IES PRS

Application Profile

Application Number: R372A05132

Competition: 84.372A05 **Date Entered:** 6/30/2005

Organization Information

Organization Name: Arkansas Department of Education

Organization Unit: Division of Research and Technology

Organization Address: 4 Capitol Mall

Little Rock, AR 72201 **Country:** United States of America

Project Director Name and Information

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Collaboration Organization(s)

Organization Name	Organization Type	State	Country	Key Personnel	Role on Project
Arkansas Department of Information Systems	State	AR	United States of America	Kolstad, Max	Project Manager for computing and telecommunications environment
Cognos, Inc.	Private, Profit-Making Organization		Canada	Mason, Mark	Project manager for Cognos implementation
TRIAND	Private, Profit-Making Organization	TX	United States of America	Dugan, Brad	Project manager for TRIAND implementation
State Educational Technology Directors Association (SETDA)	Other (Specify) Association	VA	United States of America	George, Melinda	Oversight of SETDA Networking and Dissemination Services
Metis Associates, Inc.	Private, Profit-Making Organization	NY	United States of America	Cribben, Dennis	Oversight of Metis Service Delivery

Application Title

Arkansas Department of Education Longitudinal Data System Project

State Identifier

Period of Performance

Project Begin Date: 11/01/2005 **Project End Date:** 09/30/2008

Abstract

Project Abstract

Arkansas Department of Education Longitudinal Data System Project

Arkansas currently has a distributed set of operational and transaction databases that support the State's and school districts' fiscal, personnel and program operations and statewide and federal reporting requirements. Each system has its own data model, data dictionary, business rules and

quality assurance procedures. From an operational perspective, these systems are generally satisfactory and data are adequate to meet reporting requirements, including those associated with No Child Left Behind; however, the value of the stored information is diminished by the considerable effort required to design and conduct cross-system analyses. The Arkansas Department of Education (ADE) proposes to construct a longitudinal data system to fill gaps in its current systems and more effectively manage, analyze, disaggregate, and use individual student data to support decision making at the state, district, school, classroom and parent levels, in order to eliminate achievement gaps and improve learning of all students.

Building on the existing data systems, ADE will establish an enterprise-wide data architecture and construct and deploy a data warehouse that provides for integration of the State's fiscal, student and staff data. Using its own resources, augmented by funding from the IES grant, ADE is planning to develop the following project components:

• ¬Commitment of a unique student identifier strategy;
• ¬Creation of an enterprise-wide data architecture that includes a data model, data dictionary, business rules, and quality assurance procedures;
• ¬Construction and implementation of an integrated data warehouse consisting of a set of coordinated subject-oriented data marts within the context of the Cognos Education Performance Management Solution (EPMS);
• ¬Redevelopment or enhancement of existing operational systems;
• ¬Design, construction and implementation of a web-based repository of student K-20 transcripts and methods for electronic exchange of transcripts across districts and between states and between K-12 and institutions of higher education;
• ¬Development of a Business Intelligence tool set that delivers reports, tables, charts or graphs, and spreadsheets that will allow consumers to gain access to the information they need;
• ¬An Information Distribution and Training Program that ensures that data resources and their uses are made widely known and are used to their fullest potential;
• ¬Development of a comprehensive data quality assurance program, including a provision for extensive system testing; and
• ¬Establishment of methods for documenting and disseminating lessons learned and best practices with educational leaders, researchers and the community at large.

The project will be guided by a permanent ADE Education Information Systems Planning Group (EISPG), which currently includes leaders both in ADE and the Arkansas Department of Information Systems (DIS). The EISPG will be broadened to include parent, teacher and administrator representatives. The project, which is already under way, is deeply embedded in the ongoing activities of ADE and DIS, which will ensure its sustainability following the federal funding period.

Human Subjects: No **Exempt from Regulations:** No **Exemption #:** **Assurance #:**

Exempt Narrative:

Non-Exempt Narrative:

Estimated Funding

Federal:	$3,328,503.00	**Local:**	$0.00		
Applicant:	(b)(4)	**Other:**	$0.00	**Total:**	(b)(4)
State:	$0.00	**Program Income:**	$0.00		

Federal Budget

Budget Categories	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Personnel	$90,000.00	$92,250.00	$94,864.00	$0.00	$0.00	$277,114.00
2. Fringe Benefits	$27,002.00	$27,537.00	$28,159.00	$0.00	$0.00	$82,698.00
3. Travel	$5,200.00	$5,200.00	$5,200.00	$0.00	$0.00	$15,600.00
4. Equipment	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5. Supplies	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
6. Contractual	$825,000.00	$1,030,000.00	$765,500.00	$0.00	$0.00	$2,620,500.00
7. Construction	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
8. Other	$15,000.00	$15,000.00	$0.00	$0.00	$0.00	$30,000.00
9. Total Direct Costs	$962,202.00	$1,169,987.00	$893,723.00	$0.00	$0.00	$3,025,912.00
10. Indirect Costs	$96,220.00	$116,999.00	$89,372.00	$0.00	$0.00	$302,591.00
11. Training Stipends	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

12. Total Costs	$1,058,422.00	$1,286,986.00	$983,095.00	$0.00	$0.00	$3,328,503.00

Non-Federal Budget

Budget Categories	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Personnel	(b)(4)					
2. Fringe Benefits						
3. Travel						
4. Equipment						
5. Supplies						
6. Contractual						
7. Construction						
8. Other						
9. Total Direct Costs						
10. Indirect Costs						
11. Training Stipends						
12. Total Costs						

Application Details

D-U-N-S Number:	(b)(2)	T-I-N:	71-6007390	Duration (years):	3
Any Federal Debt:	No	Specify:			
Type of Applicant:	Other (Specify)	If Other, Specify:	State educational agency		

Authorized Representative Information

AR Name	AR Address	AR Phone	AR Fax	AR E-mail	Primary:
Mr. James G Boardman	4 Capitol Mall Little Rock, AR 72201 United States of America	501-371-5005	501-371-5010	jboardman@arkedu.k12.ar.us	Yes

Project Narrative

(1) Need for the Project

INTRODUCTION

For more than a decade, the Arkansas community of policy makers, educators and parents has collectively focused on using technology as a means to achieve Arkansas' educational goals. Building on the significant work accomplished in recent years, today Arkansas is well positioned to establish an educational enterprise architecture that integrates its major statewide educational data stores and to implement a statewide longitudinal data system that will allow it to realize the goals set forth in the Institute of Education Sciences (IES) Request for Applications (RFA).

In 2000, Arkansas developed a technology plan that focused on K-12 education, with the objective of embracing all aspects of the Arkansas Comprehensive Testing, Assessment and Accountability Program (ACTAAP) and other Arkansas Department of Education (ADE) initiatives to achieve established benchmarks for teaching and learning by:

- Ensuring student-centered technology-rich learning environments;
- Empowering faculty to use technology as a tool to enhance learning;
- Equipping learners to be technology literate and productive in an information driven society;
- Engaging in collaboration with educational and community- based technology providers; and
- Endowing school personnel with immediate access to tools, data and information needed to make decisions, educate, and to learn.

The state's plan for construction of a longitudinal data system is grounded in research results and identified best practices, as well as by federal and state mandates established by *No Child Left Behind*, ACTAAP and the Arkansas Student Assessment and Educational Accountability Act, passed in 2004. ACTAAP mandates that ADE establish an education assessment system that encompasses academic standards, professional development, student assessment, and accountability, and that measures school performance and intervenes to assist low performance schools and sanction those that do not improve. The Assessment and Educational Accountability Act includes a requirement that ADE conduct longitudinal analyses of student performance on criterion-referenced tests (CRTs) and measure the value added of each year of education on student achievement outcomes.

Over the past half-decade, Arkansas has successfully pursued each aspect of this plan, making great progress towards use of computers in the classroom and towards use of data for decision-making at all levels of the education community. Having achieved much of what was set forth in 2000, Arkansas now needs to move forward to fill in the few remaining gaps in its data collection systems and to construct an enterprise architecture to integrate its multiple data stores. We anticipate that through the work to be performed under this plan, we will continue to advance Arkansas' leadership with respect to technology use and that we will be in the forefront among

the states that provide leadership in effective and efficient compilation, maintenance, use, and dissemination of data for evaluating programs, improving learning of all students, and closing achievement gaps.

CURRENT STATEWIDE SYSTEMS

Arkansas' existing architecture includes a distributed set of operational and transaction databases, each with its own data model, data dictionary, business rules and quality assurance procedures. Each of these systems was designed to accommodate the needs of organizations that collect the data or use them for a particular purpose, and each system is overseen by an ADE office responsible for the business or reporting function.

These systems are as follows:

- Financial Management System (FMS): Financial data collection and transaction processing for Arkansas' 254 school districts is supported by the Financial Management System, which employs a commercial software product from SunGard Pentamation, Inc. The district-level databases for 252 districts are housed at the Arkansas Department of Information Systems (DIS) and overseen by the Arkansas Public School Computer Network (APSCN) office, which maintains documentation, including a data dictionary and business rules for data that are transmitted to the state. Districts can choose whether and how to use features not required for state reporting. Available modules are: Accounts Receivable, Budget Preparation, Equipment Maintenance, Fixed Assets, Fund Accounting, Human Resources, IQ Reports and Queries, Purchasing, Vendor Bidding, and Warehouse Inventory. Districts have recently upgraded to a new version of FMS.

