closets and panels. (No Action Required)

Obtain board approval for a policy to secure (lock) all infrastructure equipment.

4.0 RESEARCH AND BEST PRACTICES

Enterprise-oriented technology and information policies and procedures drive an organization by providing:

- a strong foundation of data governance to manage all aspects of data, storage, security, cleanliness, and use
- objectives for utilization and benefit of technology and information resources
- definition of protocols, industry standards, and functional requirements
- equity of use, access, and support
- a blue print for "on-boarding" new staff members and terminating accounts for departing staff members
- a process for securing all district assets, physical and application (data)

4.1 Policy Strategy

Policies are found at every level of an organization forming a hierarchy. In education, this hierarchy starts at the federal level and the state, extending to the board and into departments and schools. At all levels, policies specify the desired characteristics, capabilities, and functions of the underlying resources.

At each level, the nature of the policy is more finely resolved. Federal policies define overarching values for states and states render these policies with more specificity to meet the desires of their constituency. At the federal and state levels, policies are generally qualitative and subjective. At the district, department, and school levels, policies can be quantitative and objective in form, in particular for technology and information systems.

Policies are often the link between regulatory agencies, district administration, and technology management; thus, the word ”policy” is surrounded by a vast number of other related terms, including strategy, goal, vision, direction, mission, process, tactic, procedure, plan, scheme, course and guideline.

A formalization of policies and their applications seems possible and necessary. The development of management platforms is a way to integrate the concept of policies into management methodologies.

Policies define what management has to accomplish; at the information and technology level, this definition includes protocols, functionality, organization, and other functional and operational aspects. The specific way that this delineation is achieved is not generally part of a policy. Usually interdependencies between policies of different departments are also not part of a policy. These are to be coordinated separately in accordance with business strategies.

In order to be meaningful, policies must be turned into actions. Hence, they have to be transformed into an algorithmic and functional representation.

Within the district, policies fit within a formal hierarchy as noted below:

- Strategic
- Goal and Mission
- Strategy
- Policy
- Management Procedures and Processes
- Technology and Information Systems and Services

Another hierarchy to classify policies themselves includes:

- Principal or Strategic Policy
- Directional Policy
- Organizational Policy
- Functional Policy
- Process Policy
- Procedural Policy

In these hierarchies, it is possible to form a direct connection between strategy and actions and functions at the systems level. From a technical perspective, functional policies are the fundamental means to implement strategies and support administrative and user objectives. Process and procedural policies drive the design and implementation of systems.

The following aspects form a minimum set of characteristics required to define a policy:

- **Goal:** a description of the policy's aims.
- **Target objects:** the objects that are directly affected by the policy. This includes domains as objects.
- **Triggers:** the initial cause for a policy to take on actions. These may be the same objects or events to be monitored after the policy enforcement instructions are set off.
- **Policy actions:** the functional aspect of a policy, including what (not how!) changes or measures are to be enforced -- i.e., the policy enforcement actions and instructions. This must include aspects of time, such as the duration of its activity or its monitoring process, or the intervals for monitoring. The modality of the actions is an integral part of the actions.
- **Monitor objects:** objects that measure the suitability, timeliness and efficiency of the policy actions in comparison to the desired goal.

Policy Management

Effective policy management is not about the policy, but rather the processes around it, including development of the policy, distribution to those who use the processes, and assurance that they are being followed.

Management of the policy life cycle includes the following steps:

- **Definition:** Whenever a policy is defined, there is the question of which organization or department is authorized to specify the goals and who is obliged to carry out the necessary actions.
- **Activation:** As policies originate from management strategies, they may be triggered or activated by a particular event occurring within a resource or outside of it. Hence, triggers can be timers, counters, gauges, or other asynchronous events such as faults or configuration changes.
- **Enforcement:** The enforcement of a policy consists of a chain of management actions which may act on so-called target objects. A policy may be simple in terms of initiating a change in a single target object. However, complexity rises if the target objects are not directly accessible, if appropriate objects do not exist at all, if the objects are themselves complex in their functionality, or if the enforcement is subject to conflicting policies. Policies can be assigned to one or more functional areas.
- **Monitoring:** To control the correct, efficient, and timely activity of policies, the district needs indicators to monitor the policy enforcement.
- **Deactivation:** After a policy becomes obsolete, some information from the policy may be retained for further management use, such as for accounting or security means, etc.

Time considerations are important for all of the above aspects because a policy may be active throughout the lifecycle of its target objects or may only be activated for a short while (for example, when a new network device goes into operation). Policy enforcement instructions may need to be dispatched repeatedly such as whenever new devices are added to the configuration.

Policies can be grouped according to:

- **Type of targets:** This criterion could include policies applicable to all systems from one vendor, or all PCs in one department as for target objects with common characteristics, for example.
- **Functionality of targets:** This includes all policies which apply to resources with a set of common functionalities although possibly of different characteristics otherwise.
- **Management scenario:** Policies may be associated with a particular management scenario such as network management, systems management, or application management. Some policies may overlap and should thus be grouped together as enterprise management policies. For the scenario of network management, a group of

policies may be those applicable to one specific layer of the OSI basic reference model or policies applicable to several adjacent layers.

- **Organizational criterion:** This grouping of policies reflects the organizational structure of a system (e.g., policies for specific business units of an enterprise or policies that only need to be followed in high-security departments).
- **Geographical criterion:** With this criterion, policies are grouped according to their location (i.e., affecting co-located physical and logical resources along geographical boundaries). Examples are policies for systems in a LAN segment, or a policy for all systems in a virtual private network.
- **Ownership criterion:** These policies are mainly used for security reasons (e.g., the access control to a set of private files of a particular user, or publicly accessible files).
- **Managers' functionality criterion:** This criterion is essentially the same as the above classification along the functional areas affected. However, this time the point of view is management's -- in other words, not the functional areas the target objects belong to, but a classification of the management aims defined in the policy.

From the above characteristics, a policy definition seems to be very complex. This intricacy may certainly be the case for policies that influence more than one functional area.

Functional elements of an automated system would include:

- online guidebook
- policy utilization index and search engine
- policy lifecycle management engine

Policy Development

Partial list of exemplary policies required for technology and information systems:

- technology security
- acceptable-use (or appropriate-use) policies
- restrictions on access to student records
- acceptance of commercial advertising on school websites
- acquisition, maintenance, or disposal of school equipment or applications
- acceptance of donated equipment and software
- community or after-school access to school or district technology resources

In the past, policy development has been a reactive process. Policies were generally created as needed to prevent some problem condition. In the proposed methodology, policies are actively developed to include preventive measures, but also to set goals, sustain best practices, and encourage results.

Policy development follows these primary steps:

- development of hierarchies and classifications to categorize policies
- development of a list of necessary policies based on peer research
- construction of a catalogue of current policies
- alignment of current policies with hierarchies and classification, making small changes if necessary
- assessment of gaps and draft of new policies for review
- removal of outdated or redundant policies
- establishment of review committees and policy adoption process
- publication and distribution of policies
- establishment of policy use and compliance processes

In addition to the elements defined previously, each policy would include the benefits of applying the policy and the hazards of not doing so as well as the incentives and disincentives in deciding whether to use the policy or not.

Issues for Technology and Information Policies

The district provides the staff and students with access to local, national, and international sources of information through the Internet in an atmosphere that encourages sharing of information, access to a rich collection of services and open and free discussion for academic, research, and administrative purposes. Unfortunately, computing resources can be used improperly, sometimes quite unintentionally and, in rare instances, deliberately. Accordingly, for the benefit of the students and staff, users must assume responsibility for making the best possible use of these privileges and for not abusing them. It is the responsibility of the district to develop, publish, and enforce an *Acceptable Use Policy* (AUP) to ensure that the intentions and the privileges of the use of the Internet are not violated. Therefore, updated guidelines for monitoring copyright and "acceptable use" policies regarding the district's technology resources and online information sources must be maintained and easily accessible.

Additional issues for technology and information policies include:

- close alignment of policies throughout the district, departments and schools
- continuous processes for lifecycle implementation
  recognition that policies change and adapt to conditions robust and effective policy distribution system

4.2 Technology and Information Procedures

Procedures are defined, and methods and processes used at every level of an organization to accomplish defined objectives. The most effective procedures align closely with policies and, therefore, are driven by strategy and goals. Each procedure defines the desired outcome, resource requirements and accomplishments. Procedures are used to turn policies into actions as well as to capture the best practices of the organization for sharing knowledge.

Procedure Strategy

For procedures, it is crucial to form a direct connection between strategy, actions, and functions at the systems level. Then, it is easy to implement strategies and support administrative and user objectives which drive the design and implementation of systems.

The following aspects form a minimum set of characteristics required to define a procedure:

- **Goal:** a description of the procedure's objective.
- **Target objects:** the objects that are operated on or communicated with within the procedure. Objects include inputs, outputs, decision points, processing points and storage points among others.
- **Triggers:** the initial cause for a procedure to take on action; these may be the events that are monitored or could be part of an ongoing process.
- **Procedure actions:** the functional aspect of the procedure, including what actions are taken and what measures are to be monitored for successful completion. This includes aspects of time, such as the duration of its activity or its monitoring process, or the intervals for monitoring.
- **Monitor objects:** specialized objects that measure the suitability, timeliness, and efficiency of the procedure in comparison to the desired goal.

Procedure Management

Effective procedure management includes the processes for creation and development of the procedure, distribution, and training for those who will use them and some kind of assurance or monitoring that they are being followed.

Management of the procedure lifecycle includes the following steps:

- **Definition:** includes who or which organization or department specifies the goals and who is obliged to carry out the necessary actions.
- **Activation:** clear definition of when the procedure is to be used and what event or circumstance initiates the procedure. Triggers can be arrivals, requests, timers, counters, gauges, or other asynchronous events such as faults or changes.
- **Enforcement:** tracking of monitor objects and results of the procedure.

- **Monitoring:** various indicators to control the correct, efficient, and timely activity of procedures.
- **Deactivation:** Change or abandonment of ineffective procedure.

Procedures can be grouped according to:

- **Type of targets:** procedures applicable to systems, department, objects with common characteristics, or similarity of process.
- **Functionality of targets:** procedures that apply to resources with a set of common functionalities although possibly of different characteristics otherwise.
- **Management scenario:** Procedures possibly associated with a particular management scenario such as network management, systems management, or application management. Some procedures may overlap and should thus be grouped together as enterprise management policies.
- **Organizational criterion:** grouping of procedures that reflect the organizational structure of a system. For example, procedures for specific business units of an enterprise or procedures that only need to be followed in high-security departments.
- **Geographical criterion:** procedures grouped according to their location. For example, affecting co-located physical and logical resources along geographical boundaries.
- **Ownership criterion:** mainly used for security reasons (e.g., the access control to a set of private files of a particular user or publicly accessible files).
- **Managers' functionality criterion:** essentially the same as the above classification along the functional areas affected from the point of view of management; in other words, not the functional areas the target objects belong to but a classification of the management aims defined in the procedure.

From the above characteristics, a procedural definition seems to be very complex, but one of the objectives of most procedures is to simplify a specific process or establish optimum conditions for successful completion.

Automated systems for procedure definition and distribution are not readily available.

Functional elements of an automated system would include:

- online guidebook
- procedure utilization index and search engine
- procedure lifecycle management engine

Procedure Development

A partial list of exemplary procedures required for technology and information systems includes:

- technology equipment acquisition

- response to systems service deterioration or faults
- creation of user accounts and access management

In the past, procedure development has been a reactive process. Procedures have generally been created as needed to prevent some problem condition. In the proposed methodology, procedures are actively developed to include preventive measures and also to set goals, sustain best practices and encourage results.

Procedure development follows these primary steps:

- development of hierarchies and classifications to categorize procedures
- development of a list of necessary procedures based on peer research
- research and construction of a catalogue of current procedures
- alignment of current procedures with hierarchies and classification, making small changes if necessary
- assessment of gaps and draft of new procedures for review
- removal of outdated or redundant procedures
- establishment of review committees and procedure adoption process
- publication and distribution of procedures
- establishment of procedure use and compliance processes

In addition to the elements defined previously, each procedure includes the benefits of applying the procedure and hazards of not applying it as well as the incentives and disincentives of using it or not.

Issues for Technology and Information Procedures

Effective procedures utilize technology to reinforce their alignment to district, department, and school-level goals. Technology is to be used so that it streamlines, automates, and augments existing business processes and practices. Thus, technology should support the continuous improvement of the procedure development lifecycle of strategy formulation, management, implementation and monitoring. Recognizing that procedures change and adapt to conditions, technology should be flexible, scalable, and interoperable in support of such changes.

Likewise, a robust and effective procedure access system is necessary to maintain the legitimacy of the change controls in place when procedures are modified. Technology can complement or serve as the basis for such a system so long as it provides and facilitates the primary information security elements of authentication, authorization, and access control.

Authentication is any process by which you verify that someone is who they claim they are. Whereas authorization is finding out if the person, once identified, is permitted to have the resource. Access control is a generalized term to describe how access to the specific resource is controlled arbitrarily.

4.3 Equity

Equity policies and procedures must address conflicting issues that arise due to circumstances beyond the implementation of technology.

The development of critical-mass guidelines and configurations for classrooms and learning environments provides one of the means to reach equity objectives. A school-level policy for assessing interrelated elements of technology integration will help to ensure a systemic approach to monitoring critical mass. Using such a rubric, schools will be able to assess their status regarding technology availability and access and communicate results to the district.

The district also seeks to align district- and school-level technology policies. Consensus on policy may be reached, adopted, and communicated effectively system-wide.

Equity Policies and Issues

Policy development to address equity will:

- identify equity as a specific hierarchy for classification
- develop a list of necessary policies based on peer research
- build a catalogue of current policies
- assess gaps and draft new policies for review
- establish review committees and policy adoption process
- establish policy use and compliance processes

In addition to the elements defined, each policy includes the objectives of applying the policy to remediate inequitable conditions. Some solutions are readily understood and already underway. Others may provide alternative strategies.

Issues of equity include:

- definitions of critical mass and systems requirements drives equity
- definition of equity policies as a subset of district policies
- technology-based assistive and adaptive resources

Addressed in greater depth in Chapter 3, Teaching and Learning Technologies, adaptive and assistive technologies and the universal access/universal design model provide the means to help level the playing field with respect to equitable access to teaching and learning resources for all students, especially those with learning challenges.

4.4 On-boarding

On-boarding policies should reflect a systematic and comprehensive approach to orienting a new employee to the types of technologies available to them, outlining the expectations for utilizing that technology, and include the training necessary to successfully integrate technology to enhance instruction and personal productivity.

The development of a technology on-boarding policy is a critical step in successfully bringing a new employee into a district, school, or department. Sharing information such as technology performance expectations and use beginning the first day of employment, can reduce misunderstandings, frustration and even the premature departure of a new hire.

Technology On-boarding Policies

An On-boarding policy will:

- help the employee identify with their new employer
- allow the employee to gain an understanding and practical experience in utilizing district/school provided technology appropriately and up to expectations
- avoid misunderstandings
- reduce new employee anxiety
- set performance expectations
- decrease the learning curve

4.5 Network and Information Security

Network and information security is an adjunct to the data, computing, and communication infrastructure. In the K-12 environment, it includes protection of users as well as protection of network resources.

Network security in a PreK-12 environment that is connected to the Internet is more complex than in other types of organizations. Not only must the district contend with potentially destructive attacks from outside and within the organization, it must also prevent access by minors to material that the community finds objectionable. This is required by *Children's*

Internet Protection Act (CIPA) and is a requirement of the E-rate program. Security requires policy and the technical means for implementation. The district has the measures in place to prevent unauthorized access.

Fundamental to effective security is the integration of security procedures into the culture of the district such that each individual is aware of the need for secure practices and is aware of conditions and circumstances that may lead to security problems. Many practices are little more than common sense. Some are mandated by federal laws; others are required by network systems. Taken together, they provide the environment and practices necessary for effective protection of students, staff, and information.

Network security requires developing a comprehensive set of policies and procedures to include:

- expectations for proper computer and network use
- procedures to detect, prevent and respond to security incidents

Security, however, is not absolute and comes at a cost, which can be measured in dollars for hardware, software, and staff time; but it can also be assessed in terms of loss of ease of use. Cost of preventing a potential threat must be weighed against the cost of recovering from it.

The Consortium for School Networking (CoSN) has prepared and published a series of excellent guidelines for school district network security. For a list of the available online resources, go to http://securedistrict.cosn.org/tech/Evaluation/SecPlanGridDetailView.html. CoSN discusses the security preparedness in four areas; Management, Technology, Environmental and Physical Security, and End Users. Under each of these areas, CoSN defines four levels of preparedness; Basic, Developing, Adequate, and Advanced. The information is organized as follows:

Management

District Leadership:
- Oversight
- Support

IT Security Management
- Security Implementation
- Security Planning
- Security team

Technology

Architecture – Systems Design
- Architecture
- Internet
- Perimeter Defense
- WAN Security

IT Operations

- End-user security
- WAN and LAN management

Environmental and Physical Security

Environmental Security

Physical Security

End-User Security

Participation

Each of these areas is accompanied by levels of compliance information. By way of illustration, in Table 1 below, the table row for Management: District Leadership, Oversight is shown.

Table 1: Sample Compliance Information

Management: District Leadership				
Issue	**Basic**	**Developing**	**Adequate**	**Advanced**
Oversight	Goals for security have not been articulated. District awareness of legal issues: basic. Extent of compliance: unknown. No policy specifically targets technology use.	Security goals have been outlined. Awareness of legal issues: growing. Compliance: OK at network level. Policy in early stages, addresses legal issues.	Security goals stated clearly. Awareness of legal issues: from desktop to Internet. Compliance: not fully auditable. Policy ties technology use to district mission.	Security goals integrated with educational and administrative objectives. Awareness of legal issues: comprehensive. Compliance: fully auditable policy meshes seamlessly with district mission.

These tools provide both a guideline to what should be done as well as a mechanism for measuring a district's present security condition. Access Controls

Access controls operate at the network level for wired and wireless connections and operate at the three fundamental levels:

- access to the workstation connected to a wired network
- access to network resources including addressing for wired and wireless connections

- access to information

The first line of defense against unauthorized access is close adherence to user authentication via passwords. This observance provides protection against most intentional unauthorized access with malicious intent. This protective service is accomplished by invoking workstation logon, turning on password access after inactivity, and limiting local drive sharing. Combined with this protection is careful attention to password selection and protection of the password from unauthorized discovery. It is also critical that protected information is not intentionally or unintentionally copied from a secure environment to an insecure environment. For example, recent compromises to national security arose because users copied sensitive information from department servers to personal notebooks for work at home.

To ensure user compliance with protective measures, it is necessary to strike a careful balance between protection and ease of use. Users must not believe that it is too much effort to prevent unauthorized access. Much of this belief is due to a lack of understanding about what is sensitive, what is required by law to be protected, and what the implications are for unauthorized, intentional, or accidental access to sensitive information.

Issues for implementation of access controls include:

- clear understanding of access issues
- first-line defense and response as part of user awareness
- policies and training to implement security measures
- proper balance between protection and ease of use

Information Security

Information security includes protection of data on workstations and servers and prevention of unauthorized access to data as well as private and protected data via the network, or on stored backups or printed material. Data includes information supporting administrative and learning processes and data supporting network resources and access.

Information protection starts with the recognition that critical information exists and that either due to malicious intent or by regulation, it is necessary to protect it. The same user issues apply to information security as to access control noted above. Beyond this are significantly more sophisticated threats and response strategies. Issues for implementation of information security include:

- proper identification of sensitive information
- policies and training to implement security measures
- proper balance between protection and ease of use
- provide necessary protection and no more

User Protection

User protection is focused in two areas:

- prevention of exposure of students to Web content that is deemed inappropriate by community standards
- prevention of exposure to malicious code

Protection is accomplished by channeling all traffic through a limited number of physical links, each fitted with filtering technology in compliance with district standards. Content filters monitor Web addresses to prevent requests to known inappropriate sites or specific pages and monitor returned content from unknown sites to test for specific words, concepts, or images that are deemed inappropriate. Malicious code filters scan e-mail messages in particular, but also Web content and documents to prevent damaging code from being passed to users. Generally, malicious code protection includes filters at remote e-mail servers, district e-mail servers, and local workstation e-mail agents.

All of the user-protection measures can be compromised by inattentive user practice. Bypassing access to the Web for e-mail or content and transfer of files via disk are the most prominent compromises to protective measures. In addition, there may still be content or malicious code that gets past the filters. Users must be aware of suspicious circumstances and the common sense measures that will prevent damage to systems and security.

Issues for implementation of user protection include:

- measures mandated by requirements
- proper balance between access and protection
- proper balance between protection and ease of use
- policies and training to implement security measures

Operations Continuity

The concept of "disaster/failure recovery" needs to be expanded to "operations continuity." Information stored in computer systems supports district processes. Protecting and recovering the information is only a small part of restoring the operation of the affected process. Operations continuity is divided into four phases:

1. readiness
2. response
3. recovery
4. reconstruction

These steps provide a solid methodology for identification of critical information resources, based on support of critical processes. Methodologies using checklists and procedural manuals provide clear step-wise execution of actions that can reduce the extent of a disaster or prepare for recovery from one. Operations continuity has to plan for how users will regain their productivity at an alternate location under stressful conditions. When the event has passed, it is necessary to rebuild processes and systems and engage the process of returning to normal.

Issues for implementation of operations continuity include:

- focus on users and process to drive information requirements
- training for awareness to prevent disruptions
- training and processes for effective response to events
- understanding risks and being prepared to accept risks not addressed or mitigated
- comprehensive strategies for recovery of processes including reconstruction and rebuilding

Physical Security

Physical security is protection of equipment. As such, it is an adjunct to facility security and security systems. Facility security and security systems help to prevent theft and vandalism by restricting access to authorized persons. In addition to this are the means to track shipments, inventories, and distribution. In some cases, there is strong conflict between physical security and simplified access which must be accommodated.

Fundamental to effective security is development and adoption of reasonable procedures to discourage opportunity theft during transport or use of equipment. This protective service can be implemented with barcode or radio frequency identification (RFID) and tracked with materials inventory systems.

Issues for implementation of physical security include:

- Comprehensive catalogue of equipment
- active monitoring with asset management system
- training and awareness of fundamental security procedures
- reasonable theft-deterrence and user-authentication

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations report*
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., PPS for Chapter 8) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 8, Policies, Procedures, Security, and Safety, section 5.1, Technology and Information Policies, would be numbered PPS-1.1, the second Action Plan in this same section would be PPS-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Technology and Information Policies**

  PPSS-1.1 Standards to Define Access, Use, and User Level Attainment

  PPSS-1.2 District Equity Policy

  PPSS-1.3 Help Desk/Support solution where all district staff can make requests electronically. (No Action Plan)

- **Technology and Information Procedures**

  PPSS-2.1 On-Board Policy for New Staff Members

PPSS- 2.2 Bring Your Own Device (BYOD) Policy and Procedure

PPSS-2.3 Demonstration of a basic level of attainment when new technology devices are adopted. (No Action Plan)

- **Security Policies and Systems**

PPSS-3.1 Data Security Policy

PPSS-3.2 Security System Policy

PPSS-3.3 Secure all Infrastructure Equipment (No Action Plan)

5.1 Technology and Information Policies

Initiative: Standards to Define Access, Use, and User Levels of Attainment			
Recommendation:	PPSS – 1.1 Implement a set of standards to define access, use, and levels of user attainment across the board in all schools,PK-12.	**Key Performance Indicator(s):**	1. District agreement 2. Board approval
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology School Board of Education

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	 Year 2 14/15	 Year 3 15/16
1. Convene a district technology committee (broad cross-section of users, admins, and community members).	X		
2. Develop standards/objectives to define access, use, and levels of attainment for all users.	X		
3. Develop strategies for implementing the defined objectives for access, use, and levels of attainment.	X		
4. Draft policy and obtain board approval.		X	
5. Implement the strategies for access, use, and levels of attainment.		X	X

Interdependencies: ODS-1.1 , TLT-2.2	**Estimated Cost:**	• Year 1: $5,000 • Year 2: $40,000 • Year 3: $40,000 **Total: $85,000**	**Potential Funding Source(s):**

Initiative: District Equity Policy

Recommendation:	PPSS – 1.2 Establish a consistent school district-wide equity policy that states equity is defined by access, support, and use.	**Key Performance Indicator(s):**	1. District agreement 2. Board approval
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology School Board of Education

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Define and obtain agreement on a PPSD equity policy (including access, support, use).	X		
2. Develop the strategies that will implement each of the 3 aspects of equity.	X		
3. Calculate the costs for all these strategies and show the implementation through time.	X		
4. Obtain School Board of Education approval for this policy.		X	
5. Implement these strategies by determining the gap between the definition of these standards and the status of each school.		X	X
6. Disseminate and update policies as appropriate.			X

Interdependencies: PPSS-1.1, TLT-2.2	**Estimated Cost:** • Year 1: $ 5,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $15,000**	**Potential Funding Source(s):**

5.2 Technology and Information Procedures

Initiative: On-board Policy for New Staff Members			
Recommendation:	PPSS – 2.1 Establish a policy and procedure to "on-board" and orient new staff members around using technology in the school district.	**Key Performance Indicator(s):**	1. District developed procedure 2. Board approval
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology Human Resource Manager School Board of Education

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Convene a district-wide technology users committee as a sub-group of the larger district technology committee. Include health care sign up, all new staff processes (health care, payroll, union and non-union employee flavors, benefits, no "go to" person for this new staff process – all is ad hoc currently, no one system that drives this.	X		
2. Define and outline a set of technology objectives, exposure and user expectations, for each new employee in the district.	X		
3. Draft an "on-board" policy and obtain board approval. Include a check list of what needs to be done by which type of new hire.	X		
4. Implement the objectives with new district employees.		X	X

Interdependencies: SDHR-5.1	**Estimated Cost:**	• Year 1: $ 5,000 • Year 2: $5,000 • Year 3: $5,000 **Total: $15,000**	**Potential Funding Source(s):**

Initiative: Bring Your Own Device (BYOD) Policy and Procedure			
Recommendation:	PPSS – 2.2 Establish a policy and procedure for staff and students to use their own devices on district infrastructure.	**Key Performance Indicator(s):**	1. District developed procedure 2. Board approval
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Department of Technology Technology Manager School Board of Education

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Convene a district-wide technology users committee as a sub-group of the larger district technology committee.	X		
2. Research best practices from districts that have successfully implemented BYOD policies.	X		
3. Define and outline a set of objectives to promote staff members and students using their own devices on district infrastructure.	X		
4. Outline a set of objectives to securely provide internet access to BYOD users segmented from the main PPSD network, including the use of management software.	X		
5. Draft an "on-board" policy and obtain board approval.	X		
6. Implement the objectives with new district employees.		X	X
7. Disseminate and update policies as appropriate.			X

Interdependencies: TLT-2.2, PPSS-1.1, PPSS-1.2, PPSS-2.1	**Estimated Cost:**	• Year 1: $5,000 • Year 2: $5,000 • Year 3: $5,000 **Total: $15,000**	**Potential Funding Source(s):**

5.3 Security Policies and Systems

Initiative: Data Security Policy					
Recommendation:	PPSS – 3.1 Develop a data security policy and set of procedures to assure the PPSD network and all sensitive data are protected and maintained by the school district.	**Key Performance Indicator(s):**	1. District agreement on security policy 2. Board approval		
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology School Board of Education School Operations		

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Convene a committee of IT leadership and support staff members.	X		
2. Complete an internal and external audit, and a penetration assessment to determine weaknesses and vulnerabilities, which is part of Chapter 12, CNI-6.1. (network access and data)	X	X	X
3. Research best practices and review industry standards for securing and maintaining the network and data.	X		
4. Develop a policy and a set of protocols to secure the PPSD network, servers, and all data at the transport level and at rest.		X	
5. Implement the network and data security policy district-wide.		X	X
6. Disseminate and update policies as appropriate.			X

Interdependencies: CNI-6.1	**Estimated Cost:**	**Potential Funding Source(s):**
	• Year 1: $ 5,000 • Year 2: $ - • Year 3: $ - **Total: $5,000**	

Initiative: Security System Policy

Recommendation:	PPSS – 3.2 Establish a policy and procedure to govern the way school security systems (cameras and monitors) are used, including outlining responsibilities for reviewing incidents after they occur.	**Key Performance Indicator(s):**	1. District agreement on a security system policy 2. Board approval
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology School Board of Education School Operations

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Convene a security committee as part of a sub-group of the larger district technology committee.	X		
2. Conduct an audit of all internal hardware and components associated with the current security systems in each building.(See Chapter 12)	X		
3. Determine the value of all hardware and components (e.g., digital cameras vs. analog).	X		
4. Develop a set of objectives to define responsibility for each building based system, incident review protocols, reporting protocols, and a methodology to tie technology related security protocols to physical protocols (e.g., all staff members wearing ID cards and lanyards).		X	
5. Draft a security system policy and obtain board approval.		X	
6. Implement the security system policy district-wide.		X	X
7. Disseminate and update policies as appropriate.			X

Interdependencies: CNI-1.1, CNI-2.4	**Estimated Cost:** • Year 1: $ 5,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $5,000**	**Potential Funding Source(s):**

Chapter 9:
District-, School-, and Program-Level Planning Process

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Our goals can only be reached through a vehicle of a plan, in which we must fervently believe, and upon which we must vigorously act. There is no other route to success.*
>
> *—Stephen A. Brennan*

The **District-, School-, and Program-Level Planning** chapter focuses on a coordinated approach to district, school, and program-level planning. This chapter addresses the ways in which technology resources can support and enhance the planning efforts in Providence Public School District (PPSD). It further describes processes and procedures to track the effects of planning and to monitor success.

The subtopics within this chapter include:

- District-Level Planning
- School Improvement Planning
- Department/Unit-Level Planning
- Balanced Scorecard Process
- Project Management Oversight

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *District-, School-, and Program-Level Planning Process* section of the *Key Findings and Recommendations* final report.

2.1 District-Level Planning

Superintendent Lusi and her executive team are in the process of developing a strategic plan to encompass 2012-2016. The draft version outlines five goal areas: Engaged Students and Families, Highly-Effective Educators, Rigorous and Aligned Content, Systems that Work, and Collaborative Community. It is anticipated that all projects within this time period will align to these goals.

The key findings for **District-Level Planning** include:

- The development of a district-wide strategic plan is in process.

2.2 School Improvement Planning

Five PPSD schools have been identified as Persistently Low-Achieving (PLA) schools and are targeted for school reform. Within the three defined school district zones, these schools are included in the Innovation Zone. They will be implementing a Transformational model, which involves a new principal, each of whom has submitted a Reform Plan which is posted on the school district's home page. The protocol for these schools includes a strong data component as well as the integration of technology into instruction. Beginning in the fall of 2012, United Providence (UP!) is managing the three-year reform effort in one elementary, one middle, and one high school which is PLA. The UP! protocol relies heavily on tracking data.

Using the district-created template, each school is required to submit a school improvement plan, which does not include a technology component.

The key findings for **School Improvement Planning** include:

- Beginning in the fall of 2012, United Providence (UP!) is managing the three-year reform effort in one elementary, one middle, and one high school which are PLA.
- The district-created school improvement template does not include a technology component.

2.3 Department/Unit-level Planning

Providence's District Technology Plan describes technology goals in general terms for using technology. This plan was developed by an outside consultant and adheres to the guidelines of the Rhode Island State Technology Plan. The plan is rewritten every three years. The current plan covers the years 2010–2013 and replaced the previous plan, which was for 2007–2010. This document, the Technology Blueprint, will be used to guide the plan for 2013-2016 as well as future plans. The technology plan is not systemically monitored or updated, although some updates and monitoring are conducted by the IT Department.

There are many initiatives underway in PPSD's departments and schools.

The key findings for **District/Unit-Level Planning** include:

- PPSD's current technology plan covers 2010-2013. Some monitoring and occasional updates are conducted by the IT Department. Although there is a cross-departmental oversight team, the plan is not thoroughly monitored or updated.

2.4 Balanced Scorecard Process

The Balanced Scorecard Process ensures the projects that are undertaken are aligned to the district's strategic plan, with the leadership team approving all projects to ensure this alignment. PPSD does not currently have this process in place, but the draft District Strategic Plan defines "indicators of progress" for each of the five main goals listed above.

The key findings for **Balanced Scorecard Process** include:

- Many initiatives are not coordinated or reviewed at the district level, therefore missing opportunities for increased collaboration and effectiveness.

2.5 Project Management Oversight

Effective project management ensures successful implementation so that projects come in on schedule and within estimated costs. Currently, most projects are done in isolation, without coordination and attention to interdependencies. There is not a project management office coordinating the execution of the multiple projects that are currently underway. Projects are managed by department staff as an extra task in addition to their assigned jobs.

The key findings for **Project Management Oversight** include:

- At this time, there is not a project management office to coordinate and resolve issues on each major project. The goal of the project management office would be to improve the quality of everything that is done within PPSD.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *District-, School-, and Program-Level Planning* were identified during the comprehensive information technology assessment conducted in September - October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., DSPP for Chapter 9) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 9, District, School, and Program-Level Planning Process section 3.1, District-Level Planning, would be numbered DSPP-1.1, the second recommendation in this same section would be DSPP-1.2.

3.1 District-Level Planning

DSPP-1.1 Technology as a Strategic Priority

Ensure that technology is a strategic consideration in all school district planning and that the planning of technology initiatives is in alignment with school district goals. Identify ways to harvest the full value of existing technology investments so that systems are utilized fully and new systems are not purchased to fill a need that can be addressed by existing systems. All school development plans should include a professional development plan.

3.2 School Improvement Planning

DSPP-2.1 Updated School (and Division) Improvement Plans

Revise the district-created template used for school improvement plans (SIP) and divisions to include technology goals.

DSPP-2.2 Monitoring Reform Efforts with UP!

Work with the Reform School Principals and UP! to create a Balanced Scorecard for each school, listing the goals, strategies, projects, indicators of success, and measures. Update these on a monthly basis and post the results on the school website. (No action plan needed. See DSPP-4.1)

3.3 Department/Unit-Level Planning

DSPP-3.1 Technology Steering Committee

Establish a committee of instructional staff to approve projects, help prioritize the work, and institute needed policy changes.

DSPP-3.2 Department Planning Template

Define a template for consistent department planning ensuring that it is aligned to the new District Strategic Plan and includes all major departmental projects with defined measurable objectives. (No Action Plan needed.)

3.4 Balanced Scorecard Process

DSPP-4.1 Balanced Scorecard Process

Embrace a Balanced Scorecard process in which goals are broken into measurable objectives, performance indicators are defined, and progress is tracked using baseline, actual, and target data.

3.5 Project Management Oversight

DSPP-5.1 Project Management Office

Define a process for project management oversight so that all major projects can be sponsored and reviewed by a group of executive staff who can address issues when they arise.

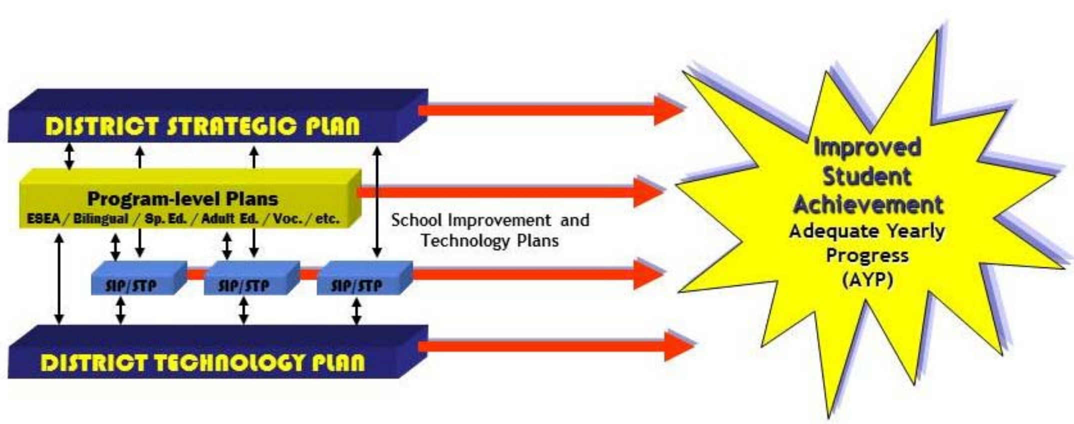
4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists on best practices and critical success factors in using technology to improve teaching, learning, and school management, and this body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online to remain current with emerging issues. In addition, they present at and attend local, national, and international conferences focusing on education and education technologies. Feedback from clients during the implementation of their Technology Blueprint initiatives contributes to CELT's experiential knowledge base. CELT has been building this collective knowledge base continually for the past nineteen years while working with departments of education, school districts large and small, and a variety of public and private organizations, many of which are national in scope.

In addition to national research approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with PPSD. The following pages highlight critical success factors that most closely relate to the need and goals of PPSD.

