BUILDING CONSORTIA-BASED IT SOLUTIONS: A DECISION SUPPORT ARCHITECTURE FOR AGENCIES IN MULTIPLE STATE GOVERNMENTS

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Consortia-based IT solutions can be found in many industries, but they pose special management challenges. This article describes an example from the public sector in which the outcomes include a decision support architecture that facilitates within-organization and cross-organization data analysis and reporting, as well as a Web-based knowledge management store for participants. The author argues that the governance model, processes, and key success factors from this project can be useful for those embarking on multi-organizational projects in which highly autonomous units have incentives to participate.

INTRODUCTION

BUILDING COMPREHENSIVE INFORMATION technology (IT) solutions that address the needs of the enterprise typically partly entails major business process and cultural change as well as significant investments in computer hardware and software. Such efforts characteristically involve an internal team of stakeholders, perhaps supplemented by external IT partner providers. Even when employing and adapting commercially available products, the costs, time, and human resource commitments, as well as the technical challenges, can prove daunting to individual units affected by the project.

Projects that require information exchange and reporting across organizational boundaries have become more common, but pose even more difficult challenges. The banking industry's ATM system is now an example of successful bidirectional, cross-platform, standardized information sharing. More recently, the healthcare industry has been making strides toward a national system of patient data exchange and analysis. These and other industries, from insurance to robotics and computer software, have employed consortia for standards-setting and the like, but competitive pressures and antitrust regulations often stand in the way of more comprehensive within-industry collaboration,

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culminating in actual solution delivery; the challenges faced by the automobile industry's Covisint reflect the difficulties (and potential for failure) faced by this type of initiative.

In contrast, public education within the United States has had a history of cooperation in such areas as curriculum development, teacher and staff development, student assessment, and information technology deployment. Although local and state governments bear the responsibilities for program delivery, the U.S. Department of Education has served as a catalyst for cooperation through its own funding and sometimes regulatory requirements. For example, federally mandated changes concerning educational program performance measurement and reporting have recently been a catalyst for state education agencies (SEAs) to collaborate on information systems for decision support.

This article describes a consortium approach to the design of a common architecture for state-specific as well as cross-state performance-based data management, analysis, and reporting practices. A secondary outcome of the project is a Web-based knowledge management store with a common body of knowledge and best practices to be shared among participating consortium members. Although this specific consortium project has outside funding, its governance model, processes, and key success factors can be a model for building consortia-based IT solutions in other settings.

THE PROJECT CONTEXT

The Catalyst: "No Child Left Behind" (NCLB) Act

When George W. Bush assumed his role as president of the United States, he vowed to make school systems and teachers more accountable for the quality of educational program delivery. This campaign pledge ultimately spawned legislation and administrative practices that have come to be known as the "No Child Left Behind" Act (NCLB). At the core of this legislation is the proposition that every school and district in America should be profiled annually based on the ability of demographic subgroups to make "adequate yearly progress" toward high aggregate goals. The metrics of this new system are based upon the measurement of individual student and teacher "scores" against state standards of excellence.