- Student Management System (SMS): A companion system to the FMS and also based on SunGard Pentamation software, the Student Management System is maintained at the district and school level and is overseen by APSCN and housed by DIS. Apart from data required for reporting to the state, districts may choose to implement additional features of the SMS modules: Daily Attendance, Discipline, Interim Progress Reporting, Medical Records, Registration, Report Cards, Scheduling, Student Inquiry Snapshot, and Student Transcripts. Districts are currently upgrading to a new version of SMS, with migration to the new system to be completed in winter 2006.

- Statewide Information System (SIS): This system, which is operated by APSCN and housed at DIS, supports electronic reporting by school districts to the ADE for seven annual reporting cycles. The SIS database contains permanent historical individual-level records of student and staff characteristics and is a primary source of data for analyses and reporting. Data items include a unique and permanent student identifier, student demographic information, enrollment of all students throughout the year, student attendance, student truancy, student graduation and exit data, student program participation, a unique and permanent school identifier, teacher characteristics, subject and grade assignments, school days, and teacher and staff attendance. Student-level information on enrollment, demographics (including gender and ethnicity) status (including economic disadvantage, English language learner, special education, migrant, gifted) and program participation is

collected in the fall and spring. Individual summary data are collected on student attendance, student infractions and student disciplinary actions. Graduation and disenrollment data are collected, as is information about the reason for student departures prior to graduation.

The 253 districts that use the SMS and FMS systems generate most of their reports to the state SIS on-line—the SMS/FMS data are imported directly—and enter other data directly. A district not using SMS/FMS provides data in an identical format. The state maintains excellent documentation, including a data dictionary, with well-defined content and common definitions for data elements, to assure the same definitions, codes, and periodicity across all schools in the state. The documentation includes business rules for data format, specification of acceptable values and missing data options. School districts generate trial reports and correct any errors prior to formally certifying and transmitting the data. APSCN employs automated data edit processes to verify data quality and to ensure that rules are met before allowing data into the state's SIS data system. Summary data at the school and district level can be accessed on-line via the ADE website. Additional edits are needed to ensure that incorrect values do not slip through this net.

- Arkansas Professional Licensure System (APLS): The APLS system was designed and is maintained by the ADE's Professional Certification/Licensure Unit. The transaction-oriented database contains information about teacher certifications, teacher education history, and staff certification. Data stored in this type of database are useful for confirming the current licenses and certifications of teachers and applicants for teaching positions, but are difficult for researchers to use. This data system will be replaced.

- Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP): All students are expected to participate in state assessments that include administration of CRTs and norm-referenced tests (NRTs). CRTs include Benchmark Exams at grades 3-8, End-of-Course Exams in Algebra I and Geometry, and a Grade 11 Literacy Exam. The CRTs are aligned to the state math and English language arts frameworks and were developed by Arkansas teachers and the ADE. Norm-referenced testing, currently the Iowa Test of Basic Skills, is administered in grades K-9 in reading comprehension and math problem solving. The Iowa Early Learning Inventory is administered to all kindergarten students at the beginning of the school year.

- ADE's ACTAAP office manages student-level test data on all assessments administered statewide. The database consists of individual test records created in conjunction with the administration of student achievement tests and end-of-course exams. Files contain detail on student assessment data within subcategories and results can be disaggregated by individual test item. The files from each test are delivered to the University of Arkansas, where the data are scrubbed and analyzed. Output files are delivered to ADE. Performance data are published to the web. The National Office for Research, Measurement and Evaluation Systems (NORMES) maintains historical data and provides controlled access to individual data and public access to summary data and analyses. Data can be accessed through ADE's AS-IS (Arkansas Student – Information Site) website.

STATUS AND ASSESSMENT OF CURRENT SYSTEMS

Assessing these systems from the standpoint of the required system and policy and implementation components outlined in the *Map of Core Elements for Establishing a Statewide Longitudinal Data System* in the RFA, the following are the most important considerations:

Unique Student Identifiers

Arkansas has a statewide system of **unique student identifiers**, with the majority of students identified by their social security numbers (SSNs). The remainder, those whose SSNs were not provided, are identified by unique nine-digit numbers that are assigned by the state and that remain with the children throughout their school careers, even if a child moves to another district. In accordance with the Family Educational Rights and Privacy Act (FERPA), Arkansas law permits the use of the SSN within educational records that are transferred to or between the ADE, other public schools and school districts. Arkansas law prohibits ADE, school districts and schools from displaying, releasing or printing the SSN on reports, ID cards or other documents without a parent's consent. Procedures are in place to ensure compliance with these restrictions.

Procedures are also in place to provide for correction of a number originally entered in error and association of the now-correct number with prior-period records that had contained the erroneous number. Recent examination of student identifiers from multiple systems—the work was performed in preparation for development of a longitudinal data system—found a high level of data quality sufficient to support association of data across systems. While the use of SSN provides the needed mechanism to associate records, this limits the ease of access for researchers because they cannot be given records with SSNs.

Data Architecture

With respect to **an enterprise-wide data architecture that includes a data model, data dictionary, business rules, and quality assurance procedures,** Arkansas currently has a distributed set of operational and transaction databases that support school operations, statewide reporting, reporting to the federal government, licensure, and maintenance of student-level test data on all assessments administered statewide. Each system has its own data model, data dictionary, business rules and quality assurance procedures. From an operational perspective, these systems are generally satisfactory and data are adequate to meet federal reporting requirements, including those associated with *No Child Left Behind*. The various databases also contain rich historical detail as well as student, staff, school and class identifiers that can be linked to associated records across the databases; however, the systems still present a classic case of a "siloed" information systems environment in which information on student enrollment, demographics and program participation, student grades, student test scores, and teacher licensure reside in varying degrees in physically distinct environments. The value of the stored information is diminished by the considerable effort required to design and conduct cross-system analyses.

This challenge was well expressed by the Southwest Educational Development Laboratory, which published an assessment of Arkansas systems in the report *Investigation of Education Databases in Four States to Support Policy Research on Resource Allocation* (2005). The researchers identified significant strengths with respect to the availability, accessibility, completeness, accuracy, consistency and alignment of data from Arkansas' major systems, as well as specific challenges that we intend to address over the coming years. An overarching challenge cited throughout the report deals with the researcher's access to data with which we concur. The authors found that because different offices within the ADE manage datasets relevant to their particular business function, researchers need to engage with multiple entities to arrange access and then either independently specify identifiers to bridge the data between two or more databases and/or work closely with Arkansas personnel who are knowledgeable of the data and can create datasets merged on the variables of interest.

Data Collection Systems

Arkansas has essentially achieved **vertical integration of local and state data collections, has had full participation in the statewide data system and has an electronic infrastructure to transfer large data files.** All but one of the school districts use SunGard Pentamation Financial Management System and SMS software modules for local data collection and to export financial data and unit-record school, class, teacher and student data to Arkansas' SIS. One school district submits data directly to SIS. The FMS and SMS databases, as well as the SIS, reside in a state-operated data center and are accessed through a statewide data communication network that connects all Arkansas public schools (buildings and district offices), 15 educational cooperatives, the ADE, institutions of higher education and other educational entities. The network provides both Internet access and access to servers at the state data center.

All school districts in the state currently have LAN/WAN connectivity. While adequate to support the current workload, the network is not sufficient and will need to be expanded to support access to the data warehouse and on-line data analyses by district and school personnel.

Just as data cannot be readily exchanged across statewide systems, data cannot be exchanged across the districts. Each school district maintains a separate database. There is also no capacity to exchange data with institutions of higher education or other states.

Planning and implementation of data collection systems has been continuous since the mid-1990s. The systems described above provide for the collection of data from districts and/or schools so that the state can incorporate data in the system for all students, classrooms, and schools under its jurisdiction. This process includes collaboration among all parties within the state and between the state and the school districts in data collection, reporting, and dissemination. All districts participate in the system and a rich set of Local Educational Agency (LEA) data are imported to SIS following LEA certification of data quality and error checking. A decision on the **cost/benefit and sustainability analyses of dynamic vs. static data extraction systems** was made when the SIS was designed.

Management of Education Data

ADE offices responsible for each of Arkansas' operational and transaction systems have established **procedures for protecting the security, confidentiality, and integrity of data, and for ensuring the accuracy and timeliness of data.** The APSCN, which administers the SIS, has established procedures for automated checking and verification of data submitted from the districts and schools. Edit criteria are defined in SIS documentation made available on-line and procedures for correcting and resubmitting data are enforced. Data that fail the edits are not imported to SIS; instead, a complete resubmission is required. The authorized official submitting data for an LEA is required to formally certify the accuracy of the data. APSCN does not have an audit function and does not test samples of SIS data against other state records or carry out reviews to verify SIS submissions to other LEA records.

Schools and districts are responsible for maintaining local access controls, data maintenance and data quality assurance of FMS and SMS. The APSCN office, a partnership of the ADE and the Arkansas DIS, supports the network, administers the FMS, SMS and SIS applications, and is responsible for SMS and FMS data standards, operating procedures and change control, and for SIS quality assurance. DIS maintains the central computing environment, designs and operates the communications network and is responsible for physical protection of SMS, FMS and SIS data, including access control, backup and data recovery.

In 2004, Arkansas began what will be a multiyear effort to design and construct an integrated **data warehouse for managing and storing longitudinally linked school** financial data, student demographic, participation and performance **data and making it accessible and useful to key stakeholders, especially teachers, schools, and districts.** A data mart containing school financial data was deployed in 2005. Pre-defined reports, lightly summarized data and underlying details, and analytic tools are available on-line to multiple levels of consumers.