- There are several interdependencies between action plans recommended in this chapter of the *Information Technology Blueprint*. Refer to each action plan for detailed interdependencies.
- Current data systems are unable to support optimal planning and performance management. The strategies and schedules for delivery of the planning support technology defined herein take into account these limitations, but may need to be adjusted based on the timing of improvements to data systems.
- Several of the projects proposed require a 2-3 year deployment effort and must include ongoing maintenance for sustainability over time.

The relationship among district strategic planning, district technology planning, and planning at the school- and program-levels is depicted in Figure 1. The overarching goal of all planning, as illustrated, is improved student achievement.



Technology in Support of Planning Process

A host of technology-based solutions and techniques are available to assist with the development, implementation, monitoring/evaluation, and communication of the plan. The district currently employs some of these approaches and others are under consideration. However, the most fundamental way that technology can assist the planning process is by providing accurate, timely, and mission-critical information to inform teaching, learning, and management as depicted in Figure 2.

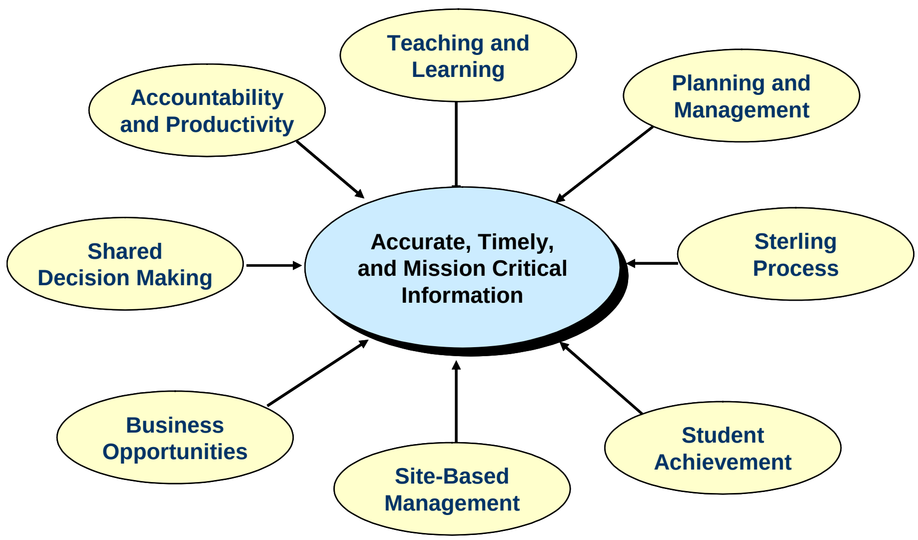


Figure 1. **Comprehensive Strategic Planning and Implementation**

Balanced Scorecard

For large implementation efforts, Web-based project management software will allow the district to simultaneously track the activities, milestones, deliverables, and benchmarks of multiple project components. It will provide the school district a greater ability to manage the vast array of information technology and capital projects, multiple partners and vendors, and associated sub-projects. The school district will be better positioned and equipped to understand problems, make decisions, and know their impact on departmental priorities and district operations.

Project decision-making will be enhanced through access to accurate and timely information. This will reduce the time required to reach the right decision and greater confidence that the right decision has in fact been made. In addition, an informed process acts to quickly resolve problems, answer issues and remove conflicts between project plans. Effective project management provides opportunities for changing directions if a situation arises that necessitates rethinking strategies and priorities. By having district-wide project management and fiscal coordination, the district can quickly and easily forecast resource and financial requirements and reflect changes to project progress and deliverables.

This initiative could be improved by data-driven systems that ensure the relevant and measurable indicators are selected for the scorecards. Furthermore, it is crucial that scorecard results being reported are based on up-to-date and accurate data. Fully implemented, a balanced scorecard strategy will provide timely feedback that can be used to determine whether a project is on-track as well as when redirection is needed.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., DSPP for Chapter 9) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 9, District, School, and Program-Level Planning Process, section 5.1, District-Level Planning, would be numbered DSPP-1.1, the second Action Plan in this same section would be DSPP-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **School Improvement Planning**

  DSPP-2.1 Updated School (and Division) Improvement Plans

  DSPP-2.2 Monitoring Reform Efforts with UP! (No Action Plan required. See DSPP-4.1)

- **Department-Level Planning**

  DSPP-3.1 Technology Steering Committee

  DSPP-3.2 Department Planning Template (No Action Plan required.)

- **Balanced Scorecard Process**

  DSPP-4.1 Balanced Scorecard Process

- **Project Management Oversight**

  DSPP-5.1 Project Management Office

5.1 School Improvement Planning

Initiative: Updated School Improvement Plans			
Recommendation:	DSPP – 2.1 Revise the district-created template used for school improvement plans (SIP) to include technology goals.	**Key Performance Indicator(s):**	1. Updated School Improvement Plan templates
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Rigorous and Aligned Content	**Leadership Responsibility:**	Chief of Staff Performance and Technology Principals Zone Directors School Improvement Principals

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Timeline Year 2 14/15	Timeline Year 3 15/16
1. Review the standard template that all principals (and division heads) use when creating their improvement plan.		X	X
2. Add to school (and division) improvement plans a section for teacher goals of technology integration into the curriculum.		X	
3. Disseminate and provide training on using the revised templates, including principal vision training to see the potential and long-term impact of not refreshing technology regularly.		X	X
4. Include these results in the principals' evaluations and current School Improvement Plan process.		X	
5. Consider developing a web-based school (and division) improvement planning tool, that is fully integrated, in real time, with PPSD's data systems. Work closely with the planning /project management office.			X

Interdependencies	Estimated Cost	Potential Funding Source(s)
Interdependencies: CA-1.1, CA-1.2, CA-2.1, CA-2.3, LESF-1.1, DSPP 4.1, DSPP 5.1	**Estimated Cost:** • Year 1: $ • Year 2: $ 10,000 • Year 3: $80,000 **Total: $90,000**	**Potential Funding Source(s):**

5.2 Department/Unit-Level Planning

Initiative: Technology Steering Committee			
Recommendation:	DSPP – 3.1 Establish a committee of instructional staff to approve projects, help prioritize the work, and institute needed policy changes.	**Key Performance Indicator(s):**	1. Technology Steering Committee that meets quarterly
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Technology Department Teaching and Learning

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Assign key instructional staff to become members of the technology steering committee. Ensure district staff, school administrators from elementary, middle and high schools are members.	X		
2. Establish operating norms, responsibilities, and meeting frequency.	X		
3. Schedule topics for approval such as policies, current projects and work prioritization.	X		
4. Publish the status and recommendations from this group to all PPSD employees.	X		

Interdependencies: ODS-1.1, ODS-1.2	**Estimated Cost:**	**Potential Funding Source(s):**
	• Year 1: $ 5,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $15,000**	

5.3 Balanced Scorecard Process

Initiative: Balanced Scorecard Process			
Recommendation:	DSPP – 4.1 Embrace a Balanced Scorecard process where a sponsor is assigned for each initiative, then proposes projects to achieve the plan goal.	**Key Performance Indicator(s):**	1. Balanced Scorecard detailing the goals and objectives outlined in the Strategic Plan
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Superintendent

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1 13/14**	 **Year 2 14/15**	 **Year 3 15/16**
1. Create a balanced scorecard reporting structure to list the goals and strategic objectives outlined in the District Plan.	X		
2. Include strategies and indicators as outlined in the plan and columns for actual and target data. Review and update as appropriate, based on how often the indicator is measured.	X	X	X
3. Track the indicators of success for the district's Strategic Plan through a balanced scorecard process.	X	X	X
4. Post this data on the PPSD website so it is accessible to stakeholders and link to individual school websites.	X	X	X
5. Conduct training for principals and department heads on defining performance indicators to ensure that they are measurable and attainable. These should include measures besides test scores.	X		
6. Schedule an update to the balanced scorecard on a regular basis so that the data will be current.		X	X

Interdependencies: DSPP-4.2	**Estimated Cost:**	• Year 1: $ 15,000 • Year 2: $ 5,000 • Year 3: $ 5,000 **Total: $25,000**	**Potential Funding Source(s):**

5.4 Project Management Oversight

<table>
<tr><th colspan="5">Initiative: Project Management Office</th></tr>
<tr><td>Recommendation:</td><td>DSPP – 5.1 Define a process for project management oversight so that all major projects can be sponsored and reviewed by a group of executive staff who can address issues when they arise.</td><td>Key Performance Indicator(s):</td><td colspan="2">1. Establishment of a Project Management Office, which conducts regularly scheduled reviews of all major projects.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Engaged Students and Family
Highly Effective Educators
Rigorous and Aligned Content
Systems that Work
Collaborative Community</td><td>Leadership Responsibility:</td><td colspan="2">Superintendent</td></tr>
</table>

<table>
<tr><th rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td>1. Assign a person to be responsible for the project management office for the district.</td><td>X</td><td></td><td></td></tr>
<tr><td>2. Agree on the operating norms, standard templates and meeting frequency.</td><td>X</td><td></td><td></td></tr>
<tr><td>3. Have each project costing in excess of $15,000 develop a project charter to get reviewed. This would include existing projects already in process.</td><td>X</td><td></td><td></td></tr>
<tr><td>4. The leadership team would review and approve all projects to start off.</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>5. The leadership team would regularly review the status of each approved project going forward.</td><td>X</td><td>X</td><td>X</td></tr>
</table>

<table>
<tr><td>Interdependencies: DSPP-4.1</td><td>Estimated Cost:
• Year 1: $ 80,000
• Year 2: $25,000
• Year 3: $25,000
Total: $130,000</td><td>Potential Funding Source(s):</td></tr>
</table>

Chapter 10:
Administrative and Productivity Systems

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"We've spent an awful lot of money, but we decided that the number one need was interoperability."*
>
> —Larry Nelson

Central information systems are the foundation that supports administrative operations and decision making throughout all of Providence Public School District (PPSD). The purpose of this chapter is to develop ways to enhance and expand information resources to better serve present needs and to provide the means to better address the needs of the future. Chapter 10: Administrative and Productivity Systems of the *Information Technology Blueprint* focuses on:

- Information Systems Strategies
- Business Management Systems
- Student Information Systems

Information systems are fundamental to school district operations, bearing that in mind it is necessary to fully recognize their strategic nature. Also, it is imperative to implement initiatives that enhance their functionality, reliability, development, and use efficiency. In addition, migration to a service-oriented delivery model driven by a school district-wide value proposition and total cost of ownership (TCO) imperatives helps to assure that these systems will continue to improve student achievement and increase school district-wide operational productivity and efficiency.

This chapter, in conjunction with the complete collection of *Information Technology Blueprint* chapters, is a dynamic, living document that is updated regularly to address:

- Emerging technologies
- New standards and specifications
- Revisions to federal, state, and local regulations and legislations
- Best practice research for information systems from the school district and nation
- Ongoing initiatives implemented within the school district

Diverse audiences will find this document of interest and constituents across PPSD will be beneficiaries of enhanced access to information and the expanded services from the school district's central information systems. The Information Technology (IT) Department and its related departments are the primary groups within the school district responsible for implementing the recommendations and initiatives presented here.

Many of the recommendations included in this section address creation of steering committees and taskforces to accomplish specific initiatives. The information included in this chapter can be used as a guideline to implement changes or provide background information to start the development process. The work in nearly all of the other sections is interdependent with the information systems presented in this section.

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Administrative Applications and Decision Support Systems* section of the *Key Findings and Recommendations* final report.

2.1 Information Systems Strategies

Developing and maintaining a systemic approach to, "define, develop, and implement both the process and data processing support for district-wide data-driven decision making systems that can be used for instructional decision making and accountability," as noted in Goal 5, Section 2.7 of the 2010-2013 school district's technology plan, is of critical importance. While data processing support is a more technical approach, developing a policy to govern all aspects of data use, input, and maintenance will help guide PPSD to build strength in the area of information system strategy.

The key findings for **Information Systems Strategies** include:

- Providence Public School District (PPSD) departments recognize that data is maintained in silos, but there is no evidence of an approved systematic approach for procuring, implementing, and integrating administrative systems required to capture and incorporate the student, administrative, and school district data necessary to effectively manage the district information system needs. This finding was clearly articulated in Goal 5 of Section 2.7 of the 2010-2013 school district technology plan.
- Several disparate systems are in use that capture and maintain some form of student, financial, and staff data. There is no real-time interface between systems. A few systems only talk or interact with one another via a simple extract, import, or export.

  The following is a partial list of systems in place: REG (custom built) is used for student information, Follett Destiny for libraries, Lawson for HR and financial management, My Learning Plan, Nutrikids, Easy IEP, etc. In addition, as an example, Special Education has several systems in use that are also siloed, including the RIDE census and Teaching Strategies Gold. REG (SIS) feeds demographic data into Easy IEP, but much of the information is not validated or controlled. These systems also do not appear to integrate with one another. The school district has announced an intention to procure a new student information system.
- Information systems are inconsistently utilized in schools due to a lack of access to hardware and/or a lack of mandate for use. Information technology reported that all aspects of REG function up to specifications; however, for reasons

related to choice or access, not all end users utilize the system. For example, attendance is completed electronically in REG (SIS) at the high schools; however, the elementary schools are unable to complete daily attendance electronically because they do not have sufficient hardware in each classroom.

2.2 Business Management Systems

The Business Management System, Lawson, a shared resource with the city of Providence, is widely regarded as a strong solution in school districts across the country. While the system is functioning on many levels in PPSD, targeted areas of improvement revealed themselves during the needs analysis phase of the IT Blueprint process. Most reported issues fit within three categories:

1. Components of Lawson may not have been deployed fully.

2. There are identified gaps in training key staff members, both during induction and in continued deployment.

3. Human Resources staff does not have access to the district Student Information System (REG); similarly, district staff members do not have access to Lawson.

The key findings for **Business Management Systems** include:

- Lawson is the current system in use in both Human Resources and Finance for the city of Providence and the school district. From the viewpoint of both the city and the school district, the system does not appear to have been deployed fully (in terms of the available software components and modules). Additionally, there is a lack of sufficient training on the system to embrace its full potential.

- Lawson and REG are connected via the employee number used by both systems. However, there is no real-time interface between the two systems. As a result, the HR department is unable to use Lawson to generate a report, for example, of how many current Kindergarten teachers are in the school district.

2.3 Student Information Systems

A Student Information System is a software application for educational organizations to manage student data. The main functions of the application include modules to enter and maintain demographic data, registration, attendance, schedule courses, manage grading, report cards, transcripts, discipline, and a variety of other tasks such as parent/student access via a portal. The PPSD Student Information System, REG, contains a variety of features and functions, reports by technology department staff members and administrators revealed that the system might not be robust enough to match the current needs, nor is there a single database currently to manage all of the modules required throughout the district. Since 2000, when REG (short for REGistration) was designed to manage the PPSD registration process, the system has evolved to include many modules.

The key findings for **Instructional Systems** include:

- The Providence Public School District utilizes a proprietary student information system called REG. REG was built to reflect the requirements of the faculty and staff members of the district. REG modules include student demographics, scheduling, grade reporting, attendance, registration and placement, discipline tracking, teacher grade book, as well as additional functionality. While REG contains all of these features and functionality, there were reports by technology department users and administrators that the system is not as robust as desired nor was utilization consistent among all schools in the district. Though the system works to specifications, there is an expressed desire by the technology department and other administrators to take advantage of newer technology, web-based modules, and a solution that will create a single database as opposed to the individual/siloed approach currently in practice. Sufficient findings to discuss the robustness of REG (SIS) with key recommendations are not available. However, it is critical that all schools and classrooms have access to the REG (SIS) system, and all users across the school district are entering daily/period attendance (PK-12), grades, progress reports, report cards, and additional information important to district users and staff personnel.
- There does not appear to be a parent portal within REG, the student information system, to allow parent access to real-time student data via the Internet. Parent portal initiatives are underway in at least two schools, involving at least two third-party solutions.
- REG, the district student information system, includes a teacher grade book module that was custom built based on Providence teacher requirements and parameters. The grade book feeds progress reports and quarterly grade entries, however, it is not required to be used. In addition to the grade book, teachers across the school district are employing a “grade book” system that best suits their needs including, other online grading solutions (fee based and free), Excel spreadsheets, and traditional paper.
- Student data populates Easy IEP from REG (SIS), however, there is no validation process. As a result, data is inaccurate at times.
- The school district utilizes Edulog as the transportation software package. The software is primarily used at the school district level to examine streets, population, and to route buses. Student data is imported from REG (the student information system) to Edulog, and managed within Edulog. The school district reported hiring a transportation consultant to evaluate practices in the transportation department, and the findings for Edulog were positive. There were not prevalent recommendations reported around the software.

Staff members reported that Edulog worked well, however they would like to receive additional training. For example, the users believe there are short cuts they are not aware of and have not been taught any.

Possibly related to Edulog, or possibly related to Lawson, it is unclear if there is a method in Edulog to track data for staff members who ride the buses as monitors and have more than one role in the school district.

- Reporting food services data in Providence is critically important as roughly 90% of the students receive free or reduced lunches. In addition, there are approximately 18 sites that report as part of Providence, however, are not part of the system (examples include parochial schools, private schools, etc…). The approach to integrating data from these locations is more hybrid in nature, and the department requires the flexibility to integrate individual data given to them as well as merge the date with the data contained in Nutrikids.

- The Library Management System is Destiny 10.2 by Follett. Most, if not all, librarians reported that the system works well for their needs. They successfully check books in and out with a handheld scanning device. Updates to the system are completed by the technology department and then training is provided to update the librarians. Until recently, librarians had administrative rights to run reports. Based on inconsistent user interaction with the data, a variety of errors, duplications, and other prominent data issues, technology enacted a policy to restrict admin access.

  The maintenance of accurate, clean data is of critical importance. In addition, access to that data by the librarians in an administrative capacity should also be valuable.

- Destiny also serves as the system to maintain inventory of all district textbooks. The textbooks come with pre-printed bar codes and are scanned into the system to maintain a catalog. However, textbooks are not being entered into the system consistently nor accurately. As books are often delivered to multiple locations and opened by different people, there is no system of checks to determine whether something was entered accurately, or at all. An estimate of as high as 80% of the textbook inventory could be inaccurate.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Administrative Applications and Decision Support Systems* were identified during the comprehensive information technology assessment conducted in September - October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., APS for Chapter 10) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 10, Administrative and Productivity Systems, section 3.1, Information Systems Strategies, would be numbered APS-1.1, the second recommendation in this same section would be APS-1.2.

3.1 Information Systems Strategies

APS-1.1 **Enterprise Approach for Procuring and Implementing Administrative Systems**

Include all existing and planned administrative and productivity systems in subsequent technology plans, describing how data will be shared and integrated across platforms and products.

3.2 Business Management Systems

APS-2.1 Examination of Current Business Systems to Determine Effectiveness

Include an in-depth study of used, un-used, and necessary components for the system to determine effectiveness and changes needed.

APS-2.2 Maximizing the Use of Business Systems through Targeted User Training

Ensure that all users of the system are fully trained to effectively and efficiently complete all job functions related to the business management system.

3.3 Student Information Systems

APS-3.1 Student Information System Use Case Model

Establish a model to define SIS user needs, components of use (current and future), expectations for user attainment, and interoperability framework with SIS included components as well as disparate system components existing in the district.

4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists on best practices and critical success factors in using technology to improve teaching, learning, and school management, and this body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online to remain current with emerging issues. In addition, they present at and attend local, national, and international conferences focusing on education and education technologies. Feedback from clients during the implementation of their technology blueprint initiatives contributes to CELT's experiential knowledge base. CELT has been building this collective knowledge base continually for the past twenty years while working with departments of education, school districts large and small, and a variety of public and private organizations, many of which are national in scope.

In addition to national research approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with PPSD. The following pages highlight critical success factors that most closely relate to the need and goals of PPSD.

4.1 Information Systems Strategies

There are multiple strategies to take into account when modifying, upgrading or replacing information systems. Factors such as change impact, data integration, and urgency need to be considered along with total cost of ownership (TCO), technical requirements, and support. To harvest increasing value from information system investments, careful planning needs to occur early in the process of designing a total information systems strategy.

The major categories of systems deployed within the school district are:

- Business systems, including financial and human resources systems;
- Instructional support systems, including a student information system and library management system

Data Accuracy, Consolidation and Sharing

Accurate data that can be consolidated and shared is critical to the effectiveness of any enterprise. At PPSD, there are a number of different systems that were not planned or integrated to share data elements. Some have been cross-walked to one degree or another and some systems have not been cross-walked at all. The goal is to achieve a smooth interoperability for maximum efficiency and effectiveness. The assessment of each of these systems as a part of the whole information system is critical.

Information Ownership and Accountability

Information ownership and accountability are significant responsibilities that contribute to efficiencies and reporting accuracies when addressed early in the data accuracy, consolidation, and sharing initiatives. They are sometimes referred to as data governance and data management. PPSD needs to clearly define a data governance methodology (see Chapter 11).

- Data governance requires cross-functional cooperation.
- Data governance requires that everyone acknowledge that without a cooperative approach, the school district can have significant problems with data accuracy, consolidation, and sharing.
- No single department is able to do it all.

4.2 Business Systems Integration

Business systems are defined as those operations necessary for the school district to operate. Systems integration is the structure which streamlines operations to achieve maximum time and cost efficiencies. Over the past several years, PPSD has employed the Lawson to meet business needs. During the next 2-3 years, the school district should continue to examine, upgrade, replace, and customize Lawson system applications to enable more effective operations and data sharing, as well as be certain staff members are sufficiently trained on utilizing the system to its fullest potential.

4.3 Student Information Systems

Student Information System software has more functionality and touches more school district personnel than any other management product used. School districts that report the greatest success implementing Student Information Systems are those school districts that create a multi-level support and professional development plan and have invested considerable time and effort to train and support users as well as customize the product while adhering to existing school district operation policies and procedures.

SISs have more functionality than can be absorbed into a school district in one or two years. To make the most effective use of SIS software requires a three- to five-year growth or maturity model focusing on the most important features first such as student scheduling, attendance and grade reporting. As time progresses, implementation of ad hoc reporting tools and customization features such as webpage integration can and should be addressed.

A report gap analysis process seeks to identify all of the reports completed throughout the school year and to ensure that the SIS provides them in an easily accessible manner. The reports may be provided as “canned” reports readily available from the system, by using an ad hoc report writer, or when necessary as a custom developed report.

Many school districts have found the most effective way to accomplish this analysis is to have administrative offices build a report file during the year as reports are due. As each report is completed, a copy is simply put into a three-ring binder. A review is added to each report indicating the ease or difficulty required to produce the report and appropriate notes on how to improve the report production. At the end of the year the report binders are gathered together providing a concise overview of what the SIS can produce and which reports need to be addressed with additional design work.

Food Services Systems

The school district food service function is a large business operation. Food Service Systems are typically utilized in two ways:

1. As a third party system that stands alone and is utilized by district staff and parents/students in the community. Data is often integrated by simple import/export functions and reporting may be done directly from the third party software or as an integrative approach with the SIS.

2. Some Student Information Systems offer a food service module that comes to the district already integrated into the student information system, therefore linked to all other modules in use by the district as desired.

Library Management Systems

Library Management Systems address a need to better manage educational resources. Having a complete picture of what you own, where it is, and knowing where it needs to be allows districts to maximize resources, minimize the cost of lost assets, more accurately forecast for future purchases and ensure students have access to the materials they need to succeed.

In addition to managing library collections, Library Management Systems also manage digital content, instructional and learning resources, and have the ability to provide valuable reports.

5.0 IMPLEMENTATION STRATEGIES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations report*
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., APS for Chapter 10) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 10, Administrative and Productivity Systems, section 5.1, Information Systems Strategies, would be numbered APS-1.1, the second Action Plan in this same section would be APS-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Information Systems Strategies**

  APS-1.1 Enterprise Approach for Procuring and Implementing Administrative Systems

- **Business Management Systems**

  APS-2.1 Examination of Current Business Systems to Determine Effectiveness

  APS-2.2 Maximizing the Use of Business Systems through Targeted User Training

- **Student Information Systems**

  APS-3.1 Student Information System Use Case Model

5.1 Information Systems Strategies

<table>
<tr><th colspan="5">Initiative: Enterprise Approach for Procuring and Implementing Administrative Systems</th></tr>
<tr><td>Recommendation: APS– 1.1 Enterprise approach for procurement and implementation of all administrative productivity systems</td><td colspan="4">Key Performance Indicator(s): 1. Develop and implement a strategy to procure, implement, and integrate all district data systems</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s): Highly Effective Educators
Rigorous and Aligned Content
Systems that Work</td><td colspan="4">Leadership Responsibility: Department of Technology</td></tr>
<tr><td colspan="2" rowspan="2">Action Steps
*Denotes that step has already started.</td><td colspan="3">Timeline</td></tr>
<tr><td>Year 1 13/14</td><td>Year 2 14/15</td><td>Year 3 15/16</td></tr>
<tr><td colspan="2">1. Convene an Information Systems sub-group of the District Technology Committee.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">2. Conduct a thorough data collection and inventory of all district data systems, current and in-process for procurement and implementation.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">3. Map a correlation of Student Information System modules to the district needs.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">4. Develop and implement a strategy to procure, implement, and integrate all district data systems.</td><td></td><td>X</td><td>X</td></tr>
<tr><td>Interdependencies: DSPP-3.1</td><td>Estimated Cost:
• Year 1: $ 60,000
• Year 2: $ 20,000
• Year 3: $ 20,000
Total: $100,000</td><td colspan="3">Potential Funding Source(s):</td></tr>
</table>

5.2 Business Management Systems

Initiative: Examination of Current Business Systems to Determine Effectiveness			
Recommendation:	APS– 2.1 Examine the current version of Lawson and all associated components to determine effectiveness.	**Key Performance Indicator(s):**	1. Determine the effectiveness of the current version of Lawson including identified components in use
Alignment to District/ Superintendent's Goal(s):	Highly Effective Educators Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Human Resource Department Department of Technology Municipal representatives

Action Steps *Denotes that step has already started.	Timeline Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Convene a Business Management Systems team as a sub-group of the PPSD District Technology Committee, include representation from municipal government	X		
2. Conduct a thorough inventory of the current components of Lawson presently in use.	X		
3. Incorporate research and best practices, as well as a needs assessment to determine what components are presently lacking or missing from the current version of Lawson.	X		
4. Examine the effectiveness of the present version of Lawson including all components of use, compared to the needs identified.		X	
5. Develop a plan to improve effectiveness of Lawson.		X	X

Interdependencies: DSPP-3.1	Estimated Cost:	• Year 1: $ 40,000 • Year 2: $ 20,000 • Year 3: $ 10,000 **Total: $70,000**	Potential Funding Source(s):

Initiative: Maximize the Use of Business Systems through Targeted User Training			
Recommendation:	APS– 2.2 Harvest increasing value from Lawson by investing in training for key personnel who can then utilize the system to the fullest extent.	**Key Performance Indicator(s):**	1. Implement a Lawson training model to build capacity among district users.
Alignment to District/ Superintendent's Goal(s):	Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Human Resource Manager Human Resource Department Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Conduct a needs analysis and survey of all staff members using Lawson to determine comfort level and to identify gaps in user knowledge.	X		
2. Examine successful Lawson use cases in districts and determine comparative data to PPSD.	X		
3. Develop a training plan to address identified gaps.	X	X	
4. Implement training and build capacity among district "power users" of Lawson, including levels of attainment.		X	X

Interdependencies:	**Estimated Cost:**	• Year 1: $ 50,000 • Year 2: $ 20,000 • Year 3: $ 20,000 **Total: 90,000**	**Potential Funding Source(s):**

5.3 Student Information Systems

Initiative: Student Information System Use Case Model			
Recommendation:	APS– 3.1 Create a Student Information System Use Case Model	**Key Performance Indicator(s):**	1. A model including all administrative systems, identified responsibilities, and defined sustainability
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Rigorous and Aligned Content Systems that Work	**Leadership Responsibility:**	Department of Technology District Leadership Team Building Based Leadership Teams

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Conduct a broad needs analysis to define Student Information System user needs, build upon initial work completed prior to SIS RFP development.	X		
2. Determine current components in use, and future components to address ongoing and expected needs.	X		
3. Develop a set of user expectations, including training goals to achieve levels of user attainment.	X	X	
4. Develop and implement an interoperability framework with a vision of how all current and future district information systems will connect with one another.		X	X

Interdependencies: **Dependent on RIDE SIS decision.**	**Estimated Cost:**	• Year 1: $ TBD • Year 2: $ TBD • Year 3: $ TBD **Total: TBD**	**Potential Funding Source(s):**

Chapter 11: Decision Support and Accountability Systems

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"In preparing for battle I have always found that plans are useless, but planning is indispensable."*
>
> —Dwight D. Eisenhower (1890-1969)

Chapter 11: Decision Support and Accountability Systems of the *Information Technology Blueprint* provides the framework to make informed decisions across an organization, and specifically, to analyze programs, identify areas for improvement, expand accountability, and help to improve student learning. The purpose of this section is to identify ways to apply decision support systems to enhance organizational efficiency and to effectively address the future needs of the organization.

Decision support systems bring together information from a variety of operational systems, and organize this data in a manner conducive to analysis and reporting. Without an integrated reporting structure, data for systemic change decisions can remain isolated and unavailable for optimal use by the organization.

The topics within this chapter include:

- Data Management
- Decision Support Framework
- Data Warehouse Implementation
- Enterprise Content Management System
- Performance/Accountability Systems

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Administrative Applications and Decision Support Systems* section of the *Key Findings and Recommendations* final report.

2.1 Data Management

The school district recognizes the need for a data governance and management process as it reviews the disparate data systems currently in place and the need for accurate integrated data to support efforts to improve student achievement. With data in REG (SIS), Lawson (Financial), and many other systems, the ability to do longitudinal analysis and provide meaningful business intelligence (BI) / Analytics is not being used to improve student learning. The purpose for data management is to provide a clear picture of data ownership, data quality, and data governance policies and procedures.

The key findings for **Data Management** include:

- At this time there is not a district data dictionary or established set of data standards.
- At this time the school district has not identified data point owner/stewardship and the responsibilities associated with data stewardship.
- There is no evidence that data accuracy expectations have been defined and that processes and procedures for ensuring data completion and accuracy levels have been established and implemented.
- Evidence suggests that a data governance structure has not been established and implemented.
- A process for establishing data quality within individual administrative and productivity systems is not in place.
- District decision making would benefit from establishing an enterprise-wide information integration.
- A process for reviewing and updating consolidated student data is not evident.
- It was not evident how much data was shared within the school district. Where there is data sharing, it is accomplished manually with homegrown interfaces.
- The Children and Youth Cabinet (CYC) expressed an interest in receiving data from PPSD to better serve the youth of Providence. Currently, PPSD does not share data in real time with any community-based groups. Some data is shared with community partners who have a memorandum of understand (MOU) with PPSD.

2.2 Decision Support Framework

The school district has a number of applications which are used to try and support the required processes for student success; however most of these are outdated. The school district has not undertaken an enterprise-scale approach to Decision Support. There was no evidence of a decision support framework. REG (SIS) has been extended to house longitudinal student data, but not in a true data warehousing / business intelligence fashion.

The key findings for **Decision Support Framework** include:

- Evidence does not suggest that the school district has developed a strategic plan for developing or procuring a longitudinal data warehouse.
- Individual student, administrative and productivity systems data has not been consolidated in one longitudinal data warehouse.
- The school system has not specified minimum standards for identifying and maintaining complete and accurate student data.

2.3 Data Warehouse Implementation

Currently there is not an overall guiding architecture that includes a Data Warehouse and a set of Operational Data Stores that collect the data. The major benefit for implementing a data warehouse is for longitudinal analysis and to provide cleansed data to the district. The school district does not have standard tools for sharing information. Most information sharing is manual or via locally developed ad-hoc interfaces.

The key findings for **Data Warehouse Implementation** include:

- The school district does not have a district-wide data warehouse, nor does it have any operational data stores that collect and deliver data. Access to existing data sources is limited.
- The school district does not have standard tools for sharing information. Most information sharing is manual or via locally developed ad-hoc interfaces.

2.4 Enterprise Content Management System

PPSD is aware that web content ownership is dispersed across the school district and individual schools. Staff members are responsible for web design and content at the school district. Each individual school maintains its website on an ad-hoc basis.

The key findings for **Enterprise Content Management System** include:

- The school district currently does not have a document management system in place to track document changes or for version control. Currently the process of version control from a centralized document management system is not occurring.

- PPSD has implemented a segment of SharePoint in the past, but did not rollout the solution district wide.
- There is no evidence of a web-based catalog of available reports and data queries.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Administrative Applications and Decision Support Systems* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., DSAS for Chapter 11) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 11, Decision Support and Accountability Systems, section 3.1, Data Management, would be numbered DSAS-1.1, the second recommendation in this same section would be DSAS-1.2.

3.1 Data Management

DSAS-1.1 Data Governance Board

Establish and empower a Data Governance board with district-wide authority. Their first task should be to establish a district-wide data governance and management policy.

DSAS-1.2 Creation of a Data Dictionary

Create a data dictionary that contains all sources of data with definitions, business rules etc.

DSAS-1.3 Establishment of Data Standards

Establish a set of data standards.

- Data standards:
  - Help management and staff to adopt common approaches to data issues
  - Build standard, repeatable processes
  - Reduce costs and in increase effectiveness

DSAS-1.4 Data Ownership and Consistency

Identify the appropriate data owner or steward for each data element. Decisions are only as good as the information derived from the data on which they are based, and data ownership and consistency is imperative to ensuring quality data and information.

3.2 Decision Support Framework

DSAS-2.1 Instructional Data Working Group

Establish a working group to assess and document data needs for teaching and learning support.

3.3 Data Warehouse Implementation

DSAS-3.1 Strategic Plan for District Wide Data Warehouse (LDS)

Create a strategic plan to procure and implement a district wide data warehouse. Establish a Data Warehouse steering committee. Charge the committee with determining the prerequisites, timeline, and staff development needs in the architecture and Data Warehouse implementation. Create a Data Manager position or expansion of an existing position to include a data manager responsible for instituting a data governance and management process that includes developing a data dictionary, developing data standards, and adopting processes and procedures for ensuring complete and accurate data.

DSAS-3.2 Data Integration Plan

Develop a plan for ongoing administrative and teacher professional development and coaching on the capabilities and use of the data warehouse. After the Data Governance Board is formed, focus on their strategies to improve the accuracy of data and then define the requirements for a district-wide data warehouse.

3.4 Enterprise Content Management System

DSAS-4.1 Content Management

Explore investing in a content management system that can provide tools to effectively manage and distribute documents and instructional material content while, at the same time, reducing costs.

3.5 Performance/Accountability Systems

DSAS-5.1 Applications Catalog

Publish and maintain a catalog of PPSD-supported applications and reports available for user decision support.

4.0 RESEARCH AND BEST PRACTICES

A significant quantity of published research exists that identifies critical success factors for using technology to improve teaching, learning, and school management, and this body of knowledge continues to increase annually. CELT staff and consultants regularly review research publications, technology journals, reports, and legal summaries, both in print and online, to remain abreast of emerging issues. In addition, they present at and attend local, national, and international conferences focusing on educational technologies. Feedback from clients during the implementation of their technology blueprint initiatives provides CELT with an experiential knowledge base as well. CELT has been building this collective knowledge base continually for the past twenty years while working with departments of education, school districts large and small, and a variety of public and private organizations, many of which are national in scope.

In addition to nationally researched approaches to technology use in education, CELT assimilates the best practices of each of our clients into our body of knowledge and will do so during this engagement with PPSD. The following pages highlight the research and best practices that most closely relate to the needs and goals of PPSD.

4.1 Strategic Issues

There are multiple strategies to take into account when modifying, upgrading, or replacing information systems in an organization the size of PPSD. Factors such as impact, integration, and urgency need to be considered along with total cost of ownership (TCO), technical requirements, maintenance, and support. The task can sometimes seem overwhelming due to the numerous applications that are currently deployed and the need to move toward integrated systems architecture and away from heterogeneous or silo system architecture.

Beneficial Use of Information Systems

Information systems, as well as the data and reports that are generated through such systems, are beneficial if they help the school district meet federal and state requirements, improve student achievement, and improve the efficiency of the organization.

Data Governance and Data Management

Data governance and data management are related and largely complementary ongoing processes. Data governance (DG) refers to the overall strategic management of the availability, usability, integrity, and security of the data employed in an enterprise (see Figure 4-1: Data Governance Structure). A sound data governance program includes:

- A governing body or council;
- A defined set of procedures;

- A plan to execute those procedures.

