Executive Summary

The California K12 High Speed Network: Developing a Service Model

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The California K12 High Speed Network (hereinafter HSN) has a clearly articulated mission: to enable educators, students and staff across the state to have access to a reliable high speed network which has the capacity to deliver high quality online resources to support teaching and learning and promote academic achievement (see: http://www.k12hsn.org/about/). Four broad goals operationize the mission:

Goal 1: Manage and support a network infrastructure that adequately serves K-12 needs today, tomorrow, and into the future.

Goal 2: Provide an open, inclusive process to nurture a culture of effective collaboration among all stakeholders.

Goal 3: Effectively and efficiently administer the California K-12 High Speed Network using good stewardship and responsive management.

Goal 4: Promote effective use of the California K-12 High Speed Network to improve teaching and learning

Practically speaking, the HSN improves instructional quality by providing technical assistance and access to resources. It therefore has the potential to affect instructional planning and delivery, teacher preparation and ongoing professional development, assessment techniques, administrative oversight, and school operations.

In early Spring 2005, the evaluation team (assisted by two graduate students in the Dept. of Educational Technology at San Diego State University) undertook preparation of a white paper tentatively entitled The California K12 High Speed Network: Developing a Service Model. Highlights of that document are presented in this Executive Summary.

As the title suggests, the intention of this effort is to inform—to ensure that the service and other decisions project managers make (whether technical, operational, conceptual, or fiscal) are fully contextualized and based on thoughtfully-conducted research and lessons learned from creative thinkers and risk-takers.

The aims for this document were several:

• Broadly characterize high speed networks.
  • Technical elements—specifically, infrastructure, hardware, software, etc.
  • Access—specifically, what it “means” to be connected to such a network—and how access responsibilities (costs, for example) are distributed among the core stakeholders, e.g., state, region, county, city (if appropriate), and school.
  • User base—specifically, the several constituent groups that the network impacts (recognizing that their needs and interests vary dramatically).
  • Conceptual—specifically, what processes (instructional planning, innovative instructional strategies/delivery mechanisms, facilities management, data management), materials (stand-alone or integrated content, applications/tools, lessons/units), specific programs/projects, collaborations, communication venues, and assessment techniques a network might support.
  • Assistance—specifically, the groups or individuals to whom network “users’ may turn for assistance (with questions in any domain).

• Briefly compare and contrast California’s “system” with others across the nation. This comparative analysis (of California’s experience with practices other states or districts have employed) is critical to understanding current network performance, contextual
factors that can stymie use, oversight practices to emulate, and areas/issues to pursue in the future.

- **Demonstrate how high-end access potentially “matters” to affects K-12**, in particular:
  - professional development
  - teacher/administrator preparation and licensing
  - curricular planning
  - classroom instruction
  - school operations
  - community connections

- **Focus on the standards (and associated criteria) by which “success” of the HSN and/or its “effectiveness” can be measured** (relative to the attributes noted in Part 3). Thus, we covered:
  - implications of the National Educational Technology Plan.
  - the viability of using established criteria as benchmarks (NETS, CEO Forum, CTAP, etc.)—and then aligning them with California frameworks and content/performance standards.
  - the viability of working more directly with a regional laboratory (NCREL, for example).
  - the complexities of using traditional outcome targets such as:
    - Scores on standardized tests
    - Teacher quality (including graduate degrees and specializations)
    - Daily attendance rates
    - Attrition and matriculation rates
    - Equipment (in schools or otherwise available)—and of what type
    - SAT scores
    - AP enrollments
    - Applications to UC and CSU campuses (as well as acceptances)
    - Grade point averages (high school)
    - Student involvement in extracurricular activities
    - Parent involvement—both formal and informal
    - Grant awards (for specialized projects)
    - Technologies utilized (example: videoconferencing), the frequency of their use (example: monthly), and their “purpose” (example: to facilitate English Dept meetings in which teachers across a 23-school district participate)
    - Nature/type of technology-infused assignments in which students (example: 11th grade/US History) are engaged
Technical Elements Common to High Speed Networks