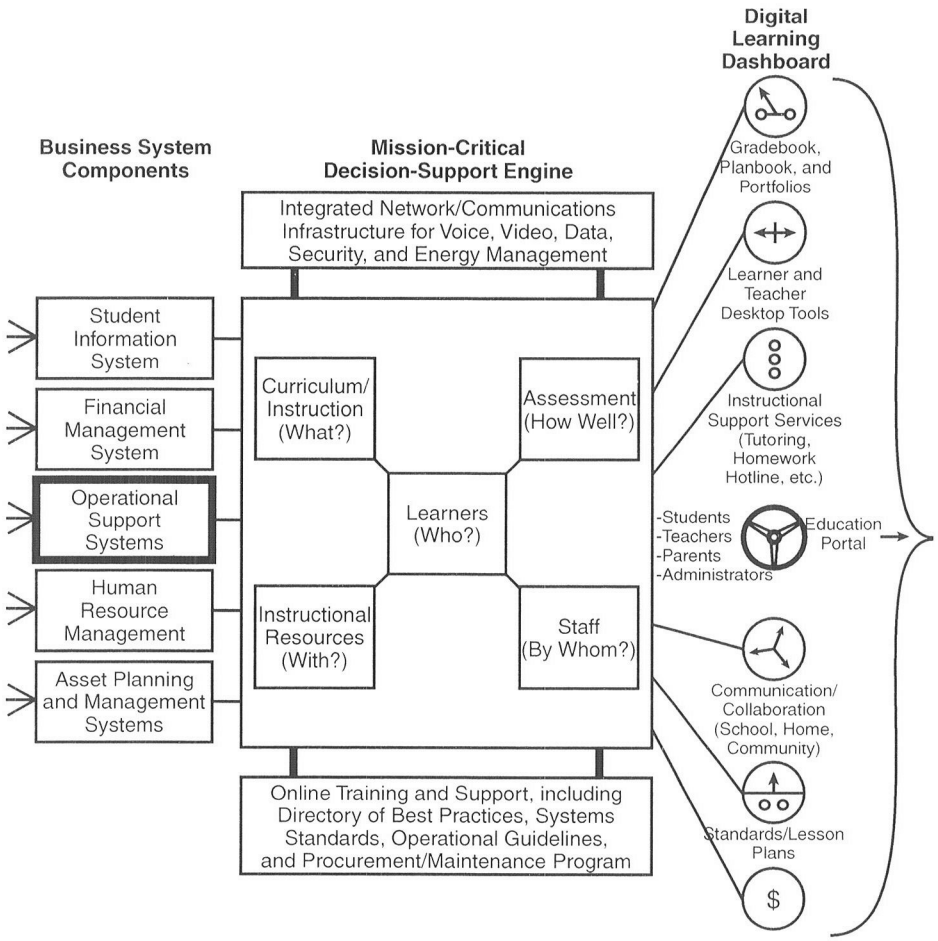
Educators have long sought more effective means to identify, address, and communicate student needs across local, state, and federal educational organizations, as well as outwardly to those they serve — the student and his or her parents. However, the NCLB mandates necessitate information collection, data management and analysis, and cross-organizational reporting capabilities that have not hitherto existed within most school systems. Indeed, prior to the NCLB Act, most reporting occurred only at the school or district level with little to no longitudinal tracking of individual performance.

In response to the gap that existed between the NCLB vision and existing capabilities, the state education agencies and their CCSSO (Council of Chief State School Officers) umbrella organization have embarked on a consortium-based solution to develop a decision support architecture in partnership with a K-12 for-profit educational consultant (the CELT Corporation). The ultimate objective of this project is a solution set that will provide for bi-directional information sharing among students, parents, teachers, school principals, district system superintendents, and state and federal government agencies via an integrated, Web-accessible platform for all stakeholders in the educational process. Over time, this standards-based system could also enable comparative research on learning systems, assessment mechanisms, socioeconomic demographics, and educational needs nationwide (see Figure 1).

From the outset, it was recognized that no single school system or government organization could achieve such an objective on its own. Instead, the Decision Support Architecture Consortium (DSAC) was crafted for this IT project, and the sponsor organization (CCSSO) engaged the for-profit consultants to coordinate the overall effort. The project also demanded an inclusive partnership and governance structure of national and state educational leaders and a wide range of industry-related IT organizations and practitioners. In addition, a typical barrier to participation by the SEAs was significantly lowered: two external foundations (the Gates and Broad Foundations) largely subsidize the external costs associated with the Phase 1 project work.