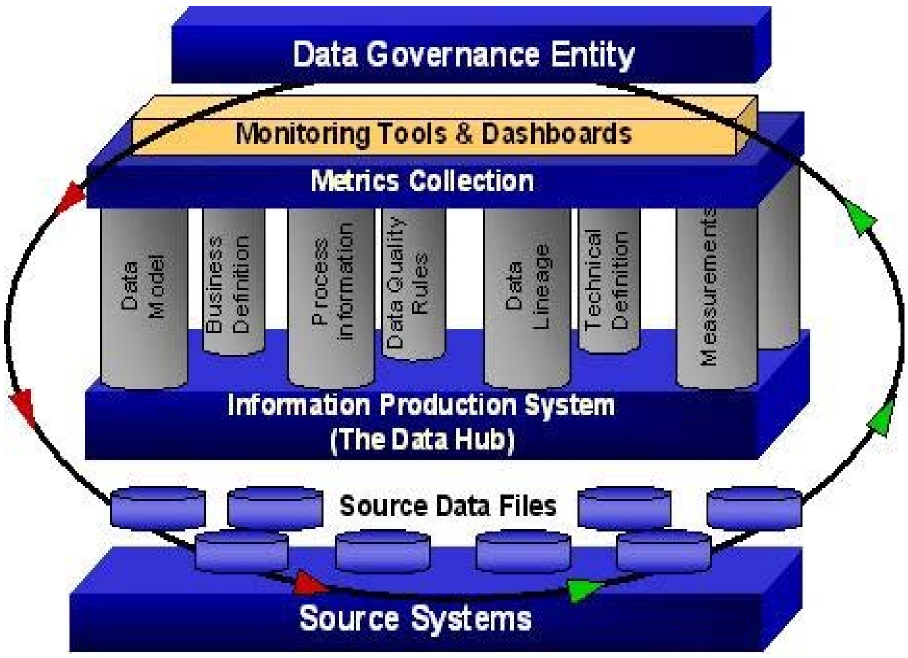


Figure 4-1: Data Governance Structure

The initial step in the implementation of a data governance program involves defining a data dictionary, data standards, and the owners or stewards of data assets. A policy must be developed that specifies who is accountable for specific portions or aspects of the data, including its accuracy, accessibility, consistency, completeness, and timeliness. Processes must be defined concerning how the data is to be stored, archived, backed up, and protected from mishaps, theft, or attack. A set of standards and procedures must be developed that defines how the data is to be used by authorized personnel. Finally, a set of controls and audit procedures must be put into place to ensure ongoing compliance.

4.2 Data Architecture

An effective architecture for decision support focused on improving and sustaining academic performance is comprised of two key elements:

- <u>Applications architecture</u> of databases and technology tools that comprise the information systems necessary for instructional improvement efforts;
- <u>Enabling processes</u> that include business, policy, staff development, communication, and organizational processes necessary for the technology to be used effectively.

The applications architecture can be considered the “hard” element of the architecture. It provides the technology (databases, computer applications, network and server infrastructure, etc.) to support the enabling processes for each component. The enabling processes can be considered the “soft” element of an overall architecture. It is critical that this element be properly defined and implemented for all components of the overall architecture.

4.3 Data Warehouse

Data warehouses can be defined as subject-oriented, integrated, time-variant, non-volatile collections of data used to support longitudinal and analytical decision making. The data in the warehouse comes from the operational environment and external sources. Data warehouses are physically separated from operational systems, even though the operational systems feed the data warehouse with source data.

The primary objective of data warehousing is to bring together information from disparate sources so that it can be used to create information in a format that is conducive to decision making. This objective necessitates a set of activities that are far more complex than just collecting data and reporting against it. Data warehousing requires both business and technical expertise, and involves the following activities:

- Accurately identifying the information that must be contained in the warehouse;
- Identifying and prioritizing subject areas to be included in the data warehouse;
- Managing the scope of each subject area which will be implemented into the warehouse on an iterative basis;
- Developing a scalable architecture to serve as the warehouse’s technical and application foundation and identifying and selecting the implementation hardware, software, and middleware components;
- Extracting, cleansing, aggregating, transforming, and validating the data to ensure accuracy and consistency;
- Defining the correct level of summarization or information construction to support decision making;
- Establishing a data refresh program that is consistent with district needs, timing, and cycles;
- Providing user-friendly, powerful business intelligence tools for desktop access to the data in the warehouse;
- Educating the business and academic communities about the realm of possibilities that are available to them through data warehousing;
- Establishing a data warehouse help desk and coaching users to effectively use the desktop tools;

- Establishing processes for maintaining, enhancing, and ensuring the ongoing success and applicability of the warehouse.

4.4 Data Infrastructure

Data Consolidation and Sharing

It is not just the storage of data in a database that improves student learning; it is also the ability to interrelate the data from many applications. To improve learning for all students requires more information than today's education applications generally capture. The data warehouse system should include large amounts of curricular, instruction, and assessment information that is pivotal to improved student achievement and enhanced teacher performance. It should also include data from student information and human resource systems.

A well-designed decision support system helps educators develop information for diagnostic purposes by linking curriculum and instruction, assessment strategies, instructional resources, student data, and staff resources.

An effective decision support system is essential in the use of data to make predictions and informed decisions that are critical to the classroom, school building, and across the school district. Business Intelligence tools provide the means to gather, analyze, and present in graphic form how to best meet the instructional needs of students.

Data Definition and Format

A data architecture and management process is essential to establishing a high-quality, educational accountability and reporting system, just as an architectural plan is essential to the construction of a building. Data architecture and processes for data management must be clearly-defined, articulated, and shared among all organization stakeholders. Figure 4-2: Decision Support Data Architecture presents the architecture for a learner-centered, instructionally-focused, performance-oriented, data-driven, customer-friendly, and fiscally-affordable educational accountability and reporting system.

The School Interoperability Framework (SIF) is a system architecture and standard adopted by educational software manufacturers to enable the integration of heterogeneous system applications. It is a push/pull technology that enables different applications that do not inherently communicate with one another other to communicate. It is foreseeable that the school district will implement additional SIF functionality for integrating disparate systems such as payroll, general ledger, and purchasing in addition to transportation.

When building a district-wide enterprise data management system, the school district must first define the type of data being collected, managed, and reported. A comprehensive analysis or survey of enterprise application systems, data collection forms, reports, and reporting cycles is critical to this process. The data dictionary is developed from the results of this analysis. The data dictionary provides a means to keep track of data and metadata (data about the data) elements within an organization. It helps identify duplicate data collection efforts and storage, and develops processes to reduce and eliminate redundancy. The intent is to collect data once, determine a single authoritative source for the data, and leverage the data repeatedly.

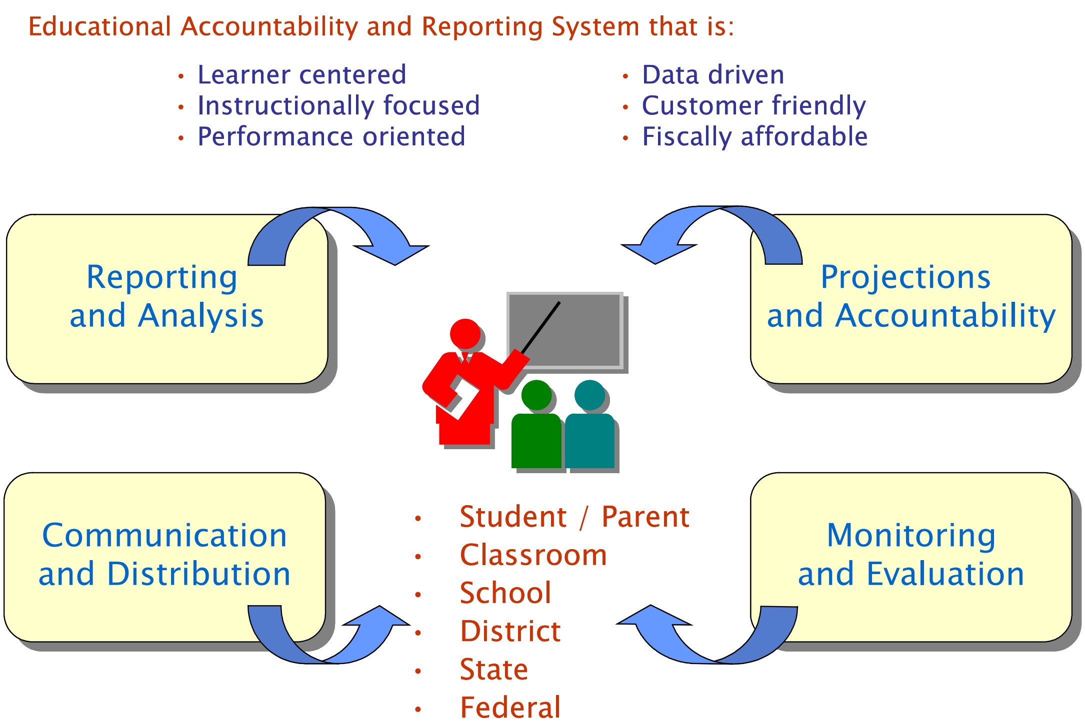


Figure 4-2: Decision Support Data Architecture

Data Entry Management

Once an authoritative source has been identified for a set of data elements and the redundant sources eliminated, the process of data entry standardization and quality improvement can begin. This process begins with a rigorous definition of the constraints on each data element and on the interrelationships between data elements.

Data Alignment

Often, different systems use different data to mean the same thing. Reporting across systems and data consolidation in a data warehouse is only possible if these differences are resolved. Data extract, transform, and load (ETL) tools designed for use in data warehouse construction can automate some of the effort required to achieve data alignment.

4.4.1 Data Ownership and Accuracy

Effective data management requires organizations to adopt a data owner or data stewardship approach. Therefore, one of the immediate challenges to a data management program is to identify the person responsible for each data element or set of elements. The data is actually an asset of the enterprise, owned by the enterprise, but it is the steward who is responsible for the accuracy and caring of that asset. The IT department does not have ownership for any data elements.

Every effort should be made to perform validation and verification of data as close to the source of input as possible; this means establishing consistent rules and parameters for the input of each data element. The data owner, or steward's, validation routines and element descriptions are all included as part of the data dictionary.

Information ownership and accountability, also referred to as data management, is a significant variable that contributes to efficiencies and reporting accuracies if addressed early in data consolidation and sharing initiatives.

Data management can be defined as:

- The systems and personnel responsible for data elements, integrity, and reporting;
- The processes for propagating data to other systems.

The school district needs to clearly define a methodology for data management. To ensure a successful data management implementation, the school district needs to overcome the following challenges related to perceived responsibility:

- No department feels it is responsible for the problem;
- Data management requires cross-functional cooperation;
- Data management requires that the school district recognize that it has significant problems with data sharing and consolidation.

One of the most significant challenges is that no school district department is responsible for all of the data and the inclusion of a responsibility for data quality in a job description is very unusual. Furthermore, once the data is in the computer, departments often feel that their responsibility has ended.

4.4.2 Data Governance and Quality Assurance

Organizations must be committed to formalizing the data management and governance process. Accurate, timely, and easy-to-use information is essential to making informed decisions and to accurate reporting of information to entities to which the organization is accountable.

4.5 Sources of Information

In the data warehouse model, operational databases such as student and finance information systems are not accessed directly to perform decision support research. Rather, they act as the source of data for the data warehouse, the information repository and point of access for informational processing. Figure 4-3 shows how data flows for decision support.

In education, data warehousing is a process where current and historical information is extracted from a variety of sources both inside (student, financial, and human resource systems) and outside (standardized test data) the school district. The information is then stored in a separate database for decision support.

The data warehouse functions as a decision support system by providing integrated and transformed enterprise-wide current and historical data to use for analysis and decision making. A variety of sophisticated business intelligence (BI) tools are readily-available in the marketplace to provide user-friendly access to the information stored in the data warehouse.

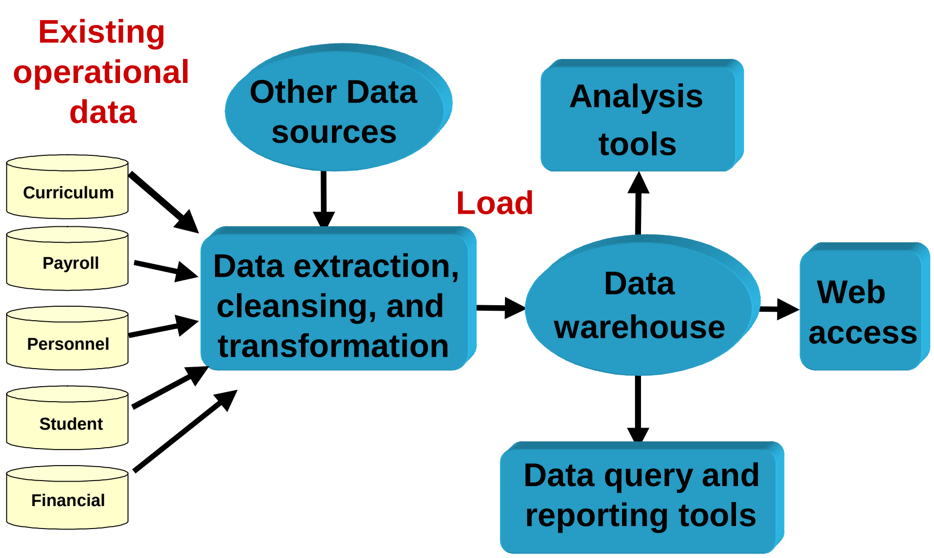


Figure 4-3: Decision Support Data Flow

Organizations typically select one integrated toolset for reporting, analysis, and student performance analysis modeling. The set includes reports, query tools, or Web access portals. It is reported that, "…parameterized reporting dashboards will emerge as the most prominent business intelligence technology, with numerous customer-facing deployments. Dashboards offer a lower-cost alternative to more expensive specialized scorecard applications, with acceptable functionality.

BI tools are designed to provide information to non-technical end users. Requirements for BI tools include:

- Web-based enterprise reporting
- Data access and integration
- Information delivery and management
- End-user analysis and drill-down capability
- Performance management
- Self-service reporting
- Integration with Microsoft Excel, Word, and Access
- Analytic dashboards, scorecards, and key performance indicator (KPI) applications

4.6 Data Use for Decision Making

Information systems, as well as the data and reports that are generated through using these systems, are beneficial if they help the school district meet federal and state requirements, provide information that helps improve student achievement, and improve the organizational efficiency.

Meet Federal and State Reporting Requirements

School districts are mandated to report ever increasing amounts of data to state and federal agencies. Currently deployed information systems, as well as future information systems, need to support this requirement and include designs that streamline information flow so that meeting additional information reporting demands is a simple task and not a burden.

Improve Student Achievement

Integrated systems that communicate data horizontally help the school district spend less time retrieving data and analyzing results and more time implementing change to affect future results. Principals and administrators will be empowered with information that will help them identify achievement trends and explore instructional interventions to improve student performance.

Improved Efficiency

Systematic modifications and upgrades should identify how changes maximize staff time and effectiveness, and lower TCO. Improving data integration and sharing will improve school district operating efficiencies and reduce TCO.

Good decisions require complete and accurate data. The information derived from the data is role specific. For example, administrators want a 10,000-foot level picture of the organization while building principals and teachers need a closer look at student groups and individuals.

The following are role-based questions that data seeks to provide in order to support improved student achievement.

Central Administrators

- What staff development programs improve student achievement?
- Is money spent on a specific program impacting learning?
- What instructional strategies are most beneficial, and for which learners?
- What are the effects of mobility on student achievement?
- Which low-performing schools are progressing, and which have stalled?

Principals

- Are there parents who have not met with their child's teacher in the past two years?
- How does school spending in a given budget category compare with the spending of other similar schools?
- Compared to schools with similar students, are students meeting standards at the same or higher levels?
- Do classroom grades correlate to standardized assessments?

Teachers

- Are students in my class performing at grade-level in all subjects?
- Which students have slowed in their academic progress?
- What resources are available for advanced math learners?
- What are the students' weakest areas on the standardized test?

5.0 IMPLEMENTATION STRATEGIES AND ACTION PLANS

The implementation approaches included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., DSAS for Chapter 11) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 11, Decision Support and Accountability Systems, section 5.1, Data Management, would be numbered DSAS-1.1, the second Action Plan in this same section would be DSAS-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Data Management**

  DSAS-1.1 Data Governance Board

  DSAS-1.2 Creation of a Data Dictionary

  DSAS-1.3 Establishment Data Standards

- **Decision Support Framework**

  DSAS-2.1 Instructional Data Working Group

- **Data Warehouse Implementation**

  DSAS-3.1 Strategic Plan for District-wide Data Warehouse

  DSAS-3.2 Data Integration Plan

- **Enterprise Content Management System**

  DSAS-4.1 Content Management

- **Performance/Accountability Systems**

  DSAS-5.1 Applications Catalog

5.1 Data Management

Initiative: Data Governance Board			
Recommendation:	DSAS – 1.1 Establish and empower a Data Governance board with district-wide authority.	**Key Performance Indicator(s):**	1. Governance Board convened 2. Governance policies published 3. System inventory with ownership published 4. Process review task force convened 5. Process review document published
Alignment to District/ Superintendent's Goal(s):	Student Achievement Strong Leadership Stakeholder Collaboration	**Leadership Responsibility:**	Leaders from across the district Teaching and Learning Department Heads Director Level staff (CFO)

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Identify membership and obtain time commitment.	X		
2. Establish meeting times.	X		
3. Establish (review and maintain) a district-wide data governance and management policy.	X	X	X
4. Set and enforce data quality and integration standards for business-critical application purchases going forward. (Example: All applications that provide administrative data purchased henceforth must be SIF compliant products. No exceptions.)	X	X	X
5. Conduct an inventory of applications from the PPSD technology and administrative leadership perspective. Identify all official business-critical systems of record and determine the authoritative data sources for each. Identify the owner / steward – a named human being – for each official authoritative data source. Document and publish these. (Note that this inventory also is a critical driver of the business continuity / disaster recovery plan.)	X		
6. Establish a task force to review data management processes throughout the District with a particular emphasis on identifying processes that ensure (or fail to ensure!) data quality at the point of capture for	X	X	X

Initiative: Data Governance Board

Recommendation:	DSAS – 1.1 Establish and empower a Data Governance board with district-wide authority.	**Key Performance Indicator(s):**	1. Governance Board convened 2. Governance policies published 3. System inventory with ownership published 4. Process review task force convened 5. Process review document published
Alignment to District/ Superintendent's Goal(s):	Student Achievement Strong Leadership Stakeholder Collaboration	**Leadership Responsibility:**	Leaders from across the district Teaching and Learning Department Heads Director Level staff (CFO)

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
all authoritative data sources. Identify "quick hit" process re-engineering and identify existing data sources that will be the authoritative source for specific data items.			
7. Conduct an inventory of applications from the end user perspective. Identify locally-developed applications that are used in place of, or in supplement to, the official systems of record. Document the reasons (user perspective) why these alternative systems are necessary.		X	
8. Develop a plan and establish priorities for upgrading, replacing, and consolidating administrative applications.		X	X

Interdependencies:	**Estimated Cost:**	• Year 1: $ 15,000 • Year 2: $40,000 • Year 3: $25,000 **Total: $80,000**	**Potential Funding Source(s):**

<table>
<tr><th colspan="5">Initiative: Creation of a Data Dictionary</th></tr>
<tr><td>Recommendation:</td><td>DSAS – 1.2 Data Dictionary Develop and maintain a district wide accountability for entering, maintaining, and using systems based on effective, clean data</td><td>Key Performance Indicator(s):</td><td colspan="2">1. Define all data elements
2. Define all definitions pertaining to all fields with the systems
3. Define the usage of all data fields
4. Document all data domains and data stewards</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Student Achievement
Strong Leadership
Stakeholder Collaboration</td><td>Leadership Responsibility:</td><td colspan="2">Leaders from across the district</td></tr>
<tr><th rowspan="2" colspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td colspan="2">1. Create, fill, and provide continued support for the Data manager (may need to clarify the term "manager" position to enforce data governance and management processes. Data analysis has been included in the current ordinance. This position would be for data governance, RIDE effort. Be clear to make sure the role is clear, need to avoid confusion with existing data manager stereotype.</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="2">2. Beginning with the district's major systems (SIS, Lawson) map each individual data element along with its definitions, business rule implications, and overall structure (data types, field lengths, etc).</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">3. For each and every data element identify the origin (source) the usage and any other type of relationships, i.e.,
• Data element: Student Name
• Origin: REG
• Usage: Student Identifier
• Initial Entry: School Nurse (K registration) or school enrollment clerk
• Review and update: school clerk
• Review and update cycle: yearly
• Related to other databases: SIF
• Database updates: daily</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Interdependencies:</td><td>Estimated Cost: • Year 1: $ 12,000</td><td colspan="3">Potential Funding Source(s):</td></tr>
</table>

Initiative: Creation of a Data Dictionary			
Recommendation:	DSAS – 1.2 Data Dictionary Develop and maintain a district wide accountability for entering, maintaining, and using systems based on effective, clean data	**Key Performance Indicator(s):**	1. Define all data elements 2. Define all definitions pertaining to all fields with the systems 3. Define the usage of all data fields 4. Document all data domains and data stewards
Alignment to District/ Superintendent's Goal(s):	Student Achievement Strong Leadership Stakeholder Collaboration	**Leadership Responsibility:**	Leaders from across the district

Action Steps ***Denotes that step has already started.**		**Timeline**		
		Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
	• Year 2: $ • Year 3: $ • **Total: $12,000**			

<table>
<tr><th colspan="6">Initiative: Establishment of Data Standards</th></tr>
<tr><td>Recommendation:</td><td>DSAS – 1.3 Establish a set of Data Standards</td><td colspan="2">Key Performance Indicator(s):</td><td colspan="2">1. Documented data standards for all existing systems
2. Development and acceptance of a data standards document</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Engaged Students and Family
Highly Effective Educators
Rigorous and Aligned Content
Systems that Work
Collaborative Community</td><td colspan="2">Leadership Responsibility:</td><td colspan="2">Technology Director, Data Stewards</td></tr>
<tr><th colspan="3" rowspan="2">Action Steps
*Denotes that step has already started.</th><th colspan="3">Timeline</th></tr>
<tr><th>Year 1
13/14</th><th>Year 2
14/15</th><th>Year 3
15/16</th></tr>
<tr><td colspan="3">1. Establish rules for each data element, i.e.,
• The student's legal first and last name shall be entered as they appear on a birth certificate or valid passport
• Nicknames will only be entered in the "nickname" field
• The middle initial will be provided with a period after the initial</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">2. Align the district's values with the three phases to establishing data standards: intent, development, and approval.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">3. Identify data elements currently in use.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">4. Review data elements for clarity and usage.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">5. Match data elements with administrative system requirements (alpha, numeric, length, etc.).</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">6. Identify new data elements.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="3">7. Review data elements with established data owner for approval.</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="3">8. Document approved data standards.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="3">9. Disseminate completed and approved data standards document.</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="3">10. Establish yearly data standards review cycle.</td><td></td><td>X</td><td></td></tr>
</table>

Initiative: Establishment of Data Standards						
Recommendation:	DSAS – 1.3 Establish a set of Data Standards		**Key Performance Indicator(s):**	1. Documented data standards for all existing systems 2. Development and acceptance of a data standards document		
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community		**Leadership Responsibility:**	Technology Director, Data Stewards		
Action Steps ***Denotes that step has already started.**				**Timeline**		
				Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
Interdependencies: DSAS 1.2, DSAS 2.1	**Estimated Cost:**	• Year 1: $ 10,000 • Year 2: $7,000 • Year 3: $4,000 **Total: $21,000**		**Potential Funding Source(s):**		

5.2 Decision Support Framework

Initiative: Instructional Data Working Group					
Recommendation:	DSAS – 2.1 Establish a working group to assess and document data needs for teaching and learning support	**Key Performance Indicator(s):**	1. Working group convened 2. Documentation format established 3. First draft published		
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Teaching and Learning		

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Identify initial working group membership and leadership. Include educators and PPSD representatives. The makeup of the team can vary as its focus moves across different school types and administrative areas.	X		
2. Begin by establishing a documentation format – keep it simple.	X		
3. Document the teaching and learning data to begin creating a district-wide logical data dictionary. The documentation is the important part and it can be done with existing office productivity tools. Postpone investing in an automated data dictionary tool.	X	X	X
4. As applications are upgraded, replaced, and consolidated, identify the authoritative sources for each data element in the logical dictionary and document these. Publish periodic updates.	X	X	X

Interdependencies: DSAS 1.2 Create Data Dictionary	**Estimated Cost:**	• Year 1: $ 8,000 • Year 2: $16,000 • Year 3: $16,000 **Total: $40,000**	**Potential Funding Source(s):**

5.3 Data Warehouse Implementation

Initiative: Strategic Plan for District-Wide Data Warehouse			
Recommendation:	DSAS – 3.1 The district has defined the need for a local data warehouse to handle all the daily operational issues of the district.	**Key Performance Indicator(s):**	1. Steering Committee convened 2. Project charter document published 3. Vendor selection completed
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	IT, data stewards, tech leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Establish a Data Warehouse steering committee. Charge the committee with determining the prerequisites, time line, and staff development needs for DSS architecture and Data Warehouse implementation / procurement.	X		
2. Using the data dictionary, develop a three-year strategic plan to add data to the data warehouse, i.e., • Year 1 – SIS and DIBELS • Year 2 – Lawson • Year 3 – certification and operations data	X		
3. Develop the project charter showing the schedule, costs and benefits of this project and obtain the leadership's team approval for this implementation.	X		
4. As data is added to the data warehouse, identify means to expand longitudinal analysis in support of student achievement. Specify what data elements will be added, when they will be added, who is responsible for the data, and how often the data element is updated.	X		
5. Obtain as much data dictionary from new vendors as possible when adding new systems (Lawson, SIS, etc)	X		

Initiative: Strategic Plan for District-Wide Data Warehouse			
Recommendation:	DSAS – 3.1 The district has defined the need for a local data warehouse to handle all the daily operational issues of the district.	**Key Performance Indicator(s):**	1. Steering Committee convened 2. Project charter document published 3. Vendor selection completed
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	IT, data stewards, tech leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
6. Determine the gap between the data available and that which staff indicates is needed.	X		
7. Develop models for appropriate data analysis and business intelligence access and use.	X		
8. Provide ongoing training and coaching to building administrators and classroom teachers in the access and understanding of data to improve instruction.	X		
9. Create a yearly review process to measure growth and effectiveness of data warehouse use.		X	

Interdependencies: DSAS-1.1, DSAS-1.2, DSAS-1.3	**Estimated Cost:**	• Year 1: $ 250,000 • Year 2: $150,000 • Year 3: $50,000 **Total: $450,000**	**Potential Funding Source(s):**

Initiative: Data Integration Plan			
Recommendation:	DSAS – 3.2 Create a strategic plan to expand and evaluate on an ongoing basis the effectiveness and use of the data warehouse.	**Key Performance Indicator(s):**	1. Staff routinely use the data warehouse (dashboards / reports / analytics) to improve student performance
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	IT, data stewards, tech leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Develop, adopt, and disseminate documentation defining each data process that is used throughout the school district on a regular basis.	X		
2. Provide professional development and coaching opportunities to school-based data teams including: • How to access data • How to develop information from data sets • Defining and implementing action based on the information • Measuring success	X	X	X
3. Survey administrative and instructional staff yearly to assess the data warehouse value and needs of staff.	X	X	X
4. Provide ongoing training and coaching to building administrators and classroom teachers in the access and understanding of data to improve instruction.			

Interdependencies:	**Estimated Cost:**		**Potential Funding Source(s):**
		• Year 1: $ 4,000 • Year 2: $22,000 • Year 3: $22,000 **Total: $48,000**	

5.4 Enterprise Content Management System

Initiative: Content Management			
Recommendation:	DSAS – 4.1 Invest in a commercial or open source Content Management system, framework, or portal technology that can provide consistency of look and feel as well as provide tools to efficiently manage distributed content responsibilities.	**Key Performance Indicator(s):**	1. Needs Document Available 2. CMS system needs analyzed and procured 3. All PPSD Web Content managed by one central CMS solution
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Content management team, district leaders

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Determine content management needs.	X		
2. Review existing SharePoint investment as well as commercial and open source CM systems.	X		
3. Select a content management system.	X		
4. Purchase (if necessary), install, and configure the CMS.		X	
5. Train users, including just-in-time training for all participants. Explore expanding SharePoint for this function.	X	X	
6. Migrate existing web content to CMS.	X	X	X

Interdependencies: SDHR-6.1	**Estimated Cost:**	• Year 1: $ 30,000 • Year 2: $40,000	**Potential Funding Source(s):**

Initiative: Content Management			
Recommendation:	DSAS – 4.1 Invest in a commercial or open source Content Management system, framework, or portal technology that can provide consistency of look and feel as well as provide tools to efficiently manage distributed content responsibilities.	**Key Performance Indicator(s):**	1. Needs Document Available 2. CMS system needs analyzed and procured 3. All PPSD Web Content managed by one central CMS solution
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Content management team, district leaders

Action Steps ***Denotes that step has already started.**		**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
	• Year 3: $12,000 **Total: $82,000**			

5.5 Performance/Accountability Systems

Initiative: Applications Catalog			
Recommendation:	DSAS – 4.2 Publish and maintain a catalog of PPSD supported applications and reports available for user decision support	**Key Performance Indicator(s):**	1. Catalog Published
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	IT, report developers

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Review existing applications and reports. (include dashboards, analytics, any apps in accountability systems)	X		
2. Create catalog with instructions for accessing each report.	X		
3. Publish catalog on web (preferably using the CMS), update periodically.	X	X	X
4. Publicize the catalog with examples of its use.	X	X	X

Interdependencies:	**Estimated Cost:**	• Year 1: $ 8,000 • Year 2: $16,000 • Year 3: $9,000 **Total: $33,000**	**Potential Funding Source(s):**

Chapter 12:
Communications and Network Infrastructure

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Communication leads to community, that is, to understanding, intimacy, and mutual valuing."*
>
> —Rollo May

The **Communications and Network Infrastructure** chapter focuses on developing ways to enhance and expand advanced infrastructure systems for communication, computing, and networking throughout Providence Public School District (PPSD). Infrastructure systems provide fundamental technology services for communication, computing, and cabling to all constituents within the district. By shifting delivery and implementation focus to service delivery models and total cost of ownership, the district will be able to increase systems capabilities, user satisfaction, and overall efficiency of systems implementation.

The subtopics within this chapter include:

- Strategic Issues
- Emerging Issues
- Network Transport Infrastructure
- Data and Services Infrastructure
- Management and Supporting Computing Infrastructure
- Network and Information Security

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Communications and Network Infrastructure* section of the *Key Findings and Recommendations* final report.

2.1 Strategic Issues

The dependence on the data communications network infrastructure continues to increase as more and more of the critical business functions as well as instructional processes move toward cloud and Internet-based services and a converged network infrastructure. The needed reliability and performance of the network are challenges that are often nonlinear functions. For example a small increase in performance for a particular application may require complex endpoint equipment or even the replacement of an entire infrastructure. For this reason, the need for building a communications strategy must begin with a solid foundation which supports the incremental need for bandwidth while cost, reliability and performance are meeting the management and instructional requirements.

The key findings for **Strategic Issues** include:

- There is evidence that IT services are moving toward a converged network infrastructure. Since IT recently assumed responsibility for the voice communications throughout the district, it is likely the network will be leveraged to support voice communications in the future. There is evidence that a plan for converging and segmenting network traffic has started to be rolled out. From the evidence it appears Providence has a sound design and is segmenting network traffic into independent VLANs. Specific segmentation includes:

VLAN	Purpose/Segmentation
2	WAN
5	Wireless
7	Multimedia
8	Security
9	Monitoring
10	Servers
15	Voice
20	Management
40	Clients

- The two newest schools including the PCTA High School and the Bishop Middle School are utilizing VoIP (Voice over IP) telephones. The administrative building recently signed a contract to upgrade to the telephone system to VoIP. There is evidence that additional schools are moving toward a VoIP solution for voice communications.
- The Local Area Network (LAN) switching is standardized on Cisco. Recently the district standardized on 1Gbps to the desktop for switch ports. There were a few instances found where workgroup switches were installed in labs and older switches that are not aligned to the standard. The wiring closets inspected appeared to be in good shape; however, some were used to store boxes and other materials. Most wiring closets did not have air conditioning. Most wiring closets were not locked.
- There are some schools where older Intel switches are still in place and need replacement/upgrades. Where schools are closed that have upgraded/Cisco equipment the upgraded/Cisco equipment is moved to replace the older Intel switch infrastructure. The district has tried to leverage E-rate to upgrade the infrastructure. Currently the district has an E-rate 470 RFP posted to upgrade approximately 20 schools to the new 1Gbps to the desktop standard.

2.2 Emerging Issues

The emergence of the need for wireless networking to support many initiatives, most importantly mobility for the students and teachers, and the opportunities this presents for future mobile device support that may include such programs as a Bring Your Own Device (BYOD) program. The need to deploy high performing wireless at all campuses is a necessity and is moving beyond an emerging issue for most schools in the country including Providence. In addition, emerging is the need to address the convergence of video surveillance onto the data communications network as well as deploy a new voice communications solution are issues on the horizon.

The key findings for **Emerging Issues** include:

- Providence currently contracts with Oshean, Cox communications, and Fibertech to provide its fiber optic Wide Area Network. In addition, a private fiber is installed.
- Wireless 801.11bgn service is available in all schools; however, service may be spotty or not adequate to support the demands. The current wireless network infrastructure was obtained with major funding support from the E-rate.
- Currently the school district is not standardized on a portal platform for all teachers, students, staff, parents, and community Network Transport Infrastructure.
- There currently is no video distribution or streaming media supported by the IT department. There is little evidence that video generation and distribution over

the network is a high-demand service. Each school is responsible for its own video surveillance solution. Administrators and school personnel reported that it was up to them to review tape from incidents and remain up-to-date on system use. There have been incidents that were not captured due to inconsistencies in the management, lack of knowledge of how to use the system to review incidents that were captured, and there appears to be an overall inconsistency in the way the systems are utilized, who's responsible, and how to best use the captured data. The IT department has a central system to provide access to the disparate and non-standard video surveillance systems. This system was created as a stop-gap measure to provide some level of control. It appears that video surveillance systems are not "officially" assigned to any group/department at the district and therefore this has created inconsistencies and lack of clear direction in this critical area.

- Few schools have VoIP solutions in place. As new schools are constructed or renovated it appears a VoIP solution is installed. A comprehensive voice communications plan is not evident.

2.3 Network Transport Infrastructure

The long term performance of the network is only as good as the foundation it is built on. Providence has done a good job addressing the cabling and switching needs of the wired network. The continued good work and attention to detail will serve Providence and its stakeholders well. As more applications move from the wired network to the wireless network, there will be additional pressure on Providence to allocate resources that were dedicated to supporting the cable and switched infrastructure to supporting the wireless and the burgeoning number of end point devices that will be connecting to the wireless network. The challenge will be managing this change and maintaining the quality infrastructure.

The key findings for **Network Transport Infrastructure** include:

- A developed classroom network standard was not evident; however, a standard configuration has been assimilated as a result of the recent school construction projects. Local Area Network design and installation methods appear to be based on acceptable best practices and industry standards.
- There were few user complaints regarding Internet access performance, and our bandwidth testing at individual school sites correlate to acceptable wide area network and Internet access performance and capacity. In addition our review of the physical design of the backbone the WAN appears sound.
- Overall the district has done a good job managing the capacity needed in the Wide Area Network (WAN) as well as Internet Access. Recently the district has released an RFP to upgrade the WAN to 10Gbps. This upgrade will support fully server consolidation and virtual desktop.

2.4 Data and Services Infrastructure

The current design of the data and services infrastructure at Providence includes a central datacenter and single high speed gateway to the Internet. All campuses data needs ultimately collapse on these two key portions of the infrastructure. As a single gateway, entry and exit point, resiliency and disaster preparedness are a key consideration. While most key data services are outsourced (such as the financial system with the City) or obtained as Software as a Service (SaaS), which has the benefits of less reliance on the districts own facilities and management, the district continues to maintain its own datacenter/systems for meeting operational, instructional and critical business data where SaaS or other options where either not selected or have not been considered. These critical business applications are address in the Administrative Computing section of this blueprint.

The key findings for **Data and Services Infrastructure** include:

- The school district operates an analog telephone network in most facilities with the exception of two new campus locations with VoIP.
- The district provides approximately 20 cell phones for district employees, such as school officers, data warehouse teams and some administrators. Technicians and other support staff utilize personal phones to conduct school district business. The district does not offer stipends or other payments for the use of personal phones.

2.5 Management and Supporting Computing Infrastructure

The network and communications systems reliance on the underlying computing systems infrastructure is as vital as the wires and switches. In this area we examine the data center, desktop management and delivery, authentication and directory services as well as single sign on.

The key findings for **Management and Supporting Computing Infrastructure** include:

- The district IT department uses Microsoft System Center Configuration Manager to manage the windows desktops.
- The school district currently has a hybrid 2003/2008 active directory. architecture in place. The district has a plan and is moving to a pure 2008 solution.
- A single sign-on strategy or solution is not planned or in place.
- There is a virtual desktop plan being developed by the IT department. In addition the district has recently adopted VMware virtual computing in the data center.