- **Broadband** is at the heart of all high speed networks. According to the FCC (http://www.fcc.gov/cgb/broadband.html), broadband connections provide at least 200 kbps of data transport.
  - It is the network *backbone* that makes broadband possible. High-capacity and well-configured backbones allow for the high bandwidth needed to transport the huge amounts of data that users send and receive.
- Networks can be configured in different ways to ensure high-speed connectivity. The three most common typologies are *star*, *bus*, and *ring*. Each has benefits and drawbacks associated with *speed*, *resiliency/reliability*, *ability to adjust for traffic load*, *cost to build and maintain*, and *opportunity for growth/expansion*.
- *Peering* and *caching* are key attributes that contribute to high-end network performance.
- Network architects have favored one of three deployment strategies: a) build an entire network from scratch; b) piece together existing networks (with appropriate technical modifications); or c) contract for access to an existing network.
- Most high speed networks associated with education are designed as *intranet*—networks for select participants (educators, nonprofits, government agencies, etc.). *The networks showcased in the document were not designed for commercial users—and commercial marketing/promotion are prohibited.*

**Interesting Facts**

- According to a June 2004 report published by the International Telecommunications Union (see: http://www.itu.int/home/), the US ranks 11th in the world for broadband deployment.
- The National Association of Regulatory Utility Commissioners (NARUC; see: http://www.naruc.org) points to *right of way* as the most important obstacle to resolve in deploying broadband.
- According to TechNet’s 2003 report entitled *State-by-State Ranking of Broadband Deployment Policies*, Michigan and Florida lead the nation in policies that encourage next-generation broadband networks. TechNet’s *State Broadband Index* calls on states to consider a range of policies critical to broadband deployment, including:
  - legislation that standardizes and expedites rights-of-way permitting;
  - adoption of a state-wide broadband strategy and creation of a lead broadband agency;
  - comprehensive infrastructure mapping;
  - policies to enable wholesale municipal networks;
  - innovative initiatives that increase private sector deployment;
  - financial incentives to reach underserved communities; and
  - demand-promotion efforts including enhanced e-government.

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1 Technet is a “…bipartisan, political network of CEOs that promotes the growth of technology and the innovation economy. TechNet focuses on politics and policy by uniting its members and policy makers to sustain and advance America’s global leadership in innovation.”

2 See: http://www.technet.org/press/Press_Releases/?newsReleaseId=2527
What High Speed Networks Do: Service Menus

- As Appendix A illustrates\(^3\), every state has or is developing/enhancing a high speed network; some states have multiple networks in place. While nearly all depend on high capacity fiber optics, actually network configurations vary.

- Personnel are key to the success of high speed networks. One of the most critical functions is the liaison. Liaisons are typically defined as those who directly interface with participating schools, agencies, or other facilities (or those seeking membership).

- Also critical to success are consistent policies and readily-available forms (or direct online access to them)—related to grant opportunities, technical support, licensing, etc.

- While intranets within state borders is the prevailing model, the number of interstate networks is growing. The goal is to make obsolete the very notion of geographical boundaries. Following are examples worth exploring:
  - The Great Plans Network (GPN) connects Nebraska, North Dakota, South Dakota, Kansas, Oklahoma, Arkansas, and Missouri’s education networks. See: \[\text{http://www.greatplains.net/}\].
  - The Mid-Atlantic Crosswords (MAX) connects Virginia, Washington DC, and Maryland’s education networks. See: \[\text{http://www.maxgigapop.net}\].