Although the reader might initially consider this project to be merely another example of government bureaucratic expansion, many of the issues addressed are similar to those faced by any IT organization charged with the implementation of cross-organizational IT solutions that require major process changes as well as IT investments at a local level. In this example, the "lines of business" appreciate that change must occur, but many are not initially aware of

FIGURE 1 An Architectural Framework for 21st Century Learning (© Celt Corporation)



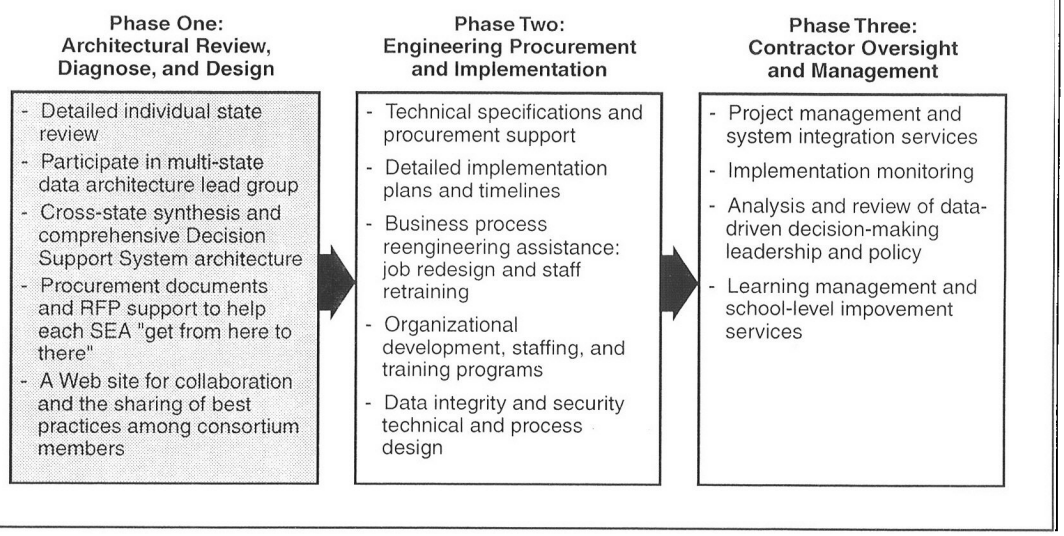
what is required to accomplish the change, nor have they allocated sufficient resources (people, time, and money) for the effort. To make matters worse, there are today no comprehensive answers available in the marketplace, nor are there standards, guidelines, and specifications for the construction of an integrated IT service as envisioned. Similar to projects in large organizations, many of the IT managers themselves are unsure of how to proceed, and the individual and agency stakeholders are handicapped by a state of unreadiness, resource constraints, and an absence of technical know-how to accomplish the mandated objectives.

The DSAC Framework and Deliverables

As originally conceived, the consortium's mission embraced goals and objectives that balanced the needs of SEAs to respond swiftly and effectively to a federal mandate (NCLB Act) with the needs of other state-level learning management system priorities. From the outset, it was clear to the project team that striking this balance was critical to building a critical mass of state participation and support. Thus, in framing their approach to the initiative, the project team sought to address these concerns through a series of commitments to stakeholders, stated in a general form below.

- Deliver a collaborative, standards-based, cost-effective approach to defining and creating student data systems for SEAs.
- Define frameworks and platforms for the more effective use of systemwide data to improve student instruction and assessment, and program resource utilization, that also satisfy NCLB mandates.
- Provide a customized assessment and plan to address the particular vision and needs for each participating state.

FIGURE 2 Project Deliverables by Phase



- Build solutions around a vertical reporting model that addresses federal, state, district, and local information management and reporting needs.
- Embrace best practices and encourage information sharing and collaboration among all stakeholders, while developing solutions in keeping with unique local and state requirements.

As shown in Figure 2, Phase 1 of the project creates an actionable blueprint for each state, based on that state's own educational priorities, complemented by a toolset of component design, specification, and procurement documents that serve to direct state planning and investment strategies. No consortium member (state) is obligated to participate beyond Phase 1, but the artifacts generated during the Phase 1 work and any follow-up knowledge will be shared with consortium members even if they choose to proceed alone in terms of subsequent work. For its part, the consortium stands ready to assist individual member SEAs in subsequent phases; for example, through a project office structure, the consortium will offer its members a shortcut to procurement at significantly lower costs (by creating a single omnibus Request for Proposal (RFP) for procurement) and an efficient (build once/deploy many) implementation scenario.

