A Report and Estimating Tool for K-12 School Districts

Value of Investment

Arizona VOI Case Study
One-to-one Student Computing
July 2007

Consortium for School Networking
Introduction to the VOI Case Studies

The CoSN Value of Investment Leadership Initiative builds upon and complements the work of CoSN’s Taking TCO to the Classroom project (www.classroomtco.org). While the TCO tools allow schools and districts to take a snapshot of the total costs of their computer environment, the new Value of Investment (VOI) tools help them anticipate and quantify both the costs and benefits of proposed technology-related projects.

VOI is not directed towards any specific application area, and the projected benefits can actually be compared with non-technology projects competing for the same funding. Projects can be focused on saving money, or towards accomplishing other K-12 goals and mandates, such as enhanced student performance, student equity, community relationships, student motivation and 21st century skills.

In early 2007 CoSN worked with three school districts to create case studies based on its VOI methodology. The three case studies (http://www.edtechvoi.org/casestudies/) were developed with thanks to the generous support of corporate sponsors and cooperation of the participating districts. Each case study district is evaluating one or more approaches to a major proposed project. The intent is to use CoSN’s VOI methodology and tools to help these districts fully understand the costs, benefits and risks of their proposed projects, as well as to evaluate the CoSN VOI methodology.

CoSN recommends that, before beginning the VOI analysis, districts should conduct TCO assessments to help them understand the costs of their installed networked computer environment and incorporate this data into the estimated costs for proposed projects. This is not always possible, however, and the three case studies represent a mix: In one of them, no former TCO assessment was performed and the cost estimates were generated less formally during the VOI analysis process. In a second case study, the results from the former TCO assessment were incorporated into the VOI analysis. In the third study, district leaders chose to use the figures from a TCO assessment only minimally because of the scope and goals of the project.

CoSN’s VOI methodology is further described in www.edtechvoi.org, where project cost estimate and benefits tools are available. As explained there, VOI methodology consists of six key steps:

1. **Determine costs**: This includes amortized initial costs (e.g., purchase of equipment, user time for development and setup), ongoing direct costs (e.g., licensing fees, ongoing professional development and support), and indirect costs (e.g., user time spent troubleshooting and dealing with system issues). Essentially, step one focuses on the TCO for the entire project.

2. **Calculate any savings**: In analyzing the anticipated benefits of a project, users of the VOI tools begin by looking at the potential financial savings. In broad terms, this
includes determining the savings from reduced current expenditures, future cost avoidance, staff productivity gains and increased revenue.

3. **Score benefits**: Since many project goals and benefits go beyond financial considerations, a scoring model is used to determine benefits and their effect on district mission, goals, mandates and other requirements. So that they can be measured, these benefits are stated in numerical terms. Typically, this is the most difficult part of the process but taking the time to quantify allows the school or district to evaluate results over time.

4. **Identify risk**: Consensus is used to determine the probability that the project will be considered successful in terms of cost and benefits. District planners are asked to determine the probability of success and this is applied to the benefits score.

5. **Compare**: Projects competing for the same funding using costs and scoring model can be compared and projected costs and benefits stated concisely.

6. **Measure success**: With benefits and costs stated in measurable terms, one can later evaluate the results. This is not only good practice for improvement of the VOI process, but a means of providing ongoing justification for sustainability of a successful project.

For each case study district, the first four steps of the Value of Investment methodology were completed. Districts with more than one project or more than one approach had the opportunity to evaluate each separately using the VOI scoring model and then compare (step 5). While it is too soon to validate the projected costs and benefits of these projects (step 6), it is CoSN’s hope to revisit these districts if the projects are implemented, and measure the results.

Data from each district was used to develop a case study that reports pertinent background leading up to the proposed project(s), including background information on the district and its computing environment and baseline TCO metrics (if a TCO assessment has been performed). From there, the proposed project is described and assessed according to the VOI methodology.
Arizona Case Study: Overview and Background

One-to-one student computing is a controversial proposition with the Arizona district’s constituents, as it is with many districts. In order to look objectively at the costs and anticipated benefits and to better articulate value, this district has performed a VOI assessment. At the heart of the decision is the district goal that “students are challenged and excel according to their abilities and exit our school system prepared for their next level of learning.”

The Arizona school district is an suburban district, close to a city, with a mostly middle to upper socioeconomic population of 2,400 students (870 in the high school). It covers an area of 19 square miles and also serves some out-of-district students. The community served by this district is growing in population; however school enrollment is not growing and may be gradually declining, as the district is located in an area that is popular for retirement and is less affordable for younger families. The district consists of two elementary schools, a middle school for grades 6-8, one four-year high school and district administrative offices located in the high school complex. The district employs 320 full time and part time employees. There are 45 teachers in the high school.