- High speed networks have a number of distinguishing characteristics associated with:
  - The process by which infrastructure decisions are made, contracts awarded, and actual work conducted/monitored
  - The nature/type of services provided—technical, instructional, informational, etc.
  - Access to (and the nature of) technical support
  - Ownership of the network—including hardware, software, and resources
  - Ongoing management and task delegation
  - Membership options (and levels of accessibility)
  - Network reach and responsibility for last mile connectivity
  - Marketing/promotion of services

The following links hint at the “diversity” issues noted above.

- **Lean in terms of unique resources accessible from the main website:** The Connecticut Education Network or CEN (see: \[\text{http://www.ct.gov/cen/site/default.asp}\]). CEN “... provides incredible access to the Internet, the next generation Internet2, the Connecticut Digital Library, and thousands of other resources exclusively targeted to students, teachers, researchers and administrators in Connecticut’s education institutions.”

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\(^3\) Much of the information for Appendix ___ was drawn from an online **Alliance for Public Technology (APT)** publication entitled: **A Nation of Laboratories: Broadband Policy Experiments in the States** (see: \[\text{http://www.apt.org/publica/lab/}\)]
• **Lean in terms of unique resources accessible from the main website:** The Missouri Research and Education Network or MOREnet (see: [http://www.more.net/about/index.html](http://www.more.net/about/index.html)). MOREnet “… provides high-speed, reliable Internet access to the state’s public sector. A unit of the University of Missouri System, MOREnet serves Missouri’s K-12 schools, colleges and universities, public libraries, state government, teaching hospitals and clinics and other affiliates. In addition to Internet connectivity, MOREnet provides training and technical support needed to make that connection a useful tool. These services ensure that the time MOREnet customers spend with technology is productive and furthers their individual missions.”

• **Resource rich website:** The Utah Education Network (UEN; see: [http://www.uen.org/ueninfo/](http://www.uen.org/ueninfo/)). UEN’s mission is to “… provide Utah students and educators access to statewide electronic network and systems for delivery of educational services that improve the quality of student achievement, communications, and efficiency of services.”

• **No resources directly linked to the main website:** The New York State Education and Research Network (NYSERNet; see: [http://www.nysernet.org/index.php](http://www.nysernet.org/index.php)). NYSERNet delivers “… next-generation Internet services to New York State's research and education community. … NYSERNet advances network technologies to enable collaboration and promote technology transfer for research and education, expanding these advancements to government, industry and the broader community.” A product borne of NYSERNet connectivity is the State Department of Education’s Virtual Learning System (VLS; see: [http://eservices.nysed.gov/vls/](http://eservices.nysed.gov/vls/)), recently showcased in EdWeek (access by subscription). Among other things, the VLS portal offers more than 2500 classroom lessons, an array of library and museum holdings, and scores of public-broadcasting programs.

There is much to learn from a cogent review of the websites in Appendix A and conversations with those who manage them. We encourage members of the NIC and ACC—or those they delegate—to create a strategy/plan to ensure the review is well-focused and aligned with their committees’ specific charge(s). Among the areas they might explore:

• Benefits/drawbacks to membership access/exclusivity
• Multiple entry paths to resources
• Organization content/resources
• Operational strategies
• How user data are collected/analyzed
• Etc.
How High Speed Networks Impact the K12 Community

Basic Assumptions

- We can assume that *high speed access* is integral to school operations, to school life, and to our expectations of student readiness for college and the workforce—that it, in fact, touches every aspect of school management. Among the areas affected are:
  - Teacher preparation
  - Professional development
  - Curricular planning
  - Classroom instruction and assessment
  - School operations (including classroom management)
  - Connections beyond the classroom (parents, larger community, experts)

The research in these areas (whether theoretical or practical) tends to fall into two broad domains—with some overlap:

- a focus on technology-infused practices
- a focus on technology-based delivery

Examples:

- San Diego County Office of Education’s *Professional Development Online Production Team* (see: [http://www.sdcoe.k12.ca.us/pdop/](http://www.sdcoe.k12.ca.us/pdop/)) produces a dizzying array of complex and highly-interactive products for both preservice and veteran teachers. Not all the content, however, targets technology—nor would one expect that to be the case.