LIMITATIONS OF CURRENT SYSTEMS AND WHAT WILL BE GAINED THROUGH THE PROPOSED WORK

In summary, the limitations of the current arrangement of systems are as follows:

- The "siloed" character of the state's educational information systems and consequent level of effort needed to accomplish linkage of student records across school years, linkage of information across information systems and across districts, which can be achieved only with specially designed and executed cross-system analysis;
- The absence of an enterprise-wide data dictionary, which results in multiple versions of "the truth" and inhibits efficient cross-system linkage. This stems from differing definitions of data items as stored in different systems and makes it difficult for data consumers to use the information.
- The level of effort required to access data for analysis; data are not available directly to those who would use it for research and analysis;
- Minor gaps between researchers' data needs and data actually collected by FMS and SMS and imported to SIS, which limits capability to perform certain analysis;

- Gaps between data needs and information stored in the APLS database making it difficult for researchers to use;
- Inability to link students' K-12 records to postsecondary education records, a significant objective for educators and a requirement for some U.S. Department of Education grants (e.g., Smaller Learning Communities); and
- Inability to link to wage reporting information to track student outcomes once they enter the workforce.

Actions Planned to Address Limitations

Over the next three years, as a result of building its new longitudinal data system, ADE will address these limitations. The longitudinal data system will bring together nearly all education data in a common environment and aggregate student information in a longitudinal form, such that cross-system and cross-year data are immediately accessible. The implementation of an enterprise data dictionary as the foundation of the warehouse environment will ensure standardization of definitions and ensure that data have common meaning irrespective of the source system from which they were derived, and that analysis that spans data in disparate source systems becomes routine and automatic. The dissemination of data with an easy browser-based interface and provision of business intelligence tools that will be accessed directly by administrators, educators and researchers will eliminate the difficulty in access experienced today.

Meanwhile, complementary efforts by ADE to fill in gaps in data collection for the SIS and SMS and upgrades to the licensure system will address theses deficiencies. The acquisition of a web-based K-20 electronic transcript system will provide both an efficient transcript transfer tool and a rich expansion of data for researchers.

Finally, consistent with state law, the warehouse will be populated with aggregated data relevant to students' workforce outcomes based on analyses of student data, in combination with unemployment insurance (UI) wage-reporting data.

Benefits to be Derived

In practical terms, the longitudinal data system will allow:

- State and district officials to use data:
    - To examine students' progress over time to measure the educational value added by schools, programs, particular teachers and particular methods of instruction.
    - To access more finely grained data to support decisions concerning curriculum frameworks and content standards and to ensure that benchmark tests reflect the content frameworks and benchmark standards.
    - To have visibility of student progress across the K-12 threshold to higher education and the workforce, with all the potential this holds for a better understanding of the relation between K-12 experience and success occurring in students' post K-12 years.
- Principals and teachers to use data:

    - To examine individual test results to determine whether students have mastered particular topics and to select students whose scores suggest a need for additional instruction or adjustment of instruction method.
    - To examine the extent to which students have been prepared to move to the next stage of education, from eighth grade to high school and high school to college by analyzing individual eighth-grade performance in combination with enrollment in and completion of advanced placement courses in high school.
    - To see information that will allow them to track students who leave a school and whose subsequent status is unknown.
    - To analyze results for subgroups of the students selected by one or more student attributes to determine the value added for each subgroup, using this information to adjust the education experience to produce better results.
    - To examine student-level attributes and historical test data in combination to isolate grade-specific indicators of future student performance, use those indicators to identify current students at risk of substandard performance and intervene to change the academic outcomes of those students.
- Parents to more fully participate in supporting their children's academic progress by providing them quicker access to information about school performance and the capacity to interpret data and use information to make decisions concerning their children's education and participate in decision-making around educational programs.
- Researchers to gain access to deeper and richer data to examine the efficacy of educational interventions and to support scientifically based research, in accordance with directives of the *No Child Left Behind Act of 2001* and for the purpose of contributing to the local, regional and national knowledge base regarding best practices.

(2) Project Design

INTRODUCTION

Arkansas proposes to construct a longitudinal data system through a collaborative process that builds on existing partnerships among the state, districts, and schools to assure the highest quality of data being imported into the statewide longitudinal data system. We will build on existing distribution channels to deliver timely and more detailed data and analyses to teachers, schools, districts, and other constituents. We will build out Arkansas' existing data architecture by redesigning Arkansas' licensure application, and by enhancing Arkansas' locally managed student management system and statewide student information system. We will establish an enterprise-wide architecture that provides for integration of fiscal, student and staff data and assembly of individual-level data within a data warehouse accessible to researchers in conformance with FERPA requirements. The warehouse will be suited to use in value-added research based on linked, longitudinal data on students, teachers, programs, initiatives and interventions. Through implementation of on-line transcripts, we will position Arkansas to establish partnerships with other states for automated exchange of student data.

Using its own resources, augmented by funding from the IES grant, ADE is planning to develop the following project design components:

- Commitment of a unique student identifier strategy;
- Creation of an enterprise-wide data architecture that includes a data model, data dictionary, business rules, and quality assurance procedures;
- Construction and implementation of an integrated data warehouse consisting of a set of coordinated subject-oriented data marts within the context of the Cognos Education Performance Management Solution (EPMS);
- Filling gaps in or redeveloping existing operational systems
- Design, construction and implementation of a web-based repository of student K-20 transcripts and methods for electronic exchange of transcripts across districts and between states and between K-12 and institutions of higher education;
- Development of a Business Intelligence tool set that delivers analytic views—reports, tables, charts or graphs, and spreadsheets that will allow consumers to gain access to the information they need;
- An Information Distribution and Training Program that ensures that data resources and their uses are made widely known and are used to their fullest potential. This will include a comprehensive training program for data consumers at all levels;
- Development of a comprehensive data quality assurance program, including provision of extensive system testing; and
- Establishment of methods for documenting and disseminating lessons learned and best practices with educational leaders, researchers and the community at large.

PROJECT DESIGN COMPONENTS OF A STATEWIDE LONGITUDINAL DATA SYSTEM

The paragraphs that follow address how the proposed longitudinal data system project design components listed above will be addressed in this project.

Student Unique Identifier Strategy

As discussed in the previous section, Arkansas' statewide system of **unique student identifiers** employs the social security number as an identifier for students whose parents provide these and, for those without SSN, a unique nine-digit number assigned by the state that remains with the child throughout the child's school career, even if a child moves to another district.

While the unique identifier can be used to link student records across multiple databases, restricted access to social security numbers constrains non-government researchers who must rely on Arkansas personnel to create linked files, thus affecting the cost and timeliness of research. Under the proposed project, student records from the multiple operational and transaction files will be assembled in a data warehouse environment. Pre-linked records, without visible social security numbers, will be directly accessible to authorized researchers and will be available for on-line analyses by data consumers at the state, district and school level, within the scope of their access authorizations. The social security number will not be displayed or disclosed. Once records are linked, a substitute identifier can be assigned.

Statewide Enterprise Data Architecture

As part of the proposed project, information architectures of the source systems will be unified within the context of a Cognos data warehouse environment. Consultants and ADE personnel will **develop an effective, statewide data model** that defines and describes the logical and physical relationships between data items and systems, and a system structure that allows efficient data maintenance and retrieval (containing relevant and linked current and historical data). The industry-standard, Kimball-compliant design will allow for **modifications and enhancements to the system's data and architecture, including system expansion over time.** (Ralph Kimball is a well-known author and accepted authority in the field of data warehousing.)

A reference database (metadata) will house a unified data dictionary that includes statewide standard definitions, acceptable values with definitions of coded values, and usage for all data elements contained in the warehouse, along with information about any variant codes or usage employed in local districts and the rules applied in mapping local data standards to the data standards and in handling missing or erroneous data. A single set of metadata will be accessed by three Cognos products. Definitions, business rules and calculation methods relevant to a particular set of data or a report will be available to data consumers. Cognos metadata service will allow ADE to have a single metadata repository for all data in the warehouse, regardless of the source. Disparate definitions and usage of a variable will be reconciled as the repository is created; users will have access to the rules employed to assemble the data and to narrative explanations of any changes in usage that have occurred over time.

Integrated Data Warehouse

The warehouse will be constructed using the Cognos Education Performance Management Solution (EPMS), which provides a framework for a K-12 integrated warehouse architecture and services to be delivered through three Cognos products: DecisionStream (extract, transform and load), ReportNet (reports) and PowerPlay (on-line processing analysis [OLAP]). Each conforms to computer-industry standards and, as configured in EPMS, incorporates federal reporting and NCLB requirements and education best practices. Each of these products has been pre-configured by Cognos to reflect generic K-12 data models and reporting needs. Cognos consultants will assist Arkansas to fit the system to local practices and to extend existing models, routines and reports to meet the needs of Arkansas' data consumers.

The warehouse will consist of a set of subject-specific data marts built on a dimensional framework that will be populated based on extracts from ADE and others source system described previously in this application.

For the SEA and LEA users, dimensions such as "student" or "school" will be defined in terms that make sense to these consumers, such as "students by district." To **enable efficient data extraction for time-based analyses**, the system will employ industry-standard techniques to handle slowly changing dimensions, such as a student's district. For this change, both the change and the history will be reflected in the data mart, so that performance analyses for prior years will accurately reflect the student's district. Cognos DecisionStream software provides an

efficient method for tracking history. As noted earlier, the approach to the design of a technical architecture was tested in 2005 with construction of an initial data mart containing financial data.

Cognos reporting will be installed on IBM Blade servers at the DIS and will run behind Cisco SSL accelerators for data security and encryption. The database is Informix. The warehouse will be supported by DIS personnel. All school districts in the state currently have LAN/WAN connectivity and use telnet vt-100 emulation software to connect to the current application software. The network for the State of Arkansas is based on frame relay and ATM technologies using TCP/IP protocol. Each of the approximately 2,000 locations currently installed has an Ethernet or token ring LAN and is linked via an edge router to a frame relay switch and ultimately to a router at DIS. All users of the statewide network share an OC3 circuit to the Internet.