2.6 Network and Information Security

Clearly the security of the network and protection of the information is an operational challenge. The necessary processes with checks and balances and constant review of security audit trails can be a major resource burden if not planned and done well. In addition, all appropriate infrastructure updates and software in the security chain must be maintained with the latest versions and capabilities to eliminate threats and potential data loss or security breach. Security is something that must be present and all users of the network should be aware of the policies and best practices through constant notifications and regular security trainings.

The key findings for **Network and Information Security** include:

- The school district does not have a network and information security plan.
- The school district does not conduct regular security audits.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Communications and Network Infrastructure* were identified during the comprehensive information technology assessment conducted in the September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., CNI for Chapter 12) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 12, Communications and Network Infrastructure, section 3.1, Strategic Issues, would be numbered CNI-1.1, the second recommendation in this same section would be CNI-1.2.

3.1 Strategic Issues

CNI-1.1 Convergence Committee

Providence should form a committee that will be responsible for network convergence. The committee primary role will be to develop a long term plan for network convergence, including capacity forecasting and RFP development for network capacity and management upgrades. In addition, as part of a change management process, the convergence committee should review, plan for the addition of, and sign off on any network impacting services that are being added to the network. These include such services as VoIP, facility management/controls, video surveillance, and video broadcast/distribution. Consider including stakeholders from administration and academics as part of the committee.

3.2 Emerging Issues

CNI-2.1 Home/School Portal

Identify the requirement for a portal strategy and develop an RFP seeking a solution for implementation. Consider filing E-rate Priority 1 funding for this service.

CNI-2.2 Comprehensive Wireless

Develop an RFP aligned with a 470 posting seeking internal connections E-Rate application seeking wireless networks expansion. Regardless of E-Rate support, Providence must understand and build upon a standard foundational wireless network architecture supporting full access in all campuses under a full load of 1 to 1 ---

regardless of BYOD adoption. The State of Rhode Island recently signed into law a "Technology Bond" to expand wireless coverage throughout all schools in the State, consider this funding along with the E-rate to further build out the future wireless network infrastructure. In addition, the comprehensive wireless should explore how Providence can extend into a community-wide wireless network providing equitable access in support of the district.

CNI-2.3 Comprehensive VoIP

Conduct a TCO of the current telephone solution district-wide. Based on the outcome of the TCO, develop a RFP for migration of the districts voice solution for all campus locations. Conduct initial assessment of the ROI for upgrading the telephone solution. Assure the solution is applied for under E-rate priority-2 along with the Wireless expansion and cabling augmentation. Assure the RFP includes any necessary switch upgrades or additions to support required PoE devices.

CNI-2.4 Video Streaming and Surveillance

Working through the convergence committee, sponsor a project to develop and plan for a single video distribution and storage strategy (this includes all content created, downloaded and stored via all systems/users and how these will be stored/distributed/viewed by all stakeholders). As part of this process, conduct a total cost of ownership (TCO) of the current video surveillance systems used district-wide. Based on the results from the TCO as well as the convergence committee's recommendation, conduct a project to upgrade/standardize the video surveillance solution. In concert with the video surveillance, assure the district adopts a single video delivery strategy/platform for streaming content internally/externally, including distance learning/video conferencing and any other requirements such as live/stored digital broadcast.

3.3 Network Transport Infrastructure

CNI-3.1 Cable and Network Switch Infrastructure

Review and augment the cabling and switch infrastructure to support the recommended VoIP CNI-2.3 and Wireless expansion CNI-2.2 projects. Develop a RFP and post a E-rate form 470 for the purpose of contracting with a network cable and switch integration vendor. Develop and formally adopt a network standard, including wireless network capacity/coverage. As part of the cabling augmentation project, bring all classrooms and school facilities network cabling up to a minimum configuration standard.

3.4 Data and Services Infrastructure

CNI-4.1 Cell Phone Device and Management

Review the current cell phone policy to understand the how the policy supports the districts operational needs. Consider the legal and security aspects of staff using a personal device that may or may not contain protected data. The district currently does not have the capability remotely manage the cell phone devices including basic services such as remote wipe. A mobile device management solution coupled with a reworked cell phone policy is needed.

3.5 Management and Supporting Computing Infrastructure

CNI-5.1 Identity Management / Single Sign-On

Develop an Identity Management / Single Sign-On plan and assure it is implemented as part of the portal plan and rollout CNI-2.1.

3.6 Network and Information Security

CNI-6.1 Network and Information Security Plan

The district must develop and adopt a plan to assure the safety and security for access to the network and more importantly the safe handling and protection of the data and information. The district should hire a consulting firm to conduct regular network penetration tests and review security policies and adherence to these by the users.

4.0 RESEARCH AND BEST PRACTICES

Communications and Network Infrastructure plays a fundamental role across the district. A robust and efficient network and communication infrastructure is without question the foundation for how the district will leverage technology in support of teaching, learning and efficient business processes.

The continued growth and reliance on information technology and the necessary change of the underlying networks and infrastructure to keep pace puts tremendous stress on the limited and available resources. Therefore, efficiencies and new methodologies will be necessary for information technology resources to meet the challenges while remaining within limited budget.

Adequate funding is a primary requisite to achieve a scope of deployment and breadth of capabilities to deliver necessary functionality for any technology system. Learning organizations must endeavor to make a careful analysis to understand the full impact of the investment. Planning must also account for the entire lifecycle including not only the technology acquisition and deployment, but also the ongoing operational budget support needs, user support, training (both end user and IT staff), upgrades and eventually decommissioning.

Traditional methods for service acquisition, deployment and support are being replaced with the growth and opportunities presented via Cloud Computing and Software as a Service (SaaS). The opportunities offer learning organizations a subscription based approach to obtaining the needed services without the complexities of managing local computing infrastructure and software upgrades and management. In addition, much of the capital cost related to infrastructure is shared with other subscribers lowering the overall costs for each individual subscriber over building it themselves. In addition, the service acquisition time to deployment is significantly less as there is no need to build or add onto a local hardware and software platform.

In as much as Cloud Computing and SaaS have provided new opportunities for service deployment, these services put strain on other parts of the infrastructure, most notably the network infrastructure, Internet access and network security. The focus must shift to reliable and enterprise networks to support the dependence on the Cloud. The loss of access to the network and Internet will render the end user device useless as these devices are merely a window into the Internet, i.e. the information utility.

4.1 Convergence

Convergence refers to the combining of voice, video, data onto a common network architecture and protocol. Historically, networks for data, voice and video applications have been built in isolation and operated and managed by separate groups.

These legacy networks have been built using different technologies at each layer, i.e. physical, transport and network. It is common to find dedicated leased lines, analog POTS lines, voice switches, ISDN and PRI for conferencing; Instructional Television Fixed Service (ITFS) and Educational Broadband Systems (EBS) and coax for television and video broadcast and a combination of leased lines, Category 5, 6 and 7 wiring, fiber and numerous devices for data. Additionally, separate systems exist for paging and public address, building systems control, security, surveillance, and clocks among many others.

This use of different approaches at all layers for each application is extremely inefficient. It is widely accepted and acknowledged by the communications industry and industry analysts as a whole that the Internet Protocol (IP) is the universal network protocol for the future. The rapid adoption and migration of data, voice and video services vendors to the utilization and standardization of IP for applications creates an environment where convergence is no longer an option, but, a simply a outcome of how business is done.

Once a converged network is in place bandwidth can be added incrementally and will be shared between applications, adding efficiency, maximizing the expense and reducing complexity. For example, when voice is quiescent, data services can take advantage of the available bandwidth; when voice or video applications are active, they can be guaranteed the bandwidth they require while data traffic continues to flow but at a reduced rate. With convergence, however, technology managers will need new tools to visualize and optimize the network traffic to allow for quality of service necessary to meet the service levels required for efficient operations and support the requirements of the applications on the converged network.

4.2 Characteristics of a High-performance Network

A network that has been well designed will be predictable and consistent in each of the following areas:

4.2.1 Performance

A well-designed network shows consistently high performance in application response time, the variation in response time, and other performance parameters.

4.2.2 Resilience

A well-designed network should offer zero-downtime for core network connectivity, i.e. resiliency at the edge of the network, including dynamic peering with multiple Internet access points and dynamic clusters of key core network hardware such as firewalls and routers. Ideally, the failure of any one link or networking device along the client-to-server path should not result in the loss of a client-server session. Automatic failover to an alternate path should occur dynamically. This interval is called the convergence time and can be defined as the span between a network topology change (such as the loss of a link) and each device on the network becoming aware of the change. Well-designed networks are characterized by consistently low convergence times.

4.2.3 Scalability

A scalable network can support growth without having to be radically redesigned. It can handle both the addition of users, network nodes or sites and the addition of new applications with increased bandwidth needs.

Ask the following question: What if our network had to serve twice the number of users, twice the number of devices or new applications that demanded twice the bandwidth? A scalable network can accommodate this growth without significant changes to its overall design.

4.2.4 Cost

Cost is the most fundamental driver behind the network-design process. Networks must not only meet a certain technical specification but must also be cost-effective in their implementation and operation.
Network designs typically trade off cost versus performance and availability. For example, we may need more bandwidth to ensure optimum application performance. However, there is usually a cut-off point where purchasing more bandwidth is no longer cost-effective. Similarly, back-up circuits may be required to ensure resilience along the client-to-server data path in the event of a failure on the primary data path. This back-up technology must be comparable in speed to the primary link to avoid degraded service when the primary connection is down.

A well-designed network will not only be cost-effective to implement, it should also have relatively consistent operating costs. A well-designed network minimizes the support costs which is often the most overlooked cost element, mainly because it is notoriously difficult to quantify. For example, we could decide to install and manage our own fiber network to reduce the WAN costs that would be incurred from a service provider. While this would undoubtedly reduce WAN costs, it would also result in increased support costs. A significant level of expertise is required to support a private fiber network; hiring and retaining such expertise is expensive. However, without such expertise in-house, the cost of network support will likely be even greater because of the need for external consultants and other third parties to fill the gaps and ensure smooth daily operations.

4.3 Capacity Planning and Forecasting

Capacity planning includes three main objectives:

- Service level assurance
- Financial and technical planning
- Support of educational decision-making

Service-level assurance means that factors such as interactive response time and batch turnaround are consistent and acceptable. This means that everyone will know and agree upon what is acceptable for each service. While it may seem that it is not hard to maintain acceptable service with unlimited budget, in fact, there are many financial and technical issues that we need to develop correctly, irrespective of cost. In addition, many factors that need to be fully developed in a well-planned computing and network environment do not have substantial incremental cost.

A close adjunct to service-level assurance is financial and technical planning. This involves meeting acceptable service goals with the greatest efficiency. But both the goals and the financial and technical resources available to meet those goals are changing. Added to this is the timeframe of analysis; maximizing efficiency, when measured over the short-term and long-term, can yield very different outcomes. To meet these challenges requires a comprehensive technology strategy to provide a map for decision-making.

The third aspect of capacity planning is support of educational decision making, both with respect to student learning and educational management. Effective technology planning will take place in the context of the specific needs of the district. Thus, we will support educational decisions as well as technology decisions.

This decision depends on responses to the following questions:

- What can be done within the limitations of the present technology infrastructure?
- What changes to the technology infrastructure are required to support emerging processes?
- What new processes and opportunities can be explored with the expansion or renovation of the technology infrastructure?

Capacity Planning is the determination of the overall size, performance and resilience of a computing or network system. The detailed components of a capacity plan will vary, depending upon the proposed usage of the system, but always consider the following:

- The required performance and response required from both the system and the network – i.e., the end-to-end performance
- The level of resilience required and the planned cycle of usage – peaks, troughs and average
- The need for 24/7 operations and the acceptability of downing the system for maintenance and other remedial work
- The anticipated storage capacity of the system and the amount of data retrieved, created and stored within a given cycle
- The number of online processes and the estimated likely contention
- The impact of security measures and back-up of data

In the past, network architects could simply add more bandwidth to networks or servers to the farm to improve performance while the organization added more users and services. As networks become more complex and users come to rely on technology more completely the art of capacity planning isn't as simple as more is better.

In education, the drive to use resources efficiently is intense. The days of over-provisioning to be assured of capacity have ended. Planning tools can also be used to uncover underused resources and avoid purchasing more hardware.

However, we need to be aware that software tools do not represent a cure-all for capacity-planning woes. Capacity planning requires knowledge of the way all the computing and network elements interact and perform. That only comes from years of study and experience with networks. If we ask the wrong question, we will get a nifty answer, but it may not solve our problem. Obviously, we need to know the right questions to ask. Capacity planning has the characteristics of an art form, one that requires an artist skilled in advanced mathematics and statistical analysis, with an eye for spotting behavior patterns in volumes of data. In addition, tools builders point out that users often do not focus on long-term planning; opting more for quick fixes that sometimes don't solve the problems and prompt network managers to overprovision networks and servers.

An effective capacity planning methodology involves two flows of activity:

- Development of a functional model of the systems under consideration
- Development of a cost model of systems operation

The functional model is grounded in the technology at a very fundamental level. In many cases, the quality of capacity planning is dependent upon the underlying functional model. Once the technology is laid out and interconnected, functional aspects, such as the form of the demand and the profile of demand over time, are included to characterize the work that is accomplished by the system. Because demand and functional capabilities of systems are interconnected, a closed loop is required to reflect changes in demand characteristics that are driven by changes in technology. Other aspects of the functional model include validation and calibration of the functional metrics, a means to forecast demand and a way to predict performance that brings together models and forecasts.

The cost model captures implementation, incremental and operational expense associated with each technology component or function. The cost model is interconnected to the functional model to reflect changes in value arising from changes in actual and predicted functional elements. Interaction of the functional and cost models yields a configuration plan, an investment plan, and a staffing plan.

The relationship between requirements and capacity is based on developing computing and network systems resources to enable satisfied users. With the requirements known, it is possible to meet user expectations in three ways:

- By designing a system to meet or exceed the predicted requirements
- By altering the requirements by managing the workload
- By tuning processes to remove demand

A significant part of planning capacity is continually gathering and predicting future requirements and then making the necessary adjustments to ensure that the workload is smaller than the available capacity in both steady and peak states. Making the adjustments is the juncture at which capacity planning experience, educational process knowledge, and creativity come together.

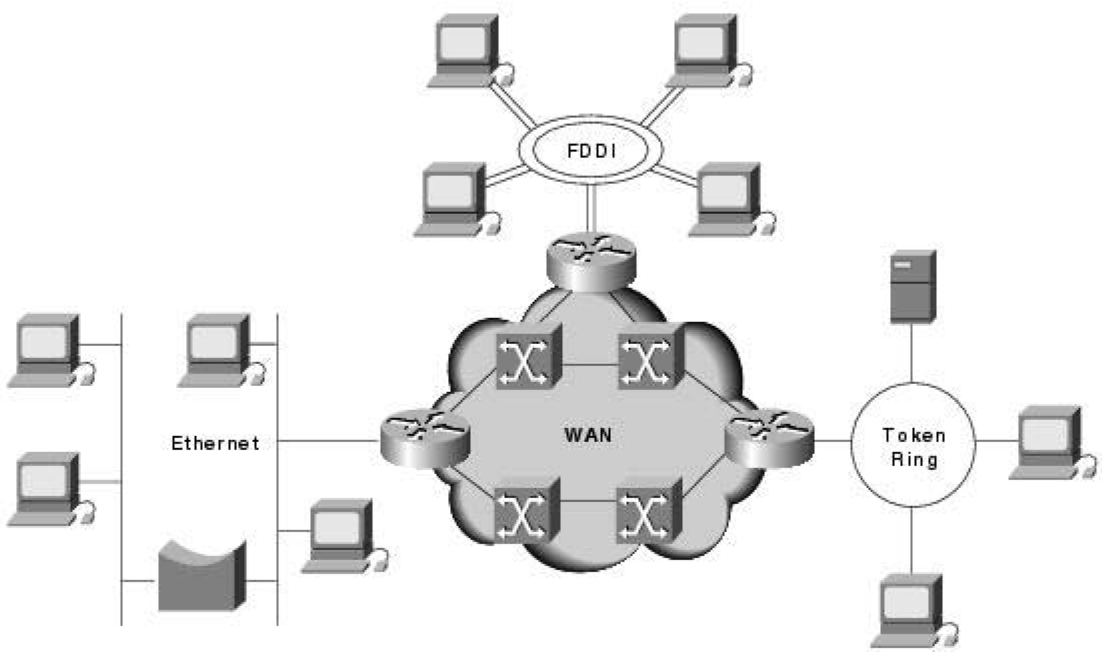
4.4 Internetworking and High Performance Networks[1]

4.4.1 Internetworking

An internetwork is a collection of individual networks, connected by intermediate networking devices, that functions as a single large network. Internetworking refers to the industry, products, and procedures that meet the challenge of creating and administering internetworks.

Figure: Different Network Technologies Can Be Connected to Create an Internetwork illustrates some different kinds of network technologies that can be interconnected by routers and other networking devices to create an internetwork.

4.4.1.1 Figure: Different Network Technologies Can Be Connected to Create an Internetwork



4.4.1.2 History of Internetworking

The first networks were time-sharing networks that used mainframes and attached terminals. Such environments were implemented by both IBM's Systems Network Architecture (SNA) and Digital's network architecture.

[1] http://docwiki.cisco.com/wiki/Internetworking_Basics, Downloaded May 6, 2012, included here for reference

Local-area networks (LANs) evolved around the PC revolution. LANs enabled multiple users in a relatively small geographical area to exchange files and messages, as well as access shared resources such as file servers and printers.

Wide-area networks (WANs) interconnect LANs with geographically dispersed users to create connectivity. Some of the technologies used for connecting LANs include T1, T3, ATM, ISDN, ADSL, Frame Relay, radio links, and others. New methods of connecting dispersed LANs are appearing every day.

Today, high-speed LANs and switched internetworks are becoming widely used, largely because they operate at very high speeds and support such high-bandwidth applications as multimedia and videoconferencing.

Internetworking evolved as a solution to three key problems: isolated LANs, duplication of resources, and a lack of network management. Isolated LANs made electronic communication between different offices or departments impossible. Duplication of resources meant that the same hardware and software had to be supplied to each office or department, as did separate support staff. This lack of network management meant that no centralized method of managing and troubleshooting networks existed.

4.4.1.3 Internetworking Challenges

Implementing a functional internetwork is no simple task. Many challenges must be faced, especially in the areas of connectivity, reliability, network management, and flexibility. Each area is key in establishing an efficient and effective internetwork.

The challenge when connecting various systems is to support communication among disparate technologies. Different sites, for example, may use different types of media operating at varying speeds, or may even include different types of systems that need to communicate.

Because companies rely heavily on data communication, internetworks must provide a certain level of reliability. This is an unpredictable world, so many large internetworks include redundancy to allow for communication even when problems occur.

Furthermore, network management must provide centralized support and troubleshooting capabilities in an internetwork. Configuration, security, performance, and other issues must be adequately addressed for the internetwork to function smoothly. Security within an internetwork is essential. Many people think of network security from the perspective of protecting the private network from outside attacks. However, it is just as important to protect the network from internal attacks, especially because most security breaches come from inside. Networks must also be secured so that the internal network cannot be used as a tool to attack other external sites.

Early in the year 2000, many major web sites were the victims of distributed denial of service (DDOS) attacks. These attacks were possible because a great number of private networks currently connected with the Internet were not properly secured. These private networks were used as tools for the attackers.

Because nothing in this world is stagnant, internetworks must be flexible enough to change with new demands.

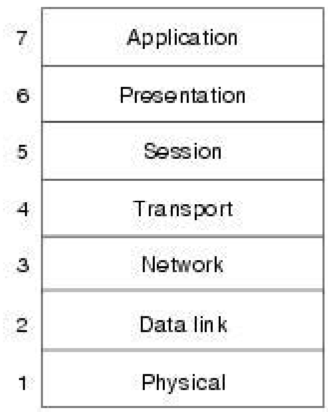
4.4.2 Open System Interconnection Reference Model

The Open System Interconnection (OSI) reference model describes how information from a software application in one computer moves through a network medium to a software application in another computer. The OSI reference model is a conceptual model composed of seven layers, each specifying particular network functions. The model was developed by the International Organization for Standardization (ISO) in 1984, and it is now considered the primary architectural model for intercomputer communications. The OSI model divides the tasks involved with moving information between networked computers into seven smaller, more manageable task groups. A task or group of tasks is then assigned to each of the seven OSI layers. Each layer is reasonably self-contained so that the tasks assigned to each layer can be implemented independently. This enables the solutions offered by one layer to be updated without adversely affecting the other layers. The following list details the seven layers of the Open System Interconnection (OSI) reference model:

- Layer 7-Application
- Layer 6-Presentation
- Layer 5-Session
- Layer 4-Transport
- Layer 3-Network
- Layer 2-Data link
- Layer 1-Physical

Figure: The OSI Reference Model Contains Seven Independent Layers illustrates the seven-layer OSI reference model.

4.4.2.1 Figure: The OSI Reference Model Contains Seven Independent Layers



4.4.2.2 Characteristics of the OSI Layers

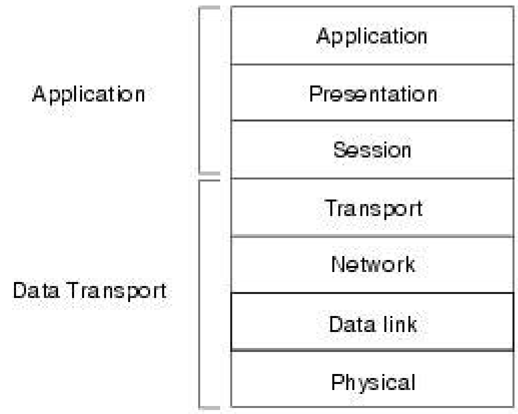
The seven layers of the OSI reference model can be divided into two categories: upper layers and lower layers.

The upper layers of the OSI model deal with application issues and generally are implemented only in software. The highest layer, the application layer, is closest to the end user. Both users and application layer processes interact with software applications that contain a communications component. The term upper layer is sometimes used to refer to any layer above another layer in the OSI model.

The lower layers of the OSI model handle data transport issues. The physical layer and the data link layer are implemented in hardware and software. The lowest layer, the physical layer, is closest to the physical network medium (the network cabling, for example) and is responsible for actually placing information on the medium.

Figure: Two Sets of Layers Make Up the OSI Layers illustrates the division between the upper and lower OSI layers.

4.4.2.21. Figure: Two Sets of Layers Make Up the OSI Layers



4.4.2.3 Protocols

The OSI model provides a conceptual framework for communication between computers, but the model itself is not a method of communication. Actual communication is made possible by using communication protocols. In the context of data networking, a protocol is a formal set of rules and conventions that governs how computers exchange information over a network medium. A protocol implements the functions of one or more of the OSI layers.

A wide variety of communication protocols exist. Some of these protocols include LAN protocols, WAN protocols, network protocols, and routing protocols. LAN protocols operate at the physical and data link layers of the OSI model and define communication over the various LAN media. WAN protocols operate at the lowest three layers of the OSI model and define communication over the various wide-area media. Routing protocols are network layer protocols that are responsible for exchanging information between routers so that the routers can select the proper path for network traffic. Finally, network protocols are the various upper-layer protocols that exist in a given protocol suite. Many protocols rely on others for operation. For example, many routing protocols use network protocols to exchange information between routers. This concept of building upon the layers already in existence is the foundation of the OSI model.

4.4.2.4 OSI Model and Communication Between Systems

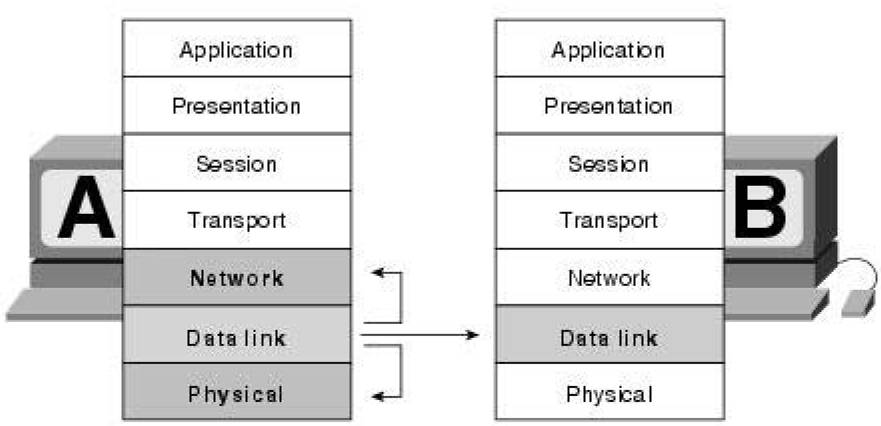
Information being transferred from a software application in one computer system to a software application in another must pass through the OSI layers. For example, if a software application in System A has information to transmit to a software application in System B, the application program in System A will pass its information to the application layer (Layer 7) of System A. The application layer then passes the information to the presentation layer (Layer 6), which relays the data to the session layer (Layer 5), and so on down to the physical layer (Layer 1). At the physical layer, the information is placed on the physical network medium and is sent across the medium to System B. The physical layer of System B removes the information from the physical medium, and then its physical layer passes the information up to the data link layer (Layer 2), which passes it to the network layer (Layer 3), and so on, until it reaches the application layer (Layer 7) of System B. Finally, the application layer of System B passes the information to the recipient application program to complete the communication process.

4.4.2.41. Interaction Between OSI Model Layers

A given layer in the OSI model generally communicates with three other OSI layers: the layer directly above it, the layer directly below it, and its peer layer in other networked computer systems. The data link layer in System A, for example, communicates with the network layer of System A, the physical layer of System A, and the data link layer in System B.

Figure: OSI Model Layers Communicate with Other Layers illustrates this example.

4.4.2.41.1. Figure: OSI Model Layers Communicate with Other Layers



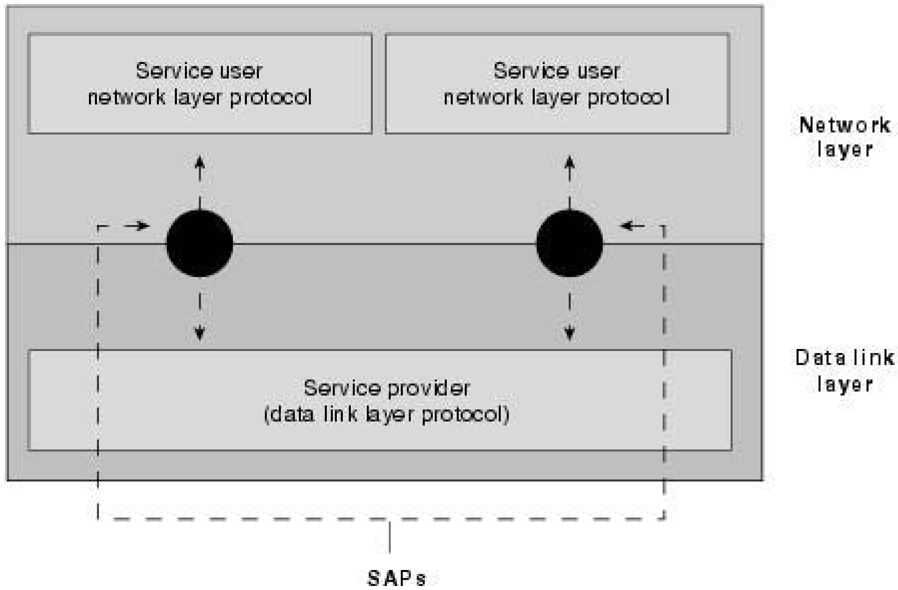
4.4.2.41.2. OSI Layer Services

One OSI layer communicates with another layer to make use of the services provided by the second layer. The services provided by adjacent layers help a given OSI layer communicate with its peer layer in other computer systems. Three basic elements are involved in layer services: the service user, the service provider, and the service access point (SAP).

In this context, the service user is the OSI layer that requests services from an adjacent OSI layer. The service provider is the OSI layer that provides services to service users. OSI layers can provide services to multiple service users. The SAP is a conceptual location at which one OSI layer can request the services of another OSI layer.

Figure: Service Users, Providers, and SAPs Interact at the Network and Data Link Layers illustrates how these three elements interact at the network and data link layers.

4.4.2.41.3. Figure: Service Users, Providers, and SAPs Interact at the Network and Data Link Layers



4.4.2.42. OSI Model Layers and Information Exchange

The seven OSI layers use various forms of control information to communicate with their peer layers in other computer systems. This control information consists of specific requests and instructions that are exchanged between peer OSI layers.

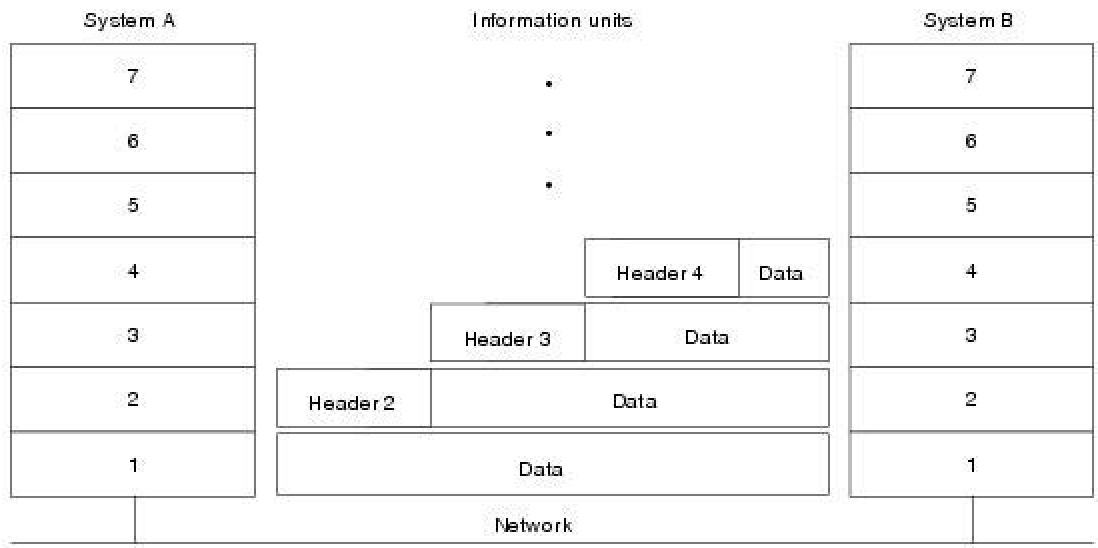
Control information typically takes one of two forms: headers and trailers. Headers are prepended to data that has been passed down from upper layers. Trailers are appended to data that has been passed down from upper layers. An OSI layer is not required to attach a header or a trailer to data from upper layers.

Headers, trailers, and data are relative concepts, depending on the layer that analyzes the information unit. At the network layer, for example, an information unit consists of a Layer 3 header and data. At the data link layer, however, all the information passed down by the network layer (the Layer 3 header and the data) is treated as data.

In other words, the data portion of an information unit at a given OSI layer potentially can contain headers, trailers, and data from all the higher layers. This is known as encapsulation.

Figure: Headers and Data Can Be Encapsulated During Information Exchange shows how the header and data from one layer are encapsulated into the header of the next lowest layer.

4.4.2.42.1. Figure: Headers and Data Can Be Encapsulated During Information Exchange



4.4.2.42.2. Information Exchange Process

The information exchange process occurs between peer OSI layers. Each layer in the source system adds control information to data, and each layer in the destination system analyzes and removes the control information from that data.

If System A has data from a software application to send to System B, the data is passed to the application layer. The application layer in System A then communicates any control information required by the application layer in System B by prepending a header to the data. The resulting information unit (a header and the data) is passed to the presentation layer, which prepends its own header containing control information intended for the presentation layer in System B. The information unit grows in size as each layer prepends its own header (and, in some cases, a trailer) that contains control information to be used by its peer layer in System B. At the physical layer, the entire information unit is placed onto the network medium.

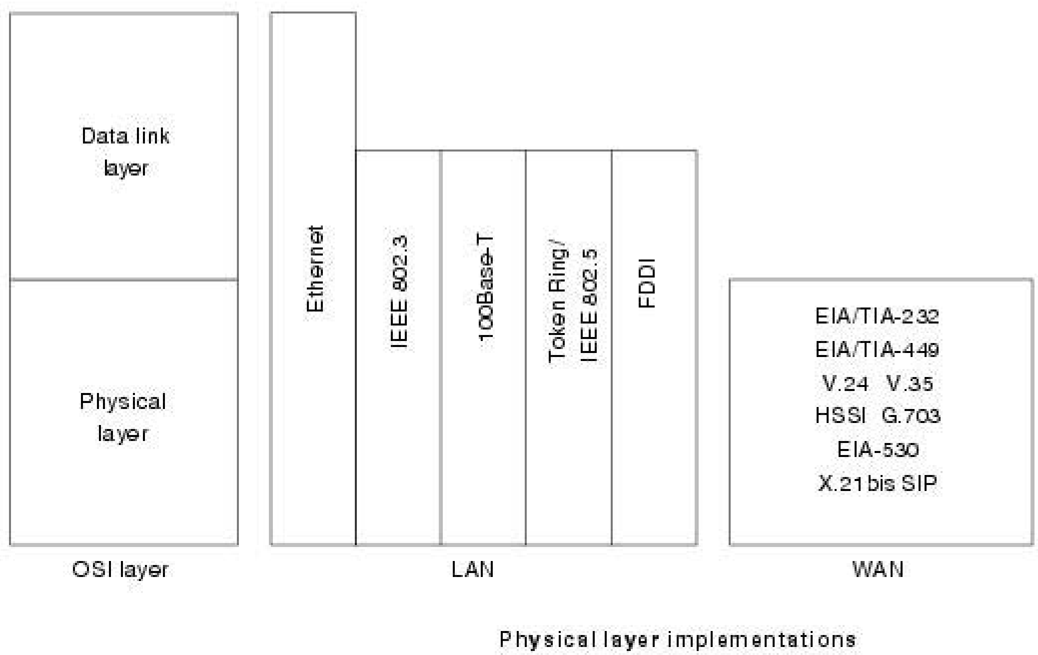
The physical layer in System B receives the information unit and passes it to the data link layer. The data link layer in System B then reads the control information contained in the header prepended by the data link layer in System A. The header is then removed, and the remainder of the information unit is passed to the network layer. Each layer performs the same actions: The layer reads the header from its peer layer, strips it off, and passes the remaining information unit to the next highest layer. After the application layer performs these actions, the data is passed to the recipient software application in System B, in exactly the form in which it was transmitted by the application in System A.

4.4.2.5 OSI Model Physical Layer

The physical layer defines the electrical, mechanical, procedural, and functional specifications for activating, maintaining, and deactivating the physical link between communicating network systems. Physical layer specifications define characteristics such as voltage levels, timing of voltage changes, physical data rates, maximum transmission distances, and physical connectors. Physical layer implementations can be categorized as either LAN or WAN specifications.

Figure: Physical Layer Implementations Can Be LAN or WAN Specifications illustrates some common LAN and WAN physical layer implementations.

4.4.2.51. Figure: Physical Layer Implementations Can Be LAN or WAN Specifications



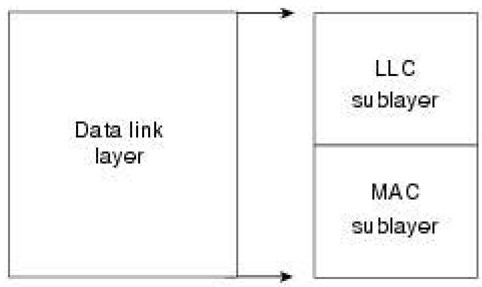
4.4.2.6 OSI Model Data Link Layer

The data link layer provides reliable transit of data across a physical network link. Different data link layer specifications define different network and protocol characteristics, including physical addressing, network topology, error notification, sequencing of frames, and flow control. Physical addressing (as opposed to network addressing) defines how devices are addressed at the data link layer. Network topology consists of the data link layer specifications that often define how devices are to be physically connected, such as in a bus or a ring topology. Error notification alerts upper-layer protocols that a transmission error has occurred, and the sequencing of data frames reorders frames that are transmitted out of sequence. Finally, flow control moderates the transmission of data so that the receiving device is not overwhelmed with more traffic than it can handle at one time.

The Institute of Electrical and Electronics Engineers (IEEE) has subdivided the data link layer into two sublayers: Logical Link Control (LLC) and Media Access Control (MAC).

Figure: The Data Link Layer Contains Two Sublayers illustrates the IEEE sublayers of the data link layer.