PHASE 1 PROCESSES

Building Membership in the Consortium

In June 2003 at a meeting of CCSSO members in Indianapolis, council leaders announced the Decision Support Architecture Consortium initiative and their partnership with CELT. From that point going forward, a kick-off team began the cultivation process to win the support of SEA leaders. As it turns out, this was not an easy task. Although a Chief Education Office may head each organization, the underlying structure of the SEAs varied markedly. In some instances this officer could commit the state to the project directly, but in most instances such decisions were deferred to others: the SEA's chief academic officer (curriculum), the CIO (technology), and their respective senior-level staffs. As a result, winning the states over to the consortium became more of a team-based solution selling process.

To break the ice, a senior executive from CCSSO, CELT, or another partner (e.g., a cooperating SEA/CEO) would call on the CEO and explain in detail the goals and the objectives of the consortium. If all went well, this conversation would open the door for more extensive phone conferences between the Phase 1 team and their education program and technology counterparts within the state agency. The purpose of these second-tier conversations was to demonstrate that the team was focused on state needs and priorities, was respectful of the boundaries between state IT roles and those of the project staff, and that the team's intent was to broaden the state's options concerning decision support. In short, these conversations emphasized partnering for mutual benefit and as such were critical to winning SEA support.

Finally, the sales process took into account the preparedness and funding status of each

member state relative to the requirements of the NCLB: some SEAs were already well ahead of others; others had requests for proposals ready to go out to vendors for data warehousing and decision support solutions; still others were totally unprepared for the challenges posed by the U.S. Department of Education's mandates. Similarly, some state legislatures had allocated funding for NCLB-related activities and others had not. In the final analysis, it was this flexibility to adapt its offerings to meet the diverse capabilities of potential members that facilitated a state's acceptance of the consortium approach.

Finding the right mix of incentives to win individual member support will always be a challenge. Some members will join to share the benefits of their "leadership" with others. Some will see the value in learning from their peers (or at the very least leveraging the resources of sister business units). Some will recognize the time and financial gains to be had from collaboration. And still others will join out of the fear of being left behind. To be effective, the team will need to discover and exploit those levers that work best among the relevant stakeholders.

In this case, as previously mentioned, the low cost of participation was a strong incentive for collaboration. Generous grants from the Gates and Broad Foundations reduced the direct cost of participation in the Phase 1 initiative to a nominal amount. A sliding scale was employed, requiring some SEAs to pay as little as $50,000. Even at the high end, these fees represented only a fraction of the true cost of delivering Phase 1 to the membership. In return, however, an investment of time and effort was required for all participants: each SEA had to engage in the data gathering and assessment process, including document gathering, interviews, and the review of the preliminary report. Subsequently, each member also would share what it learned from Phase 1 (and later) efforts via a Web-based knowledge management platform. During 2004, the Phase 1 team anticipates data-gathering activities involving at least 30 SEAs. Evidence to date suggests that even though the states have been through similar information-gathering exercises, they have found great value in the diagnostic tools offered for this project. However, the jury is still out as to whether the states will participate in the creation of a broad knowledge base of experience going forward.

Solution Delivery: Process and Tools

In December 2003, the team began to pilot the data-gathering process with two state organizations (Georgia and Wyoming). From the outset it became clear that rigorous tools were required to ensure the consistent gathering of quality data across organizations. Ironically, to create those tools, the project team concluded that they must create a decision support architectural framework of their own — at least as a "straw person" to the process. As they learned from their field work, they have modified and strengthened the initial model to more accurately reflect the realities in the SEAs.

From the beginning, the team posited that SEA decision support systems must support the set of business processes and IT capabilities in Table 1. Although this appears to be a formidable list of objectives, several national organizations had already addressed, or were working on, key components in this list (see the links to research sites provided in the bibliography).