The longitudinal system will be designed to **ensure secure access to data and formal reports to protect the confidentiality of individuals, in compliance with FERPA and the statistical reliability of results.** Access to individual data will be granted based on scope of responsibility and right to know. Summary data that exceed the scope of someone's right to know or that are made available to the general public will not include data on any attribute or group of attributes that can used to identify individual students or teachers in the subgroup reported. If fewer than a specified number of students or teachers in a subgroup share a common attribute or set of attributes, summary data on that attribute will not be reported. This will be handled in the metadata presentation rules, which will be defined by ADE.

Filling Gaps in or Redeveloping Existing Systems

As an integral part of the proposed longitudinal data system project, we will modify and enhance these source operational systems upon which the data warehouse will rely, to fill any data gaps and to improve data quality. For example, the SMS will be modified to capture additional information about students who were not included in state assessments (CRTs and NRTs). Methods for collecting ACTAAP assessment data will be examined to identify opportunities for **shortening reporting time and increasing the accuracy of student assessment data.**

The work of **cataloguing local data collection methods and data structures** has been carried out over the past decade in conjunction with construction and management of the source systems. However, we will update and supplement the documentation for the source systems, particularly with respect to local usage of SMS fields that are not imported to the Statewide Information System and that will be incorporated into the data warehouse.

To replace APLS, we will acquire a technology solution that supports data collection and reporting with respect to teacher and staff qualifications, certification, testing and professional development, and that captures documentation and evidence in electronic form. This solution will be designed to accommodate data requirements associated with a high objective uniform state standard of evaluation and highly qualified teacher analyses. Data will be imported to the warehouse.

Electronic Transcript System

As part of the proposed project, we will establish a web-based repository of K-20 student transcripts and methods for electronic exchange of transcripts across districts and between states and between K-12 and institutions of higher education. Based on the TRIAND WEST solution, this system will deliver the **potential capacity to track students past the 12th grade.** WEST is designed to handle the intricacies of actually transferring transcripts from one district to another or to another state; FERPA requirements around this process are addressed in a ready-made solution. Other features include automatic emailing of a notification when a transcript is accessed by another entity that is handled by WEST directly. ADE anticipates that the Arkansas Department of Higher Education will participate in the WEST system, as far as transcripts are concerned, creating a longitudinal dataset that crosses the K-12 boundary.

WEST will also support **student record transfers to other States**, compliant with FERPA regulations. WEST was selected as the repository, in part because of its dominance in the adjacent state of Texas, where WEST is used by 100 school districts serving about two million students, almost half of Texas' 4.2 million K-12 students. WEST will also support authorized transfer of high school transcripts to colleges outside of Texas, facilitating the college applications process for graduating students. Recipient colleges need not be WEST subscribers; the transfer is handled via protected and controlled access over the Internet.

Business Intelligence (BI) Tools

In parallel with the work of constructing and perfecting the technical components of the longitudinal data system, we will **design** methods for data presentation to individuals who will be **using business intelligence tools** to view educational data; we will **establish procedures for maintaining the tools.** The BI tools we deploy will be based on Cognos ReportNet, for **reporting** and Cognos PowerPlay, for on-line **analyses**. From the user perspective, the system will consist of products—reports, tables, charts or graphs, and spreadsheets for consumers of the products. Our focus will be on generating useful, high-quality products and getting the right set of products to each consumer, while protecting the privacy of both the subjects of the data and users of the system.

One set of products will consist of fully automated versions of routine reports to local, state and federal agencies, delivered through a streamlined process that reduces the burden on state, district and school personnel. For example, Education Data Exchange Network (EDEN) submissions can be automatically prepared, using scrubbed data from the warehouse and routines that verify correctness against EDEN standards, so that batch submissions are accepted on the initial pass.

Other products will be designed for particular subgroups of consumers: parents and guardians, students, teachers, principals, policy makers, administrators, members of the business community, and members of the general public, including those with special interests. The information needs and wants of each subgroup will be solicited during the planning stage and suggested by documented best practices and third-party research.

Information Distribution Program

Our approach to distribution of products to Arkansas consumers will be comprehensive, but cautious. Sets of relevant products will be assembled, passed through a quality assurance review, tested in focus groups, refined and then advertised and made available to all members of the subgroup of consumers through appropriate channels, such as Campus Leadership Teams, which include parent representatives, or the Chamber of Commerce for members of the business community. Existing state-to-district-to-school knowledge-distribution channels will be converted to the new delivery system, and new channels will be developed. Through this process, Arkansas will become a leader among the states in the use of innovative analytical tools and reports to inform policy and decision-making.

As with any new service or good, each product will be accompanied by information about its utility and constraints on use. Cognos ReportNet and PowerPlay offer users immediate on-line access to relevant parts of the system metadata. Other mechanisms can be used to inform consumers of relevant research and guide their use of the data to make decisions.

ADE will design and develop a marketing program and a comprehensive training program to support the effective use of the warehouse by multiple user groups. The program will combine limited instructor-led sessions with a distance-learning facility that includes e-training modules, interactive instructor-led sessions, and on-line guidance with respect to both practice and technical matters. To support and sustain the consumer end of the longitudinal system, as well as to ensure continued relevance of the system, we will foster an on-line learning community. We will facilitate local competency teams of volunteers, who will become the local experts, engage their peers and provide feedback to data stewards and technicians.

We will also put in place an infrastructure to facilitate new research and analyses of the statewide longitudinal data and support cooperation with IES and partnerships around identification of best practices with respect to development and use of longitudinal data systems to improve performance. We will invite researchers from the University of Arkansas and other appropriate public-, independent- and private-sector organizations to mine the well-documented, high-quality and rich store of data maintained in the warehouse, in accordance with legal and regulatory requirements for the protection of privacy.

Data Quality Assurance Program and System Testing

To assure the highest quality of data being imported into the statewide longitudinal data system, we will carry out an educational data quality program modeled on guidelines issued by the U.S. Office of Management and Budget (OMB)[1] and the information quality goals of the U.S. Department of Education as presented in the department's strategic plan. Arkansas' goal will be to ensure that information supplied to the Arkansas educational community, to the U.S. Department of Education and to independent researchers is accurate and reliable. ADE's program will include:

[1] *Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies,* February 22, 2002, 67 FR 8452-8460

- Agreement on the nomenclature to be used throughout the system to identify and describe dimensions of data quality, particularly with respect to selecting and naming dimensions of quality—experts employ a variety of terms, such as accurate, believable, trustworthy, timely, having utility, useful, relevant, objective, reliable—and on defining each dimension;
- Specification and adoption of methods for measuring the level of data quality with respect to each dimension and for monitoring changes in the level of quality of particular variables with respect to each dimension;
- Analyses of the causes of substandard levels of data quality, both system-wide and local, and design of corrective mechanisms, which may include software modifications to detect and prevent errors at the point of data collection or misinterpretation of data presented to the user as an output; process redesign to adjust error-prone steps in workflows; raising the level of data-quality awareness training; and additional training of individuals who collect, enter or use data; and
- Independent, third-part audits of data quality as well as ongoing monitoring and creation of periodic reports describing the state of educational data quality in Arkansas.

System testing will be conducted at each stage of the process and will be carried out by the technical team, data subject experts and end users, with each role brought into the process at the appropriate time.

- Each system component and process will be validated by the technical team to ensure that data are not corrupted as they pass through the ETL (extract, transfer, load) stages and that ETL processes perform in accordance with specifications. Warehouse data will be reconciled to source data through generation of parallel reports and analyses of reasons for any discrepancies in results.
- Subject experts will focus on testing of the quality of data loaded to the warehouse and on accuracy of reports and OLAP analyses. Tests will employ actual source data, and results will be verified from end to end—source data, calculation method, output results.
- After the ADE/DIS/Cognos project team has completed testing, the system will be tested by users drawn from each segment of the potential user base and invited to participate in testing of training procedures and system usability and usefulness, including usability and usefulness of accessible metadata. Training will include careful explanation of what data exist in the warehouse and of any known gaps or data-quality problems.
- The technical team will conduct tests to measure end-to-end system performance under peak load. A steward assigned to each data mart—the person who has primary responsibility for the source data specific to that data mart—will be responsible for defining the user tests to be performed, reviewing test results and approving the move of the data mart into a production environment. Change control procedures will be employed and, post-deployment, a test cycle will occur following every modification to a source dataset, an ETL process or a report.

Components of the system will be moved into a production environment following signoff of the designated steward.

Sharing Data with Researchers and Sharing Research

Arkansas will establish a program to facilitate secondary analysis of Arkansas education data. Modeled on the National Data Archive for Child Abuse and Neglect (NDACAN), the program will provide moderate-fee access to longitudinal datasets stripped of personal identifiers and specifically constructed to meet the needs of researchers in the field of education, accompanying comprehensive and up-to-date data dictionaries and other documentation and technical assistance. A librarian function will ensure that researchers are able to locate existing datasets of interest, request construction of other files that they may need, and obtain answers to questions they may have concerning field definitions or usage. This program will integrate services of ADE, the Department of Information Systems, and the University of Arkansas to supplement and expand data services currently available through the University's National Office for Research, Measurement and Evaluation Systems (NORMES), and to provide mechanisms for dissemination of research results via the Internet and World Wide Web. An electronic newsletter will announce the availability of additional datasets and publication of research studies based on Arkansas data.