4.4.2.61. Figure: The Data Link Layer Contains Two Sublayers



The Logical Link Control (LLC) sublayer of the data link layer manages communications between devices over a single link of a network. LLC is defined in the IEEE 802.2 specification and supports both connectionless and connection-oriented services used by higher-layer protocols. IEEE 802.2 defines a number of fields in data link layer frames that enable multiple higher-layer protocols to share a single physical data link. The Media Access Control (MAC) sublayer of the data link layer manages protocol access to the physical network medium. The IEEE MAC specification defines MAC addresses, which enable multiple devices to uniquely identify one another at the data link layer.

4.4.2.7 OSI Model Network Layer

The network layer defines the network address, which differs from the MAC address. Some network layer implementations, such as the Internet Protocol (IP), define network addresses in a way that route selection can be determined systematically by comparing the source network address with the destination network address and applying the subnet mask. Because this layer defines the logical network layout, routers can use this layer to determine how to forward packets. Because of this, much of the design and configuration work for internetworks happens at Layer 3, the network layer.

4.4.2.8 OSI Model Transport Layer

The transport layer accepts data from the session layer and segments the data for transport across the network. Generally, the transport layer is responsible for making sure that the data is delivered error-free and in the proper sequence. Flow control generally occurs at the transport layer.

Flow control manages data transmission between devices so that the transmitting device does not send more data than the receiving device can process. Multiplexing enables data from several applications to be transmitted onto a single physical link. Virtual circuits are established, maintained, and terminated by the transport layer. Error checking involves creating various mechanisms for detecting transmission errors, while error recovery involves acting, such as requesting that data be retransmitted, to resolve any errors that occur.

The transport protocols used on the Internet are TCP and UDP.

4.4.2.9 OSI Model Session Layer

The session layer establishes, manages, and terminates communication sessions. Communication sessions consist of service requests and service responses that occur between applications located in different network devices. These requests and responses are coordinated by protocols implemented at the session layer. Some examples of session-layer implementations include Zone Information Protocol (ZIP), the AppleTalk protocol that coordinates the name binding process; and Session Control Protocol (SCP), the DECnet Phase IV session layer protocol.

4.4.2.10 OSI Model Presentation Layer

The presentation layer provides a variety of coding and conversion functions that are applied to application layer data. These functions ensure that information sent from the application layer of one system would be readable by the application layer of another system. Some examples of presentation layer coding and conversion schemes include common data representation formats, conversion of character representation formats, common data compression schemes, and common data encryption schemes.

Common data representation formats, or the use of standard image, sound, and video formats, enable the interchange of application data between different types of computer systems. Conversion schemes are used to exchange information with systems by using different text and data representations, such as EBCDIC and ASCII. Standard data compression schemes enable data that is compressed at the source device to be properly decompressed at the destination. Standard data encryption schemes enable data encrypted at the source device to be properly deciphered at the destination.

Presentation layer implementations are not typically associated with a particular protocol stack. Some well-known standards for video include QuickTime and Motion Picture Experts Group (MPEG). QuickTime is an Apple Computer specification for video and audio, and MPEG is a standard for video compression and coding.

Among the well-known graphic image formats are Graphics Interchange Format (GIF), Joint Photographic Experts Group (JPEG), and Tagged Image File Format (TIFF). GIF is a standard for compressing and coding graphic images. JPEG is another compression and coding standard for graphic images, and TIFF is a standard coding format for graphic images.

4.4.2.11 OSI Model Application Layer

The application layer is the OSI layer closest to the end user, which means that both the OSI application layer and the user interact directly with the software application.

This layer interacts with software applications that implement a communicating component. Such application programs fall outside the scope of the OSI model. Application layer functions typically include identifying communication partners, determining resource availability, and synchronizing communication.

When identifying communication partners, the application layer determines the identity and availability of communication partners for an application with data to transmit. When determining resource availability, the application layer must decide whether sufficient network resources for the requested communication exist. In synchronizing communication, all communication between applications requires cooperation that is managed by the application layer.

Some examples of application layer implementations include Telnet, File Transfer Protocol (FTP), and Simple Mail Transfer Protocol (SMTP).

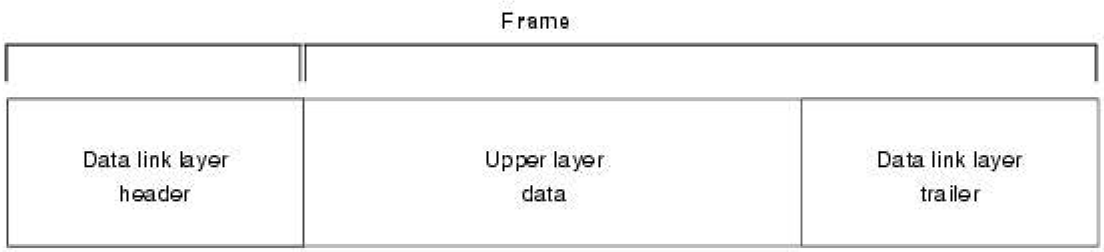
4.4.3 Information Formats

The data and control information that is transmitted through internetworks takes a variety of forms. The terms used to refer to these information formats are not used consistently in the internetworking industry but sometimes are used interchangeably. Common information formats include frames, packets, datagrams, segments, messages, cells, and data units.

A frame is an information unit whose source and destination are data link layer entities. A frame is composed of the data link layer header (and possibly a trailer) and upper-layer data. The header and trailer contain control information intended for the data link layer entity in the destination system. Data from upper-layer entities is encapsulated in the data link layer header and trailer.

Figure: Data from Upper-Layer Entities Makes Up the Data Link Layer Frame illustrates the basic components of a data link layer frame.

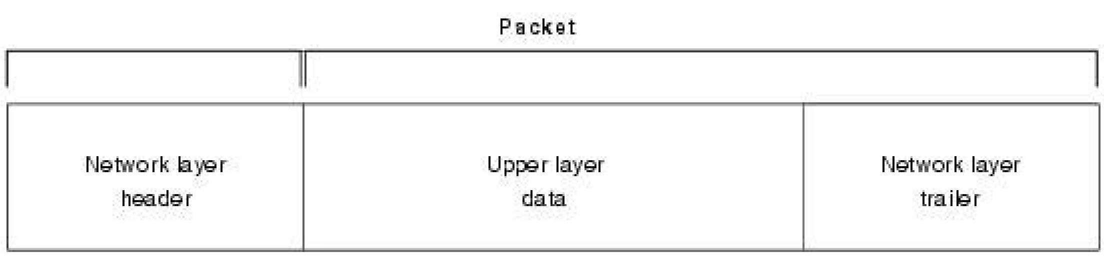
4.4.3.1 Figure: Data from Upper-Layer Entities Makes Up the Data Link Layer Frame



A packet is an information unit whose source and destination are network layer entities. A packet is composed of the network layer header (and possibly a trailer) and upper-layer data. The header and trailer contain control information intended for the network layer entity in the destination system. Data from upper-layer entities is encapsulated in the network layer header and trailer.

Figure: Three Basic Components Make Up a Network Layer Packet illustrates the basic components of a network layer packet.

4.4.3.2 Figure: Three Basic Components Make Up a Network Layer Packet



The term datagram usually refers to an information unit whose source and destination are network layer entities that use connectionless network service.

The term segment usually refers to an information unit whose source and destination are transport layer entities.

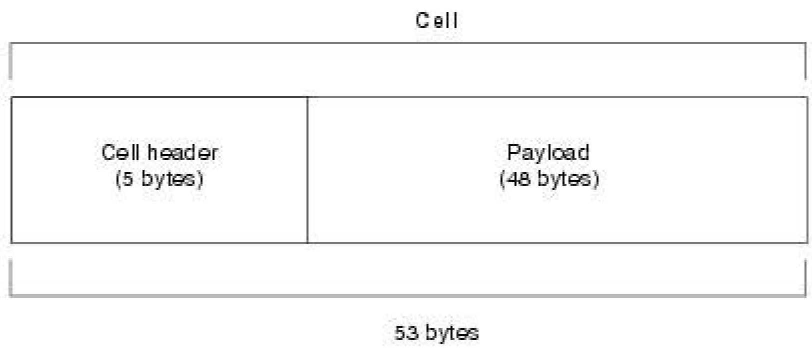
A message is an information unit whose source and destination entities exist above the network layer (often at the application layer).

A cell is an information unit of a fixed size whose source and destination are data link layer entities. Cells are used in switched environments, such as Asynchronous Transfer Mode (ATM) and Switched Multimegabit Data Service (SMDS) networks. A cell is composed of the header and payload. The header contains control information intended for the destination data link layer entity and is typically 5 bytes long. The payload contains upper-layer data that is encapsulated in the cell header and is typically 48 bytes long.

The length of the header and the payload fields always are the same for each cell.

Figure: Two Components Make Up a Typical Cell depicts the components of a typical cell.

4.4.3.3 Figure: Two Components Make Up a Typical Cell



Data unit is a generic term that refers to a variety of information units. Some common data units are service data units (SDUs), protocol data units, and bridge protocol data units (BPDUs). SDUs are information units from upper-layer protocols that define a service request to a lower-layer protocol. PDU is OSI terminology for a packet. BPDUs are used by the spanning-tree algorithm as hello messages.

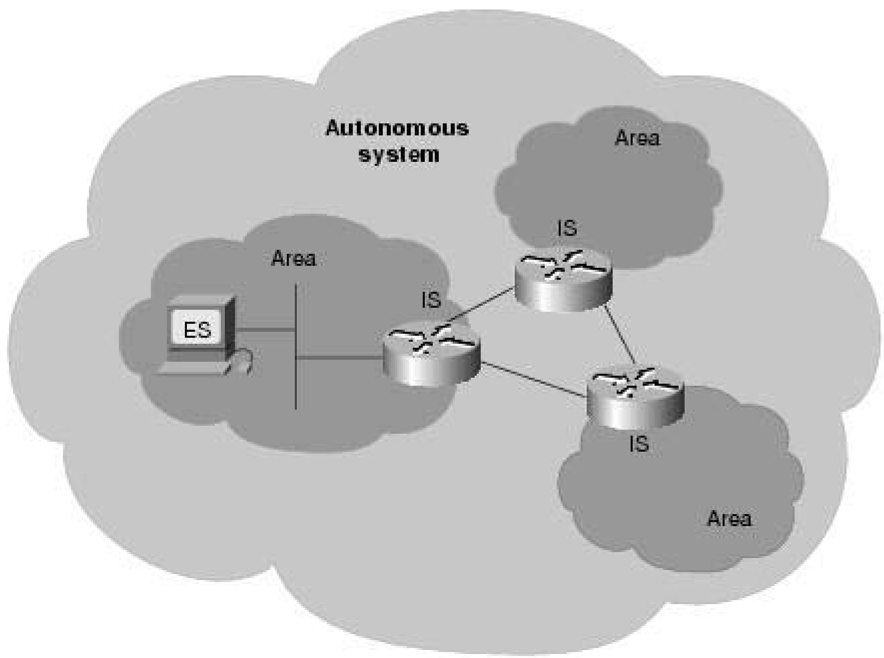
4.4.4 ISO Hierarchy of Networks

Large networks typically are organized as hierarchies. A hierarchical organization provides such advantages as ease of management, flexibility, and a reduction in unnecessary traffic. Thus, the International Organization for Standardization (ISO) has adopted a number of terminology conventions for addressing network entities. Key terms defined in this section include end system (ES), intermediate system (IS), area, and autonomous system (AS).

An ES is a network device that does not perform routing or other traffic forwarding functions. Typical ESs include such devices as terminals, personal computers, and printers. An IS is a network device that performs routing or other traffic-forwarding functions. Typical ISs include such devices as routers, switches, and bridges. Two types of IS networks exist: intradomain IS and interdomain IS. An intradomain IS communicates within a single autonomous system, while an interdomain IS communicates within and between autonomous systems. An area is a logical group of network segments and their attached devices. Areas are subdivisions of autonomous systems (AS's). An AS is a collection of networks under a common administration that share a common routing strategy. Autonomous systems are subdivided into areas, and an AS is sometimes called a domain.

Figure: A Hierarchical Network Contains Numerous Components illustrates a hierarchical network and its components.

4.4.4.1 Figure: A Hierarchical Network Contains Numerous Components



4.4.5 Connection-Oriented and Connectionless Network Services

In general, transport protocols can be characterized as being either connection-oriented or connectionless. Connection-oriented services must first establish a connection with the desired service before passing any data. A connectionless service can send the data without any need to establish a connection first. In general, connection-oriented services provide some level of delivery guarantee, whereas connectionless services do not.

Connection-oriented service involves three phases: connection establishment, data transfer, and connection termination.

During connection establishment, the end nodes may reserve resources for the connection. The end nodes also may negotiate and establish certain criteria for the transfer, such as a window size used in TCP connections. This resource reservation is one of the things exploited in some denial of service (DOS) attacks. An attacking system will send many requests for establishing a connection but then will never complete the connection. The attacked computer is then left with resources allocated for many never-completed connections. Then, when an end node tries to complete an actual connection, there are not enough resources for the valid connection.

The data transfer phase occurs when the actual data is transmitted over the connection. During data transfer, most connection-oriented services will monitor for lost packets and handle resending them. The protocol is generally also responsible for putting the packets in the right sequence before passing the data up the protocol stack.

When the transfer of data is complete, the end nodes terminate the connection and release resources reserved for the connection.

Connection-oriented network services have more overhead than connectionless ones. Connection-oriented services must negotiate a connection, transfer data, and tear down the connection, whereas a connectionless transfer can simply send the data without the added overhead of creating and tearing down a connection. Each has its place in internetworks.

4.4.6 Internetwork Addressing

Internetwork addresses identify devices separately or as members of a group. Addressing schemes vary depending on the protocol family and the OSI layer. Three types of internetwork addresses are commonly used: data link layer addresses, Media Access Control (MAC) addresses, and network layer addresses.

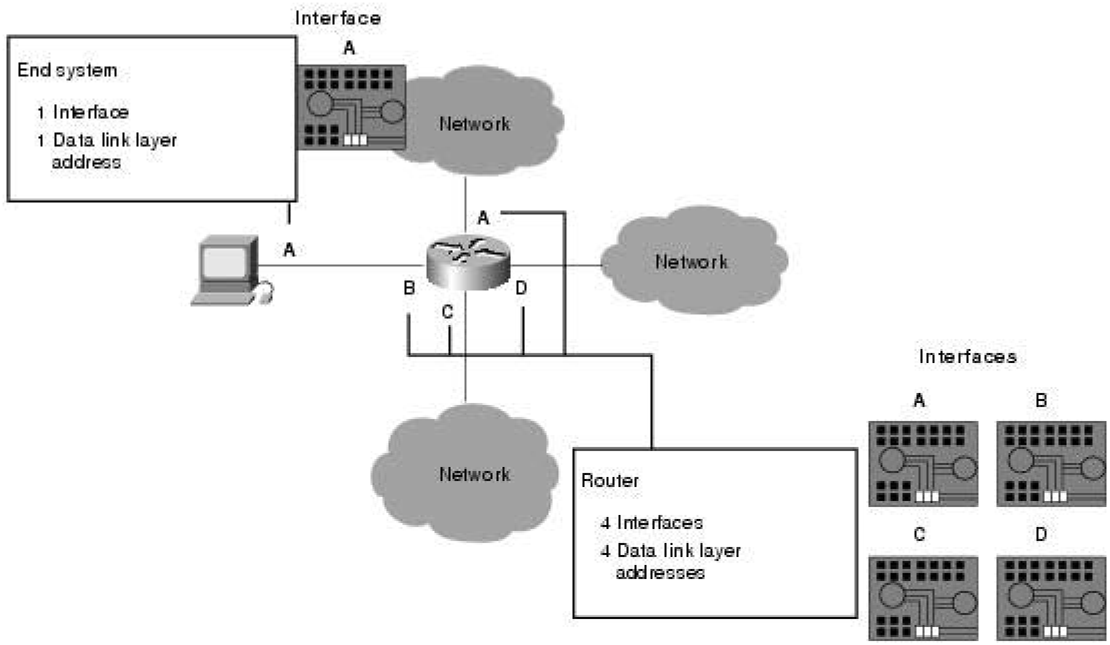
4.4.6.1 Data Link Layer Addresses

A data link layer address uniquely identifies each physical network connection of a network device. Data-link addresses sometimes are referred to as physical or hardware addresses. Data-link addresses usually exist within a flat address space and have a pre-established and typically fixed relationship to a specific device.

End systems generally have only one physical network connection and thus have only one data-link address. Routers and other internetworking devices typically have multiple physical network connections and therefore have multiple data-link addresses.

Figure: Each Interface on a Device Is Uniquely Identified by a Data-Link Address illustrates how each interface on a device is uniquely identified by a data-link address.

4.4.6.11. Figure: Each Interface on a Device Is Uniquely Identified by a Data-Link Address

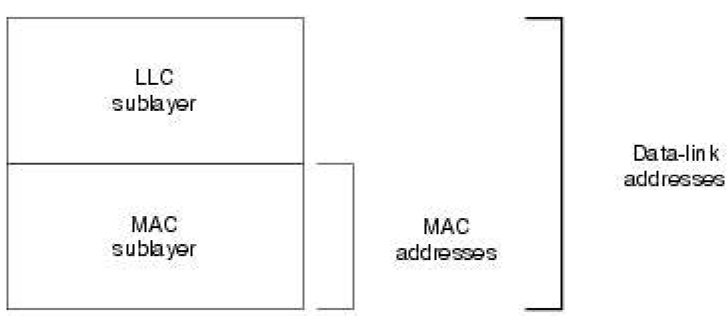


4.4.6.2 MAC Addresses

Media Access Control (MAC) addresses consist of a subset of data link layer addresses. MAC addresses identify network entities in LANs that implement the IEEE MAC addresses of the data link layer. As with most data-link addresses, MAC addresses are unique for each LAN interface.

Figure: MAC Addresses, Data-Link Addresses, and the IEEE Sublayers of the Data Link Layer Are All Related illustrates the relationship between MAC addresses, data-link addresses, and the IEEE sublayers of the data link layer.

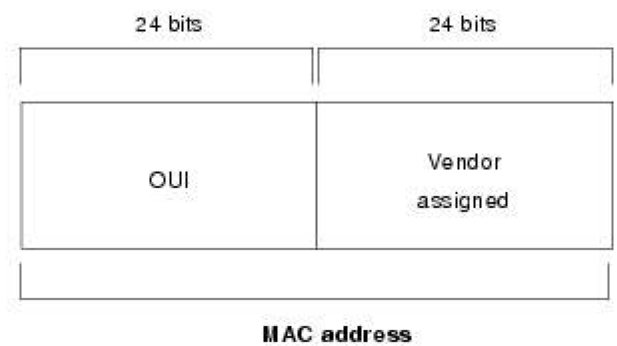
4.4.6.21. Figure: MAC Addresses, Data-Link Addresses, and the IEEE Sublayers of the Data Link Layer Are All Related



MAC addresses are 48 bits in length and are expressed as 12 hexadecimal digits. The first 6 hexadecimal digits, which are administered by the IEEE, identify the manufacturer or vendor and thus comprise the Organizationally Unique Identifier (OUI). The last 6 hexadecimal digits comprise the interface serial number, or another value administered by the specific vendor. MAC addresses sometimes are called burned-in addresses (BIAs) because they are burned into read-only memory (ROM) and are copied into random-access memory (RAM) when the interface card initializes.

Figure: The MAC Address Contains a Unique Format of Hexadecimal Digits illustrates the MAC address format.

4.4.6.22. Figure: The MAC Address Contains a Unique Format of Hexadecimal Digits



4.4.6.3 Mapping Addresses

Because internetworks generally use network addresses to route traffic around the network, there is a need to map network addresses to MAC addresses. When the network layer has determined the destination station's network address, it must forward the information over a physical network using a MAC address. Different protocol suites use different methods to perform this mapping, but the most popular is Address Resolution Protocol (ARP).

Different protocol suites use different methods for determining the MAC address of a device. The following three methods are used most often. Address Resolution Protocol (ARP) maps network addresses to MAC addresses. The Hello protocol enables network devices to learn the MAC addresses of other network devices. MAC addresses either are embedded in the network layer address or are generated by an algorithm.

Address Resolution Protocol (ARP) is the method used in the TCP/IP suite. When a network device needs to send data to another device on the same network, it knows the source and destination network addresses for the data transfer. It must somehow map the destination address to a MAC address before forwarding the data. First, the sending station will check its ARP table to see if it has already discovered this destination station's MAC address. If it has not, it will send a broadcast on the network with the destination station's IP address contained in the broadcast. Every station on the network receives the broadcast and compares the embedded IP address to its own. Only the station with the matching IP address replies to the sending station with a packet containing the MAC address for the station. The first station then adds this information to its ARP table for future reference and proceeds to transfer the data.

When the destination device lies on a remote network, one beyond a router, the process is the same except that the sending station sends the ARP request for the MAC address of its default gateway. It then forwards the information to that device. The default gateway will then forward the information over whatever networks necessary to deliver the packet to the network on which the destination device resides. The router on the destination device's network then uses ARP to obtain the MAC of the actual destination device and delivers the packet.

The Hello protocol is a network layer protocol that enables network devices to identify one another and indicate that they are still functional. When a new end system powers up, for example, it broadcasts hello messages onto the network. Devices on the network then return hello replies, and hello messages are also sent at specific intervals to indicate that they are still functional. Network devices can learn the MAC addresses of other devices by examining Hello protocol packets.

Three protocols use predictable MAC addresses. In these protocol suites, MAC addresses are predictable because the network layer either embeds the MAC address in the network layer address or uses an algorithm to determine the MAC address. The three protocols are Xerox Network Systems (XNS), Novell Internetwork Packet Exchange (IPX), and DECnet Phase IV.

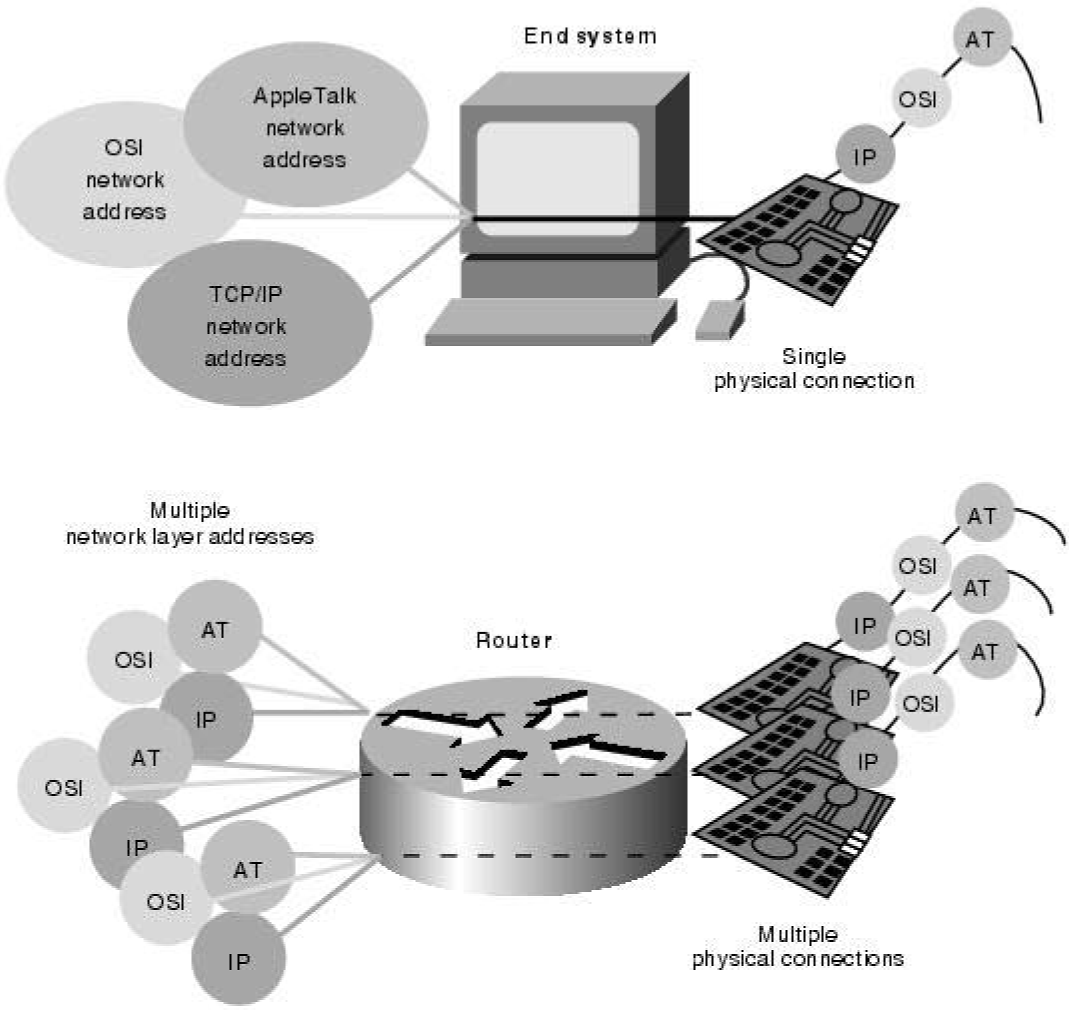
4.4.6.4 Network Layer Addresses

A network layer address identifies an entity at the network layer of the OSI layers. Network addresses usually exist within a hierarchical address space and sometimes are called virtual or logical addresses.

The relationship between a network address and a device is logical and unfixed; it typically is based either on physical network characteristics (the device is on a particular network segment) or on groupings that have no physical basis (the device is part of an AppleTalk zone). End systems require one network layer address for each network layer protocol that they support. (This assumes that the device has only one physical network connection.) Routers and other internetworking devices require one network layer address per physical network connection for each network layer protocol supported. For example, a router with three interfaces each running AppleTalk, TCP/IP, and OSI must have three network layer addresses for each interface. The router therefore has nine network layer addresses.

Figure: Each Network Interface Must Be Assigned a Network Address for Each Protocol Supported illustrates how each network interface must be assigned a network address for each protocol supported.

4.4.6.41. Figure: Each Network Interface Must Be Assigned a Network Address for Each Protocol Supported



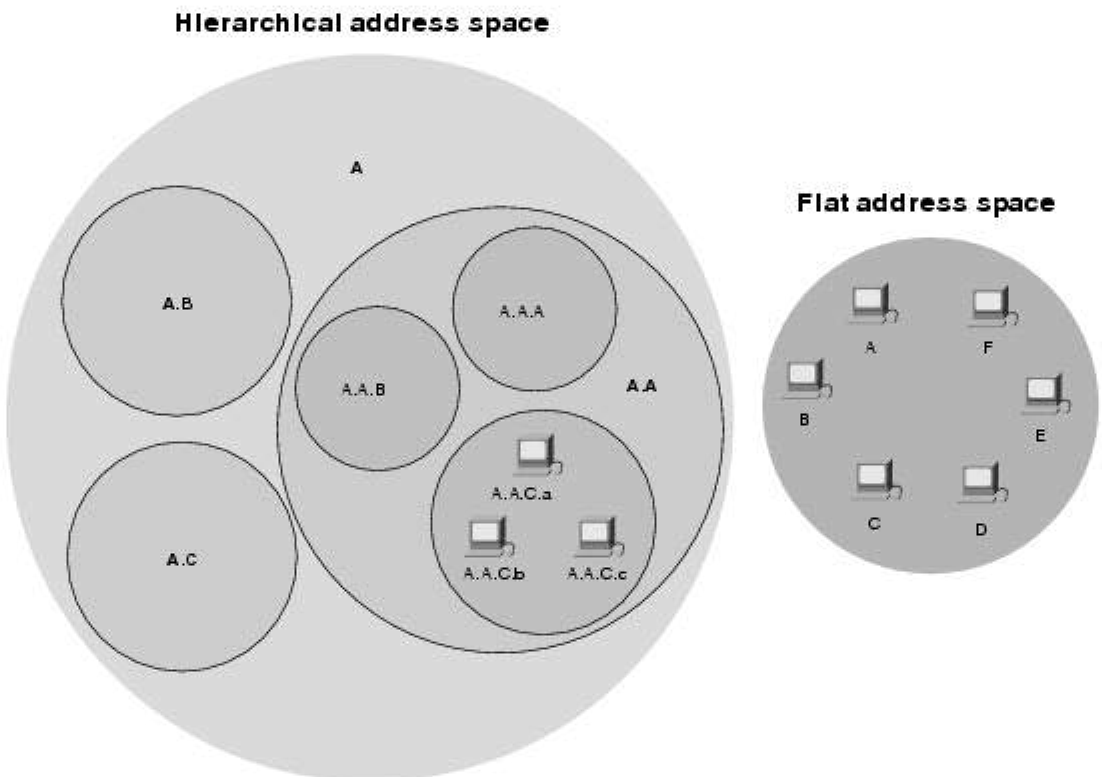
4.4.6.5 Hierarchical Versus Flat Address Space

Internetwork address space typically takes one of two forms: hierarchical address space or flat address space. A hierarchical address space is organized into numerous subgroups, each successively narrowing an address until it points to a single device (in a manner similar to street addresses). A flat address space is organized into a single group (in a manner similar to U.S. Social Security numbers).

Hierarchical addressing offers certain advantages over flat-addressing schemes. Address sorting and recall is simplified using comparison operations. For example, "Ireland" in a street address eliminates any other country as a possible location.

Figure: Hierarchical and Flat Address Spaces Differ in Comparison Operations illustrates the difference between hierarchical and flat address spaces.

4.4.6.51. Figure: Hierarchical and Flat Address Spaces Differ in Comparison Operations



4.4.6.6 Address Assignments

Addresses are assigned to devices as one of two types: static and dynamic. Static addresses are assigned by a network administrator according to a preconceived internetwork addressing plan. A static address does not change until the network administrator manually changes it. Dynamic addresses are obtained by devices when they attach to a network, by means of some protocol-specific process. A device using a dynamic address often has a different address each time that it connects to the network. Some networks use a server to assign addresses. Server-assigned addresses are recycled for reuse as devices disconnect. A device is therefore likely to have a different address each time that it connects to the network.

4.4.6.7 Addresses Versus Names

Internetwork devices usually have both a name and an address associated with them. Internetwork names typically are location-independent and remain associated with a device wherever that device moves (for example, from one building to another). Internetwork addresses usually are location-dependent and change when a device is moved (although MAC addresses are an exception to this rule). As with network addresses being mapped to MAC addresses, names are usually mapped to network addresses through some protocol. The Internet uses Domain Name System (DNS) to map the name of a device to its IP address. For example, it's easier for you to remember www.cisco.com instead of some IP address. Therefore, you type www.cisco.com into your browser when you want to access Cisco's web site. Your computer performs a DNS lookup of the IP address for Cisco's web server and then communicates with it using the network address.

4.4.7 Flow Control Basics

Flow control is a function that prevents network congestion by ensuring that transmitting devices do not overwhelm receiving devices with data. A high-speed computer, for example, may generate traffic faster than the network can transfer it, or faster than the destination device can receive and process it. The three commonly used methods for handling network congestion are buffering, transmitting source-quench messages, and windowing.

Buffering is used by network devices to temporarily store bursts of excess data in memory until they can be processed. Occasional data bursts are easily handled by buffering. Excess data bursts can exhaust memory, however, forcing the device to discard any additional datagrams that arrive.

Source-quench messages are used by receiving devices to help prevent their buffers from overflowing. The receiving device sends source-quench messages to request that the source reduce its current rate of data transmission. First, the receiving device begins discarding received data due to overflowing buffers. Second, the receiving device begins sending source-quench messages to the transmitting device at the rate of one message for each packet dropped. The source device receives the source-quench messages and lowers the data rate until it stops receiving the messages. Finally, the source device then gradually increases the data rate as long as no further source-quench requests are received.

Windowing is a flow-control scheme in which the source device requires an acknowledgment from the destination after a certain number of packets have been transmitted. With a window size of 3, the source requires an acknowledgment after sending three packets, as follows. First, the source device sends three packets to the destination device. Then, after receiving the three packets, the destination device sends an acknowledgment to the source. The source receives the acknowledgment and sends three more packets. If the destination does not receive one or more of the packets for some reason, such as overflowing buffers, it does not receive enough packets to send an acknowledgment. The source then retransmits the packets at a reduced transmission rate.

4.4.8 Error-Checking Basics

Error-checking schemes determine whether transmitted data has become corrupt or otherwise damaged while traveling from the source to the destination. Error checking is implemented at several of the OSI layers.

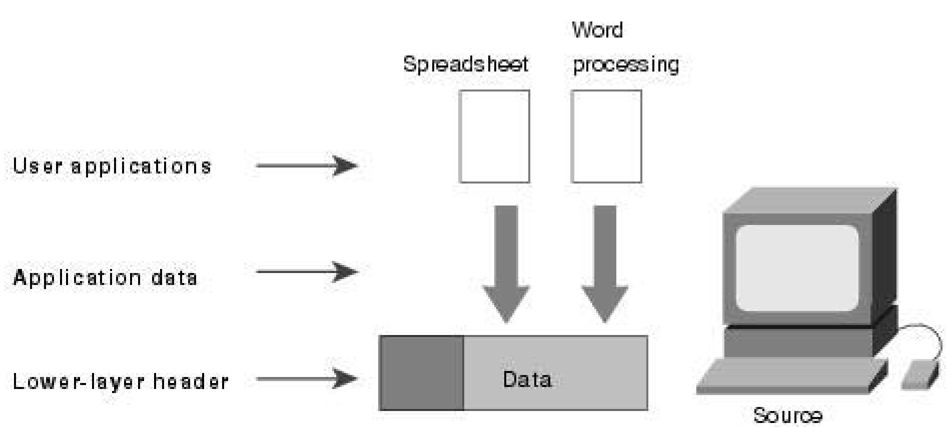
One common error-checking scheme is the cyclic redundancy check (CRC), which detects and discards corrupted data. Error-correction functions (such as data retransmission) are left to higher-layer protocols. A CRC value is generated by a calculation that is performed at the source device. The destination device compares this value to its own calculation to determine whether errors occurred during transmission. First, the source device performs a predetermined set of calculations over the contents of the packet to be sent. Then, the source places the calculated value in the packet and sends the packet to the destination. The destination performs the same predetermined set of calculations over the contents of the packet and then compares its computed value with that contained in the packet. If the values are equal, the packet is considered valid. If the values are unequal, the packet contains errors and is discarded.

4.4.9 Multiplexing Basics

Multiplexing is a process in which multiple data channels are combined into a single data or physical channel at the source. Multiplexing can be implemented at any of the OSI layers. Conversely, demultiplexing is the process of separating multiplexed data channels at the destination. One example of multiplexing is when data from multiple applications is multiplexed into a single lower-layer data packet.

Figure: Multiple Applications Can Be Multiplexed into a Single Lower-Layer Data Packet illustrates this example.

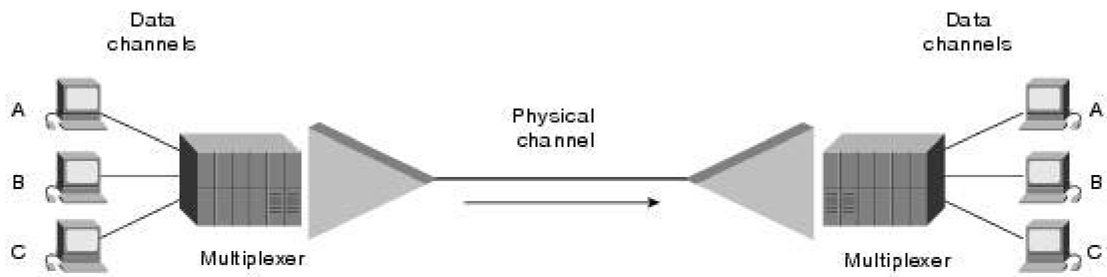
4.4.9.1 Figure: Multiple Applications Can Be Multiplexed into a Single Lower-Layer Data Packet



Another example of multiplexing is when data from multiple devices is combined into a single physical channel (using a device called a multiplexer).

Figure: Multiple Devices Can Be Multiplexed into a Single Physical Channel illustrates this example.

4.4.9.2 Figure: Multiple Devices Can Be Multiplexed into a Single Physical Channel



A multiplexer is a physical layer device that combines multiple data streams into one or more output channels at the source. Multiplexers demultiplex the channels into multiple data streams at the remote end and thus maximize the use of the bandwidth of the physical medium by enabling it to be shared by multiple traffic sources.

Some methods used for multiplexing data are time-division multiplexing (TDM), asynchronous time-division multiplexing (ATDM), frequency-division multiplexing (FDM), and statistical multiplexing.

In TDM, information from each data channel is allocated bandwidth based on preassigned time slots, regardless of whether there is data to transmit. In ATDM, information from data channels is allocated bandwidth as needed by using dynamically assigned time slots. In FDM, information from each data channel is allocated bandwidth based on the signal frequency of the traffic. In statistical multiplexing, bandwidth is dynamically allocated to any data channels that have information to transmit.