The district’s mission statement says, “We Achieve and Celebrate Educational Excellence.” Indeed, depending on how you measure, this district is ranked third in the state for student achievement, although community support for funding capital outlay overrides to fund this level of excellence has been waning.

The Information Technology organization reports to the executive director of curriculum and instruction. The support and planning staff consists of the technology director, one network administrator, and one support specialist. A centralized Web-based support process and voicemail is utilized and all end user support is provided by this staff.

All buildings are connected to the district office by T1 (1.5mbps) lines. A 6mbps line provides the internet connection. 1,200 client computers are supported. 315 of these computers are available for student use in the high school, for a student/computer ratio of 2.8 to one. Overall, the district has a 3.72 student/computer ratio.
The Proposed Project – One-to-One Student Computing

The Arizona school district is investigating two approaches to one-to-one student computing for the high school. One approach is to provide a laptop computer to each student. This approach has not been well-received by the community up to this point, as a large percent are older part-time residents without school age children and view a school-provided laptop as an extravagance. The other approach is to populate most classrooms with fixed desktop or laptop computers, and provide students with portable flash drives to move work between school and home. The district is currently surveying student families concerning home computer equipment.

In preparation, each of the 34 high school teachers has been provided with a laptop computer and initial training.

Reasons sited for pursuing this major project with its technical, financial and political issues include:

- Maintain high student achievement levels, as indicated by standardized test scores;
- Attract new students from surrounding areas, home schooling and private/charter schools;
- Provide students with the skills they need to be successful in college (over 90% of the graduates go on to college) and the workforce.

The district will be seeking funding from the community via a six or seven year capital outlay override tax. In efforts to find a one-to-one student computing solution that is amenable to the community, the two options mentioned above are being explored. The primary difference between the two options is whether the students will have their own laptop or use classroom computers and rely on a family-owned home computer for homework. If the second option is selected, students will most likely be issued a USB flash memory device to transfer data between their home system and classroom computers. In either case, student work currently is and will continue to reside on a district data server and not on individual classroom or student laptop computers.

The initial planning for this project has started, and a trial referendum was turned down by voters last November. The district is now digging deeper into the projected costs and benefits of the one-to-one student computing options so that they can better articulate the goals and objectives of this project in terms that are meaningful to the community. The CoSN VOI methodology was used to help develop the business case for one-to-one computing to present to the community.

Family surveys, which are currently being conducted, are being used to determine the availability of computers, Internet access and appropriate personal productivity software at home. This is a key component to the classroom computer option. If the percentage of home access is high enough, those without access will be addressed on an individual basis so that all high school students are assured home access to an appropriately configured computer.
High school teachers currently have laptop computers. The plan is to lease the laptop or classroom computers, while paying for server and infrastructure upgrades up-front. The lease will allow for a systematic refresh of the client computers.

The VOI assessment will help to determine the value of one-to-one student computing in terms of district goals and mandates, and will be used to help determine the relative costs and benefits of providing in-classroom one-to-one computers or student laptops. If approved, the approach will be to finalize vendor negotiations and implement the chosen option in fall of 2008.

Teacher mentors will be assigned and further teacher training on the use of computers as a part of the curriculum will take place spring or summer of 2008. Teachers participating in the pilot program will be trained on course development for the online learning software, curriculum software, productivity software and other software that will be available to them. Teachers will receive a stipend for training, and select in-service days will be used for training purposes.

To support the additional computing infrastructure, the district is planning to hire one additional technician or support specialist, and is also looking towards in-house warranty support from the vendor.

**Project Cost Analysis**

When determining anticipated project costs, it is useful to understand current TCO as a means of projecting ongoing costs for the proposed project. While helpful, TCO assessment is not a requirement for projecting VOI costs. This district has not performed a TCO assessment, so that some direct and indirect labor costs are rough estimates.

The district used CoSN’s VOI project cost estimator to determine projected costs for both the student laptop and in-classroom one-to-one student computing options. A wireless network is needed for the laptop solution, while wired network upgrades are required for the in-classroom approach.

**Cost Estimates for Student Laptop and In-classroom Alternatives**

<table>
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<tr>
<th>Project Name</th>
<th>Last Edited</th>
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<th>Annualized Initial Cost</th>
<th>Ongoing Costs</th>
<th>TCO Annualized</th>
<th>Per-student TCO*</th>
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* 870 high school students
### One-to-one Student Laptops - 900 Units

#### Direct (budgeted) Expenses

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<th>Annualized (Calculated)</th>
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- **Note**: Computer, network and software technology purchases. Note that all items included in a lease should be included as annual expenses (not initial cost).