(3) Project Personnel

The following key personnel from ADE and DIS participate on the permanent Education Information Systems Planning Group (EISPG), which functions as the steering committee for the Longitudinal Data System Project. In this section, we highlight the qualifications, roles and responsibilities of each member of the ADE project team, along with the percent of time to be devoted to this project in each of the three years. Resumes for these key ADE and DIS personnel are provided in Section F of this proposal.

ADE Personnel

James Boardman (15%, 15%, 15% dedication), who will serve as the Project Director, is the Assistant Commissioner for the Division of Research and Technology. One of this section's primary responsibilities is to analyze data and produce informational reports for policy makers, educators, business and industry leaders, and the general public. Mr. Boardman provides advice and oversight to the group and has special responsibility with respect to the data that will be disseminated by means of the new warehousing environment. Mr. Boardman will provide overall leadership to the Longitudinal Data System project.

Dr. Bobbie Davis (15%, 10%, 5% dedication), the Assistant Commissioner for the Division of Fiscal and Administrative Services, chairs the EISPG group. The Internal Administration Section of the ADE oversees the financial accounting system of the agency and develops and oversees the agency's budget.

Danita Hyrkas (15%, 10%, 5% dedication), APSCN Internal Operations Coordinator, functions as the EISPG group's Project Manager. She is responsible for coordination of meetings, keeping minutes, etc. She will continue in this role as well as provide expertise related to APSCN subject matter.

Kathleen Crain (15%, 10%, 5% dedication), Financial Applications Manager, is responsible for FMS (financial data from Pentemation and financial reporting). She is primarily responsible for financial data quality. She will continue to supply expertise and act as data steward for financial data.

Carmen Jordan (15%, 10%, 5% dedication), Student Applications Manager, is responsible for SMS (student data contained in the Pentemation environment). She will act as data steward for SMS data.

DIS Personnel

Max Kolstad (15%, 10%, 5% dedication) is the APSCON Project Manager for DIS. DIS is responsible for the hosting of the computing infrastructure resources where many of the existing data systems are already housed and where the new warehousing environment will likewise reside. Mr. Kolstad is responsible for the managing issues relating to the impact this project will have on the state's communication network as well as ensuring that processing and other computing infrastructure resources are planned and provided to meet the needs of the initiative.

In addition to these key staff members, the ADE plans to hire a Project Manager and Assistant Project Manager (100%, 100%, 100%). These two individuals will report to the Project Director and will be responsible for providing overall management for the project, overseeing all project activities and project planning, scheduling, reporting, contract management, and risk management, as well as other functions.

(4) Resources

In order to carry out this project, ADE and DIS will continue to make a major commitment of staff time and infrastructure resources from their regular budgetary funds. As discussed elsewhere in this application, the state's longitudinal data systems project has been under way for a considerable period, and Arkansas has already developed and deployed many of the key elements that will comprise it, including vertical integration of local and state data collection, installation of Cognos data warehousing tools, and implementation of the student financial component of its data warehousing environment.

Arkansas is well on its way to an initial implementation of the student information component of this environment. It has already invested some $1.5M in Cognos tools and services. In addition to state-level commitments and work, a very large commitment of resources and effort have been and will continue to be made to this project by local school districts and school staff throughout Arkansas. The budget documents included elsewhere in this application capture those ADE/DIS staff resources most directly dedicated to this effort. However, because the project is so deeply embedded in the ongoing operation of the state's educational processes, it is difficult to distinctly isolate and quantify the full value of all non-IES grant-funded resources that will be used to carry out this work. While an estimate has been included in the non-federal portion of the budget for data processing services contracted by ADE from DIS that are project related, no estimate has been made for example of the value of equipment and facilities that ADE is providing.

While current funding has allowed Arkansas to pursue this work and bring it to an important level of achievement, Arkansas seeks to leverage the IES grant funds to substantially enhance and increase potential outcomes of its currently planned project effort. Augmentation of current resources though an IES grant will allow Arkansas to accelerate the pace of its work and to expand its scope to more fully address and realize the benefits of the full range of elements that are incorporated in the vision of the longitudinal data system embodied in the RFA and that are specifically addressed in this application.

Based on current plans, Arkansas has, for example, already acquired the Cognos software tool suite, is already addressing technical work related to mapping of source system elements to the warehouse data structures, is developing necessary ETL protocols, is planning for the upgrade in computer and communication infrastructure needed to support its data warehousing strategy and will upgrade existing operational systems. However, grant funds will allow for the addition of new elements to the current planned work and/or placing of much greater emphasis on other critical elements that together will allow for a broader strategic focus of the project initiative in line with the objectives outlined in the RFA. These elements include the development of a comprehensive enterprise data model; development of a comprehensive data quality assurance plan; acquisition of the TRIAND electronic transcripts component of its planned architecture; distribution and use of warehouse data by parents, teachers administrators and researchers; and the evaluation of the initiative and its impact on student achievement.

The resources needed to achieve such an augmentation of the current project include the expansion of ADE resources assigned to the project, the acquisition of professional consulting services, and the purchase of the planned electronic transcript system from TRIAND. The planned resource augmentation to be funded by IES grant funds are outlined below:

Arkansas Staff Resource Augmentation

Arkansas wishes to add two project managers whose role will be to assist the Project Director and the Educational Information Systems Planning Group in overall day-to-day management of this project. The new project managers would be dedicated on a full-time basis, unlike other ADE/DIS staff whose dedication is both part-time and in kind.

Contracts

Cognos

- ADE wishes to add provision for additional consulting services from the Cognos technical staff in Years 2 and 3 of the project, to address elements such as the integration of data from the TRIAND K-20 electronic transcript modules and other elements that cannot fully be anticipated in advance, but can be expected to arise in a project of this size and complexity.

TRIAND

- In Year 1 ADE will enter into contract with TRIAND, a major supplier of educational software systems, to utilize its electronic transcripts system, which is delivered via the web on an ASP (Application Service Provider) model. In addition, ADE wishes to make allowance for the capture of additional transcripts from Arkansas institutions of workforce education and higher education. This addition to recurring costs is expected to fall by more than half at the conclusion of the project and Arkansas is committed to bearing the ongoing annual expense from that point forward. This element of ADE planned architecture will address in an important way the cross-state solution development encouraged in the RFA, allowing Arkansas to immediately exchange transcripts with a large number of Texas districts where there is considerable movement of students back and forth between Arkansas and Texas.

Metis Associates, Inc.

- Data Quality Assurance - Working in close cooperation with ADE staff, Metis Associates will develop a comprehensive data quality assurance plan and then assist ADE in its implementation.
- Program Evaluation - Metis Associates will design and complete an evaluation of the project and examine both the success of the implementation and use of the longitudinal data system and its impact on student outcomes.
- Management Consulting - Metis Associates will supply management consulting services to support ADE in the areas of project planning/management and technical and educational policy research, as requested by the Project Director, over the life of the grant.

SETDA

- To ensure that our work on the longitudinal data system is informed by the work in other states and contributes to the work of other states, Arkansas will partner with the State Educational Technology Directors Association (SETDA) for dissemination and networking services (DANS). Consistent with the intent of the application notice, DANS seeks to bring grantees together to share their lessons learned, recommendations, approaches, standards, and tools with other states, districts, schools, and organizations. Services that we will receive from DANS will support our role in providing leadership in effective and efficient compilation, maintenance, use, and dissemination of data for evaluating programs, improving learning of all students, and closing achievement gaps. DANS will also provide a vehicle for leveraging the work supported through the IES grant by providing mechanisms for disseminating products and lessons learned, except where such products are proprietary. SETDA will seek opportunities and submit proposals for grant partners to speak at conferences to share the state's approach in implementing the IES grant.

In Year 1 ADE will select and enter into a contract with an appropriate web-based training development vendor for the development of web-based training modules that will allow for self-paced web training by teachers, parents, administrators, researchers and others in the use of

standard reports and business intelligence tools that will be delivered over the course of the project.

Arkansas is fully committed to sustaining the longitudinal data system established in the three-year grant period through its regular budgeted resources in the period following the IES grant. Sustaining the TRIAND WEST system in the years following the grant expiration will be possible through the redeployment of the considerable state resources that are devoted to building the longitudinal data system to its maintenance and support at the end of that time.

(5) Management Plan

COLLABORATIVE MANAGEMENT FRAMEWORK

The design for a statewide longitudinal data system and its implementation will be managed within the context of an already well established ADE organizational infrastructure. This infrastructure encompasses financing, personnel, policies and procedures, a computing environment, telecommunications capacity, distribution channels, and feedback measures of the system's efficacy to ensure that the needs of state data consumers and other constituents are continuously accommodated.

The ADE has a long history of inclusive planning that involves school boards, schools, teachers, parents, students, the public, and other constituents, and we plan to continue this, both by asking these data consumers what information they need, on what schedules and in which formats, as well as by keeping them informed of other states' best practices with respect to use of data and researchers' findings and recommendations concerning the use of data to drive decision making. The process of uncovering needs is always iterative, and over time, our system will grow and evolve as our constituents become more sophisticated users of information and pose new questions. We will seek suggestions from our constituents directly and through other organizations that are engaged in advancing the use of education data. This will include NORMES at the University of Arkansas, which operates a website that serves as a resource for everyone who has a stake or an interest in education in Arkansas and the National Center for Educational Accountability, which conducted a study that identified best practices in Arkansas with respect to using data to support educational decision making.
For information about what parents need and ways to respond to this need, ADE will turn to researchers, organizations that represent parents and the parents themselves. Research has demonstrated that parental involvement in schools produces benefits for the children of involved parents as well as for the student body in general, and Arkansas schools are mandated to establish parent involvement policies based on standards and statutes promulgated by the U.S. Department of Education (e.g., Title I).