- The University of San Diego is one of many, many universities offering California’s teachers opportunities online⁴ to meet requirements associated with the Level 2 credential. Some courses have a technology-focus; others, of course do not.

- LA Unified’s *Learning Zone* (see: [http://www.lausd.k12.ca.us/lausd/offices/opd/](http://www.lausd.k12.ca.us/lausd/offices/opd/) and [http://www.lausd.net/lausd/offices/pddss/](http://www.lausd.net/lausd/offices/pddss/)) attends to professional development online. While some courses/workshops are technology-focused (*Learn How to Integrate Computers in Your Classroom*), others are not.

- A growing number of preservice teachers are completing their field-work portfolios online, using such programs as TaskStream ([http://taskstream.com/pub/](http://taskstream.com/pub/)). The *assumption* is that all those who input to the tool (teacher candidates, university field supervisors, mentor teachers) have the high-speed access they need (including at the field site) to complete their tasks.

Point to discuss:

- Do these six areas provide a viable way for the HSN to organize its resources?

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⁴ [http://www.onlinelearning.net/CourseCatalog/CourseDetail.cfm?s=821.x020t854y.005e319y80&CID=1001754955](http://www.onlinelearning.net/CourseCatalog/CourseDetail.cfm?s=821.x020t854y.005e319y80&CID=1001754955)
The Value of Needs Assessment

- Gathering needs assessment data about each of the six areas earlier mentioned ensures that the HSN “service package” is customer-focused, its mission/vision clear, its expenditures cost-effective, and its goals/objectives attainable.

Needs assessment can take many forms: observation, interviews, review of documents, surveys, action plans, etc. The results inform service decisions—but also provide baseline data critical to later measurement about impact and growth.

- As important is that needs assessment can speak to the underlying conditions that color and often constrain how the K-12 enterprise unfolds, to wit:
  - **Policy.** At the heart of federal, state, and local policies are expectations, mandates, and standards that schools must meet in order to conduct business.
  - **Daily Practices and Guidelines.** Everyday school/district operations are bound by local guidelines, codes, and/or ordinances. They dictate school start/end times, class size, class length, the availability of specialized services to eligible students, purchasing processes, hiring practices, etc.
  - **Environment.** Space (including space allocation) affects how classes unfold. Instructional planning and delivery are bound by the ways rooms are configured (internally) and furnished.
  - **Culture.** Schools are communities with cultural mores. School culture reflects what is valued, rewarded, appreciated, and recognized—and, by extension, what is not.
  - **Priorities.** Schools set priorities, with “order” most often determined by the consequence of nonperformance, noncompliance, or missed targets.
  - **User knowledge and skills/competencies/proficiencies.** Both staff and students come to the table with technology skills sets. Unfortunately, decisions related to technology (software, hardware, connectivity) are often made without thoughtful assessment—causing personal discouragement/disappointment, missed opportunities, and costly mistakes.
  - **Costs/budgets.** Schools operate within limited budgets—and initiatives that aren’t well-connected to school priorities and values tend to be dismissed.
  - **Bureaucratic heaviness.** Schools are bureaucratically thick, with few empowered and independent decision-making discouraged. Delayed decisions or decisions made in haste (i.e., to ensure end-of-year money isn’t “lost”) lead to poor choices that don’t well serve the school community.
  - **Rapid change.** Technological advances strain the decision-making process. It is impossible to keep up.

