



Secretary to Secretary *The Path from Data to Decisions*

From a keystroke at a school to a stakeholder's decision, a network of software applications supports data driven decision making (D3M). Linking software applications for data sharing is the role of technology standards such as SIF™ (Schools Interoperability Framework). System interoperability reduces the burden on school staff, strengthens data quality, and improves the timeliness of data collection/reporting efforts.

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A constant in education is that much of our data originate when a school secretary registers a student for the first time. Data about the student pass through the different levels of the education enterprise and eventually end up in reports read by the U.S. Secretary of Education. Along the way, all the stakeholders in the education community manage, access, or use the data within this enormous network of software applications and data exchange processes.

What has *not* remained constant is how this process works. Significant advances have been made in how education information systems acquire, exchange, store, and provide their data to decision makers. In fact, this paper describes how national standards enable linkages across the organizational levels of the education enterprise so data can be exchanged securely and electronically—and importantly, quickly.

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The vision this picture represents is one of interoperability in which data are entered once, then shared electronically with all the other software systems within a pre-established community or zone. To participate in this zone, users and software applications must meet ultimate standards for authentication, authorization, and physical security. The confidentiality of personally identifiable data within an individual's records must be maintained faithfully within both data files and reports.

Clearly, this single illustration of interoperability simplifies the processes required. There are also alternative models and paths that can connect software applications. The purpose here is not to recommend or endorse a single model, but to show that models are practical to make all the connections required to achieve a truly interoperable education information community. That said, this picture illustrates how many players there are at the different levels of the education enterprise. Each and every one of them depends upon timely, quality data for their purposes.

Interoperability is used here as a general term describing the linking of software applications in a network or zone such that data can be exchanged accurately, quickly, and securely.

What Needs to be Done

There are actions required on the part of all the players in this arena to make interoperability a reality.

Schools:

- Require that your software systems be linked so you can enter data only one time and have them shared across all systems.
- Resolve any misgivings or conflicts that may now exist that hinder sharing of data across offices within your school. The security, authentication, and authorization features in today's systems provide excellent controls.
- Address issues with FERPA, state legislation, and local policy to allow interoperability with these controls in place.
- Require that all the data you enter at your school be available to you for decision making. Expect data reporting to be a two-way process.
- Begin sending and receiving electronic student transcripts.
- Learn about SIF, understand what your school and district need in order to implement SIF technology.

The standard used to illustrate the data exchange process is *SIF*, the **Schools Interoperability Framework**.

This open standard provides the best available technology solution at this time. A description of SIF can be accessed at www.sifinfo.org.

Districts:

- Complete the SIF "District Survey and Implementation Planner" available online at no cost at www.sifinfo.org. The results are provided in the form of a plan describing your district's status and recommending next steps in the process of implementing interoperability.
- Follow the next steps recommended in the "District Implementation Plan" provided after completing the on-line planning tool.
- Include the SIF recommended requirements in requests for proposals and bids for software applications. See www.espsolutionsgroup.com/sifrfp for sample text.
- Require that all data be "Max Yield Data" as described on www.educationadvisor.info. Max Yield Data are those that everyone agrees are worth the effort to collect and report.
- Support schools in sending and receiving electronic student transcripts.
- Encourage your state education agency to accept electronic files and individual records in SIF, XML, or other standard formats.

State Education Agencies:

- Encourage districts to complete the SIF "District Survey and Implementation Planner." Review the results to help plan statewide initiatives that support school, district, and state interoperability.
- Include interoperability standards and requirements in all requests for proposals or bids for software systems.
- Design and implement state-level information systems to be two-way—both collecting data from schools and districts and returning enhanced data to them for decision support.

U.S. Department of Education:

- Encourage states to participate in standards organizations such as SIF to ensure the best design and the greatest universality for data exchange standards.
- Continue the development of and the alignment of all the on-going data standards activities, e.g., National Center for Education Statistics Data Handbooks On-Line (<http://nces.ed.gov/programs/handbook>) and the Education Data Exchange Network.
- Continue the active participation of USED in SIF standards development.
- Coordinate with SIF to develop objects for SEAs to submit data to EDEN.
- Support the efforts to promote electronic transcript exchange standards by SPEEDE/EXPRESS, PESC XML transcript standard, and SIF's transcript objects.