The resulting hypothetical framework in Figure 3 brings together these various process and infrastructure components. In keeping with consortium commitments, the model encompasses both the need for NCLB compliance (i.e., the upward flow of data to the federal level) with the downward flow of data to local agencies, teachers, students, and parents. It was also important for emphasizing the consortium's value proposition to the key stakeholders. For the project team, this framework was also the starting point in the development of two data-gathering tools: one that focused on SEA decision support policies and processes, and the other that collected information on the state's associated enabling IT infrastructure.

The policy and process tool (a.k.a. the Architecture for Decision Support Template) decomposes an SEA's decision support needs into core business processes, related enabling processes, and IT infrastructure components, which correspond to elements in the architecture framework. The tool then poses a series of questions designed to position the SEA along the various axes of the framework, grading each feature as "planned," "under development," or "implement." In so doing, the project team can identify the gaps in business policies and processes that separate the state organization from the consortium's decision support solution. Similarly, the technology enablement questionnaire (a.k.a. DSAC Technical Framework Tool) requires that the research team rate the availability of all key state IT infrastructure

TABLE 1 Business Processes and IT Underpinnings for Decision Support Architecture

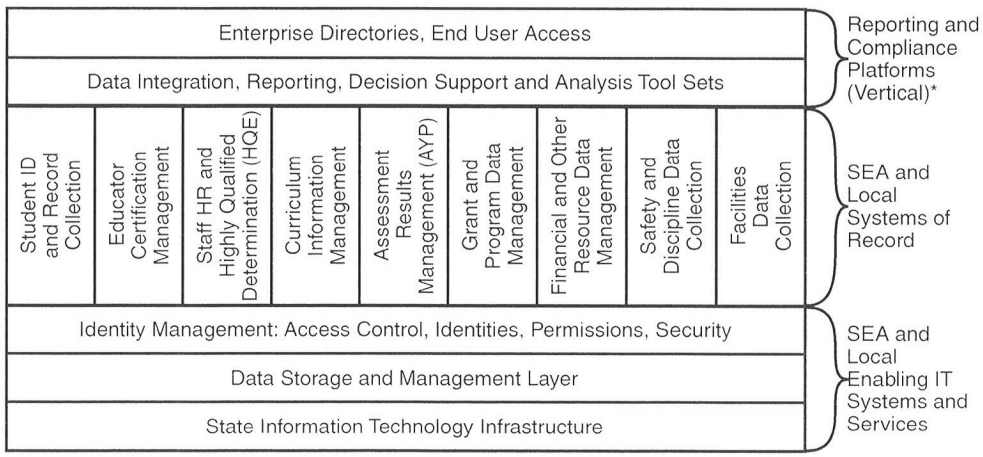
Business Processes

Set learning standards
Administer statewide assessments
Certify educators
Distribute money (formula funding, grants and aid)
Manage accountability systems
Monitor federal programs
Collect and report data (students, staff, curriculum, program, facilities, finance, other resources)

IT Capabilities

Enterprise directory and administrator security services
Student ID management and record collection
Educator certification management
Staff record collection and "highly qualified determination" (of teachers)
State curriculum information management (learning standards, courses)
State assessment results management
Grant and program data collection
End-of-year finance data collection
Safety and discipline information data collection
Facilities information data collection
Data warehousing
Data analysis and decision support tools