Measuring HSN Impact

Framing Measurement

- A first step in measuring impact is to determine the investigational issues of interest, specific aspects of those issues to explore—and by what means, likely sources of information, frequency/duration of data collection, ways to promote positive attitudes about assessment/engage stakeholders, how results/findings will be used and by whom, who has access to the raw data—and for what purposes, and strategies for ensuring measurement accuracy and rigor.
• Good measurement is fully integrated into program operations; it is part of doing business—not a response to a perceived problem or shortcoming.
• A corollary of good measurement is needs assessment (as earlier described).
• The National Educational Technology Plan (see: http://www.nationaledtechplan.org/) provides seven action steps that can frame an assessment plan.
• Common understanding of key terms improves measurement rigor and focused use of findings/results. For example, several prominent educational organizations provide “standards” that—in essence—define technological literacy—one of many terms with which key HSN players struggle.
• International Society for Technology in Education (ISTE; see: http://cnets.iste.org/currstands/cstands-il.html). The ISTE literacy standards “cover” the entire school community (students, preservice and veteran teachers, administrators) and fall into three distinct areas: information literacy, independent learning, and social responsibility.
• The American Library Association (ALA; see: http://www.alaa.org). The ALA embeds technology into the performance indicators/outcomes associated with each of its six comprehensive information literacy standards. Standard 2, for example, states that the information literate student accesses needed information effectively and efficiently—and is comprised of five indicators (mostly organized around one’s ability to search for information online and manage what he or she finds).
• Rafferty (1999) organizes technological literacy into three subgroups or domains: text-based alphabetic literacy (which includes interpreting and using information that’s not arranged in sentence or paragraph form); representational literacy (which implies competence with media and symbol interpretation); and tool literacy (which is the ability to use common applications to read, interpret, evaluate, critique, and use information).

It is easy to become overwhelmed by standards—and one must be select in choosing sets that align well with the HSN’s operational charge. That said, standards such as these do more than ensure common definitional ground; they provide fodder for determining the role high speed access plays in developing technological literacy and improved “performance.”

Other problematic terms include content, resources, innovative and high-end. Distinguishing between and among lessons, events, activities, and programs is also difficult.

Aligning Measurement with Standards Systems
If appropriately adapted/tailored, several respected standards systems lend themselves to the measurement of HSN impact.
• Many in the K12 arena look to the highly touted National Educational Technology Standards (NETS) project5 to measure technological competence or technology’s influence on performance. Developed by the International Society for Technology in

5 http://cnets.iste.org/index3.html
Education (ISTE) with funding from the Preparing Tomorrow’s Teachers to Use Technology initiative (PT3; see http://pt3.org), NETS is, in fact, the benchmark by which a growing number of funded technology-infusion efforts are assessed.

Since 1999, several state agencies and professional associations affiliated with teacher preparation have wholly adopted one or more of its several versions. The allure of NETS—whether focused on K-12 students, preservice candidates, veteran teachers, or school administrators—is its breadth of vision. First, performance standards are couched in terms of essential conditions that must be in place institutionally and programmatically if technology is to flourish. To illustrate, among the several conditions associated with teacher preparation include:

- a shared vision for technology;
- equitable access to hardware, software, and telecommunications;
- a commitment to student-centered approaches;
- continuous and rigorous assessment practices to ensure technology use is effective; and active support (resources, expertise) from outside the school (including the business and other communities).

All NETS competencies, regardless of audience (students, teachers, administrators) are organized around clusters. For students, indicator outcomes (termed profiles) are leveled by grade range (PreK-2, 3-5, 6-8, 9-12); for teachers, they are structured around the four phases that characterize teaching training and early practice: general preparation; professional preparation; student teaching/internship; and first-year teaching.

While not a curriculum, per se, NETS does provide more curricular support than the other frameworks showcased in this section. Example “lessons” are fairly explicit; a searchable database in the NETS for Teachers area of the website allows one to locate materials according to such criteria as lesson title, teacher profile (e.g., first year or student teaching/internship); subject area (including educational foundations); and grade range.