4.4.10 Standards Organizations

A wide variety of organizations contribute to internetworking standards by providing forums for discussion, turning informal discussion into formal specifications, and proliferating specifications after they are standardized.

Most standards organizations create formal standards by using specific processes: organizing ideas, discussing the approach, developing draft standards, voting on all or certain aspects of the standards, and then formally releasing the completed standard to the public.

Some of the best-known standards organizations that contribute to internetworking standards include these:

- **International Organization for Standardization (ISO)**-ISO is an international standards organization responsible for a wide range of standards, including many that are relevant to networking. Its best-known contribution is the development of the OSI reference model and the OSI protocol suite.
- **American National Standards Institute (ANSI)**-ANSI, which is also a member of the ISO, is the coordinating body for voluntary standards groups within the United States. ANSI developed the Fiber Distributed Data Interface (FDDI) and other communications standards.
- **Electronic Industries Association (EIA)**-EIA specifies electrical transmission standards, including those used in networking. The EIA developed the widely used EIA/TIA-232 standard (formerly known as RS-232).
- **Institute of Electrical and Electronic Engineers (IEEE)**-IEEE is a professional organization that defines networking and other standards. The IEEE developed the widely used LAN standards IEEE 802.3 and IEEE 802.5.
- **International Telecommunication Union Telecommunication Standardization Sector (ITU-T)**-Formerly called the Committee for International Telegraph and Telephone (CCITT), ITU-T is now an international organization that develops communication standards. The ITU-T developed X.25 and other communications standards.
- **Internet Activities Board (IAB)**-IAB is a group of internetwork researchers who discuss issues pertinent to the Internet and set Internet policies through decisions and task forces. The IAB designates some Request For Comments (RFC) documents as Internet standards, including Transmission Control Protocol/Internet Protocol (TCP/IP) and the Simple Network Management Protocol (SNMP).

4.5 Management Strategies[2]

For many districts, educational management and information management are locked in a death spiral of interrelated inefficiencies. Overcoming these difficulties requires radical technological and process changes. Each views the world from very different perspectives and together they agree on very little, especially the deployment of new enabling technologies.

[2] 2[14] Conrad, Kurt. "Measuring the Strategic Value of Information Technology Investments." *The Sagebrush Group* (1995): http://www.sagebrushgroup.com/value.htm#Section%201 (accessed April 2004).

Prospects for Change

Recognizing the interdependence of educational management and information management and using that understanding to make changes are two different things. Although collaboration and teaming are required to synchronize technology and process changes, a gulf exists in most organizations today. The two camps (customers and their suppliers) speak different languages and hold dramatically different attitudes about the potential role of technology. Combined, these differences seem to create an inherent barrier to significant change. Learning organizations that cannot successfully employ and synchronize radical technological and process changes are increasingly falling behind in their ability to meet the changing expectations of their customers.

The process automation arena is one of the more significant battlefields. Most process automation technologies are not well-suited to traditional justifications as they are not targeted at reducing the costs of specific production processes. In addition, many of them are enabling technologies, which derive most of their benefits from dramatic changes to processes, not from simple automation or reductions in cost. E-mail, for example, is an enabling technology and its true value comes from the changes that result to the district as a whole, not just from the displacement of paper mail.

Paradoxically, it is enabling technologies that could do the most to improve district performance. Successful deployment of enabling technologies requires the teaming of technology staff and their customers. Such a level of collaboration is difficult in many organizations in which the gulf of understanding results in open warfare over control of how decision-making responsibilities are allocated; how budget levels are set; what mechanisms are used to allocate funds; how projects are approved and managed; how technologies and technology standards are selected and implemented.

Correcting these problems requires that both the technology staff and their customers stop looking at each other for not doing things correctly and develop a shared vocabulary and value system toward integrating the necessary changes. Before a solution can be found, however, the cause of this interdependent ineffectiveness must be identified. Some causes and approaches to resolving them are addressed below.

Finance-based Concepts of Value

Management, not capital, is the critical input to modern organizations. Because of this, a continued reliance on finance-based indices of value prevents organizations from making intelligent choices when dealing with overhead (the costs of management) and technology staff (the tools of management).

The conceptual turning point occurred when an epidemiological model was proposed, in which technology is analogous to prescription drugs. The application, doses and therapeutic powers can be clinically substantiated before use.

American productivity appeared to fall as white-collar workers became an increasing portion of the labor force and the gains from "information work" evaded calculation. Reduction of clerical and secretarial staff is counted as a cost savings, even if their work is just shifted to higher-paid managerial and professional personnel.

Misperceptions of Scarcity

The classic methods of measuring financial value, such as return on assets (ROA) and return on investment (ROI), trace their origin to a time when capital was the scarcest, and thus most valuable, input. Today, people who can organize and motivate their employees and know how to maximize the use of capital may be more scarce than capital itself.

Confusion over Overhead

As budgets are reduced, many organizations respond by cutting overhead, which is the cost associated with management. This makes sense if money — not management — is the critical scarce resource. But current funding prevents organizations from understanding the fundamental economics of overhead and the true impact of these decisions. Overhead has value – specifically, preparing for the future.

In districts today, the biggest challenge is not how to "cut overhead" but how to re-engineer management processes and infuse them with needed information technologies to make them more efficient and responsive.

Today's information systems offer the district unprecedented opportunities to provide higher quality services tailored to the public's changing needs, delivered faster, more effectively and cheaply. Moreover, they can enhance the quality and accessibility of important knowledge and information, both for the public and for federal managers.

It is the need to improve the effectiveness of management that drives the various definitions of strategic value, but the same misperceptions of relative value that produce erroneous decisions about overhead often prevent needed information technologies from being developed and deployed.

Strategic Information Management

The GAO Executive Guide identifies three functions that are "critical to building a modern information management infrastructure" and eleven fundamental practices that are grouped by the functions. The eleven practices do not appear to be in any particular order.

I. Decide to Change

- Recognize and communicate the urgency to change information management practices
- Get principals and department heads involved and create ownership
- Take action and maintain momentum

II. Direct Change

- Anchor strategic planning in customer needs and mission goals
- Measure the performance of key mission delivery processes
- Focus on process improvement in the context of an architecture
- Manage information systems projects as investments
- Integrate the planning, budgeting and evaluation process

III. Support Change

- Establish customer/supplier relationships between line and information management professionals
- Position a Chief Information Officer as a senior management partner
- Upgrade skills and knowledge of line and information management professionals

IT professionals need to broaden their views beyond their current technology focus. One approach may be to apply the concepts of technology transfer. Outsourcing should be used, not just for reducing or eliminating the work scope of the existing organizations, but as a tool for increasing the skill levels of agency and contractor employees. The bundling of on-site training with software, hardware and integration services contracts can be an important mechanism for injecting needed skills.

At its core, Information Management is based on the simple idea of the customer defining the criteria against which performance will be measured and thus paid for. Put in different terms, the IT customers working with IT will negotiate service-level agreements for the critical services provided. Further, these service-level agreements must be aligned with district and departmental goals and objectives.

For many districts, information management has been reduced to a cost-savings program. This is no longer sufficient to meet rising customer expectations. Management practices that made sense at the turn of the century no longer fit an economy dominated by the production of goods and services that are increasingly differentiated by their growing information content.

Again, the shift from finance-based to performance-based concepts of value is critical to developing a common framework for measuring the impact of IT on organizational effectiveness of external activities delivered to the district. Internal services include personnel costs and internal direct and indirect expenses for personnel, facilities, other resources, and charges.

Acquisition costs are the easiest to quantify. Support costs are generally the largest over the life of the system. Usability is difficult to quantify; unless there is a defined way to put numbers against functionality, it is best to either leave the numbers out or clearly cite the supporting evidence. Productivity costs include loss of staff productivity during downtime, lost-opportunity cost due to lack of availability and information recovery. Hidden costs can be a substantial value but difficult to ascertain.

Use of Standards to Manage Support Costs

The use of standards is critical for managing the total cost of ownership. Standards play an important role by establishing organizational clarity on technology, educational and administrative processes and procedures. Technology standards include not only the technology itself, but also how that technology is configured, managed and supported. Standards must also be applied to the educational and administrative processes and procedures utilized in managing an organization's networking environment, particularly if that organization utilizes remote sites. Standards and guidelines are crucial to establishing a productive IT environment at a reasonable cost.

Standards must be applied where they make the most sense; an organization does not have to have l00% conformance to a standard. The ultimate goal is organizational effectiveness and not universal conformity to a standard. Standards enable an organization to take better advantage of volume pricing, decrease acquisition processing costs, decrease support and training costs and improve the organization's ability to share data and applications. Standardization needs to be considered on five fronts: hardware, user interface, applications, infrastructure, and processes.

Better Coordination among Support Structures

Many computing environments are developed with multi-layered support structures but lack an overall coordination of effort. For example, those that support telecommunication equipment installation typically do not consult with those installing the desktop computer for a user. A lack of coordination results in severe levels of duplicated services and limits an organization's ability to implement standards and apply system management tools.

An organization's Information Systems Department needs to define the boundaries and roles of computing, communications and user support groups. The important goal is the clear delineation of responsibilities for supporting the desktop-computing environment. Organizations need to realize that the computing asset base needs to be administered and managed, not ignored. Organizations that have implemented centralized management and operation of servers are experiencing measurably lower operations costs.

Automated Inventory and Software Metering Tools

A current inventory of computing, communication and network hardware and software assets can assist in eliminating duplicative maintenance, improve asset disposal, eliminate duplicate software licensing fees and improve disaster recovery planning to reduce support costs. Manual tracking of the inventory is a difficult job requiring physical inspection of each item. Automated inventory systems significantly accelerate the effort and are less costly than traditional manual inspections.

Software-metering tools allow an organization to identify easily the software used by the network and assist in determining the correct number of software licenses. Metering tools can also assist support staff in determining concurrent use of software applications when the software is distributed to all users and licenses are determined according to the number of executions. Metering systems play an important role in security and software distribution by enforcing limited-use and site licenses for particular software packages. An effective inventory control system should track both hardware and software assets.

Remote Access Maintenance, Virus Detection, and Back-up

When systems are distributed, it is extremely difficult to perform routine maintenance and inspection of the system, conduct enterprise-wide virus detection and repair and perform data back-up and restoration. In a networked environment, the vast majority of maintenance functions can be performed through automated remote-access tools that allow District staff to open a session on other systems in the network, run programs, and diagnostics and inspect and alter files.

Network virus detection programs allow support staff to execute virus scans either on demand or on a scheduled basis and initiate automatic repair or system isolation.

The back-up process wastes both time and equipment when it is performed by the end user and may also lead to lost, misplaced and stolen back-up media. An organization should conduct both scheduled full and incremental back-ups for data. In addition, an organization should design their LAN systems to include appropriate bandwidth and storage capacity for more efficient on-line storage utilization. It is critical to reduce the support costs associated with routine maintenance and virus detection and repair.

4.6 Emerging Issues

4.6.1 Metropolitan Fiber Network

Clearly, the demand for network communications capacity has been increasing at a pace that exceeds many organizations' capability to meet. Fortunately the technology and conditions are in place to economically meet and exceed this demand in school districts throughout the country. Major driving factors include access to fiber optic cable and the proximity of locations needing service both of which school districts enjoy.

The information transport capacity of fiber optic cable continues to transform the wide-area data communications market, particularly for schools, from a bandwidth purchasing market to a connectivity purchasing market. The legacy bandwidth market was created by telephone service carriers forcing data communications over expensive, bandwidth capacity-limited, shared public switched networks. In the emerging connectivity purchasing market, bandwidth is a factor only in the equipment installed at each location. The consumer purchases fiber-based connectivity with virtually unlimited bandwidth potential. Unlike the legacy time-division public switched networks, the supplier simply provides dedicated physical connectivity (with reliability) and does not need to dictate artificial bandwidth restrictions.

This can clearly be demonstrated in that estimates show that close to 80% of U.S. homes have broadband network connections (see Figure 2). Where once the home user struggled with dial-up connections, barely if ever realizing the hoped-for 56kbps connections, they now enjoy connection speeds in the multi-megabit range. In many markets, broadband services are rolling out offering home users 50Mbps connections. The uses of the network connection are evolving toward the realization today of a single network capable of supporting voice, video and data. With so much happening in the home, how can the schools keep up? Once again, the schools are challenged to provide an environment that its students, parents and community are demanding, an environment where rich content and media is available on-demand, a network infrastructure that can support the demands of an exponential increase in what it can deliver.

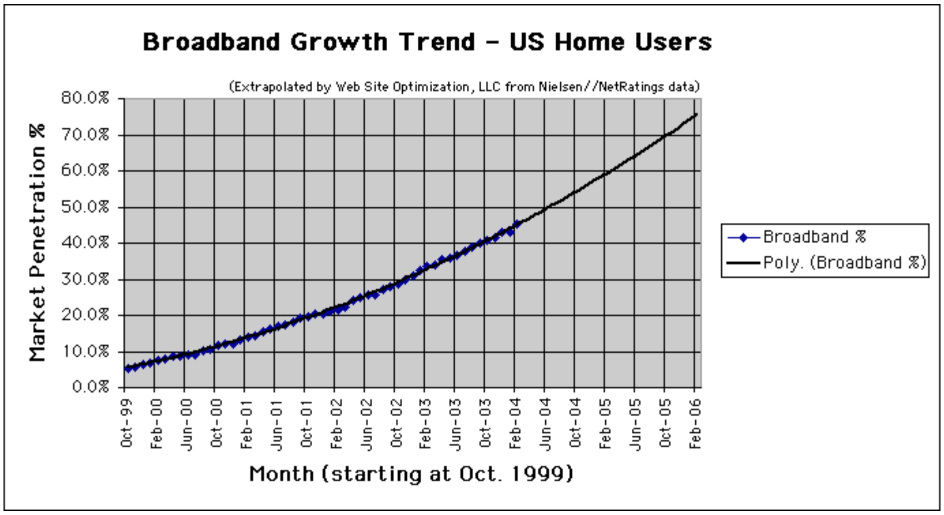


Figure 2: Broadband Growth Trend – U.S. Home Users[3]

How is the changing market advantageous and of benefit to Public Schools? The opportunity is here to make a transformational leap away from ever again having to ask the question, "Can the network support technology initiatives for the benefit of the students?" A network without artificial capacity limitations will provide the ability to rapidly and cost-effectively deploy and make available to the students and teachers a world-class educational system and deploy timely solutions when and where they are needed without consideration or delay of obtaining adequate network capacity.

The conditions that present themselves position school districts throughout the country to make this transformation, freeing the minds of decision makers to offer the best technology available with the goal to increase student achievement today.

4.6.2 Portal

An **enterprise portal**, also known as an *enterprise information portal* (EIP), is a framework for integrating information, people and processes across organizational boundaries. It provides a single point of entry,[1] often in the form of a Web-based user interface, and is designed to aggregate information through application-specific portlets.

The district needs to understand how it is to integrate applications being deployed across the enterprise. The integration of these applications and the ease for access to information will drive the value and return on investment for the investments made. Behind this effort is the basic foundation for the management of data and the need to understand and effectively use this to the benefit of the enterprise.

[3] Broadband Growth Trends – US Home Users, as retrieved June 1, 2007 from http://www.websiteoptimization.com/bw/0403/

Fundamental Features

Single Point of Entry — enterprise portals can provide single sign-on capabilities between their users and various other systems. This requires a user to authenticate only once. Access control lists manage the mapping between portal content and services over the portal user base.

Integration — the connection of functions and data from multiple systems into new components/portlets.

Federation — the integration of content provided by other portals, typically through the use of WSRP or similar technologies.

Personalization — Users can customize the look and feel of their environment. Customers who are using EIPs can edit and design their own websites which reflect their own personality and own style; they can also choose the specific content and services they prefer.

Permissioning — the ability for portal administrators to limit specific types of content and services users have access to. For example, a company's proprietary information can be entitled for only company employee access.

Common Applications

- Content Management System
- Document Management System
- Collaboration Software
- Applications Management and Delivery
- Student Information Management
- Data Driven Decision Intelligence
- E-mail Management
- Intranet

4.7 Network Transport Infrastructure

4.7.1 Wireless Networks

Wireless technology provides options that were not economically practical until very recently. The primary benefits of wireless technology are elimination of the cable, providing the user mobility, ease of network access for anytime, anywhere learning, and swift deployment of network coverage for managers and planners. Wireless may not provide complete mobility for every user. For example, if power is required to serve the end-user device, much of the advantage for wireless connectivity is rendered moot.

Battery technology is making great strides and it is not hard to imagine a device that with one charging cycle can provide service to the length of a school day.

With the advent of switching in the network, the collision domain has been reduced to one device. In wireless networking, devices within proximity of a wireless access point are in a collision domain as in old broadcast collision detect networks. For this reason, deployment of wireless technology needs to be carefully considered in a context that goes beyond the network itself. This broadcast type domain creates security and management issues. Some manufacturers have started to produce products that address this important issue.

The primary aspect of equity as a factor in the data infrastructure is related to deployment to every classroom. Wireless technology provides an attractive alternative to wired technology in this case due to the speed of deployment possible and the reduced cost achieved by eliminating the need for in-ground installation of cable. In addition, wireless technology may help to eliminate certain distance limitations built into the standards for the cabling infrastructure.

Wireless networks do not replace wired networks. They are a complement to them to provide connectivity for mobile users and devices.

Issues for deployment of wireless networks include:

- Alignment of compelling benefit with network functionality
- Data security and access control
- Integration of wired and wireless network into a single hybrid network
- Cell switching for roaming devices
- Wireless network speeds may not provide adequate support for high-bandwidth instructional applications, however new technologies are eliminating this
- Wireless networks require additional network management overhead to ensure proper access and security
- Range of access antennas

Benefits of wireless:

- Rapid achievement of equity and deployment of technology
- Convenience
- Mobility for teachers, staff and students
- Increased productivity and access to network resources
- Deployment of one-to-one and support
- Integration of wireless devices including handheld and telephones

- Inventory management and security
- Guest access and community benefit
- Future flexibility and expandability
- Lower cost per device than wired

4.7.2 Wide Area Network

The objectives for the WAN are to:

- Provide access to network and Web-based content for instruction, research and learning enrichment from the Internet and from school and central Web servers
- Connect individuals, departments and constituencies across the district and in the future support communication including visual and audio
- Provide the means to process forms, workflow and surveys for administrative purpose
- Deliver media and applications to workstation for student learning and staff training
- Provide secure access to protected student, business, financial and human resource information
- Provide central management, back up and security to workstations and file and application servers
- Provide security and protection of facilities including video surveillance
- Reduce costs through consolidation of resources
- Provide future telephony transport services as the voice-over-IP technology matures.

Beyond any other function, the WAN provides the means to interconnect the district into a cohesive whole for learning, teaching, and administration. To achieve this vision, school and district staff must strive to build a culture in which technology is a primary communication mode. An outcome will be the need for greater bandwidth to serve digitization of many disparate services.

Issues for deployment of the wide area network include:

- Universal protocols to serve diverse data streams
- Throughput to meet foreseeable needs
- Scalability to meet future needs
- Data protection to secure communications
- Robustness of systems to sustain failure and hazard

- Traffic assessment and shaping
- One-time and ongoing costs including support and maintenance

24 / 7 Access

As access to information and communication resources becomes even more fundamental to effective administrative and educational processes, and as users become connected via the Web, education organizations will need to adopt an always-on approach to the communication and information infrastructure. As the Web and other connectivity options provide access for administrative and educational processes, users will no longer be limited by geography or the clock in their need for access. An extreme example is the virtual high school that could literally serve a global community.

Issues of 24/7 access includes:

- Support and maintenance services available 24/7
- Greater systems reliability to reduce off-hour service disruptions
- Independence of systems services from employee work cycles
- Remote management of systems to facilitate rapid response

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- District's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., CNI for Chapter 12) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 12, Communications and Network Infrastructure section 5.1, Strategic Issues, would be numbered CNI-1.1, the second Action Plan in this same section would be CNI-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- **Strategic Issues**

  CNI-1.1 Convergence Committee

- **Emerging Issues**

  CNI-2.1 Home/School Portal

  CNI-2.2 Comprehensive Wireless

  CNI-2.3 Comprehensive VoIP

  CNI-2.4 Video Streaming and Surveillance

- **Network Transport Infrastructure**

  CNI-3.1 Cable and Network Switch Infrastructure

- **Data and Services Infrastructure**

  CNI-4.1 Cell Phone / Mobile Device Management

- **Management and Supporting Computing Infrastructure**

  CNI-5.1 Single Sign-On

- **Network and Information Security**

  CNI-6.1 Network and Information Security Plan

5.1 Strategic Issues

Initiative: Convergence Committee			
Recommendation:	CNI– 1.1 Form a committee that will be responsible for network convergence.	**Key Performance Indicator(s):**	1. Committee is seated 2. Charter is reviewed and adopted
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Develop the charter for the Convergence and Digital Infrastructure Committee. Ensure committee has the authority to research and propose policy.	X		
2. Identify and appoint members.	X		
3. Develop agenda and conduct kickoff event. Consider a retreat format facilitated by third party.	X		
4. Conduct quarterly meetings.	X	X	X

Interdependencies: CNI-2.2 Comprehensive Wireless, CNI-2.3 Comprehensive VoIP, CNI-2.4 Video Streaming and Surveillance, CNI-3.1 Cable and Network Switch Infrastructure, CNI-5.1 Single Sign-On	**Estimated Cost:** • Year 1: $ 5,000 • Year 2: $1,000 • Year 3: $1,000 **Total: $7,000**	**Potential Funding Source(s):** Local Funds

5.2 Emerging Issues

Initiative: Home/School Portal			
Recommendation:	CNI– 2.1 Identify the requirement for a portal strategy and develop and RFP seeking a solution for implementation.	**Key Performance Indicator(s):**	1. Requirements Defined and Adopted 2. Funding Secured via E-rate
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work Collaborative Community	**Leadership Responsibility:**	Department of Technology Communications Department FACE Family and Community Engagement

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Develop requirements for portal such as: • Integration with Virtual Desktop • Single sign-on • Web/HTML access • Application delivery • Cloud based subscriptions support	X		
2. Identify solution and conduct pilot.	X		
3. If pilot is successful, move toward full deployment.		X	
4. Implement district-wide.		X	
5. Conduct training.		X	X
6. Consider filing E-rate Priority 1 funding for this service.	X	X	X

Interdependencies: CNI 5.1, CAP 1.1	**Estimated Cost:**	• Year 1: $ 200,000 • Year 2: $100,000 • Year 3: $100,000 **Total: $400,000**	**Potential Funding Source(s): E-rate & Local**

Initiative: Comprehensive Wireless/Community Wi-Fi

Recommendation:	CNI– 2.2 Develop an RFP aligned with a 470 posting seeking internal connections E-Rate application seeking wireless networks expansion.	**Key Performance Indicator(s):**	1. District has comprehensive Wi-Fi Throughout all locations 2. Community Wi-Fi information utility planning commission is formed
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Develop wireless standard for adoption. Assure standard is based on quality of user experience and coverage for assuming 1+ devices per user.	X		
2. Establish a community-wide Wi-Fi planning committee (consider change of cable commission to "Information utility commission") of key local, state and other subject matter experts. kickoff with vision and goals planning session. Identify challenges and opportunities for city-wide public wifi network.	X		
3. Develop and RFP seeking proposals to deploy/augment the existing district-wide Wi-Fi network to support the quality of user experience standard and assumptions. As option include request for community Wi-Fi.	X		
4. Issue RFP with E-rate/470 posting for internal connections support where appropriate.	X		
5. Evaluate and award contract.	X		
6. Implement Comprehensive Wireless for district-wide in-building Wi-Fi.		X	X
7. Develop strategic plan including funding sources for community wide Wi-Fi network.		X	X
8. Regardless of E-Rate support, Providence must understand and build upon a standard foundational wireless network architecture supporting full access in all campuses under a full load of 1 to 1 --- regardless of BYOD adoption.			

Interdependencies: CNI 3.1	**Estimated Cost:** • Year 1: $ 100,000 • Year 2: $2,000,000 • Year 3: $1,000,000 **Total:$3,100,000 (without community Wi-Fi consideration)**	**Potential Funding Source(s):** eRate

Initiative: Comprehensive Voice over IP

Recommendation:	CNI– 2.3 Conduct a TCO of the current telephone solution district-wide. Based on the outcome of the TCO, develop an(?) RFP for migration of the district's voice solution for all campus locations. Conduct initial assessment of the ROI for upgrading the telephone solution.	**Key Performance Indicator(s):**	1. RFI is posted and responses received 2. RFP conducted and contract awarded 3. New VoIP solution in place
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Conduct assessment of current telecommunications services. Providing voice for the district. Develop and post request for information to understand the value propositions for a local or cloud based VoIP solution.	X		
2. Use RFI responses to develop and post RFP with E-rate 470 seeking funding for selected VoIP solution. As a hosted solution, VoIP is E-rate eligible as a priority 1 service.		X	
3. Award contract for VoIP solution and launch project.		X	
4. Assure proper maintenance and operational support is in place to support new VoIP solution. 5. Core approval for 4 schools, funded with local funds, issue of admin building (falling below 90%) eligibility – still issue of being able to get some components, but not all (handsets not included – can be up to $400 per handset) Consider putting more sophisticate in offices and less so for teachers.			X

Interdependencies: CNI 3.1	**Estimated Cost:** • Year 1: $ 100,000 • Year 2: $ 1,500,000 • Year 3: $500,000 **Total: $2,100,000**	**Potential Funding Source(s): E-rate, Local Funds, Bond**

Initiative: Video Streaming and Surveillance

Recommendation:	CNI– 2.4 Working through the convergence committee sponsor a project to develop and plan for a single video distribution and storage strategy (this includes all content created, downloaded and stored via all systems/users and how these will be stored/distributed/viewed by all stakeholders).	**Key Performance Indicator(s):**	1. Deployed digital video and surveillance solution.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Task the convergence committee with development of the video and surveillance vision and integrated high level strategy.		X	
2. Develop phased approach for integrated video strategy including requirements and operational support needs as well as high level cost estimates. Consider: a. Video Surveillance System b. Distance Learning/Conferencing c. Digital Video Media Content production and source control/storage d. Live digital broadcast		X	
3. Identify funding sources and develop requests for proposals.		X	
4. Conduct necessary procurement processes.		X	
5. Award and implement.			X

Interdependencies: CNI 3.1	**Estimated Cost:** • Year 1: $ 0 • Year 2: $ 100,000 • Year 3: $1,000,000 **Total: $1,100,000**	**Potential Funding Source(s): Local Funds**

5.3 Network Transport Infrastructure

<table>
<tr><th colspan="7">Initiative: Cable and Network Switch Infrastructure</th></tr>
<tr><td>Recommendation:</td><td colspan="2">CNI– 3.1 Review and augment the cabling and switch infrastructure in support of the recommended VoIP CNI-2.3 and Wireless expansion CNI-2.2 projects.</td><td>Key Performance Indicator(s):</td><td colspan="3">1. All schools are cabled with minimum 5e and all meet minimum standard configuration.
2. All switch ports standardized.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td colspan="2">Engaged Students and Family
Highly Effective Educators
Systems that Work</td><td>Leadership Responsibility:</td><td colspan="3">Department of Technology</td></tr>
<tr><td colspan="4" rowspan="2">Action Steps
*Denotes that step has already started.</td><td colspan="3">Timeline</td></tr>
<tr><td>Year 1 13/14</td><td>Year 2 14/15</td><td>Year 3 15/16</td></tr>
<tr><td colspan="4">1. Based on recommendation from Convergence and Digital Infrastructure Committee, develop the requirements, schedule and seek pricing for upgrade to LAN and cabling infrastructure.</td><td>X</td><td>X</td><td></td></tr>
<tr><td colspan="4">2. Post RFP aligned with E-rate for internal connections to fund network and cable project. Ensure the equipment is supported by the network management and endpoint management.</td><td>X*</td><td>X</td><td></td></tr>
<tr><td colspan="4">3. Deploy and refresh network hardware and cabling.</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="2">Interdependencies: CNI 2.1, CNI 2.2, CNI 2.3, CNI 2.4</td><td colspan="2">Estimated Cost:
• Year 1: $ 1,000,000
• Year 2: $1,000,000
• Year 3: $1,000,000
Total: $3,000,000</td><td colspan="3">Potential Funding Source(s): E-rate, Local Funds, RIDE Bond Issue (potential) for schools not funded with eRate or from funds in schools that receive greater eRate levels</td></tr>
</table>

5.4 Data and Services Infrastructure

Initiative: Cell Phone Device and Management			
Recommendation:	CNI– 4.1 Review and update the current cell phone policy and implement a Mobile Device Management solution.	**Key Performance Indicator(s):**	1. Cell phone policy updated 2. MDM solution in place
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
1. Conduct cell phone policy review and adjust/update, assure alignment with Mobile Device Management (MDM) strategy.	X		
2. Align cell phone policy with E-rate reimbursements.	X	X	X
3. Develop requirements for mobile device management solution, consider BYOD.	X		
4. Review and implement mobile device management solution and review/update policy on who gets what type of phone, device, and for what purposes (phone, tablet, laptop, desktop – choices/options).	X		

Interdependencies: PPS-2.2	**Estimated Cost:**	**Potential Funding Source(s):** E-rate, Local
	• Year 1: $ 200,000 • Year 2: $50,000 • Year 3: $50,000 **Total: $300,000**	

5.5 Management and Supporting Computing Infrastructure

Initiative: Identity Management/Single Sign On			
Recommendation:	CNI– 5.1 Develop a Identity Management/single sign-on plan and assure this is implemented as part of the portal plan and rollout CNI-2.1.	**Key Performance Indicator(s):**	1. All network users (Students, Staff and Administration) are authenticating with their own credentials for access to the network and resources. 2. New identity management policy is developed and approved.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps *Denotes that step has already started.	Timeline:		
	Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Develop with the portal effort an effective Identity management strategy.	X		
2. Include upgrade Active Directory platform, expand and integrate existing solutions into a active directory and Single Sign On.	X		
3. Develop plans for full rollout of Active Directory for all local wired and wireless network users. Develop and approve new policy for network access and identity management for guest users. Roll-out new AD and Identity management solutions.	X	X	
4. Institute new login policy for identity management.	X	X	
5. Monitor effectiveness of policy and enforcement.		X	X

Interdependencies: CNI 2.1	**Estimated Cost:**	**Potential Funding Source(s): Local**
	• Year 1: $100,000 • Year 2: $100,000 • Year 3: $100,000 **Total:$300,000**	

5.6 Network and Information Security

Initiative: Network and Information Security Plan			
Recommendation:	CNI– 6.1 The district must develop and adopt a plan to assure the safety and security for access to the network and more importantly the safe handling and protection of the data and information.	**Key Performance Indicator(s):**	1. Network and Information Security Plan Adopted 2. Regular security audits are conducted
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Department of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Create the role of Network and Information Security Officer. Assign network security accountability to the Network and Information Security Officer. (See Chapter 5)	X		
2. Draft, approve, and implement a Network and Information Security Plan (NISP) that addresses the Human, Physical and Digital layers and includes the following components: • Understand and Assess • Plan and Act • Monitor and Control	X		
3. Contract with information network security company to conduct security audit including specific and actionable recommendations.	X	X	X
4. Complete recommendations of security audit. This may include adjustments to the LAN and Wireless projects as needed.	X	X	X
5. Review and update NISP annually.		X	X

Interdependencies: ODS-1.1	**Estimated Cost:**		**Potential Funding Source(s):**
		• Year 1: $ 150,000 • Year 2: $ 200,000 • Year 3: $ 200,000 **Total: $550,000**	

Chapter 13: Community/Home Access and Participation

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Community cannot long feed on itself; it can only flourish with the coming of others from beyond: their unknown and undiscovered sisters and brothers."*
>
> —Howard Thurman

The **Community/Home Access and Participation** chapter focuses on creating a vision for community access to educational opportunities and technical resources as well as full community participation in the lifelong learning process. The success of any educational system is dependent upon the degree to which the community at large supports that organization.

The strategic implementation of technology resources can provide better and more diverse vehicles and opportunities for parents, the business community, and higher education to interact with the school district. This availability interaction enables the community to see their schools' work-in-progress and view and study the information that they will use to hold the system accountable for results. This empowering of the community contributes more effectively to the education system. Listening to what the community expects and wants from its schools and developing accountability tools to help the public understand the school district's performance are keystones to any a successful public engagement effort.

The subtopics within this chapter include:

- Home/School/Community Connection
- School-to-Career Connection
- Board of Education
- Public Information and Awareness
- Community Involvement

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September - October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Communications and Network Infrastructure* section of the *Key Findings and Recommendations* final report.

2.1 Home/School/Community Connection

Parent and community engagement is a high priority in Providence Public School District (PPSD) and is one of the five school district goal outlined in the school district's draft 2012-2016 strategic plan: "Our Schools, Our Future." Several years ago, PPSD established a department of Family and Community Engagement. The department's focus is to: "to inform, involve, and empower parents and families focusing on the Joyce Epstein 6 Keys Framework."

The active Parent Advisory Council is an excellent example of the school district showing its commitment to family input. This council, which is composed of one parent from each school, meets 10 times a year, and receives meeting support and logistics from the school district's PPSD Family and Community Engagement office. While some schools report active and involved Parent Teacher Associations (PTAs), the PTA at other schools is inactive or even non-existent.

While many families in Providence have a computer with Internet access at home with Internet access, a significant number of others do not. As the use of technology in the classroom increases, so too does the need for access from home for homework, research, collaboration, and also for communication. It is estimated at home access is between 50-75%. The school district's Parent Center contains desktop and laptop computers that are reported to have high usage, especially for the language learning software. A few additional kiosks are available at the main administration building. Beginning in the fall of 2012, each school building created a Parent Zone. At the time of data collection, the zones were in their infancy, but most contained a phone and provided a meeting space for parent and community volunteers.

PPSD primarily utilizes written communication and telephone calls for parent/community notification. ParentLink serves as the emergency call notification system to contact parents/guardians via telephone on notices and events. Some principals use the system more frequently to communicate school events. The district also has an online presence through its website, and Facebook account. Many staff are not aware of the district's social media efforts.

In at least two schools, principals and teachers are experimenting with parent access using Edline or Edmoto. District-wide, PPSD parents do not have access to a portal, which among other things could be used to update contact information and view relevant information such as attendance, student grades, assignments, etc.

The key findings for **Home/School/Community Connection** include:

- PPSD highlights parent and community engagement as one of its five district strategic goals
- Printed and telephone communications, including ParentLink, are the primary methods used by the school district to disseminate information. Between 50-75% of families have home access to the Internet.
- As a whole, PPSD parents do not have access to a parent portal, but at least two schools are piloting one.

2.2 School-to-Career Connection

Providence Career and Technical Academy (PCTA) provides a comprehensive vocational technical program for students in grades 9-12. Programs include the auto and construction trades, plumbing and electrical, masonry, heating, ventilation and air conditioning, graphic communications, cosmetology, and food services. Evidence suggests that the programs are all fully functioning.

In the past, PPSD used WaytoGoRI.org to support students' exploration into colleges and careers. It is unclear if it is still being used. The middle schools also administer a career survey. At least one PPSD high school has maintained a good relationship with local hospitals and that provide students opportunities to explore health care career options.

The key findings for **School-to-Career Connection** include:

- Middle school students partake in a career survey to help determine career paths.
- Some community partnerships allow high school students to explore career opportunities.

2.3 Board of Education

The Providence School Board is made up of nine appointed members who serve three-year staggered terms. The School Board conducts business meetings on the second Monday of every month and workshops on the fourth Monday of every month. Prior to the meeting, the agenda is posted online. Additionally, the superintendent's administrative assistant also uploads electronic files for review by School Board members prior to the meeting.

The school board maintains its own web presence using Electronic School Board (ESB). The software has been in place for a number of years. The current version is 3.33F.

Board members access materials electronically prior to meetings. Currently they are not using Electronic School Board's full functionality such as the discussion feature and electronic voting.

School Board policies are posted on Electronic School Board. These relate to school assignments, bullying, conduct, and other topics of general interest.

The key findings for **Board of Education** include:

- The School Board meets twice a month and does not have any standing sub-committees, with the exception of one that is state mandated.
- The School Board uses Electronic School Board to post policies, publicize meeting agendas and minutes, and privately distribute documents to the Board prior to meetings. The full use of Electronic School Board has not been realized.

2.4 Public Information and Awareness

The school district website provides access to school district documents, information about a number of school district activities and awards, as well as links to local and state resources. The website includes links to each school, each department, and the School Board. The PPSD website provides a source of information for stakeholders and contains current information.

A greater level of technology awareness is needed by the community. The community is aware of technology within the school, but they are not conscious of the degree, disparity, and the particular level of technology within schools. A community wide vision for minimum technology levels should be established and a plan dissemination must be deployed.

Anecdotal evidence throughout the district shows that most parents are interested in their students' school performance.

Each school has a district-developed school webpage as part of the PPSD website that provides foundational demographic information. Each school has a parent volunteer or school designee who maintains additional content. When school webpages did contain additional content, it was often outdated.