FIGURE 3 Framework for Decision Support Architecture



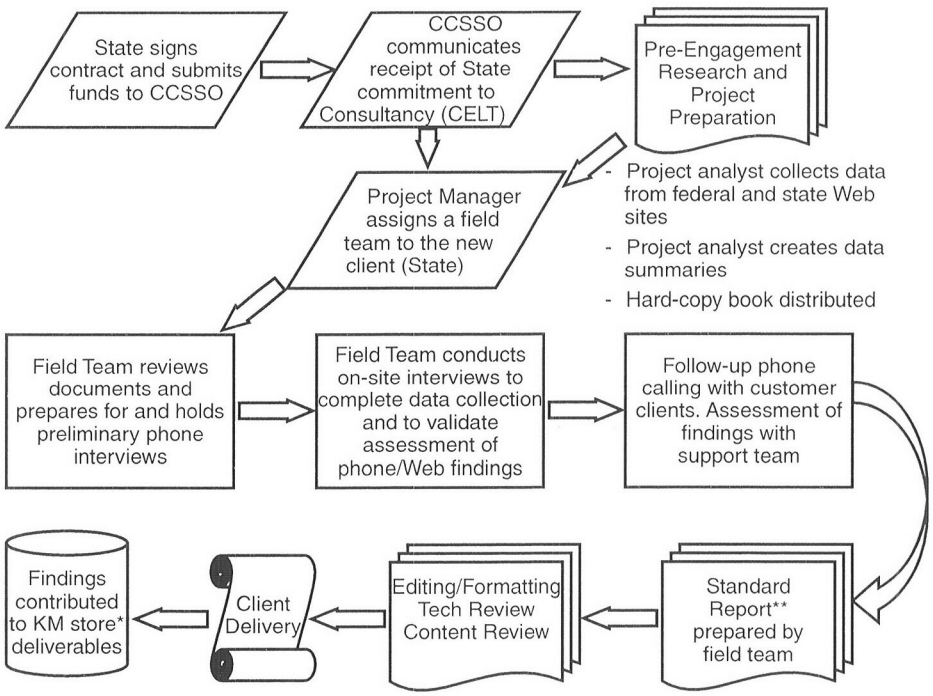
*Vertical bi-directional reporting embraces federal, state, district, school, and classroom requirements.

components for a decision support solution in terms of their appropriateness, completeness, and adaptability, ranging from "outmoded," to "aging," to "mature," to "leading edge." This tool captures the particular capabilities and brand-name products associated with each state system of record and infrastructure hardware/software element.

However, collecting data is a two-edged sword. It is essential to scoping the consortium's issues and in defining the solution set, but the process can stimulate unwarranted expectations around outcomes or annoy those with political agendas tangential to the undertaking. In this case, the consortium vetted its tools with key, representative, and trusted stakeholders to ensure that it gathered the right intelligence without generating concern, consternation, and/or misunderstandings.

With an initial framework and the primary data-gathering tools in hand, field teams were assigned to the states. Each field team included

FIGURE 4 Process Workflow for Data Gathering and Assessment at State Level



*KM store deliverables include generalizable frameworks, specifications, RFP components, best practices, etc., for access by consortium members.
**Standard Report includes: I. Executive Summary and Overview, II. Current Environment, III. Recommendations, IV. Implementation Process, V. Appendices (URLs to KM store and published materials).

a business process and a technology specialist working in tandem. Given the scope and complexities of the undertaking, the data-collection process was highly iterative. Because some portion of relevant project data had already been collected by existing programs and processes, the field teams began with a thorough review of those public domain information sources (see the bibliography at the end of this article). They next conducted phone interviews with the chief education officer and his or her direct reports, building relationships, gathering high-level data, and identifying the next tier to be interviewed. Another set of phone interviews ensued with subject matter experts, including state curriculum and technology officers, district superintendents, schoolboard members, and teachers as appropriate. Finally, the field team would schedule a two-day on-site visit to validate the information gathering to date and to fill in any gaps in the narrative. The steps in the research process are summarized in Figure 4.