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**Consortium for School Networking**  
**July 2007**

[www.cosn.org](http://www.cosn.org)  [www.edtechvoi.org](http://www.edtechvoi.org)
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(1) Major one-time purchases should be amortized over the expected life of the project, up to 5 years (longer for building refurb).

(2) Ongoing costs include ongoing support and equipment leasing.
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(1) Major one-time purchases should be amortized over the expected life of the project, up to 5 years (longer for building refurb)
(2) Ongoing costs include ongoing support and equipment leasing
Differences in the total cost of ownership between the two approaches include:

- Leased computers, servers and software is planned in either case, but the annualized technology cost is approximately $122,000 more for student laptops ($135 per computer).

- Direct Labor implementation costs for implementing the on-site computer approach are estimated at $240,000 to run networking and power for the computer labs, versus only $30,000 for supporting student laptops.

- The Electrical and HVAC categories reflect more power service upgrades to accommodate labs for in-house computers than for the student laptops.

Projected Benefits, Risk and Assessment

The anticipated benefits and risks of the in-house and outsourced approaches for the online learning project are much the same. In this case, then, it makes most sense to develop just one benefits assessment in terms of value to the district and then review any relative merits of the two approaches separately. The overriding factor driving the decision between the two approaches will be community acceptance.

While the focus of one-to-one projects is not monetary savings, the district expects to accrue some financial benefit. The two biggest factors are revenue from increased enrollment and savings due to enhanced teacher productivity. The increased enrollment is based on the belief that students currently attending private schools or being home-schooled will be attracted to the one-to-one program. Teacher productivity is based on time saved by automating homework and testing processes. As shown on the chart that follows, the risk-weighted dollar savings offset the estimated annual project TCO by $141,600, leaving a net risk-weighted annualized TCO cost of $506,828 ($583 per high school student) for the student laptop approach or $443,257 ($509 per high school student) for the in-house lab approach.

Major qualitative benefits include student achievement measurements as a key to maintaining a high academic ranking within the state, 21st century life skills in preparation for their next level of learning, enhanced curriculum through online learning, enhancing teaching and retaining good teachers, and continued community involvement.

The following page shows the projected benefits worksheet for the laptop project. With the use of thumb drives and if students have computer access outside of school for homework, there are few differences between the laptop solution and in-school one-to-one solution. While there are some conveniences to the laptop approach, there are fewer liabilities and better control, including systems management, with the in-school lab one-to-one approach.

This district did not attempt to score the benefits by applying importance to goals or effect of the benefits on those goals, since arriving at a numeric score is mostly helpful in comparing projects that are competing with other different projects for funding.
## Project Description: One-to-one student laptop project

<table>
<thead>
<tr>
<th>School or District</th>
<th>Importance</th>
<th>Anticipated Project Benefits*</th>
<th>Effect*</th>
<th>Score</th>
<th>$ Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission, Goals and Mandates</td>
<td>State in Measurable Terms (Substitute your specific project goals)</td>
<td></td>
<td>-10 to +10 (Calculated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>$$ Savings (Only items not included in Project Cost Estimator)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost avoidance: Textbooks</td>
<td>$35,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce printing and postage costs</td>
<td>$1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhance teaching staff productivity(FTE at burdened salary):</td>
<td>$46,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generate revenue (grants, bonds, Erate, other):</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase/maintain student enrollment from 870 to 880</td>
<td>$75,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Qualitative Benefits that Affect Mission, Goals, Mandates

#### Student Achievement
- Increase number of students taking AP classes from 127 to 250 by 2013. This will help to drive overall high school achievement levels.
- Increase number of students graduating with a highest distinction diploma by 2013
- Increase graduation rate from 97% to 98.5% by 2013
- Increase the number of students moving from the standard diploma track to a higher track from 10% to 20% students following their freshman year, by 2011.
- Promote cooperation and collaboration among students for intellectual and interpersonal development and mentoring, measured by number of students involved in extra-curricular activities, clubs, community service

#### 21st Century Life Skills
- Use of technology in the learning context so students know how to learn by integrating use of productivity tools into the educational process. Every student will take and 99% pass a proficiency test in the tools used for course work.
- Develop critical thinking and problem-solving skills by
- Foster better student-teacher communications through the use of electronic tools

#### Enhanced Curriculum through Online Learning
- Provide new advanced courses via online learning. The district will introduce 5 new courses by 2010
- Ensure that curricular design maximizes opportunity for a broader educational experience through on-line based curriculum
- Provide a broader selection of courses for all students with alternative areas of concentration