- The Milken Family Foundation for Educational Technology promotes its Seven Dimensions for Gauging Progress. First published in 1998, the document helps policymakers, educators, and technology directors determine “… the conditions that should be in place for technology to be used to its greatest educational advantage in any classroom.” Central to the companion piece, entitled Technology in American Schools: Seven Dimensions of Progress - An Educator’s Guide, is a continuum of progress indicators for each dimension organized around three stages of progress: entry, adaptation, and transformation. Transition steps guide an educator from one stage to the next.

Each of the framework’s dimensions (Dimension 1: Learners; Dimension 2: Learning environments; Dimension 3: Professional Competency; Dimension 4: System Capacity; Dimension 5: Community Connections; Dimension 6: Technology Capacity; and Dimension 7: Accountability) is relatively independent, comprised of core areas that stakeholders (most often, within a K-12 environment) should consider as technology and telecommunications are deployed.

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6 See: http://pt3.org/stories/index.html for examples of NETS infusion into accredited credentialing programs—targeting both preservice candidates and teacher educators
7 See: http://cnets.iste.org/teachers/pf/pf_achieve-equit-access.html, for example.
8 See: http://www.mff.org/publications/publications.taf?page=158
For example, fundamental to Dimension 3: Professional Competency are core technology fluency; curriculum, learning, and assessment; professional practice and collegiality; and classroom and instructional management. Teachers interested in generating a status report/profile of their knowledge, skills, and attitudes in these four areas complete the Professional Competency Continuum Online Assessment Tool. The General Assessment provides a competency overview while Detailed Assessments in the four major areas or strands generate customized advice and resources.

Especially appealing about the Seven Dimensions is that the assessment scales (in particular, those associated with professional development) signify receptivity to change and innovation (not merely personal skill, comfort, or frequency of use/application) and encourage group-level (not merely individual) participation (helping to ensure that program transformation is about us ... not merely about me).

• The Standards for Technological Literacy: Content for the Study of Technology—published in 2000—is an outgrowth of the International Technology Education Association’s (ITEA) Technology for All Americans Project. The Standards, which explicitly address what every student in grades K-12 should know and be able to do to be technologically literate, were closely reviewed by the National Research Council (NRC) and the National Academy of Engineering (NAE) prior to publication—and the framework reflects their influence in terms of design, flow, and organization. Currently, the Standards are endorsed by the above referenced organizations as well as the American Association for the Advancement of Science’s (AACE) Project 2061, the National Council of Teachers of Mathematics (NCTM), and the National Science Teachers Association (NSTA). The Standards differ from other frameworks to emerge in recent years because they define the study of technology as a discipline. As such, this document is far more than a “… checklist for the technological facts, concepts, and capabilities that students should master at each level” (Dugger, 2001, p. 514). One chapter, in fact, advocates for technology as an integral part of the school curriculum (detailing the importance of preparing students to live in a technological world), while another calls on educators, the business community, and others to vigorously support the effort.

The standards themselves, 20 in all, are of two distinct but complementary types. The cognitive standards attend to basic knowledge about technology—how it works and its place in the world. The process standards target specific student abilities or competencies. Organizationally, the standards fall into five distinct themes:

• Those associated with the nature of technology theme call for students to acquire knowledge of the characteristics and scope of technology; the core concepts of technology; and the relationships among technologies and the connections between technology and other fields.

• Those associated with the technology and society theme task students with learning the cultural, social, economic, and political effects of technology; the

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9 According to its website, ITEA is the largest professional educational association and information clearinghouse devoted to enhancing technology education (across the K-12 spectrum). The Association’s Technology for All Americans Project (TfAAP) was largely funded by the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA). See: http://www.project2061.org/default_flash.htm and http://www.iteawww.org/TTA/Publications/STL/STLMainPage.htm for further details.

10 And coupled with the recently-published Advancing Excellence in Technological Literacy, tackles key facets of the instructional process: student expectations, assessment strategies, professional development guidelines, and program standards.
effects of technology in the environment; the role of society in the development and use of technology; and the influence of technology on history.