With the phone and site work behind them, each field team then prepares the state-specific report using a standard template. The report draft is first reviewed for completeness and quality by an extended project team before it goes to the particular SEA's leadership for preliminary review. The signoff of the draft document includes either a face-to-face or a Web-based meeting to ensure that the SEA leadership is

TABLE 2 Documentation Provided to State Agencies

Architectural frameworks that define appropriate policy, process, and information technology components
Process best practices for decision support system design, development, implementation, and ongoing support
Technical specifications for the IT elements of the solution set
Based upon the frameworks and specifications, draft RFP components for the adaptation and adoption within state-specific procurement processes
A library and directory of other information sources of relevance decision support system development for state and local agencies
Other knowledge artifacts of interest/use to consortium members

comfortable with the findings before they are made official. This step is particularly important in a consortium project where large and small political considerations may determine the longevity of member participation, and where assessments without the proper context can lead to misunderstandings that could damage the collegial framework of member interactions. If properly packaged, the consortium findings will assist SEAs in their quests for state and federal funding to implement the report's recommendations. Although it may incur added expense and take more time, an iterative approach to information sharing and ongoing membership cultivation and education is part of the information-sharing process.

Process Deliverables

Each SEA receives its own hard-copy assessment and recommendation documentation (see Table 2), which can be used to help the SEA choose a particular course of action as they plan Phase 2 and 3 activities. Most state organizations will rely on public RFP processes to identify hardware, software, and service providers for follow-up work. Whatever their chosen path, consortium members will have a rich body of generalized knowledge to inform their next steps.

As the field teams release individualized state reports, they will update their own practices and models based upon their hands-on experiences with the SEAs. With a critical mass of state studies in hand (somewhere between five and ten), the team should have access to a well-tested set of tools as well as the deliverables in Table 2. It is these knowledge assets that are expected to offer the strongest return on investment for state participation in the consortium.

For the time being, the focus of the consortium remains on Phase 1 data collection, analysis, and reporting. In the future, the consortium Web site will also feature articles on current field work in participating states, threaded discussions built around subjects of concern to DSAC members, e-mail and other group communication capabilities, links to other Web resources, and so forth. As states launch their more tailored decision support system solution sets, the project Web site can serve as one of the venues for sharing these developments with other state and local members.

KEY SUCCESS FACTORS AND LESSONS LEARNED

At the time of writing, the Decision Support Architecture Consortium is still a work in progress. Yet, even at this stage in its evolution, it is clear to those involved that the effort's current and ongoing success is dependent upon a number of key factors, which are described in Table 3. There are also some general lessons to be learned from this consortium project experience.

First and foremost, collaboration improves results. Although some state members of the consortium had progressed further along the solution development curve than others before joining the project, all members have benefited from leveraging a common vendor's resources, applying project findings, and avoiding the mistakes of their colleagues on the bleeding edge. To help others find their way and to ensure a high level of common understanding and collective communication, the consortium relies upon a Web-enabled, knowledge management platform.

Second, healthy competition within the consortium encouraged the timid to move with the group toward a more aggressive solution than they might otherwise have sought on their own.

Third, because any large-scale IT deployment also entails business process reengineering and change, the political "horse trading" and negotiations that were part and parcel of the consortium experience helped to develop among some participants the "political" and people skills so necessary to winning business unit support for change.

These same lessons would also be relevant for both large in-house projects involving stakeholders from highly autonomous units, as well as undertakings that involve multiple cross-organizational collaboration with external entities.

CONCLUSION

Although consortia-based approaches to IT solution delivery do not apply in all settings, our case study suggests that effective project management is key. All large-scale IT projects must take into account the diverse needs of those affected by such efforts. Ignoring or rationalizing stakeholder resistance to change or differing priorities places the project at risk; to gain line-of-business buy-in in an enterprise setting, it is much better to model an approach that anticipates and flattens these barriers proactively. In a consortium setting, such methods are needed to build membership.

TABLE 3 Lessons Learned

Leadership:

A consortium approach needs an individual or organization to initially catalyze and organize the effort, as well as to spearhead initial priority setting, methods, and funding.
An authoritative, yet neutral/objective party is best positioned to charter the launch.
A charter is essential in clearly defining the purpose of the consortium, the roles and responsibilities of consortium members, and in attracting/growing membership.
The consortium's value proposition needs to be articulated to the membership in ways that are meaningful. The overall offering must clearly align with the concerns and interests of the individual member organizations, and a strong economic incentive needs to exist for members to join rather than going it alone.