#### Teachers continually advance their practice using effective research-based professional strategies
- Increase teacher retention rate from 90% to 95%
- Increase teacher satisfaction survey results from 80% to 90%
- Increase ability to attract good and highly qualified staff
- Promote cooperation and collaboration among staff for curriculum enhancement and mentoring program
- Enhanced teacher collaboration in developing and sharing media and lessons and other resources based on creation and usage of lessons on the public drive
- Provide self-guided staff development in new skills

#### The community provides the resources to enable the district to continue its mission.
- Empower parents and caregivers with the tools to become more involved. Enhance teacher/parent communications through
- Provide a broader range of community technology training through additional availability of computers in the high school

### Total Score and Dollar Value for this Project

| Probability of Success: 80% | Risk-weighted Dollar Value and Score for the Project | 0 | $141,600 |

**MISSION STATEMENT**
We Achieve and Celebrate Educational Excellence

**Students are challenged and excel according to their abilities and exit our school system prepared for their next level of learning.**

**DISTRICT VISION**
(The district) will be the best school district in the State of Arizona. This will be evident when all stakeholders create an environment where:

- All schools are labeled excelling by the State of Arizona.

**Maintain the "Excelling School" label as one of the top 3 schools in the state - ongoing based on the following measurements: standardized test scores and Annual Yearly Progress**
Reduction of textbooks and enhanced teacher productivity are cited as the biggest cost savings. Teacher time savings are realized largely in the automation of homework assignment, hand-in from students and graded back to students, along with the ability to conduct on-line testing and grading. The district, which has facilities to handle increased enrollment looks forward to this project being responsible for pulling in students from home schooling and other schools, generating additional revenue for the district.

It is a key district goal for the district for “all schools (to be) labeled excelling by the state of Arizona.” This is supported by the district vision “to be the best school district in the state of Arizona.” Advocates for the one-to-one student computing program feel that this project will help to keep the high school in the excelling category.

In addition, many of the specific project benefits are focused directly on the school goal “students are challenged and excel according to their abilities and exit our school system prepared for their next level of learning.” These benefits fit general categories of student achievement, 21st century skills, and enhanced curriculum through online learning.

Other district goals supported by this project include: “Teachers continually advance their practice using effective research-based professional strategies,” and “The community provides the resources to enable the district to continue its mission.”

**Conclusion**

The proposed one-to-one student computing initiative requires a capital outlay override tax to the community. With a large percentage of retired and part-time residents, there has been less than enthusiastic response to previous initiatives to put a laptop computer in the hands of all high school students. To address this concern, the district is evaluating an in-house one-to-one alternative for the high school, where computers will be readily available in school, and students will be issued flash memory cards to transfer their data and assignments between home and school.

Of real importance to winning constituent support is the ability to state the benefits and costs in measurable terms and to relate the benefits to specific district mission and goals. Using the VOI Project Cost Estimator, this district has detailed projections of the total cost of ownership for both approaches. The VOI benefits worksheet helped the district to think about and include some anticipated savings to be applied against the TCO costs and to set measurable anticipated benefits that relate directly to the district’s goals. Use of the CoSN VOI methodology and tools has allowed this district to explain in concise terms why the one-to-one student computing proposal is important to achieving the school district’s mission and goals, which are focused on educational excellence.
Appendix A: Definitions

Total Cost of Ownership (TCO)
TCO can be defined generally as all of the costs involved in implementing and maintaining computers and related networks. Relevant definitions include:

Total Cost includes all costs within the CoSN-Gartner TCO model. It is a balanced look at what it truly takes to support a computer for the district. The metric includes both Direct and Indirect costs.

Direct Costs includes all technology and direct labor costs incurred by the school district during the study period (hardware, software, external application providers, and direct labor).

Indirect Costs includes all of the labor incurred by the user community for the study period. Indirect Labor includes the costs of users supporting one another, time spent in training classes, casual learning, self support, user applications development and downtime costs.

Hardware includes the annual costs for client computers, peripherals, servers, network equipment, and printers.

Software includes the annual costs for all software running on client computers and servers. This would include infrastructure software, educational and administrative software, personal productivity software, as well as content and curriculum specific software.

Direct Labor includes burdened salaries from personnel whose job role includes operations and financial support, professional training, or curriculum development.

External Application Provider includes all costs associated with organizations that provide the use of applications, and associated services to customers.

Client Cost per Client Computer measures the annualized cost of personal computers, and peripherals divided by the total number of client computers.

Server Cost per Client Computer measures the annualized cost of servers divided by the total number of client computers.