- Those allied with the design theme focus on students understanding the attributes of design; engineering design; and the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

- Those featured in the abilities for a technological world theme call for students to apply the design process; use and maintain technology products and systems; and assess the impact of products and systems.

- Those associated with the designed world theme focus on students selecting and using a broad range of technologies: medical; agricultural and biotechnological; energy and power; information and communication; transportation; manufacturing; and construction.

Coupled with each standard are benchmarks—which specify its fundamental content elements. Simply put, “... benchmarks are statements, organized around grade ranges (K-2, 3-5, 6-8, and 9-12), that describe the specific knowledge and abilities that enable students to meet a given standard” (Dugger, 2001, p. 515). Finally, the document features examples (vignettes) that illustrate how a teacher might plan, implement, and assess instruction to help students attain mastery of a specific standard.

Like NETS, the ITEA Standards are attractive—comprehensive, developmentally-appropriate, precise without being overly prescriptive, coupled with peripheral guidance (e.g., assessment and professional development standards) that makes implementation feasible, well-connected to the sciences, and thoughtfully presented.

- The CEO Forum on Education and Technology (see: http://www.ceoforum.org/) offers two School Technology & Readiness (StaR) Charts—one for the K-12 community, the other for colleges/universities offering teacher preparation programs. Each features a comprehensive assessment that organizes results into one of four profiles. The Early Tech label suggests that an institution, college/school, or teacher prep program offers little or no technology or promotes use that is—at best—perfunctory and low level (e.g., linear tutorial or drill/practice). Target, on the other hand, describes an institution, college/school, or teacher prep program that serves as an innovative model for others to emulate—where staff organize students in innovative ways; offer robust, challenging tasks/activities that build decision-making, problem-solving, and communication/interpersonal competence—and improve academic performance; and target capacities that reflect the work settings students will face upon graduation.11

Each of the four profiles is fairly complex, comprised of several component parts. For example, the Digital element of the K-12 chart is itself comprised of five factors: format; role of education and degree to which digital content is infused into the curriculum; how students use digital content to enhance their learning; % of students with access to digital content—as well as frequency or regularity of access; and percentage of the budget allocated for purchase/acquisition of digital resources.

Institutions reportedly use the ratings data in several ways: to set benchmarks and goals (e.g., around infrastructure/capacity or professional development)—and then monitor progress toward their attainment; to identify technology needs for which grant/award

11 Three key or guiding questions serve as an advance organizer for the StaR Chart (both versions): Is technology (at the school or district level) being used in ways that ensure the best possible teaching and learning? What is a school or district’s “technology profile?” What areas (at the site/district level) should be targeted to ensure effective integration?
applications may be written; to determine how best to allocate technology funds already available; and as the basis of statewide technology assessments. The idea is to make institutions focus on what are dubbed the five key building blocks for student achievement in the 21\textsuperscript{st} century: assessment, alignment, accountability, access, and analysis.

The assessments are decidedly lean—especially when compared to the detail of the charts themselves. Nonetheless, the framework is simple to deploy and offers immediate results and next-steps prescriptions that, though generic, are easy to interpret.

- The enGauge framework—jointly produced by the North Central Regional Educational Laboratory (NCRE; see: \url{http://ncrel.org}) and the Metiri Group (see: \url{http://www.metiri.com/})—is designed to help schools and school districts use technology more effectively and transform themselves into high-performance organizations.

Like NETS, it is structurally organized around essential conditions (reprised below), each featuring several indicators that attend far more to beliefs about innovative teaching/learning and social/digital equity than proficiency with specific hardware and software.

- **Forward-thinking, shared vision**—a systemic approach which ensures that students are prepared to learn, work, and live successfully in a knowledge-based global society.

- **Effective teaching and learning practices**—how well the vision is being executed via well-designed (and technology-integrated) instructional settings premised on sound field-based research.

- **Educator proficiency with effective teaching and learning practices**—the extent to which educators can proficiently implement, assess, and support a variety of teaching and learning strategies.