Some teachers report creating individual webpages that are not part of the school webpage. These pages are used to post class information, syllabi, and in some cases, homework assignments. At least one school is in the piloting phase with Edline with some teacher websites linked to the school page. The pilot phase is not fully implemented in this school, so some classes don't have any information posted, while others have an active web presence.

The key findings for **Public Information and Awareness** include:

- The school district website is maintained by PPSD, with the responsibility for content by the school department/school. The district website provides access to general school district information, contact information for department heads and schools, and school board documents. While the website does not provide all of the information that stakeholders might desire, it is accessed regularly and provides a consistent source of information for the PPSD community.
- Each school has a webpage with foundational demographic information. Additional school information is posted for a few schools by a parent volunteer or school designee that may or may not be updated regularly.
- Few teachers within the school district maintain an active class web presence for their classes.

2.5 Community Learning Programs

PPSD has several well-established partnerships to provide the community with adult learning opportunities, including ones for enrichment and continuing education, but not graduate equivalent diplomas (GEDs).

PPSD partners with Dorcas Place to offer adult education at five schools. They offer English as a Second Language in during the day and evenings. These programs are well attended. The school district owns 30 licenses of Rosetta Stone and has computers available at 797 Westminster for adult use. PPSD also partners with the Rhode Island Parent Network to offer leadership trainings free of charge.

The key findings for **Community Learning Programs** include:

- Adult education programs are available through Parent Resource Center. GEDs are not currently offered.
- •Additional community learning opportunities are available through a partnership with Dorcas Place

2.6 Community Involvement

Community members in Providence donate generously to the schools, this includes both their time and resources. PPSD has a number of active business partnerships and volunteer programs. Some are developed and maintained by individual schools and while others are nurtured and managed by the district's Family and Community Engagement Department. While these are not necessarily focused on technology initiatives, they support the district in a number of valuable ways.

The level of community involvement varies greatly from school to school.

The PPSD Volunteer Application authorizes PPSD to conduct a criminal background check and scan of the National Sex Offenders List. It is unclear how the Family and Community Engagement manages, shares, and stores this data.

The key findings for **Community Involvement** include:

- The district has a large number of active partnerships within the community. These support the district through donations, volunteers, and mentoring.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Communications and Network Infrastructure* were identified during the comprehensive information technology assessment conducted in the September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., CAP for Chapter 13) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 13, Community/Home Access and Participation, section 3.1, Home, School, and Community Connection, would be numbered CAP-1.1, the second Action Plan in this same section would be CAP-1.2..

3.1 Home/School Community Connection

CAP-1.1 Parent Portal

Select and implement a single, district-wide parent portal solution

CAP-1.2 Kiosks for Public Internet Access

Expand Internet access to other areas around the city, including community centers and public libraries, by ensuring that technology resources with broadband connection are deployed in these facilities. This additional access will provide services to community members who may not have web access from home.

3.2 School-to-Career Connection

CAP-2.1 Technology-Related Career Exploration

Expand on school-to-career activities that encourage students to explore technology related careers. Create roadmaps for student and parents to outline the types of careers that are available for students based on their skills and interests and address the training or education that are needed to attain these career goals. In addition to strategies such as job shadowing days and career fairs, expand opportunities for senior year internships as well as dual enrollment opportunities or other partnerships with higher education that allow individualized career exploration. Publicize these events on the school district website. (No action plan required.)

3.3 Board of Education

CAP-3.1 Harvesting Increased Value from Electronic School Board

Review the full capacity of the existing software to determine which additional features should be implemented, such as the discussion feature and or electronic voting features during the board meetings. (No Action Plan Required.)

3.4 Public Information and Awareness

CAP-4.1 Annual Student Technology Fair

Plan and host a student technology fair to highlight successful practices at the school level and the strategic direction in which the district is heading. This event can be sponsored by vendors and holds the potential to increase public/business interest in PPSD technology pursuits. Michigan hosts a very successful Student Technology Fair each fall in the legislative building - http://www.macul.org/otherevents/studenttechnologyshowcase/

CAP-4.2 School Website Refresh

Develop a comprehensive school-based website strategy that includes realistic, viable, and manageable options for both the school website and individual pages for classes, teachers, and departments.

3.5 Community Learning Programs

CAP-5.1 Expanded Opportunities for Adult Education

Expand existing adult education programs to include an online or video-based adult education program. Add options for parents or adult community members who desire to increase their academic foundation. Include Graduate Equivalency Diplomas in the list of offerings.

3.6 Community Involvement

CAP-6.1 Business Partnership Support

Continue to identify new along with supporting and nurturing the numerous existing business partnerships in the district. (No action plan needed.)

4.0 RESEARCH AND BEST PRACTICES

Until recently, parent involvement in schools meant participating in PTA meetings, volunteering in the classroom, chaperoning a field trip, and attending field day. Communication was accomplished through the report card, progress report, and an occasional summons to meet with the teacher or principal. For the most part, by the time a parent became aware that their child was having difficulty, the problem had been going on for quite a while and the child was significantly behind. If a parent's first warning was the report card at the end of the term, the student could have been struggling for several weeks while the rest of the class moved forward. By that time, all parties are frustrated – parent, student, and teacher – and resolving the problem becomes more difficult. It is often too late to address issues of missed homework, and rather than being confused about a single concept, the student has missed all of the content that followed.

The influx of technology into K-12 schools has made it possible for parents to be involved at a much earlier stage and thus take ownership of the child's academic achievement. The ubiquity of televisions, home computers, cell phones, and parent portals makes it possible for parents to communicate with teachers on a regular and frequent basis without interrupting either the school day or the parents' schedule. This enhanced communication, along with an abundance of school-related data, enables parents to be up-to-date on grades, assignments, activities, and other school requirements.

For an increase in parent involvement to achieve the desired results, however, there must be a paradigm shift so that both schools and parents welcome and acknowledge that involvement. When selecting the tools to increase involvement, the district should consider the desired outcomes and be prepared to address peripheral issues that may arise. Teachers and school administrators must be open to the suggestions and presence of parents rather than perceiving this as an intrusion.

In addition, it must be realized that not all parents are equally equipped to respond to the information that they receive. While some parents perceive homework as a means of improving children's achievement, others, many of who may be in lower socio-economic groups, are less able to provide assistance with homework. Parent involvement of this type can be most effective when combined with an increased level of teacher communication.

The ability of LPS PPSD to promote a successful collaboration between the community and the school district is dependent upon multiple factors that are not all under the school district's control. These factors include robust connectivity, community interest, ongoing support, and improvement in existing programs.

In addition to continuing the process of integrating technological skills and technology resources into the community, PPSD must continue their support of parental, business, and other key-stakeholder involvement in PPSD affairs. The dynamic participation of all groups in the school affairs is crucial in the continued success of PPSD.

There is strong community interest in obtaining real-time information relative to childrens' school status. Equally important is the need to create Web communication strategies by utilizing an infrastructure that will enhance effective and positive internal and external communications. The Web communication facilities and outreach will raise public awareness throughout the district.

Careful planning, budgeting, and implementation will be required to ensure that all these factors are established and maintained to support the integration of 21st Century technologies to advance community access and participation initiatives in support of student achievement. With the appropriate use of communications and social networking tools, classes of all ages can participate in learning activities with students from around the world to gain insight into different cultures and expand learning opportunities.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- School district's and superintendent's goals
- *Key Findings and Recommendations* report
- Current status of projects currently ongoing in PPSD
- High priority areas as identified by PPSD leadership staff
- Current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, district/ superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., CAP for Chapter 13) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 13, Community/Home Access and Participation, section 5.1, Home, School, and Community Connection, would be numbered CAP-1.1, the second Action Plan in this same section would be CAP-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the district's priority goals.

Action Plans are included for the following recommendations:

- **Home/School/Community Connection**

  CAP-1.1 Parent Portal

  CAP-1.2 Kiosks for Public Internet Access

- **School-to-Career Connection**

  CAP-2.1 Technology-Related Career Exploration (No Action Plan required.)

- **Board of Education**
- CAP-3.1 Harvest Increased Value from Electronic School Board, including capturing and archiving video of BoE meetings and professional development for BoE members to use existing features. (No Action Plan required.) **Public Information and Awareness**

  CAP-4.1 Annual Student Technology Fair

  CAP-4.2 School Website Refresh
- **Community Learning Programs**

  CAP-5.1 Expand Opportunities for Adult Educations
- **Community Involvement**

  CAP-6.1 Business Partnership Support (No Action Plan required.)

5.1 Home/School/Community Connection

Initiative: Parent Portal			
Recommendation:	CAP – 1.1 Select and implement a single, district-wide parent portal solution.	**Key Performance Indicator(s):**	1. Implementation and monitoring of a single, district-wide parent portal solution.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Systems that Work Collaborative Community	**Leadership Responsibility:**	Family and Community Engagement Leadership Office of Technology

Action Steps ***Denotes that step has already started.**	**Timeline** **Year 1 13/14**	 **Year 2 14/15**	 **Year 3 15/16**
1. Develop requirements for portal such as: • Integration with Virtual Desktop • Single sign-on • Web/HTML access • Application delivery • Cloud based subscriptions support	X		
2. Identify solution and conduct pilot.	X		
3. If pilot is successful, move toward full deployment.		X	
4. Implement district-wide.		X	
5. Conduct training.		X	X
6. Consider filing E-rate Priority 1 funding for this service.	X	X	X

Interdependencies: CNI 2.1	**Estimated Cost:**	• Year 1: $ • Year 2: $ • Year 3: $ **Total: 300,000 (costs covered in CNI-2.1)**	**Potential Funding Source(s):**

Initiative: Kiosks for Public Internet Access

Recommendation:	CAP – 1.2 Expand Internet access to other areas around the city, including community centers and public libraries, by ensuring that technology resources with broadband connection are deployed in these facilities.	**Key Performance Indicator(s):**	1. Kiosks around the city
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Collaborative Community	**Leadership Responsibility:**	Family and Community Engagement Leadership Office of Technology

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Expand awareness about schools that remain open for parent/community access to technology resources and library media centers. Explore options for extending hours in additional schools.	X		
2. Consider installing computers at the entryways of schools and other municipal buildings.		X	
3. Consider installing public computers with wireless access in municipal buildings or common areas at apartment complexes, churches, or other community centers.		X	
4. Offer free training sessions on how to use the kiosks (workstation) or welcome centers to community members through evening or Saturday classes.		X	
5. Develop a plan to develop and disseminate this technology training on videotape and DVD and place in public libraries and video rental stores for "free access" to the community. This can also be broadcast on cable public access channel.		X	
6. Evaluate the computer kiosks annually to determine the level of use, repair issues, etc.		X	X

Interdependencies:	**Estimated Cost:**	**Potential Funding Source(s):**
	• Year 1: $ 1,000 • Year 2: $ 20,000 • Year 3: $ 4,000	

Initiative: Kiosks for Public Internet Access					
Recommendation:	CAP – 1.2 Expand Internet access to other areas around the city, including community centers and public libraries, by ensuring that technology resources with broadband connection are deployed in these facilities.	**Key Performance Indicator(s):**	1. Kiosks around the city		
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Collaborative Community	**Leadership Responsibility:**	Family and Community Engagement Leadership Office of Technology		
Action Steps ***Denotes that step has already started.**			**Timeline**		
			Year 1 **13/14**	**Year 2** **14/15**	**Year 3** **15/16**
	Total: $25,000				

5.2 School-to-Career Connection

No action Plans Required.

5.3 Board of Education

No action Plans Required.

5.4 Public Information and Awareness

Initiative: Annual Student Technology Fair			
Recommendation:	CAP – 4.1Plan and host a student technology fair to highlight successful practices at the school level and the strategic direction in which the district is heading.	**Key Performance Indicator(s):**	1. Percentage of schools showcasing technology at annual technology fair. 2. Percentage of school community members attending annual technology fair.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Collaborative Community	**Leadership Responsibility:**	Technology Department Teaching and Learning Department Family and Community Engagement Leadership

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Create a team of district staff, selected school technology leaders, teachers, and PR professionals from the community to coordinate the district technology fair. Review the Michigan Student Technology Showcase and other state websites as examples at: http://www.macul.org/otherevents/studenttechnologyshowcase/	X	X	X
2. Identify business partnerships to support and fund the event and publicize through newspapers, website, and intra-district communications.	X	X	X
3. Select a date and location for a regional technology consortium. Invite school board members, city council, and other key guests.	X	X	X
4. Solicit teams of students, teachers, and library media specialists to showcase how technology is used in the schools.	X	X	X
5. Invite vendors to exhibit their new and emerging technologies to show how technology can be used for student achievement.	X	X	X
6. Identify a keynote speaker as well as district speakers. Prepare awards and gifts as appropriate.	X	X	X
7. Conduct event, ensuring that it is well publicized.	X	X	X

<table>
<tr><th colspan="6">Initiative: Annual Student Technology Fair</th></tr>
<tr><td>Recommendation:</td><td>CAP – 4.1Plan and host a student technology fair to highlight successful practices at the school level and the strategic direction in which the district is heading.</td><td>Key Performance Indicator(s):</td><td colspan="3">1. Percentage of schools showcasing technology at annual technology fair.
2. Percentage of school community members attending annual technology fair.</td></tr>
<tr><td>Alignment to District/ Superintendent's Goal(s):</td><td>Engaged Students and Family
Highly Effective Educators
Rigorous and Aligned Content
Collaborative Community</td><td>Leadership Responsibility:</td><td colspan="3">Technology Department
Teaching and Learning Department
Family and Community Engagement Leadership</td></tr>
<tr><td colspan="3" rowspan="2">Action Steps
*Denotes that step has already started.</td><td colspan="3">Timeline</td></tr>
<tr><td>Year 1
13/14</td><td>Year 2
14/15</td><td>Year 3
15/16</td></tr>
<tr><td>Interdependencies:</td><td>Estimated Cost:</td><td>• Year 1: $ 6,000
• Year 2: $ 6,000
• Year 3: $ 6,000
Total: $18,000</td><td colspan="3">Potential Funding Source(s):</td></tr>
</table>

Initiative: School Website Refresh

Recommendation:	CAP – 4.2 Develop a comprehensive school-based website strategy that includes realistic, viable, and manageable options for both the school website and individual pages for classes, teachers, and departments.	**Key Performance Indicator(s):**	1. Updated School Webpages
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Systems that Work Collaborative Community	**Leadership Responsibility:**	School Principals

Action Steps ***Denotes that step has already started.**	**Timeline**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Once a parent portal has been selected, implement widespread training opportunities.		X	
2. Working with the revised description of library media specialists, charge them with leading the efforts to work with the communications department and Learning Technology support group to develop a vision for school webpages, including teacher pages.		X	
3. Provide training for implementation of an effective school, department, and classroom website.		X	X
4. Provide opportunities for development of pages and highlight effective pages on the district website.		X	
5. Consider adding web presence as part of the educator evaluation tool.			X

Interdependencies: CAP1.1, LESF-1.2, ODS-1.2, ODS-3.1	**Estimated Cost:** • Year 1: $ • Year 2: $50,000 • Year 3: $25,000 **Total: 75,000**	**Potential Funding Source(s):**

5.5 Community Involvement

No Action Plans Required.

Chapter 14:
IT Monitoring, Evaluation Programs, and Implementation Management

Table of Contents

1.0 INTRODUCTION AND RATIONALE

> *"Two forces bring these worlds together: The accountability world is moving from monitoring processes to monitoring results. The evaluation world is being demystified, its techniques becoming more collaborative, its applicability broadened, and its data no longer closely held as if by a hostile, foreign power."*
>
> —*Lisabeth Schorr,* Common Purpose: Strengthening Families and Neighborhoods to Rebuild America

The **IT Monitoring, Evaluation Programs, and Implementation Management** chapter focuses on the role of technology resources as tools to monitor and assess the effectiveness of the delivery of curriculum content, and supports the assessment of student achievement as well as best business practices. The integration of scientifically-researched best practice teaching and learning technologies into Providence Public School District (PPSD) enables school district leaders and stakeholders to know whether changes in resources are improving student learning and to observe best of class business practices with technology.

The subtopics within this chapter include:

- Plan Monitoring
- Plan Evaluation
- Reporting Outcomes to Stakeholders

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September—October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *IT Monitoring, Evaluation Programs, and Implementation Management* section of the *Key Findings and Recommendations* final report.

Providence Public School District does not have a standard project development process with defined phases, including evaluations. A suggested process could include these phases:

- project definition
- monitoring and reporting
- research best practices
- development
- testing
- implementation with a pilot first, then rollout
- documentation
- evaluation

The project leader would be responsible for conducting all these phases with a predefined standard template for each. Also evaluations would be a part of every project.

2.1 Plan Monitoring

Monitoring is a key part of the project development process to ensure management has the chance to resolve issues on a timely basis before they become unrecoverable. The project team would be responsible to provide timely updates to all constituents.

The key findings for **Plan Monitoring** include:

- Providence Public School District (PPSD) does not currently monitor existing initiatives at a high level to ensure that the project is on schedule, within budget, and complete, including support and training efforts.
- The current PPSD technology plan 2010-2013 was developed by UPD Consulting. The plan is monitored by a cross-departmental team which has not met since the fall of 2011.
- There is no Project Management Oversight Committee (PMOC) to review projects from the high level, nor is there a school district-wide technology committee or steering committee to consider how technology impacts all school district initiatives.

2.2 Plan Evaluation

PPSD does not have a standard evaluation process in place for the review of projects for a lesson-learned library and continuous improvement program.

The key finding for **Plan Evaluation** includes:

- There is currently no plan in place for evaluating the impact and effectiveness of major initiatives.

2.3 Reporting Outcomes to Stakeholders

PPSD has a website for each department and school but it is not updated regularly, so it is rarely used. Communications and transparency to all users builds trust and confidence, so the suggestion is to make the reporting effective by regular updates and simplified charts to communicate status.

The key finding for **Reporting Outcomes to Stakeholders** includes:

- There is no process to report evaluations or plans to stakeholders. This includes school and department projects. There is little or no communication of project status to district constituents.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *IT Monitoring, Evaluation Programs, and Implementation Management* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., MEPI for Chapter 14) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 14, IT Monitoring, Evaluation Programs, and Implementation Management, section 3.1, Plan Monitoring, would be numbered MEPI-1.1, the second recommendation in this same section would be MEPI-1.2.

3.1 Plan Monitoring

MEPI-1.1 Technology Advisory Committee

Establish a technology steering committee and executive leadership team to monitor status of all technology initiatives, including the Technology Blueprint and School Improvement Plans, on a regular basis. This will be a standard process for district-wide use. This committee will be responsible for creating a standard technology planning template for schools, which must be submitted, approved, and followed in order for the schools to spend their technology funds. This will be part of the Project Management Office (PMO) described in Chapter 9.

MEPI-1.2 IT Blueprint Update

Establish a School Board-level agreement to set aside funds to audit, update, and adapt the IT Blueprint at least annually to meet changing needs of the school district.

3.2 Plan Evaluation

MEPI-2.1 Project Evaluations

Define a process for monitoring and evaluating the effectiveness of all major initiatives.

3.3 Reporting Outcomes to Stakeholders

MEPI-3.1 Reporting Status

Develop and implement a dashboard reporting system to display the ongoing progress of major school district initiatives. Consider a website, newsletter or other methods.

4.0 RESEARCH AND BEST PRACTICES

The overarching critical success factors required for successful implementation of the recommendations found in this chapter include:

- enlightened leadership;
- a critical mass of resources focused on high-priority initiatives;
- committed, competent, and empowered faculty and staff;
- efficient organizational structures and processes;
- a culture of continuous improvement.

Because the monitoring and evaluation functions relate not only to the technology plan, but to all district operations, two additional critical success factors are identified:

- Embed accountability for outcomes at every level throughout the district. This orientation represents a shift in focus from evaluating the completion of tasks and activities to evaluating whether those tasks and activities actually resulted in the accomplishment of outcomes. An example of such a shift in focus is an increased attention to determining whether the participants in staff development activities actually successfully employ the practices addressed in the training.
- Provide education, training and support services for decision makers in using implementation monitoring and outcomes assessment data. The district is investing considerable resources in helping administrators, particularly building principals, to use student performance data in guiding district and school improvement initiatives. A commensurate investment is required in helping program managers to use implementation data to inform their decisions regarding ongoing adjustments in tasks and activities.

Plan Evaluation

As school districts around the country implement plans to integrate technology into the curriculum, School Committee members, teachers, parents, and administrators are asking, “How do we know it is working?” Technology evaluations are normally the weakest components of technology plans. In order to integrate technology effectively into the curriculum, technology planners must have a reliable instrument for measuring the success of the technology plan.

Create an Evaluation Committee

The evaluation committee is a district-wide committee with representatives from all grade levels and includes teachers, administrators, and School Committee members. The purpose of the committee is to represent all stakeholders in order to effectively represent their interests and concerns.

A formative evaluation is one that assists in the project design while a summative evaluation assists in collecting and analyzing data that is produced by the project. Both evaluations will be helpful in the successful implementation of the projects defined in this *Information Technology Blueprint*.

The school should take these action steps to develop the evaluation plan:

- **Step 1: Identify indicators, benchmarks, and measures for each objective.**

Indicators are statements that orient the system to a measure of performance that can be used to gauge progress. Each indicator typically focuses on only one aspect of an objective. Benchmarks and measures are related to each indicator. A benchmark is a specific target that describes an expected level of success. A measure is an item reflecting the evidence needed to answer a research question, inform an indicator, or determine how close the organization is in achieving a benchmark. A measure typically includes data such as percentage, test scores, ratios, etc. They are similar to indicators, but are much more specific and concrete.

- **Step 2: Assign responsibility for evaluating each objective to the appropriate project manager.**

Evaluation should be embedded within the appropriate program unit responsible for each objective. The assessment process should be simultaneously top-down and bottom-up, gathering information from the operating system about what is happening in schools with respect to the objectives, what new or enhanced interventions are needed to obtain the results, and what new or unanticipated outcomes and results are being realized. Project managers need to understand and take responsibility for their own strategy maps.

- **Step 3: Select measures and methods.**

Data gathering will require the use of uniform measures and methods for each indicator. Standards will be established for assuring quality data collection and analysis. Qualitative as well as quantitative data will be needed. The project manager can use methods such as focus groups, on-site observations, and participant journals to obtain an in-depth picture of what is happening.

- **Step 4: Establish a database for tracking performance measures.**

The district should employ databases, preferably electronic, for collecting, organizing, and disseminating data and information in diverse forms to serve multiple audiences. These databases could address what is working or not working and why. The data warehouse will be helpful for this analysis. The intent is to provide information to all using the district's telecommunications infrastructure as well as more traditional means of communication.

- **Step 5: Develop analysis and reporting procedures and formats.**

Detailed analytic reports and simple Web-based displays linked to key objectives and indicators should be used. The district evaluation team helps decision makers develop and use a suite of e-tools for collecting, analyzing, and reporting data on selected performance indicators.

- **Step 6: Identify key decision makers requiring specific indicator data.**

District decision makers must be targeted regarding their information needs and decision-making contexts. This process should be linked to the *Plan-Do-Study-Act* cycle. Each strategic technology initiative manager is responsible for reporting on a select number of indicators (4-6) that communicate progress in addressing specific technology objectives. Dashboards are created for each initiative and for the overall *Information Technology Blueprint*.

- **Step 7: Provide training and support.**

The district must provide technical assistance to decision makers in such areas as data collection, data management, data analysis, and communication. The technology of monitoring and evaluation must be complemented by competencies. There must be an organizational capacity to learn and adjust. Database decision making must become a core competency. One way to provide this assistance may be through contracts with researchers at area universities, who have in-depth knowledge of the most current data collection and analysis techniques.

- **Step 8: Support school- and district-based action research.**

A growing body of research identifies the characteristics of learning opportunities and environments that affect student learning positively. The district could support schools in their use of action research to identify those specific characteristics and attributes. Some action research initiatives already exist in partnership with local universities and nonprofit groups and these partnerships could be expanded.

- **Step 9: Use technology applications to support evaluation.**

The district might develop electronic databases and scorecards to alert and automatically inform those who need to know about specific data, as in the case of a principal tracking a new program's performance or a teacher watching her students' progress on a key learning standard. The district could use Web-accessible databases to capture, organize, and make widely available information on numerous small, immediate adjustments made during implementation. These systems can provide up-to-date information on the status of each indicator.

Effectively implementing these strategies will require resources beyond those currently available in the district. Developing monitoring and evaluation as core competencies is so important, however, that the district may want to develop partnerships with local higher education institutions and other organizations that have expertise in these specific functions. In addition, institutions of higher education offering advanced degrees in technology, research and evaluation, or leadership may view the district's technology initiatives as targets of opportunity for graduate research.

Monitoring Plan

Typically, implementation monitoring is focused on the execution of plan initiatives. Implementation monitoring will provide real-time information and requires systems for watching and adjusting in a real-time mode to maintain compliance with the plan and to guide decisions regarding adjustments. The planners carefully select tasks and activities, and are interested in determining the fidelity of the implementation of these tasks and activities at each site in the district.

The key tasks related to monitoring plan implementation include:

- **Identification of Tasks, Deliverables, and Timelines:** Each major initiative or program should include a delineation of tasks and timelines.
- **Discrepancy Analysis:** Each project manager should undertake a discrepancy analysis of expected versus actual implementation performance.
- **Communication:** Processes, structures, and tools need to be established for uniform communication, regarding adherence to timelines and related deliverable specifications.
- **Decision-Making Structures**: Processes and structures need to be established for informing decisions about mid-course corrections and possible redesign of project/program initiatives. All monitoring information should be maintained in a database, accessible by key decision makers during the monitoring cycle.

Using the Balanced Scorecard, Digital Dashboard, and other Technology to Track Progress

Dr. Robert Kaplan (Harvard Business School) and Dr. David Norton developed a novel approach to strategic management in the early 1990s. This system is named the "balanced scorecard." Recognizing some of the weaknesses and vagueness of previous management approaches, the balanced scorecard approach provides a clear prescription as to what companies should measure in order to "balance" their financial perspective.

The balanced scorecard is a ***management system*** (not only a measurement system) that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise.

Technology can help pull together project data into a meaningful structure for progress tracking. Many organizations use dashboards of selected performance information customized for each specific initiative or objective. These dashboards are updated regularly and made available to the managers of specific initiatives.

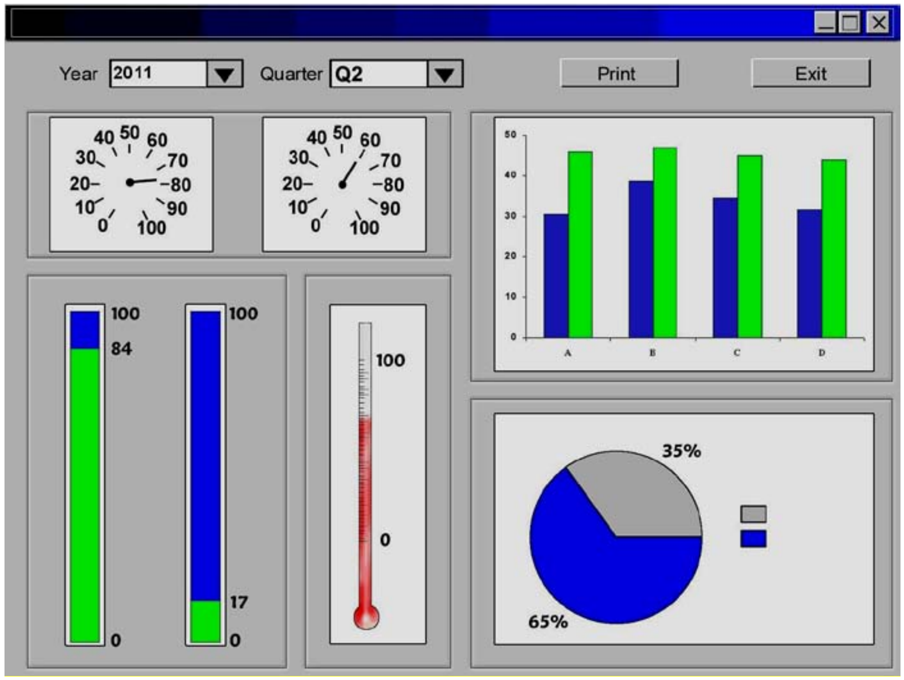


Figure 1. Sample Performance Information Dashboard

Figure 1 is a generic skeleton of a dashboard prototype, with graphical components that are useful in the quick assessment and evaluation of project status for management review. The selection and usage of statistical graphs is determined by the type and breadth of the data, the audience it is directed to, and the questions being asked.

The types of data captured in a typical dashboard include both qualitative data (e.g., words or text) and quantitative data (numbers). For outcomes that can be tracked or measured against a quantifiable benchmark, the identical odometer-like indicators in the top left-hand corner of the dashboard, along with the three thermometer-like indicators below them, are useful for relaying measured progress. These indicators are useful for displaying budgetary information (actual versus estimated, percent expensed, balances) and duration (% complete, % towards goal, remaining duration).

The bar graph in the top right-hand corner of the dashboard displays continuous data in ordered columns. A bar graph is visually strong and categories of continuous measure include time, cost, etc. Another visually appealing indicator is the pie chart in the bottom right-hand corner of the dashboard, which is useful for displaying data as a percentage of the whole. The pie chart's utility also comes into play if there is a need for displaying the distribution of resources among different departments.

The thermometer at the bottom could indicate overall project status, giving an overall indication of the project's performance, based on the objective indicators and subjective project managers' opinions. Much information can be inferred through these visual indicators, which is why they are so useful for the "above-the-trees" view of the forest when it comes time to monitor and evaluate troubled projects.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- school district's and superintendent's goals
- *Key Findings and Recommendations* report
- current status of projects currently ongoing in PPSD
- high priority areas as identified by PPSD leadership staff
- current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., MEPI for Chapter 14) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 14, IT Monitoring, Evaluation Programs, and Implementation Management, section 5.1, Plan Monitoring, would be numbered MEPI-1.1, the second Action Plan in this same section would be MEPI-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Plan Monitoring**

  MEPI-1.1 Technology Advisory Committee

  MEPI-1.2 IT Blueprint Update

- **Plan Evaluation**

  MEPI-2.1 Project Evaluations

- **Reporting Outcomes to Stakeholders**

  MEPI-3.1 Report Status

5.1 Plan Monitoring

Initiative: Technology Advisory Committee			
Recommendation:	MEPI – 1.1 Create and authorize a PPSD Technology Advisory Committee to monitor and evaluate the implementation of the Information Technology Blueprint and to review school technology plans.	**Key Performance Indicator(s):**	1. Creation of PPSD Technology Advisory Committee with regular meeting schedule
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Executive Leadership

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Appoint a technology steering committee to oversee and approve technology standards, technology policies and provide input to new and evolving needs. Ensure representatives are from schools, district staff, and community members. Suggested size is 6-8 members.		X	
2. Establish regular meetings with published agendas, minutes, and actions.		X	
3. Conduct an annual audit/update and change the IT Blueprint to meet changing needs.		X	X

Interdependencies: MEPI-1.2, DSPP-1.1, DSPP-3.1	**Estimated Cost:**	Year 1: $ Year 2: $5,000 Year 3: $ 5,000 **Total: $10,000**	**Potential Funding Source(s):**

Initiative: IT Blueprint Update			
Recommendation:	MEPI – 1.2 Establish a School Board-level agreement to set aside funds to audit, update, and adapt the IT Blueprint at least annually to meet changing needs of the school district.	**Key Performance Indicator(s):**	1. Annually updated and reviewed IT Blueprint 2. Funds set aside for update
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Highly Effective Educators Rigorous and Aligned Content Systems that Work Collaborative Community	**Leadership Responsibility:**	Superintendent School Board IT Director

Action Steps ***Denotes that step has already started.**	**Timeline:** **Year 1** **13/14**	 **Year 2** **14/15**	 **Year 3** **15/16**
1. Establish a board-level agreement to set aside funds to audit, update, and adapt the IT Blueprint at least annually to meet changing needs of the school district.	X	X	X
2. Engage an independent agency to conduct the IT Blueprint update.	X	X	X
3. Work collaboratively with contractor to document current status, identify commendations, and recommend improvements.	X	X	X
4. Disseminate report to PPSD community on an annual basis.	X	X	X
5. Review and adopt recommended changes and improvements.	X	X	X
6. Provide a bi-annual report to the PPSD community on implementation status.	X	X	X

Interdependencies: MEPI-1.1, DSPP-1.1	**Estimated Cost:**	Year 1: $ 25,000 Year 2: $ 25,000 Year 3: $25,000 **Total: $75,000**	**Potential Funding Source(s):**

5.2 Plan Evaluation

Initiative: Project Evaluations				
Recommendation: MEPI – 2.1 Define a process for monitoring and evaluating the effectiveness of all major initiatives.		**Key Performance Indicator(s):** 1. Established monitoring and evaluating process		
Alignment to District/ Superintendent's Goal(s): Systems that Work		**Leadership Responsibility:** Superintendent of Schools CFO		
Action Steps ***Denotes that step has already started.**		**Timeline:**		
		Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Assign a person to define the standard project development process with evaluations as one phase.			X	
2. Create standard templates for use in this process.			X	
3. Require review of this evaluation form in the leadership team meetings.			X	
4. Train district staff in the use of this process/with evaluations.			X	X
5. Make evaluations part of all project leaders' responsibilities and not one person's.			X	X
Interdependencies: DSPP-5.1, DSPP-4.1	**Estimated Cost:** Year 1: $ Year 2: $ 6,000 Year 3: $ 2,000 **Total: $8,000**	**Potential Funding Source(s):**		

5.3 Reporting Outcomes to Stakeholders

Initiative: Reporting Status			
Recommendation:	MEPI – 3.1 Develop and implement a dashboard reporting system to display the ongoing progress of major school district initiatives. Consider a website, online newsletter, or other methods.	**Key Performance Indicator(s):**	1. Dissemination of ongoing progress of major school district initiatives via an easy to understand dashboard. 2.
Alignment to District/ Superintendent's Goal(s):	Engaged Students and Family Collaborative Community	**Leadership Responsibility:**	Executive Board Leadership

Action Steps ***Denotes that step has already started.**	**Timeline:**		
	Year 1 13/14	**Year 2 14/15**	**Year 3 15/16**
1. Assign a person to be the project leader.		X	
2. Develop a draft common format for the recommended dashboard elements, considering budget, schedule, issues, and other relevant indicators unique to the project.		X	
3. Review the draft with a set of pilot projects.		X	
4. Revise as needed.		X	
5. Implement on all new and in-process projects.		X	X
6. Train all affected staff on its use.		X	X

Interdependencies:	**Estimated Cost:**	Year 1: $ Year 2: $ 7,000 Year 3: $ **Total: $7,000**	**Potential Funding Source(s):**

Chapter 15:
Budget, Funding Sources, and Total Cost of Ownership (TCO)

Table of Contents

1.0 INTRODUCTION AND RATIONALE

"We believe that TCO (and fiscal management) allows for a strong connection between wise investment decisions and instructional choices that lead to higher student achievement."

—John Bailey, former Director of Technology
at the U.S. Department of Education

The **Budget, Funding Sources, and Total Cost of Ownership (TCO)** chapter focuses on the financial management of the technology initiatives. Adoption and adaptation of world-class fiscal processes can help to ensure that the systems and services needed to meet the educational goals of the school district can be affordable. Improved financial management maximizes the likelihood that technology initiatives are realized by reducing the obstacle of insufficient funding.

The subtopics within this chapter include:

- Budget
- Funding Sources
- Total Cost of Ownership (TCO)

2.0 BACKGROUND AND CURRENT STATUS

A comprehensive information technology assessment was conducted in September—October 2012. This chapter of the *Information Technology Blueprint* is predicated on the needs analysis and detailed key findings documented in the *Budget, Funding Sources, and Total Cost of Ownership* of the *Technology Needs Assessment* final report.

2.1 Budget

The Providence Public School District (PPSD) finance organization has a very good handle on the technology spending in the district. Summary and detail reports are available, however these may be spread across multiple and fragmented budget categories and across individual school budgets.

The key findings for Budget include:

- It is unclear what the total technology expenditure is in the school district. Although there is a Technology budget, there is evidence of technology equipment being purchased in all areas of the school district's annual budget report as well as in individual school budgets. Technology equipment purchases must be managed, maintained, and supported by the technology department and the one-time capital costs are only a small fraction of the total cost to properly deploy and support new technology equipment.
  - Where and how does PPSD fund the purchase of computers and software?
  - Where and how does PPSD fund the purchase of LCD, Interactive Whiteboards, and other technology equipment?
  - Where are PPSD technology expenditures actually being assigned in the budget?
  - How much is PPSD really spending on technology school district-wide?
- There appears to be technology expenditures in many budget categories, not to mention those that may be funded outside the school district budget such as through local PTA or other sources.