Arkansas has developed a multiyear management plan for construction, implementation and maintenance of a longitudinal system. Our management plan describes how we will carry out the project, achieve the goals described in Section 1 and establish **logistical capacity to create and maintain a statewide longitudinal data system.** Administrative processes, infrastructure components and policy commitments necessary for construction and maintenance of the longitudinal data system will be built around existing partnerships among the state, districts, and

schools. With the exception of the TRIAND WEST system and a planned Professional Qualifications database, data mart source systems have been in place for many years and are well supported within the existing administrative structures. Legislative mandates and historical precedent demonstrate the commitment of all stakeholders and assure that, once implemented, the longitudinal data system will be adequately supported through state budget allocations and personnel assignments and will be used by the Arkansas community of stakeholders, including policy makers, educators, parents and researchers.

PROJECT MANAGEMENT APPROACH

Project Oversight

The longitudinal data system project will be planned and guided by the permanent EISPG described above, which has been in place for seven years and includes representation from the ADE Central Administration Section and Offices of Internal Administration, Accountability, and Information and Technology and the Arkansas Department of Information Systems. Other individuals, who attend when planning involves their areas of interest, represent the Departments of Workforce Education and Higher Education, the State Legislature, local school districts, Educational Service Cooperatives, and consultants. This group manages development of strategic plans, creates tactical plans and budgets and manages technology projects from end to end. The group is chaired by the Assistant Commissioner for the Division of Financial and Administrative Services and meets regularly to review project progress, assess the reasons for any deviation from plans and take corrective action. In addition to their roles as members of the EISPG, many of these individuals will have direct operational roles in the project as well. The EISGP will be responsible to the Deputy Commissioner and Commissioner of ADE.

The Education Information Systems Planning Group, acting through the Project Management Office (PMO) and the project teams/subgroups assigned to the project, will have responsibility for ensuring that components of the longitudinal data system are planned in concert and that warehouse services and analytic applications are introduced to end users in a carefully planned manner and only when all essential components of the longitudinal data system are in place. These essential components include high-quality, trustworthy data; an adequate computing and telecommunications environment; data products that have passed end-to-end testing and been approved by the data steward; and training and help desk services. In addition:

- The Group will review the impact of any shortfalls in expected budget allocations or delays in the completion of project activities, assess the risks of proceeding in the absence of funding or a deliverable, adjust plans as necessary and apply available remedial measures to keep the project on track. In general, a delay in distributing project products is preferred over a less-than-acceptable distribution.
- The Group will consult, collaborate, partner and cooperate with federal personnel and others to ensure achievement of IES goals with respect to effective and efficient compilation, maintenance, use and dissemination of data for evaluating programs, improving learning of all students, and closing achievement gaps.
- The Group will approve plans for, oversee and guide development and implementation of a statewide program of data quality assurance.

- The Group will receive feedback from the subgroups concerning systemic or pervasive problems encountered by implementers of the warehouse or end users and will ensure that appropriate corrective action is initiated. (Operating units at ADE and DIS will be responsible for day-to-day management and resolution of problems.)
- The Group will ensure that change management processes are in place and complied with, and will intervene if significant lapses that may affect success of the project occur. (Operating units at ADE and DIS will be responsible for day-to-day change management in accordance with established procedures.)
- Beginning in Year 2, the group will receive quarterly reports from the project evaluation team and will initiate corrective action to adjust project elements as appropriate to improve the quality and effectiveness of the system in meeting reporting and decision support needs.
- At the end of Year 3, the group will receive a final evaluation report which will serve as a basis for development of a three-year plan for maintaining, enhancing or redesigning the longitudinal data system to address any deficiencies and to assure continued improvement in academic achievement of all students and in closing achievement gaps.

Project Management

Acting on behalf of the EISGP, Jim Boardman will be assisted by two newly added project managers, who will be responsible for day-to-day direction and management of the project. These individuals will in effect constitute a PMO function for the project and will be responsible to ensure project activities are appropriately planned, scheduled and carried out in accordance with established plans. The two newly added project managers will be responsible for a full array of project management tasks, including assisting the Project Director in the design and implementation of a more formal project organizational structure, developing comprehensive project plans and schedules, managing these plans, addressing project risk management, project reporting, etc. The PMO will have overall responsibility for the work of the project resource groups and teams and individuals who will carry out the work of the project.

To support the three-year longitudinal data system project, project management resources will be augmented. ADE will contract with Metis Associates, Inc. to provide management consulting services to the group, to include the development of a quality assurance program. The PMO will also have the support of professional service staff from TRIAND and Cognos and the support of SETDA DANS as previously described.

Project Organization and Project Team Structure

The planned project management structure, including composition of teams and subgroup, is as shown in Figure 1 on page 25:

- The center column shows project team/subgroup responsibilities. Individuals on these committees have functional responsibility for specific aspects of the project. For example, the DIS representative who has functional responsibility for supporting APSCN will have project management responsibility for Infrastructure plans. People on the Data Stewardship team have functional responsibility for the specialized subject data within

their respective areas of responsibility within ADE. This includes primary responsibility for the architecture and definition of data within their scope and data quality. They will work closely with Cognos in the definition of data mapping between existing data stores and the warehouse data structures.

- The boxes on the left side of the chart in Figure 1 identify external resources that will support construction and implementation of the longitudinal data system. The Data Architecture Steering Committee will include a representative from each segment of the enterprise: policy, ADE operating offices, school district, school, and parent. The other boxes represent contractors. The Evaluator is shown in a box at the bottom of the figure.
- The boxes on the right represent users of the data warehouse services and analytic applications, as well as organizations and individuals engaged in distribution and use of the data. Competency groups will be loosely organized collections of data consumers who are encouraged to come together to share their expertise and promote use of the data to evaluate programs, improve learning of all students and close achievement gaps. The distribution process will be planned and managed by the Data Presentation and Distribution subgroup.

Project Timeline

The timeline for this project, outlining the planned accomplishments in each of the three grant years, is presented in Appendix A.

PROGRAM EVALUATION

ADE will contract with Metis Associates, Inc. for evaluation services. Metis Associates, Inc. is an independent research and evaluation consulting firm formed in 1977 to provide human services evaluation, research, and design support to public, philanthropic, and private-sector organizations. Metis has extensive experience in IT strategic and business planning, project management, quality assurance and system assessment, data management and systems development for human services and educational initiatives conducted by both government and community-based organizations. In addition, Metis has over two decades of experience conducting educational research and evaluation in K-12 educational settings. Since 2003, Metis has been conducting a rigorous statewide implementation and outcomes study of the ADE's Environmental and Spatial Technology (EAST) initiative through funding from the U.S. Department of Education's Evaluating State Education Technology program.

In Years 1 and 2, Metis will conduct a formative evaluation of the longitudinal data system project and will provide ADE, its federal partners and local collaborators with quarterly reports on (1) the extent to which the system has been developed and implemented in accordance with the design, and (2) the quality and effectiveness of the system in meeting the reporting and decision needs of the stakeholders. As part of its initial work, Metis will collaborate with ADE to develop clear evaluation criteria for determining successful development/implementation, quality, and effectiveness in meeting its goals.

With respect to development and implementation, the evaluation will examine the system from the perspective of each data consumer role, to answer the following questions: Do the analytic

applications fit each stakeholder group's specified needs with respect to the user interface and presentation formats? Does the system meet each stakeholder group's specified information needs, with respect to coverage, level of detail, timeliness and data quality? Do approaches to engaging stakeholders work? Do stakeholders participate in training at the expected level? Do individual stakeholders who complete on-line or instructor-led training achieve the learning objective of the training? Is post-training support available and adequate? Proposed methods of data collection include individual and/or focus group interviews and surveys. Interviews and focus groups will be conducted at the state level during the initial phases of development in order to obtain timely feedback. As implementation progresses, surveys will be administered to training participants in order to assess the effectiveness of the training and post-training support. In addition, documentation concerning requests for technical assistance or trouble-shooting will be analyzed to identify areas of improvement and understand response effectiveness.