Software Vendors:

- Join SIF and participate actively.
- Obtain SIF certification for agents and software applications sold to the education community.
- Encourage districts to complete the SIF "District Survey and Implementation Planner."
- Support and use open standards such as SIF in the design of software applications.

Explaining the Process

The illustration developed describes the path that data follow when traveling from a school to the federal level. The path surrounds the stakeholders who are poised to practice their data driven decision making on demand.

Four levels of the education enterprise are illustrated.

1. **The School:** This is the basic level of the information community. Most education data originate here. Many errors in the education data community begin at the point the data are initially entered—and are faithfully perpetuated throughout the system. Problems with data quality at this level are the most insidious, persisting inconspicuously throughout shared systems at other levels with serious effects. The school level is also where the data for individuals is the most meaningful. This is the level where the individuals described by the data exist and where services for them are delivered. There is more personal connection between the data and the people they represent here. Data quality begins here, the responsibility for error correction typically returns here.

The information systems at the school handle individual records. Creating an interoperable zone here eliminates the most re-keying of data and has the most potential for avoiding errors. The timeliness of data is most crucial at the school level—data that are available after an instructional activity has occurred are valueless.

2. **The District:** The district level represents the consolidation of administrative services to support schools. Whether this is a responsibility within the only school in the administrative structure (e.g., a very small district or charter school), a supervisory union, a regional center, a cooperative, a county, or a typical local education agency (LEA), the district functions to consolidate data for submission to the state education agency (SEA). The district has responsibility for quality control both in monitoring data from schools and in ensuring accuracy in reporting to the SEA.

Districts have information systems that manage functions across schools, e.g., transportation, finance, human resources, etc. However, these and others such as food services and library services may be either at the school or district level.

3. **The State Education Agency:** The state level accumulates data from the district level. However, some state data collections come directly from schools. The SEA has responsibility for some statewide information systems such as educator certification, school and district accreditation, school and district accountability, and statewide student assessments. At the SEA level, the data submitted from districts are consolidated with data collected directly by the SEA.
4. **The U.S. Department of Education:** The federal level is represented by the U.S. Department of Education (USED). By design, individual student and other unit records are not accepted by USED. SEAs are expected to calculate their official statistics for submission to USED. (There are some exceptions for special programs, but these are rare and closely regulated.)

USED has built the Education Data Exchange Network (EDEN) to manage their major data submissions from SEAs. This reporting process is electronic and accepts files in XML or flat file formats.

A fifth dimension to this education data community is the data driven decision making (D3M) of the stakeholders themselves. Apart from the software, hardware, networks, and policies that make up the infrastructure of the education information system, the stakeholders stand in the middle awaiting access to the data to take action. These stakeholders overlap the actual levels of the education community, but for simplicity in the picture, they are shown at the level where they most frequently operate. The “public,” participating at all four levels, include taxpayers, news media, and other interested people.

1. **School:** Parents, students, teachers, school staff, school advisory groups, businesses, and the public
2. **District:** LEA superintendent, local board of education, district staff, public
3. **State:** SEA superintendent, state board of education, SEA staff, state legislature, and the public
4. **Federal:** Secretary of education, USED staff, White House, Congress, and the public

These D3M practitioners access education data from public and/or private web sites. Authorized staff within an agency also access reports and run queries using the internal decision support resources.

The Path from Secretary to Secretary

This illustration tracks data about an individual student from the time a school secretary enters them into the student information system to the time the U.S. Secretary of Education views a report with aggregate statistics that include the student’s data.

1. The general process represented in this illustration begins with a school secretary (or other person responsible for registration) entering registration information about a student into the school’s student information system (SIS) application. With the SIF interoperability in

place, the SIF agent for the SIS updates the new data in all the other software applications sharing the School SIF Zone. No duplicate keying of the data into separate systems is required.