2.2 Funding Sources

The school district participates in E-Rate for priority one and two services. For many schools the belief was that it is unlikely that they would receive funding for internal connections projects, however, the FCC has authorized for funding year 2011 to fund all applicants for internal connections where in the past it was rarely funded anywhere below the 80% district level. For schools who had the discipline to file, they have won.

This means that Providence, when considering the network refresh, should assure they file for internal connections for all schools just in case this happens again.

2.3 Total Cost of Ownership (TCO)

The school district tries to assess Total Cost of Ownership calculation for technology investments. If used consistently, this would permit a financial view of total costs over time with the added dimensions of Return on Investment (ROI) information.

2.3.1 Direct IT Costs

The Direct Information Technology (IT) Costs are defined as those expenses directly associated with the Information Technology solution. They include the costs of hardware, software, configuration, project management, installation, training, and testing of the solution. For example, the Direct IT costs of using a new Voice over IP (VoIP) telephone solution include the network hardware at each facility, all of the VoIP phone handsets, and all of the professional services related to project management, installation, and training.

2.3.2 Indirect IT Costs

The Indirect IT Costs include expenses related to collateral systems that may need modification or upgrades because the collateral systems are either dependent upon the proposed solution, or the collateral system itself serves the proposed system. A solution that replaces an existing technology will often rely on newer technologies, and as such may require an additional investment in the collateral systems. Using the same telephone solution as an example: a collateral system which depends on the services and function of the Direct IT solution is a call notification system, whereas a collateral system that serves the proposed solution is the Wide Area Network (WAN), or in the case of VoIP, the Local Area Network (LAN).

2.3.3 Operational Costs

The Operational Costs are annual, recurring costs associated with ensuring that the proposed solution functions at an acceptable level. The costs include annual maintenance, outside technical support, support staff, third party services, and any moves, additions, and/or changes. A solution that replaces an existing technology can prompt a reduction in operational costs. Operational Costs for the VoIP telephone solution example include the maintenance contract on equipment and the dedicated technicians supporting the system.

The key findings for **Total Cost of Ownership** include:

- The Return of Investment (ROI) calculations and recently the Value of Investment (VOI) work completed by the Consortium for School Networking

(COSN) are good tools to understand the capital investments being made and how they can be justified.

- It is not clear if PPSD calculates TCO for all technology equipment and services. True understanding of the total cost of ownership for technology is revealing and important to understand the impact of technology purchases.

3.0 MAJOR RECOMMENDATIONS

A set of high-level recommendations in the area of *Budget, Funding Sources, and Total Cost of Ownership (TCO)* were identified during the comprehensive information technology assessment conducted in September – October 2012 and were described in the *Key Findings and Recommendations* report. This section outlines the major recommendations that address the current status described in the previous section of this document.

For external reference purposes, each *Recommendation* is numbered with an acronym representing the chapter (e.g., BFT for Chapter 15) and a number representing the section and sequence of individual recommendations. For example, the first recommendation in Chapter 15, Budget, Funding Sources, and Total Cost of Ownership, section 3.1, Budget, would be numbered BFT-1.1, the second recommendation in this same section would be BFT-1.2.

3.1 Budget

BFT-1.1 Maintain Technology Spending Tracking Measure

Code/identify all technology expenditure/purchases and track through the technology department. Bring all technology equipment purchases under technology lifecycle support. Include all school technology expenditures in the identification and tracking process.

3.2 Funding Sources

No action plans

The school district must develop a technology refresh policy that includes the decommissioning of all old technology. This includes outdated equipment with poor performance, increasing support needs, and diminishing capabilities may ultimately hurt the school district when considering the overall technology experience of the students, teachers, and staff. PPSD should consider pulling in all computer purchases into a centrally managed refresh program and seeking the necessary funds to maintain a modern and well performing inventory.

3.3 Total Cost of Ownership (TCO)

BFT-3.1 Develop and Implement a Total Cost of Ownership Model

Develop a technology purchase process that includes TCO calculation. TCO calculation should be clearly understood and included in the decision to purchase and install any equipment or service. Also consider developing processes to calculate ROI for capital expenditure.

4.0 RESEARCH AND BEST PRACTICES

Computing and network systems Total Cost of Ownership (TCO) is defined as the cost for delivery of a specific functionality for a specified period of time that includes all the elemental and incremental costs. TCO is a total view of costs across all the involved organizations and, as such, provides a complete view of a project or an asset's costs. It comprises a set of tools and methodologies to measure and manage the costs.

COSN/Gartner Group1 has benchmark data on eight U. S. school districts that have used TCO. The results show that the total cost of ownership data painted a picture that was entirely different from the traditional justification of individual projects. Many districts found in their original implementation of TCO that some cost data was difficult to obtain because of the inadequacies of the financial system. The case studies show how TCO led the schools to target specific areas that were candidates for cost reduction.

Best practices in developing a cost model for K12 schools that assesses costs over a 3-5 year period include:

- **design:** engineering, piloting, testing, evaluation
- **acquisition:** procurement, direct costs of purchased and leased hardware, software and services, receiving/inventorying, installation, facilities, startup, configuration
- **operation:** administration, scheduling, monitoring, tuning, back-up, maintenance, repair, change management
- **support:** technical, functional, training, troubleshooting
- **usability:** efficiency of access, simplicity of use, increased capabilities
- **productivity:** lost availability, information recovery
- **hidden:** off-purpose use, co-worker support, unaccounted facility expenses

The COSN/Gartner Group study found that the use of TCO helped the districts:

- Manage and assess technology investments in the context of organizational goals
- Measure the impact of technology
- Develop and document budgetary guidelines
- Understand the actual costs for new initiatives
- Identify and document ongoing direct costs and indirect labor costs for technology services.

[1] "COSN/Gartner TCO Tool & Case Studies", May 2004 http://classroomtco.cosn.org/gartner_intro Reviewed July 2005

AEL's Institute for the Advancement of Emerging Technologies in Education (IAETE) has recently updated its online TCO calculator to assist schools in developing school and district technology budgets. As with any budget/cost model, the TCO analysis begins with a detailed list of assumptions. It is necessary to clearly define the way these assumptions influence the factors for each category of cost and ask whether the assumptions contribute costs to the various options under analysis. Typical assumptions include number of users; demand or use of systems; nature of demand and changes in demand; or utilization over time.

The IAETE K12 TCO Calculator divides costs into three broad elements: acquisition costs, external services, and internal services, although it generally follows the COSN TCO model. Acquisition costs are generally the most easily quantified including hardware, software, and other line-item entries. External services are defined as external activities delivered to the district. Internal services include personnel costs and internal direct and indirect expenses for personnel, facilities, other resources and charges.

Acquisition costs are the easiest to quantify while support costs are generally the largest over the life of the system. Usability is difficult to quantify; unless there is a defined way to put numbers against functionality, it is best to either leave the numbers out or clearly cite the supporting evidence. Productivity costs include loss of staff productivity during downtime, lost-opportunity cost due to lack of availability, and information recovery. Hidden costs can be a substantial value but difficult to ascertain.

5.0 IMPLEMENTATION APPROACHES AND ACTION PLANS

The implementation strategies included in this chapter incorporate the following factors:

- school district's and superintendent's goals
- Key Findings and Recommendations report
- current status of projects currently ongoing in PPSD
- high priority areas as identified by PPSD leadership staff
- current status of Rhode Island and federal legislative efforts

The *Action Plans* that follow provide specific steps for implementing the major initiatives developed in this *Information Technology Blueprint* chapter. For each initiative, school district/superintendent's goals, indicators of success, primary leadership responsibility for implementation, interdependencies, and potential funding sources are identified.

For external reference purposes, each *Action Plan* is numbered with an acronym representing the chapter (e.g., BFT for Chapter 15) and a number representing the section and sequence of individual Action Plans. For example, the first Action Plan in Chapter 15, Budget, Funding Sources, and Total Cost of Ownership, section 5.1, Budget, would be numbered BFT-1.1, the second Action Plan in this same section would be BFT-1.2.

Staging and phasing of implementation steps is displayed over three years. Some initiatives will continue beyond this three-year timeframe. The staging/phasing matrix indicates the year in which the activity is planned to begin and end. An "X" denotes the start of an activity. Activities that are already in process are marked with an asterisk (*). Note that changing budgetary conditions may accelerate or impede the implementation schedule.

The *Action Plans* will be useful to PPSD in determining an annual work plan for implementation activities, and for anticipating the resources and budgetary support needed from year to year to achieve the school district's priority goals.

Action Plans are included for the following recommendations:

- **Budget**

  BFT-1.1 Maintain Technology Spending Tracking Measure

- **Funding Sources**

  No action plans

- **Total Cost of Ownership (TCO)**

  BFT-3.1 Develop and Implement a Total Cost of Ownership Model

5.1 Budget

Initiative: Develop Technology Spending Tracking Measures			
Recommendation:	BF-1.1 Identify and track all technology expenditures/purchases. Code/identify through the Technology Department	**Key Performance Indicator(s):**	1. All technology expenses, including school purchases are identified and tracked through Technology Department. 2. Clear and accurate accounting of all technology equipment.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Chief Financial Officer Chief of Staff Performance and Technology Director of Technology

Action Steps ***Denotes that step has already started.**	**Timeline:** **Year 1 13/14**	**Year 2 14/15**	**Year 3 15/16**
1. Review the process currently used by PPSD to track categories of technology expenditures.	X		
2. Compare common measures for technology spending from other similar size school districts as well as high performing organizations.	X		
3. Ensure the establishment of a technology refresh budget category, even if this is unfunded.	X	X	X
4. Reset technology expenditure categories in the budget as required and provide the necessary training to allow for proper categorization of spending under any new scheme.	X	X	X
5. Establish annual measure and monthly reporting of technology spending that are based on the new categories. Continue providing longitudinal style reporting of expenditures.	X	X	X

Interdependencies:	**Estimated Cost:**	Year 1: $ n/a Year 2: $ Year 3: $ **Total: $ n/a**	**Potential Funding Source(s):** Local Funds

5.2 Total Cost of Ownership (TCO)

Initiative: Develop and Implement a Total Cost of Ownership Model			
Recommendation:	BF-3.1 Develop a technology purchase process that includes a TCO calculation.	**Key Performance Indicator(s):**	1. TCO calculations for all technology purchases.
Alignment to District/ Superintendent's Goal(s):	Systems that Work	**Leadership Responsibility:**	Chief Financial Officer Chief of Staff Performance and Technology Director of Technology

Action Steps ***Denotes that step has already started.**	**Timeline:** Year 1 13/14	Year 2 14/15	Year 3 15/16
1. Develop a TCO template to be used for the justification for all technology expenditures.	X		
2. Ensure all projects funded have a complete TCO calculation. Review and consider TCO as part of the funding request.	X	X	X
3. Develop a Return on Investment (ROI) template to access the reduction or increase in operating costs.	X	X	X

Interdependencies:	**Estimated Cost:**		**Potential Funding Source(s):**
		Year 1: $ Year 2: $ Year 3: $ **Total: $ N/A**	Local funds

6.0 BUDGET DEVELOPMENT AND ASSUMPTIONS

The budget contains only capital, subscription, or additional costs associated with the school district's information technology. This does not consider current IT expenditures such as telephones, data lines, and software maintenance plus new *IT Blueprint* initiatives that include costs for staff, software, and hardware throughout the school district. This budget does include items that are "in addition" to current and capital request expenses. The focus of this budget development is to capture the future costs in terms of time, equipment, software to fund the majority of the equipment needs and with the addition of a refresh program. PPSD will be able to move some of the current operational budget and expenditures to reduce this budget and this process should be fairly straight forward based on the current expenditures.

In many cases existing staff have been indicated as the best ones to perform the initiative work, although outside help may be necessary in some cases. However existing staff are also performing other school district work. If they were to work on the new initiative, either someone else would have to do the work they were doing or the school district will decide that the work can be postponed or is no longer needed. This document does not provide forecasting for the additional workload/resource need due to the initiatives. It assumes the school district will, as part of its continuous improvement process, make priority decisions on the allocation of staff and funds.

The *IT Blueprint* outlines approaches for developing a comprehensive information technology system to serve all PPSD educators, students, programs, and divisions. In determining the overall cost of the information technology initiative, the technology budget was developed using an **initiative based model** coupled with a **formula based model**.

Initiative-Based Model

The initiative based model uses the initiatives described in the action plans *IT Blueprint* chapters 2 through 14. There are approximately one hundred and twenty-four separate initiatives described in these fourteen sections. Each initiative has an estimate of staffing, equipment, software, and maintenance costs. In addition, each initiative has a cost phase-in by year and one or more funding sources associated with it.

Formula-Based Model

The formula-based model is used to calculate the costs for the telecommunications equipment, computers, and associated software and these costs are then allocated to appropriate initiatives within the sections where the technology recommendations are discussed. The formula-based model uses the following process to estimate costs:

- identify populations to be served
- establish technology targets (ratios) for each technology component
- determine total needed by applying populations to technology targets
- deduct existing resources that do not need to be replaced in the next three years

- calculate unmet need by subtracting existing resources from total need
- associate each technology component with one or more initiatives
- determine phase-in for each technology component by year and facility type

The technology targets used to calculate the budget are defined in the formula budget assumptions sections. These target technology assumptions are not intended as a mandate of specific placement or configuration of equipment at a campus. It is expected that campuses will choose a range of power and capabilities for their classrooms, teachers, and administrators using the guidance in other sections of the *IT Blueprint*. Thus, when a cost is identified in the technology budget, it is an average expected cost. For example, some workstations may cost more than the average while others will cost less or several hand held devices might be used instead of a workstation.

The total need is determined by applying the technology ratios to the populations served. The unmet need is the total need reduced by the quantity of existing resources that do not have to be replaced over the three years of the technology plan.

Whenever possible the budget uses a total cost of ownership (TCO) methodology which includes:

- adequate training, professional development, and support for all personnel
- instructional, productivity, and administrative software
- maintenance of equipment and software
- replacement costs of existing equipment

Cost estimates are based on average current prices. The budget also includes the cost of maintaining hardware and software purchased under this plan.

Once the necessary costs are determined, the school district will establish an ongoing, annual commitment as a “line-item” in the regular budget to support education technology in classrooms and schools.

6.1 General Budget Assumptions

Funding for technology in the charter schools is not included in the budget model. Current contract prices are used for goods and services when they are available.

6.2 Initiative Based Budget Assumptions

Initiative based budgets are calculated within subsidiary workbooks grouped by chapter. Costs are estimated for each initiative and broken out by:

- Labor and Services – includes permanent and temporary staff, consultants, and contractors
- Hardware – includes all hardware not included in the formula-based calculations
- Hardware Maintenance – automatically calculated from hardware purchase information

- Software – includes all software not included in the formula-based calculations
- Software Maintenance – automatically calculated from software purchase information.
- Other – includes ASP services and any other costs not covered by the above categories

The worksheets use the following assumptions:

- Hardware maintenance = 20% of hardware acquisition cost
- Software maintenance = 15% of annual acquisition cost
- Fully loaded annual cost of a professional FTE = $86,000
- Fully loaded annual cost of a clerical FTE = $48,000
- Daily rate for a consultant = $1,000
- Daily rate for a contractor = $500
- Consultants and contractors work an average of 20 days per month

6.3 Formula Budget Assumptions

The following describes the factors involved in the formula-based portion of the budget. It starts with current and projected demographics and then describes the technology components required.

The technology components needed at the classroom, Information and Technology Resource Centers, school office, and overall school are described in detail in Chapter 3: Teaching and Learning Technologies. These technology components are included in the initiatives and action plans in Chapter 4: Learning Environments and School Facilities.

For more information about what these technology components are, why they are needed, and how they fit into the curriculum to facilitate student achievement, please consult the referenced documents.

Current/Projected Demographics

Table 1 below shows the student enrollment FY 12-13. The school district has been experiencing the addition of approximately 6,000 students per year. The projections assume that the influx of students will be spread across the grades in the same proportion as the school district's current grade distribution.

Table 1: FY12-13 Student Enrollment by School Type and Projections

	Actual	Students by School Type						Year over Year
School Type	**FY 12-13**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**	**Growth**
Elementary School	12,369	12,411	12,453	12,496	12,538	12,581	12,623	0.34%
Middle School	4,762	4,778	4,794	4,811	4,827	4,844	4,860	0.34%
High School	6,718	6,741	6,764	6,787	6,810	6,833	6,856	0.34%

DISTRICT TOTAL	**23,849**	**23,930**	**24,011**	**24,093**	**24,175**	**24,257**	**24,340**	
Percent Change		0.34%	0.34%	0.34%	0.34%	0.34%	0.34%	

The increase in student population (Table 1) has an impact on the number of classrooms needed, as shown in Table 3 below but no impact on the number of schools (Table 2).

Table 1: Current Number of Schools

	Actual	**Schools and Facilities**					
Facility Type	**FY 12-13**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Elementary School	23	23	23	23	23	23	23
Middle School	6	6	6	6	6	6	6
High School	8	8	8	8	8	8	8
Administrative Sites	4	4	4	4	4	4	4
DISTRICT TOTAL	**41**	**41**	**41**	**41**	**41**	**41**	**41**
New Schools / Facilities Required		0	0	0	0	0	0

Changes in the number of students does not have an impact on the number of schools, as shown above. The projection model shown in Table 2 assumes that the same average number of students per school will remain the same over the next five-years.

Table 2: Classroom Equivalents by School Type

	Actual	**Classroom Equivalents by School Type**					
School Type	**FY 12-13**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Elementary School	715	718	720	723	725	728	730
Middle School	275	276	277	278	279	280	281
High School	389	390	391	393	394	395	397
DISTRICT TOTAL	**1,379**	**1,384**	**1,388**	**1,394**	**1,398**	**1,403**	**1,408**

Classroom Technology

Table 4 describes the costs for common technologies budgeted for classrooms.

Table 3: Cost per year for Classroom Technology

Classroom Technology	Per	Unit Cost	Elementary School	Middle School	High School
Computer	Student	$800	0.33	0.33	0.33
School Device*	Student	$400	0.33	0.33	0.33
Laptop Computer	Teacher	$950	1.00	1.00	1.00
Document Camera	Classroom	$500	1.00	1.00	1.00
Mntd Projection System	Classroom	$1,000	1.00	1.00	1.00
Interactive White Board	Classroom	$2,500	1.00	1.00	0.50
Audio Enhanced Sound System	Classroom	$2,000	1.00	1.00	1.00
Media Control Panel	Classroom	$250	1.00	1.00	1.00
Slate	Classroom	$350	1.00	1.00	1.00

* "Device" refers to desktop computer, handheld, tablet, PDA and other portable learning tools.

Library / Media Center Technology

Table 5 describes the rations costs for common technologies budgeted for the Information and Technology Resource Centers (formerly Library/Media Centers).

Table 4: Cost per Year for Library/Media Centers

Library / Media Center Technology	Per	Unit Cost	Elementary School	Middle School	High School
Library Workstations	School / Facility	$800	10.00	15.00	26.00

School Office Technology

Table 6 describes the cost per year for common technologies budgeted for the school office.

Table 5: Cost per year for School Office Technology

Offices	Per	Unit Cost	Elementary School	Middle School	High School	Administrative Sites
Workstation	Non-Instructional Support Staff	$800	1.00	1.00	1.00	1.00
Laptop	Administrator	$950	1.00	1.00	1.00	1.00
Workstation	Instructional Support Staff	$800	1.00	1.00	1.00	1.00

School Technology

Table 7 describes the cost per year for common technologies budgeted at the school level. Note that various factors are applied to different school types based on the relative expense needed to supply the school with the indicated technology. NOTE: School Facilities Networks including wireless upgrades are detailed in individual action plan.

Table 6: Cost per year for School Technology

School / Facility	Per	Unit Cost	Elementary School	Middle School	High School	Administrative Sites
Energy Mgmt Upgrades	School / Facility	$5,000	1.00	2.00	3.00	3.00

6.4 Implementation Phase-in

Initiative Phase-ins

Please refer to the Action Plan section of each initiative to see the project tasks and timelines over the next five-years.

Formula Classroom Technology Phase-in

The following table shows the percent phase-in of classroom technology for the first five-years by elementary school (Elem), middle school (Mid), high school (High). The phase in takes into account existing assets and the depreciation of these over the term of the five years.

Table 7: Percentage Phase-in of Classroom Technology (divided into two tables for easier viewing)

		FY 13-14				FY 14-15				FY 15-16			
Classroom Technology	Per	Elem	Mid	High	Adm	Elem	Mid	High	Adm	Elem	Mid	High	Adm
Computer	Student	40%	40%	40%	40%	20%	20%	20%	20%	20%	20%	20%	20%
School Device*	Student	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Laptop Computer	Teacher	40%	40%	40%	40%	20%	20%	20%	20%	20%	20%	20%	20%
Document Camera	Classroom	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Mntd Projection System	Classroom	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Interactive White Board	Classroom	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Audio Enhanced Sound System	Classroom	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Media Control Panel	Classroom	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%

Slate	Classroom									33%	33%	33%	33%

		FY 16-17				FY 17-18			
Classroom Technology	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Computer	Student	20%	20%	20%	20%				
School Device*	Student	20%	20%	20%	20%	20%	20%	20%	20%
Laptop Computer	Teacher	20%	20%	20%	20%				
Document Camera	Classroom	20%	20%	20%	20%	20%	20%	20%	20%
Mntd Projection System	Classroom	20%	20%	20%	20%	20%	20%	20%	20%
Interactive White Board	Classroom	20%	20%	20%	20%	20%	20%	20%	20%
Audio Enhanced Sound System	Classroom	20%	20%	20%	20%	20%	20%	20%	20%
Media Control Panel	Classroom	20%	20%	20%	20%	20%	20%	20%	20%
Slate	Classroom	33%	33%	33%	33%	34%	34%	34%	34%

Formula Library / Media Center Technology Phase-in

Table 9 shows the percent phase-in of Information Technology Resource Center technology for the first five-years by *elementary school (Elem), middle school (Mid), high school (High).*

Table 9: Information Technology Resource Center Phase-in % (divided into two tables for easier viewing.)

		FY 13-14				FY 14-15				FY 15-16			
Library / Media Center Technology	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Library Workstations	School / Facility	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%

		FY 16-17				FY 17-18			
Library / Media Center Technology	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Library Workstations	School / Facility	20%	20%	20%	20%	20%	20%	20%	20%

Formula School Office Technology Phase-in

School office technology will be phased in at 20% per year for each school office technology, as shown in Table 10.

Table 10: School Office Technology Phase-in % (divided into two tables for easier viewing.)

		FY 13-14				FY 14-15				FY 15-16			
Offices	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Workstation	Non-Instructional Support Staff	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Laptop	Administrator	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Workstation	Instructional Support Staff	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%

		FY 16-17				FY 17-18			
Offices	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Workstation	Non-Instructional Support Staff	20%	20%	20%	20%	20%	20%	20%	20%
Laptop	Administrator	20%	20%	20%	20%	20%	20%	20%	20%
Workstation	Instructional Support Staff	20%	20%	20%	20%	20%	20%	20%	20%

School Technology Phase-in

The following table shows the percent phase-in of school technology for the first five-years by elementary school (Elem), middle school (Mid), high school (High). Last two years are not shown since there are no additional phase in.

Table 10: School Office Technology Phase-in %

		FY 13-14				FY 14-15				FY 15-16			
School / Facility	**Per**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**	**Elem**	**Mid**	**High**	**Adm**
Energy Mgmt Upgrades	School / Facility					50%	50%	50%	50%	50%	50%	50%	50%

7.0 FIVE-YEAR BUDGET PROJECTION

The following table is the estimated five-year budget to implement fully the *Information Technology Blueprint*. See the previous section to understand how it was developed.

	FIVE YEAR BUDGET ANNUAL EXPENDITURES - ALL SOURCES					
Initiative	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**5-Year Total**
Chapter 2: Curriculum and Assessment	**117,000**	**102,000**	**92,000**	**27,000**	**27,000**	**365,000**
Student Technology Standards						
CA-1.1 Adopt Student Technology Standards	25,000	20,000	20,000			65,000
CA-1.2 Develop a Scope and Sequence for Technology Skills	60,000	30,000	30,000			120,000
Curriculum and Technology Integration						
CA-2.1 Embed Technology Skills into the PPSD Aligned Curriculum		10,000	5,000	5,000	5,000	25,000
CA-2.2 Evaluate and Disseminate Current Successful Technology Practices	12,000	12,000	12,000	12,000	12,000	60,000
Student Assessment, Reporting, and Evaluation						
CA-3.1 Support Elementary Reading Program Diagnostic and Remediation Tools	10,000	10,000	10,000	10,000	10,000	50,000
CA-3.2 Improve Middle School Student Attainment of 21st Century Technology Skills	10,000	10,000	10,000			30,000
Curriculum Development and Instructional Management						
CA-4.1 Prepare Teachers to Fully Use the Capabilities of the IMS for Teaching and Learning		10,000	5,000			15,000
Chapter 3: Curriculum and Assessment	**105,000**	**550,000**	**350,000**	**50,000**	**50,000**	**1,105,000**
Instructional Applications and Digital Content						
TLT-1.1 Digital Content Review, Selection, and Procurement Process	5,000					5,000
TLT-1.2 Web-Based Digital Resources Clearinghouse	40,000	250,000	50,000	50,000	50,000	440,000
TLT-1.4 Web 2.0 Resources and Cloud-Based Software Services		240,000	240,000			480,000
Technology Utilization						
TLT-2.1 21st Century Classroom Configurations	5,000	5,000	5,000			15,000

TLT-2.2 Equity Policy and Guidelines						
Special Populations						
TLT-3.1 Differentiating Instruction for Students with Special Needs	5,000	5,000	5,000			15,000
Information and Technology Resource Centers (Libraries/Media Center)						
TLT-4.1 Library Media Services in Support of 21st Century Skills & ICT Literacy	50,000	50,000	50,000			150,000
Chapter 4: Learning Environments and School Facilities	**4,027,000**	**3,719,000**	**3,879,000**	**3,135,000**	**2,336,000**	**17,096,000**
Technology-Enhanced Learning Environments						
LESF-1.1 Minimum Technology Learning Environments Guidelines	5,000	5,000	5,000			15,000
LESF-1.2 Instructional Technology Refresh Program	3,779,000	2,975,000	3,135,000	3,135,000	2,336,000	15,360,000
LESF-1.3 Online Learning Opportunities	105,000	105,000	105,000			315,000
School Facilities						
LESF-3.1 Energy/Building Access/ Lighting Controls		358,000	358,000			716,000
LESF-3.2 Construction and Renovation Standards	138,000	276,000	276,000			690,000
Chapter 5: Organizational and Staffing	**282,000**	**279,000**	**272,000**			**833,000**
Organization and Staffing						
ODS-1.1 Information, Communication, and Technology Services (ICTS) Department	96,000	86,000	86,000			268,000
ODS-1.2 "Learning Technology" Support Group	172,000	172,000	172,000			516,000
IT Career and Programs Development						
ODS-2.1 Job Portfolios for ICTS Staff	3,000	15,000	3,000			21,000
ODS-2.2 Career Roadmap for ICTS Staff			5,000			5,000
Technical and End-User Support						
ODS-3.1 Revise the Role of the Library Media Specialists	3,000	5,000	5,000			13,000
Staffing for Operational, Technical, and End-User Support						
ODS-4.1 Service Level Agreements	8,000	1,000	1,000			10,000
Chapter 6: Staff Development and Human Resources Management	**5,000**	**753,000**	**743,000**			**1,501,000**
Staff Proficiencies						
SDHR-1.1 Technology Proficiencies for All Staff		50,000	20,000			70,000
SDHR-1.2 Rigorous Technology Professional Development		650,000	650,000			1,300,000
Staff Development Programs						
SDHR-2.1 Systemic Technology Professional Development		8,000	33,000			41,000
Staff Development Planning						
SDHR-3.1 District-Wide Technology Professional Development Plan	5,000	5,000	5,000			15,000
Proficiency-Based Approach to Staff Development and Human						

Resources Management						
SDHR-4.1 Proficiency-Based Model for Human Resource Management		30,000	20,000			50,000
Recruitment, Selection, and Retention of Highly Qualified Staff						
SDHR-5.1 Web-based Staff Development Management System		10,000	15,000			25,000
Technology in Support of Staff Development Programs						
SDHR-6.1 Virtual Staff Development Opportunities						
Chapter 7: Standards, Procurement, Maintenance, and Asset Management	**95,000**	**75,000**	**245,000**			**415,000**
Technology Standards						
SPMA-1.1 Standards Committee	5,000	5,000	5,000			15,000
SPMA-1.2 Classroom and Facility Standards	5,000	5,000	5,000			15,000
Procurement Guidelines						
SPMA-2.1 Streamlined Standards Purchasing	5,000	5,000	5,000			15,000
SPMA-2.2 Web Purchasing Site	5,000	5,000	5,000			15,000
Maintenance Procedures						
SPMA-3.1 Desktop Image Maintenance	25,000	5,000	200,000			230,000
Asset Management						
SPMA-4.1 Service Management Program	50,000	50,000	25,000			125,000
SPMA-4.2 Capital Asset Management						
Chapter 8: Policies, Procedures, and Security	**30,000**	**60,000**	**60,000**			**150,000**
Technology and Information Policies						
PPS-1.1 Standards to Define Access, Use, and User Level Attainment	5,000	40,000	40,000			85,000
PPS-1.2 District Equity Policy	5,000	5,000	5,000			15,000
Technology and Information Procedures						
PPS-2.1 On-Board Policy for New Staff Members	5,000	5,000	5,000			15,000
PPS-2.2 Bring Your Own Device (BYOD) Policy and Procedure	5,000	5,000	5,000			15,000
Security Policies and Systems						
PPS-3.1 Data Security Policy	5,000					5,000
PPS-3.2 Security System Policy	5,000	5,000	5,000			15,000
Chapter 9: District-, School-, and Program-level Planning	**100,000**	**45,000**	**115,000**			**260,000**
District-level Planning						
DSPP-1.1 Technology as a Strategic Priority						
School Improvement Planning						
DSPP-2.1 Updated School Improvement Plans		10,000	80,000			90,000
Department-Level Planning						

DSPP-3.1 Technology Steering Committee	5,000	5,000	5,000			15,000
Balanced Scorecard Process						
DSPP-4.1 Balanced Scorecard Process	15,000	5,000	5,000			25,000
Project Management Oversight						
DSPP-5.1 Project Management Office	80,000	25,000	25,000			130,000
Chapter 10: Administrative and Productivity Systems	**247,000**	**157,000**	**147,000**	**97,000**	**97,000**	**745,000**
Information Systems Strategies						
APS-1.1 Enterprise Approach for Procuring and Implementing Administrative Systems	157,000	117,000	117,000	97,000	97,000	585,000
Business Management System						
APS-2.1 Examination of Current Business Systems to Determine Effectiveness	40,000	20,000	10,000			70,000
APS-2.2 Maximizing the Use of Business Systems through Targeted User Training	50,000	20,000	20,000			90,000
Student Information Systems						
APS-3.1 Student Information System Use Case Model						
Chapter 11: Decision Support and Accountability Systems	**337,000**	**291,000**	**138,000**			**766,000**
Data Management						
DSAS-1.1 Data Governance Board	15,000	40,000	25,000			80,000
DSAS-1.2 Creation of a Data Dictionary	12,000					12,000
DSAS-1.3 Establishment Data Standards	10,000	7,000	4,000			21,000
Decision Support Framework						
DSAS-2.1 Instructional Data Working Group	8,000	16,000	16,000			40,000
Data Warehouse Implementation						
DSAS-3.1 Strategic Plan for District-wide Data Warehouse	250,000	150,000	50,000			450,000
DSAS-3.2 Data Integration Plan	4,000	22,000	22,000			48,000
Enterprise Content Management						
DSAS-4.1 Content Management	30,000	40,000	12,000			82,000
Performance/Accountability Systems						
DSAS-5.1 Applications Catalog	8,000	16,000	9,000			33,000
Chapter 12: Communications and Network Infrastructure	**1,855,000**	**5,051,000**	**3,951,000**			**10,857,000**
Strategic Issues						
CNI-1.1 Convergence Committee	5,000	1,000	1,000			7,000
Emerging Issues						
CNI-2.1 Home/School Portal	200,000	100,000	100,000			400,000
CNI-2.2 Comprehensive Wireless	100,000	2,000,000	1,000,000			3,100,000

CNI-2.3 Comprehensive VoIP	100,000	1,500,000	500,000			2,100,000
CNI-2.4 Video Streaming and Surveillance		100,000	1,000,000			1,100,000
Network Transport Infrastructure						
CNI-3.1 Cable and Network Switch Infrastructure	1,000,000	1,000,000	1,000,000			3,000,000
Data and Service Infrastructure						
CNI-4.1 Cell Phone / Mobile Device Management	200,000	50,000	50,000			300,000
Management and Supporting Computing Infrastructure						
CNI-5.1 Single Sign-On	100,000	100,000	100,000			300,000
Network and Information Security						
CNI-6.1 Network and Information Security Plan	150,000	200,000	200,000			550,000
Chapter 13: Community/Home Access and Participation	**12,000**	**84,000**	**40,000**			**136,000**
Home/School/Community Connection						
CAP-1.1 Parent Portal						
CAP-1.2 Kiosks for Public Internet Access	1,000	20,000	4,000			25,000
Public Information and Awareness						
CAP-4.1 Annual Student Technology Fair	6,000	6,000	6,000			18,000
CAP-4.2 School Website Refresh		50,000	25,000			75,000
Community Learning Programs						
CAP-5.1 Expand Opportunities for Adult Education	5,000	8,000	5,000			18,000
Chapter 14: IT Monitoring, Evaluation Programs, and Implementation Management	**25,000**	**43,000**	**32,000**			**100,000**
Plan Implementation						
MEP-1.2 Monitoring Technology Equity		5,000	5,000			10,000
Plan Evaluation						
MEP-2.1 Evaluate Implementation Status		6,000	2,000			8,000
Reporting Outcomes to Stakeholders						
MEP-3.1 Report Implementation Status		7,000				7,000
Maintain Updated Technology Plan						
MEP-4.1 Blueprint Updates	25,000	25,000	25,000			75,000
Chapter 15: Budget						
Budget						
BFT-1.1 Develop Technology Spending Tracking Measure						
Total Cost of Ownership (TCO)						
BFT-3.1 Develop and Implement a Total Cost of Ownership (TCO) Model						

Total	**7,237,000**	**11,209,000**	**10,064,000**	**3,309,000**	**2,510,000**	**34,329,000**
Annual Average						**6,865,800**

The following is a five-year budget projection by funding source.

Classroom Technology	**Per**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**5 Years**
Computer	Student	$921,897	$460,949	$460,949	$460,949	$0	$2,304,743
School Device*	Student	$615,754	$615,754	$615,754	$615,754	$615,754	$3,078,771
Laptop Computer	Teacher	$686,280	$343,140	$343,140	$343,140	$0	$1,715,700
Document Camera	Classroom	$130,300	$130,300	$130,300	$130,300	$130,300	$651,500
Mntd Projection System	Classroom	$260,600	$260,600	$260,600	$260,600	$260,600	$1,303,000
Interactive White Board	Classroom	$554,000	$554,000	$554,000	$554,000	$554,000	$2,770,000
Audio Enhanced Sound System	Classroom	$521,200	$521,200	$521,200	$521,200	$521,200	$2,606,000
Media Control Panel	Classroom	$69,200	$69,200	$69,200	$69,200	$69,200	$346,000
Slate	Classroom	$0	$0	$159,852	$159,852	$164,696	$484,400
Classroom Technology Total		$3,759,231	$2,955,143	$3,114,995	$3,114,995	$2,315,750	$15,260,114
		25%	19%	20%	20%	15%	100%
Library / Media Center Technology	**Per**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**5 Years**
Library Workstations	School / Facility	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
Library / Media Center Technology Total		$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
		20%	20%	20%	20%	20%	100%
Offices	**Per**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**5 Years**
Workstation	Non-Instructional Support Staff	$320	$320	$320	$320	$320	$1,600
Laptop	Administrator	-$2,090	-$2,090	-$2,090	-$2,090	-$2,090	-$10,450
Workstation	Instructional Support Staff	$99,040	$99,040	$99,040	$99,040	$99,040	$495,200

Offices Total		$97,270	$97,270	$97,270	$97,270	$97,270	$486,350
		20%	20%	20%	20%	20%	100%
School / Facility	**Per**	**FY 13-14**	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**5 Years**
Energy Mgmt Upgrades	School / Facility	$0	$177,500	$177,500	$0	$0	$355,000
School / Facility Total		0	177,500	177,500	0	0	355,000
		0%	50%	50%	0%	0%	100%
Total All Areas		3,876,501	3,249,913	3,409,765	3,232,265	2,433,020	16,201,464
Cost Per Student Per Year		$162	$135	$142	$134	$100	$135
Percent by year		24%	20%	21%	20%	15%	100%