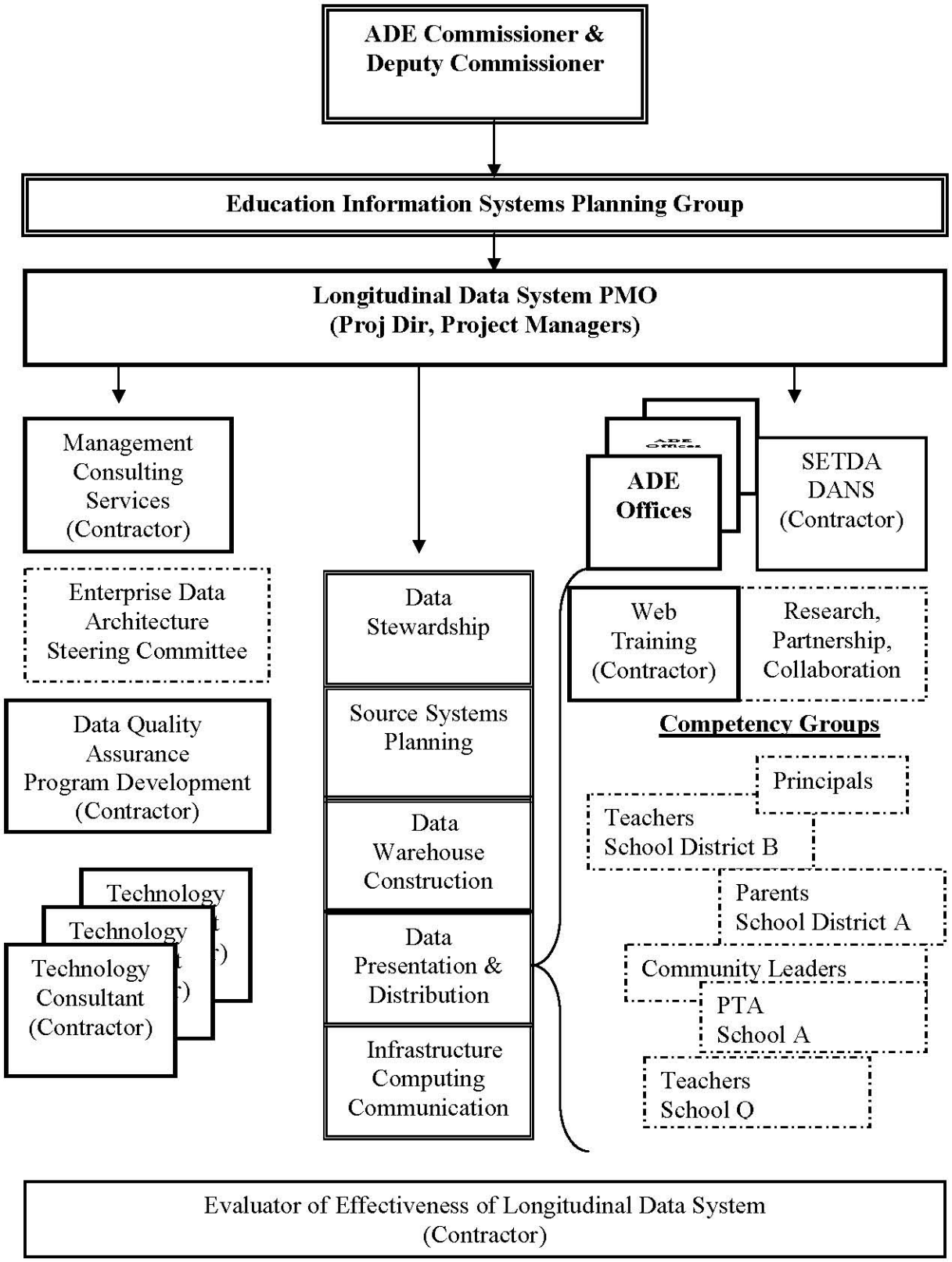
With respect to the quality and effectiveness of the system in meeting the reporting and decision needs of each stakeholder group, the evaluation will test the project assumptions and design to answer the following questions: Do individual stakeholders who completed training use the system to support decision-making during subsequent periods, as after one month, after three months, after six months, after one year, and at what level? What factors influence continued use of the system? Is there evidence that the availability of information affects stakeholders' decisions? Is there evidence that teachers' data-driven decisions have a positive effect on student performance in the classroom? Is there evidence that principals' data-driven decisions have a positive effect on the performance of teachers and students? Are competency groups formed and meeting as planned? Different data collection methods will be utilized for distinct stakeholder groups and designed to obtain the most appropriate set of information/data from each group. At the state level, individual interviews and/or focus groups will be conducted. Periodic surveys will be administered to district and school personnel, and examples of effective or innovative use, or processes to expand use, of the data will be documented. Information obtained through surveys also may be supplemented by focus groups of key stakeholders convened by ADE at training or other statewide or regional meetings.

Metis will also design a summative evaluation in consultation with ADE, the federal partners and other partners and collaborators. The summative evaluation, which will be planned during the second year of the project and implemented in year three, will be designed to measure the effectiveness of the longitudinal system in catalyzing improvement in academic achievement of all students and in closing achievement gaps. The summative evaluation will be designed to address questions such as: To what extent has the statewide data system resulted in valid, reliable, and accessible statewide cross-sectional and longitudinal data? To what extent have linkages been developed between ADE and other states that will allow the sharing of historical student data, and what have been the results of the linkages? To what extent has ADE disseminated information about the data system and its availability for use in research and evaluation, and what have been the results? To what extent are the wider school community, the public, and key stakeholder groups aware of the system? To what extent has the statewide longitudinal data been used to evaluate program effectiveness, improve student learning and academic achievement, and close achievement gaps? The methods utilized for the summative evaluation will be selected in Year 2 in accordance with the evaluation design; however, they

may include surveys, opinion polls and information obtained through public and community forums, as well as analyses of student achievement data.

ADE agrees to participate in a national evaluation of statewide longitudinal data systems to determine the quality of the data included in the data systems, and will cooperate with the Department of Education on such an evaluation.

Figure 1. Longitudinal Data System Project Organization



RESUMES OF
KEY STAFF

James Gale Boardman

(b)(6)

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Present	Assistant Commissioner, Division of Research and Technology Arkansas Department of Education, Little Rock, Arkansas
1998-2005	Assistant Director for Information and Technology Arkansas Department of Education, Little Rock, Arkansas
1970-1998	Arkansas Department of Education, Little Rock, Assistant Director for Planning and Curriculum Assistant Director of National Migrant Student Record Transfer System Associate Director of Office of Accountability Coordinator of Teacher Licensure Educational Administrative Supervisor Curriculum Specialist
1968-1970	Monette Public Schools, Monette, Missouri Mathematics Teacher Physical Education Teacher Football/Basketball Coach
1967-1968	Pulaski County Public Schools Oak Grove High School Mathematics Teacher
Education	M.S.E. University of Central Arkansas, Conway, Arkansas B.S.E. University of Central Arkansas, Conway, Arkansas
Additional Course Work	National Science Foundation Grant on Education Applications of Computers University of Missouri University of Texas University of Miami

Prior to assuming the position of Assistant Commissioner of the Research and Technology Division at the Arkansas Department of Education, I have served as Assistant Director for the Information and Technology Section. For the last five years I have been a member of the Senior Management Team of the agency and have performed various administrative functions including drafting legislation, proposing and presenting rules and regulations for consideration by the State Board of Education, and testifying before multiple legislative committees and sub committees.

I also have had management and supervisory responsibility for six units at the Department whose goals and objectives are centered on technology infrastructure and educational technology. Among the primary roles of these units are the development and implementation of a statewide distance learning program, maintaining and improving the department's technology infrastructure and capacity, providing technology resources and monitoring technology programs in all the school districts within the state.

Bobbie A. Davis

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ACADEMIC DEGREES

B.S.E., 1966, Arkansas State University, Major in English, Minor Language Arts

Masters Degree, 1982, University of Arkansas Fayetteville, Major in Secondary Education

Educational Specialist Degree, 1984, University of Arkansas Fayetteville, Major in Educational Administration

Doctorate in Education Degree, 1992, Memphis State University, Major in Educational Administration, Collateral in Business Management

AREAS OF CERTIFICATION

Secondary English, Secondary Principal, Administrator

WORK EXPERIENCE

Assistant Director of Internal Administration, Arkansas Department of Education, 1997 to Present
Responsibilities include: Oversight of Public School Fund Budget and the Department of Education Budget, Child Nutrition, Special Education, Personnel, AASIS Leave and Time, APSCN, Liaison to Educational Cooperatives, Oversight of school nurses, Federal Grants Management, Teacher Retirement Waivers, Ethics Disclosures, Agency Audits, Agency Facilities, Central Services, Printing, Mail Service, Security, and Maintenance.

Assistant Director for Finance and Administration, Arkansas Department of Education, 1994-1997
Responsibilities included: Information and Technology, Local Fiscal Services, Fiscal Distress, Loans and Bonds, Insurance, District and Agency Audits, Personnel, Finance, Child Nutrition, Central Services, Administrative Services, Maintenance, Facilities, Workforce Education Liaison, Printing, Security, Federal Grants Management, School Plant, and Transportation

Superintendent, Brinkley School District, 1990-1994

WORK EXPERIENCE

Assistant Superintendent, Brinkley School District, 1982-1990
Responsibilities included: federal programs, testing, gifted and talented programs, federal personnel, substitute program, staff development, coordinator of School Personnel System, coordinator of student management system, Grant responsibilities included:Title 1, Chapter 2, JTPA, Eisenhower Grant, Drug Free Schools, Alternative Classroom Grant

Federal Coordinator, Brinkley School District, 1979-1982
Wrote federal grants; developed, implemented, monitored and evaluated programs; supervised staff; conducted staff training

Adjunct Professor, East Arkansas Community College, Forrest City, Business Communication and Composition

Teacher, Brinkley School District, Secondary English, 1966-1978

PROFESSIONAL AFFILIATIONS

Phi Kappa Phi Honor Society
Phi Delta Kappa
Delta Kappa Gamma Society International
Arkansas Association of School Business Officials
Arkansas Association of Educational Administrators

PROFESSIONAL ACTIVITIES

Board Member, Arkansas State Employee and Public School Employee Health and Life Insurance Board, 1998-2005

Council Member, Chief Information Officers Council, 2004-2005

Board Member, Child Health Advisory Board (Act 1220), 2003-2005

Designee, Tobacco Commission Advisory Board, 2002-2005

AREAS OF KNOWLEDGE AND EXPERIENCE

Business Communications	Federal Grants Training	
COBRA	Grant Writing	Job Descriptions
EEOC	Bid Laws	FMLA
Health Insurance	Purchasing	Provision 2
School Nurse Programs	State Contracts	AASIS
Free/Reduced Price Meals	APSCN	Personnel
Drafting Rules		

PROFESSIONAL PRESENTATIONS

Act 61 Workshops, conducted 36 statewide workshops on Finance Management, Leadership, and Law, 2004-2005