- If the school has a local data repository, mart, or warehouse, the data also go there for use in the decision support system's reports and queries, and for display on the school's web site.
 - New students require a state student identifier. The secretary connects to the SEA's student identifier and locator system for one to be assigned or for an existing one to be found.
 - Electronic transcripts are produced for college admissions, schools where students have transferred, and many other activities requiring authentication of a student's record.
2. The data entered by the secretary travel through the school's system and go to the school-to-district SIF zone shared by all other schools within the district. The data are then directed to the district's data repository, mart, or warehouse.
 - Within the district's SIF zone, the data are shared by all software applications with SIF agents.
 - The student's data are moved to the district-to-state report management process, where state reports are created. This process acknowledges that the data as stored within a district's system typically require some processing before they can pass on to the SEA.
 3. The data within the district's system come out of the district's state report management process and travel to the district-to-state SIF zone. The data are then directed to the SEA's data repository, mart, or warehouse.
 - Within the SEA's SIF zone, the data are shared by all software applications with SIF agents.
 - The SEA's student identifier and locator system manages the unique statewide student identifiers for all schools and districts, and keeps the SEA's internal information systems up-to-date.
 - The student's data are moved to the state-to-federal report management process, where federal reports are created. This process acknowledges that the data stored within a state's system as individual records must be converted to aggregate statistics before they can pass on to the SEA.
 4. The data within the SEA's system come out of the state-to-federal report management process and travel to the state-to-federal SIF zone. The data are then directed to EDEN.
 - EDEN's decision support functions provide both standard reports and queries to the USED users, including the Secretary of Education.
 5. At any time during the journey of the data from school to USED, the stakeholders practicing D3M have appropriate access to reports and queries either through web pages or internal to an agency through the standard reports and queries.

Components of the Data Exchange Process

The process flow diagram contains several components that are linked together in SIF zones or over the Internet.

Electronic Transcripts represent the exchange of official student records among elementary and secondary schools, postsecondary institutions, and other agencies (e.g., NCAA, certification agencies, businesses/employers, armed forces, etc.). Several alternative standards exist or are being developed for these electronic exchanges, e.g., SPEEDE/ExPRESS (ANSI X12 EDI), SIF Transcript Objects (XML), and PESC Transcript (XML). The challenge is crosswalking between these standards to enable all schools and agencies to participate in electronic exchanges.

Student Identifier and Locator Systems represent a function that assigns and maintains unique student identifiers for all the students in a state. The locator function allows a school to verify a student's identifier to avoid assignment of duplicates.

District-to-State Report Management represents the requirement for districts to extract, transform, and load their data into the required format for submission to their SEA. In this process, business rules, formulas, and code crosswalking are applied to meet the mandated standard.

State-to-Federal Report Management represents the requirement for SEAs to extract, transform, and load their data into the required format for submission to the USED for EDEN. In this process, business rules, formulas, and code crosswalking are applied to meet the mandated standard. In addition, aggregate statistics are derived from individual records.

Software applications manage the instructional and administrative functions for schools, districts, states, and the U.S. Department of Education.

A SIF-Certified Agent extracts data from a software application, transfers them to a standard format, and loads them into the SIF zone for exchange with other software applications.

In an environment where data are exchanged using the Schools Interoperability Framework (SIF) technology, a SIF Zone is created connecting the authorized trading partners. A zone integration server (ZIS) is the electronic post office system – accepting data from one software application and delivering it to another.

Without SIF, an organization will use another automated data exchange process to extract, transfer, and load the data. In 2004, many of these processes were labor intensive—requiring custom programming of extracts and reformatting of data each time they were handed off from one software application to another.

The Decision Support System that makes data driven decision making (D3M) possible depends upon a central data resource with reporting tools such as *ad hoc* queries and standard reports. The Central Data Resource can be a simple repository where data from a variety of sources are brought together. At the high end, a data warehouse provides not only a central location, but also an organized integration of the data into a relational set of tables that present the data in an optimal way for access and analysis.

A Web Site is the public portal to the organization's published information. The portal also provides controlled access to confidential information for authorized users.