Membership:

Recognize that each member of a consortium comes to the proposition with his or her organization's own goals and baggage. Do not design a one-size-fits-all approach, but recognize the relative positioning of members' capabilities prior to joining the consortium.
Growing consortium membership means having the right people in the conversation (i.e., personal networking) and the "sell" must tailor the benefits of joining to the member.
Be respectful of the local domains of responsibility and expertise represented by prospective members. Make it clear that you seek partnerships and mutually beneficial outcomes in realizing the goals of the consortium.

Partnership:

Build trust at all levels within the organization through continuous, timely, and open communication. Electronic media such as Web site and collaborative software tools can enable such practices.
Engage others and be inclusive. If other organizations offer complementary or similar benefits, look to collaborate or merge with those entities.
Involve external experts and marketplace thought leaders.
Employ consortium members to recruit others and to contribute to the content and products that constitute your desired offerings.
Consider commercial partners for financial sponsors and logistical support, recognizing it is a two-edged sword: external IT providers have much to offer to the discussion, but also have a vested interest in swaying the outcome towards their products and service offerings.

Continuous Improvement through Collaboration:

Do not reinvent the wheel. When data gathering, first go to published or other available sources before conducting surveys, interviews, and other direct data gathering.
Leverage collective findings, but allow for individualized priorities and initiatives when servicing individual members.
Model the results anticipated to initially build tools for effective data collection and analysis, but quickly modify these tools as you learn more about the business processes and technological capabilities of your members.
Pilot your tool sets and processes, but then give special consideration to those members who have served as your initial guinea pigs.
Be iterative in your data collection, analysis, review, and consultation processes.
Invest the time and other resources to share and leverage knowledge for mutual advantage.

In addition, broad-based stakeholder involvement in the development of project tool sets, and consistent use of the tools during the life of the project, are sensible stratagems irrespective of the project's governance model. Although some IT project teams pay only lip service to knowledge management, this case study clearly demonstrates that attention to the documentation of processes, lessons learned, and overall delivery can be essential to the value proposition for a consortium-based IT project. ▲

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Internet-Based Sources of Information for Related Government Initiatives

- USDOE Information
  - http://www.ed.state.{state name}
  - http://www.measuredprogress.org/"state"profile/
  - http://www.ed.state.us/integrated programs/NCLB/reading_first_grant.pdf
  - http://www.ed.state.us/Reportsand Statistics/AttendanceAndEnrollment.htm
- Adequate Yearly Progress (AYP)
  - http://www.ed.state.us/integratedprograms/NCLB/AYP&SINI.htm
- Financial Information
  - http://www.ed.state.us/Reportsand Statistics/FinancialReports.htm
  - http://www.ed.state.us/Reportsand Statistics/StaffingAndSalary.htm
- Assessment Letters
  - http://www.ed.gov/admins/lead/account/finalassess{state name}.html
  - http://www.ed.gov/admins/lead/account/finalassess/{state name}.html
- NCLB Decision Letter
  - http://www.ed.gov/admins/lead/account/letters/{state name}.doc
- State Plan
  - http://www.doe.k12.ga.us/_documents/support/plan/esea_plan.pdf
  - http://www.ed.gov/admins/lead/account/stateplans03/gacsa.pdf
- State Status
  - http://www.ecs.org/NCLBsurvey
- Quality Counts 2004
  - http://www.edweek.org/sreports/qc04/state.cfm?slug={state name}
  - http://www.edweek.org/context/states/stateinfo.cfm?stateabbrv={state name}
- State Profile and Report Card
  - http://www.ed.state.nh.us/NAEP/purpose.htm
  - http://www.edweek.org/sreports/qc04/state_data.cfm?slug={state name}
  - http://nces.ed.gov/nationsreportcard/states/profile.asp
- PDMI Documents
  - http://evalsoft07.evalsoft.com/pbdmi/asp/{state name}