Act 1220 Presentations on Nutrition and Physical Activity Standards and Law, 2003-2004

Federal Programs Coordinators on Federal Grants Management and audit procedures, 2004

Consolidation Workshops for districts consolidating as a result of Act 60, 2004

U.C.A. Leadership Classes, taught review of new legislation.
Dr. Bobby Altom Leadership Course, 2003-2004

Arkansas Tech Russellville, taught review of new legislation and finance issues for administrators. Dr. Mary Gunther Leadership Course, 2003

Henderson State University, taught review of legislation and finance issues. Dr. Penny Ferguson Leadership Course, 2004-2005

Principal's Finance Management workshops at Wilbur D. Mills Education Service Cooperative, Crowley's Ridge Education Cooperative, Northeast Arkansas Education Cooperative, and Northcentral Arkansas Education Service Center, 2004-2005

REFERENCES

References available upon request

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Danita Hyrkas

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501-682-5199 Office

Special Knowledge:

- Business Administration
- Financial Accounting
- Administrative/organizational principles, procedures and practices
- Information Systems Technology
- Computer Technology

Skills:

- Management, Organizational, Communication, and Problem Solving Skills
- Excellent Interpersonal skills
- Excellent computer skills, including web design
- Skilled in the use of Microsoft Word, MSExcel, MSPowerPoint, MSAccess,MSPublisher, MSProject, FrontPage, Pentamation FinancePlus, Pentamation Student Open Series and Plus, Cognos Reportnet, Visio, and various other software.

Specialized Training

- Budget Planning, Microsoft Office Suite,and have attended numerous other workshops on software products and Internet usage.
- Fund Accounting
- Quality Team Management
- AASIS training – Human Resources, Financial, Purchasing, Payroll

Experience:

4/6/98 to Present - Arkansas Department of Education - (501)682-4887
Position: APSCN Internal Operations Coordinator

- Manage and supervise administrative support staff
- Administer all phases of organizational activities related to business and personnel management
- Serve on the APSCN Steering Committee
- Foster effective communications throughout APSCN departments, Financial, Student and State Reporting; the ADE, and the Department of Information Systems (DIS)
- Plan for and assist in administering APSCN special projects such as software conversions, server upgrades, etc.
- Assess budget needs and monitor APSCN expenditures
- Research and analyze reports, data, documents as needed
- Edit and make recommendations for APSCN training documents and for State Reporting Cycle documentation
- Manage the APSCN web site
- Establish and implement office procedures and policies
- Assist in creating and maintaining the APSCN Standards of Operation (SOP)

- Maintain APSCN personnel files, interview prospective employees, recommend for hire
- Compose effective correspondence with vendors, customers, staff and related agencies.

6/97 to 4/6/98: Arkansas Public School Computer Network (APSCN), - Robert Friedman, Director, (501)682-4887
Position: Office Manager

- Manage and supervise administrative support staff
- Administer all phases of organizational activities related to business and personnel management
- Manage and maintain multiple bank accounts and investments of funds
- Manage and supervise all phases of financial accounting
- Prepare and submit all Federal and State required reporting
- Analyze accounting reports and create monthly financial statements for multiple funds
- Report to the Board on the financial status of the organization
- Establish and implement office procedures and policies
- Maintain personnel files and administer employee benefit plans
- Compose effective correspondence with vendors, customers, staff and related agencies.
- Assist in assessing budget needs and submit annual budgets for Board approval

9/83 to 6/30/97: IMPAC Learning Systems, Inc. (ILS) - Ray Scott, Administrator, (501) 324-9652
Position: Office Manager

- Supervise administrative support staff
- Manage and supervise all office functions: personnel, payroll, budgets, record keeping, and accounting
- Maintain multiple bank accounts and investments of funds
- Approve purchase orders and personnel leave requests
- Assist in planning and coordinating the implementation of IMPAC computer projects
- Coordinate the purchase and delivery of computer and technology equipment for IMPAC projects
- Negotiate hardware and software maintenance contracts with school districts
- Negotiate hardware and software licensing agreements and/or contracts with vendors
- Assist school districts in the procurement of computer and related technology equipment
- Establish and implement office procedures and policies
- Compose correspondence, create and analyze financial reports
- Prepare financial reports for Board presentations
- Initiate hardware and software bid requests, assist in analyzing and selecting vendors from the bid responses
- Assess budget needs and submit annual budgets for Board approval

10/82 - 8/83 Owens-Illinois, Inc., PO BOX 30, Tracy, CA 95376, (209)835-5701
Position: Executive Assistant to the Plant Manager
An executive assistant position to the plant manager in a glass container manufacturing corporation employing over 700 employees.

11/80 - 10/82 Tracy School District, 315 East 11th Street, Tracy, CA 95376, (209)835-8000
Position: Special Services Administrative Assistant II

- Managed the Special Services Office
- Managed, supervised and evaluated performance of support staff
- Composed correspondence, approved purchases,
- Set-up and monitored confidential student testing files
- Supervised the preparation of confidential psychological reports on students

3/80 - 11/80 Tracy School District, 315 East 11th Street, Tracy, CA 95376, (209)835-8000
Position: Classified Personnel Administrator

- Administered all facets of soliciting, hiring, firing and maintaining classified (non-certified) staff for the Tracy School District

11/74 - 12/78 Chemetron Corporation, Santa Fe Springs, CA
Position: Executive Assistant to the Western Regional Sales Manager

- Managed the regional sales office for this supplier of pigment to ink and paint companies.

Education:

College	Business Admin	Christian Life College, Stockton, CA
Business College	Programming.	MTI Business College, Stockton, CA

Continuing Education/Workshops/Seminars

- Performance Evaluation, Grievance Prevention and Handling, Computers and Data Processing, Time Management, The Human Element (T.H.E.) Course, Stress Management, Business Financial Management, Coaching and Teambuilding Skills for Managers and Supervisors and Building Budgeting Skills

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KATHLEEN CRAIN

Career Objective

To use and continue to develop my computer and accounting skills and technical and managerial experience with an organization in a challenging environment. To gain additional business knowledge, experience, and judgment necessary for advancement.

Education

1991 University of AR at Monticello, Monticello, AR

- **BS, Accounting**
- **CPA**

Experience

1995-Present AR Public School Computer Network Little Rock, AR

Director Financial Applications/Support

- Supervise nine field support in the training, setup, transition, implementation and support of a mandated state-wide Accounting software. One and one-half years as field support followed by promotion to supervisor of the financial division. Instruct software trainers, write training guides and user documentation procedures, liaison to Pentamation software supplier for updates, problems, etc., assist troubled districts with out-of-balance situations, procedural and auditing problems as well as provide double entry accounting lessons, and assist field support with overload schedules. Project Manager for major software conversion for 281 databases Nov. 2004-May 2005. Present workshops at various organizational meetings such as Arkansas Association of School Business Officials. Liaison to Legislative Audit to provide documentation and information for districts as necessary. Supervise four help desk personnel.

1992–1995 Union Camp Corporation Monticello, AR

General Accountant

- Supervised three accounting personnel; payroll/production reporting, accounts payable, and accounts receivable clerks. Responsible for month-end closing journals; cash receipts, payroll distribution, labor distribution, labor accrual, labor accrual reversal, employer taxes, corporate office charges, sales tax, sales, interplant charges, material usage, waste, inventory change, overhead and freight closure, and closing journal to corporate office. Supervised monthly physical inventory. Prepared monthly inventory data. Updated computer resin costs on a timely basis. Assisted Controller in preparing monthly financial statements.

1991–1992 Jefferson County Pine Bluff, AR

Accounting Operations Manager

- Responsible for all accounting operations for Jefferson County; 1992 Budget - $7,763,402.00. Supervised two full-time accounting graduate employees and two part-time employees. Took minutes at the Quorum Court meetings; number, filed and updated budget with all supplemental ordinances passed. Prepared monthly payroll for 250 employees grossing approximately 264,000, insurance enrollment, deductions, garnishments, changes, etc. Accounts payable for approximately twenty fund accounts. Federal grant for Drug Prosecution Fund. Proficient on Lotus and Word Perfect. Reconciled funds monthly with County Treasurer's Office. Prepared quarterly fuel excise tax reports, sales tax reports, employment security division reports, FICA, Federal and State Withholding deposits and reports. Reconciled bank statements. Reported and filed workers' compensation injuries and claims.

1991–1991 CONAM Construction Company, Prudhoe Bay, AK

Assistant Office Manager

- Time limited Construction Project. Prepared time sheets, entered time on computer, prepared payroll reports. Assisted office manager in preparing Internal Cost Reports, Client Cost Reports, Progress Reports, Travel Arrangements, Equipment Usage, and Billing and Invoicing. Expedited mail, reports, etc.

1987-1990 University of AR at Monticello Monticello, AR

Bookkeeper & Secretary II/Academic Affairs

Responsibilities to the Vice Chancellor for Academic Affairs:

Dr. A. E. Etheridge.

- Maintained Title III Budget approving grants to the extent of funds. Provided approved minigrant purchase order & travel instructions to faculty. Composed faculty development and routine graduate education correspondence. Reviewed faculty travel authorizations and reimbursements for accuracy. Prepared purchase orders and budget transfers to Academic Affairs. Maintained Academic Affairs books to reflect all purchases and charges. Reconciled Academic Affairs Books with Office of Finance & Administration. Prepared monthly financial statements. Prepared and mailed routine statistical reports. Compiled and maintained faculty statistics. Calculated summer salaries and prepared faculty appointments. Registered graduate students and collected tuition. Assisted with the compilation of news letter. Designed and prepared flyers and brochures-desk top publishing.