Network Cost per Client Computer measures the annualized cost of network equipment (hubs/routers/switches, etc.) divided by the total number of client computers.

Students per Available Client Computer includes the total number of students divided by the total number of client computers located in classrooms, libraries, media centers, labs, etc.,
along with the total number of student dedicated client computers, not including student
owned equipment.

**Teachers per Teacher Dedicated Client Computer** includes the total number of classroom
teachers divided by the total number of client computers dedicated for use by these
individuals.

**Non Classroom Personnel per Non Classroom Personnel Client Computer** includes the
total number of non-classroom personnel divided by the number of client computers
dedicated for use by these individuals.

**Client Computers per Server** includes the total number of client computers divided by the
total number of servers.

**Operations and Financial Cost** measures the total personnel costs, vendor costs associated
with “hands-on” labor, and help desk support around client computers, servers, printers, and
network equipment. It also includes any costs around planning and process management,
finance and administration (budgeting, procurement, asset management etc.), and physical
database administration.

**Professional Development and Training costs** include training of personnel to provide
familiarization, and proficiency with the operation of equipment and software to carry out
school tasks whether instructional or administrative.

**Curriculum Development and Support costs** include labor involved in integrating
technology into the teaching and learning process.

**Client Computers per Staff Metrics** The number of Operations and Financial, Professional
Development and Training, and Curriculum Development and Support personnel are divided
by the total number of client computers to create client computers per staff metrics. Looking
at the data this way tends to normalize for high or low salaries when making comparisons.

**Value of Investment (VOI)**
VOI is a methodology developed by CoSN to help school technology leaders to better
identify costs and benefits of proposed technology projects, in K-12 terms. Relevant
definitions:

**Initial Costs** are the up-front costs incurred for obtaining equipment and implementing the
proposed project, including direct labor and user time in development and training.

**Amortized Years** is the planned or expected life of the project, generally not to exceed five
years or the useful life of the equipment and other technology.
**Ongoing Costs** include the ongoing TCO costs of the proposed project, such as leased equipment, ongoing support and training and ongoing indirect labor.

**District (School) Mission, Goals, Mandates** are formalized statements that most districts and private schools have as their main values and focus. These are generally broad statements that provide a direction for the district (school).

**Importance** of the goals is a measure of the relative importance of each goal, mandate or other district (school) wide imperative.

**Anticipated Project Benefits** are benefits of the proposed project stated in measurable terms and aligned with a respective district goal or mandate. These benefits can be stated as monetary savings for the district (school) where applicable, and/or as benefits related to the public service of the educational institution.

**Effect** is the relative effect that a given anticipated project benefit has on a related district (school) mission, goal, mandate or other imperative. This is measured on a scale of -10 (large negative effect) to +10 (large positive effect).

**Score** is a calculation of the effect of a benefit times the importance of the related mission, goal, mandate or other imperative.

**Risk** is the probability of success as a percentage measured by the level of confidence that the proposed project will essentially meet or exceed the Anticipated Project Benefits.
Appendix B: Related CoSN Resources

A description of CoSN’s VOI methodology, VOI assessment tools and other VOI case studies can be found on CoSN’s VOI website, www.edtechvoi.org. VOI case studies include:

2007 Arizona VOI Case Study
A proposed one-to-one student computing initiative

2007 Iowa VOI Case Study
A plan to provide formative student assessment through data and queries

2007 Wisconsin VOI Case Study
Proposed online learning alternatives

Please refer to the following documents (available at the www.classroomtco.org website) for additional information regarding TCO in the K-12 environment:

Why Total Cost of Ownership (TCO) Matters
Necessary reading before getting started

Preparing for TCO Analysis
Input fields required for the Web-based TCO Tool and extensions for further evaluations

The Web-based TCO Tool
A review of the Web-based TCO Tool

2003 Case Studies
California District Case Study
An urban district with 140,000 students

Minnesota District Case Study
A rural district with 4,000 students

Pennsylvania District Case Study
A rural district with 2,500 students

Utah District Case Study
A suburban district with 49,000 students

2004 TCO Case Studies
Missouri District Case Study
A rural district with 450 students

Texas District Case Study
A Suburban District with 35,500 students

Virginia District Case Study
A suburban/urban district with 166,000 students

Wisconsin District Case Study
An urban district with 21,500 students

One-to-one TCO/VOI Case Studies

Consortium for School Networking
July 2007

www.cosn.org  www.edtechvoi.org
**District 1**
A rural and small town district with 10,200 students

**District 2**
A mostly rural district with 1,800 students

**District 3**
A rural district with 867 students

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**Contact Information**

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