- **Digital-age equity**—how well all students and unique/specialized student needs are being addressed in educational tasks that align with/reflect the vision.

- **Robust access anywhere, anytime**—the extent to which students and staff have the access they need to support effective instruction.

- **Systems and leadership**—how well the system has transformed itself into a high-performance learning organization.

Similar to the CEO Forum’s StaR Chart, enGauge includes assessments that generate profiles (or snapshots) of the institution or survey-taker’s progress toward “effective” views about and uses of technology; the output also depicts how the institution or respondent prioritizes “21\textsuperscript{st} century skills” and values technology integration in various subject areas. enGauge generates a menu of “high impact” technology-based resources matched to an institution and/or individual's profile.

The enGauge output is lengthy and detailed—unwieldy to transform or convert into concrete plans of action. The framework’s system-wide view, though laudable, calls for many vantage points or positions to be consolidated (from teachers to district technology coordinators)—an immense task for which many school personnel are not well suited or properly trained. enGauge also does not offer much guidance about how

\footnote{See: \url{www.ncrel.org/engauge/framework/sitemap.htm} for full descriptions of each essential condition and its associated indicators.}
to get started and ensure success; in general, the fairly trite advice features five “steps”: Learn (Investigate the rationale and history behind the 21st century skills); Advocate (Set a goal worth striving for); Focus (Find the fit for your school; make the commitment); Activate (Try things; make necessary system changes; get everyone ready); and Impact (Implement with integrity).

To discuss: the value and practical implications of adopting a standards system. For example, should the HSN offer resources that reflect where users “are” relative to their technology skills/competence?

**Tackling Academic Achievement**

- Researchers have long attempted to demonstrate technology’s impact on academic performance. For example, staff from the American Institutes for Research (AIR; see: [http://www.air.org/] recently reported on their in-progress study of the influence of 16 commercial products on academic achievement in reading and mathematics. Funded with moneys dedicated to research authorized under No Child Left Behind, staff were quick to note that—despite their taking great pains to devise rigorously tested instruments and control for the factors that typically plague classroom-based research—this study would be flawed, with results somewhat suspect and generalizability limited. The HSN faces an even more daunting research challenge since the program is primarily focused on technology access—not a discipline-specific or skill-based intervention into which technology has been infused.

A more promising strategy, according to many researchers, is to focus on specialized targets, for example, schools that:

- Offer a unique relationship with the business community (San Diego’s High Tech High; see: [http://www.hightechhigh.org/] )
- Are undergirded by a clearly-delineated instructional philosophy (Napa’s New Technology High; see: [http://www.newtechhigh.org/School/about/about_default.asp] )
- Showcase 24/7 access (Lemon Grove School District; see: [http://www.lgsd.k12.ca.us/lgsd/default.htm] )
- Target traditionally underserved populations, e.g., English Language Learners or students with special needs
- Allow students to attend at least a part of their school day virtually
- Etc.

Such studies could lead to results that point to more general—but supportable—claims of impact in which the State is interested.

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Final Thoughts

- The K12/higher education break seems artificial; nearly every network reviewed appears to target the K-20+ community. *How might connections with higher education be better promoted on the website?*

- Last mile connectivity is really a two-prong issue—one logistical and the other attitudinal.
  
The first concerns the “mechanics” of ensuring school-level access to the HSN—including who bears the costs, who assesses and addresses technical obstacles, etc.
  
The second concerns perceptions of what constitutes the school day and the clear mandate to think 24/7. Districts and schools with a consumer focus aim to meet their constituents’ needs for access before and beyond the traditional school day. Teachers increasingly use that time for instructional planning, assessment, communicating with parents and colleagues, and/or attending to their own professional growth. Students increasingly use that time to complete assignments and extend and/or remediate their learning. What is the HSN’s obligation to serve “off-hour” needs?