



## Arizona Department of Education

# Arizona Education Learning and Accountability System (AELAS) Business Case

*“Preparing Arizona Students for College- and Career-Success”*

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## 1.0 Executive Summary

### 1.1 Introduction

Arizona's current education system is starving for information and resources. Parents, teachers, and policymakers routinely ask questions the Arizona Department of Education (ADE) can't answer due to a lack of easily accessible, readily available data. Arizona's schools also face a shortage of resources in the slowly recovering economy. Despite these challenges, there is one very decisive action the state can take to make millions of additional dollars available to local schools without raising taxes or increasing formula costs. By undertaking the design and implementation of a comprehensive education data system, Arizona can redirect millions of current dollars spent on redundant and inefficient systems into the classroom. This new statewide data system, mandated by A.R.S. § 15-249, is known as the Arizona Education Learning and Accountability System (AELAS). By making the process of running a school system more efficient, AELAS will allow schools to shift monies currently being expended on software systems into the classroom. Additionally, it is being designed to collect student-level data for our State's pre-kindergarten to post-secondary educational programs to better serve all educational stakeholders in the state.

AELAS is at a critical point. All Arizona students deserve an education system that will help prepare them for future careers and leadership roles, and a number of recently enacted reforms require reliable data to succeed. The AELAS project is in alignment with ADE's vision of providing unparalleled support to Arizona educators and education agencies, achieving transparency, and providing evidence-based strategies for improvement. It also aligns with the four pillars Arizona's education reform plan—*data usage, standards and assessments, great teachers and leaders, and support of struggling schools*—with a data-centric approach. Finally, it provides the data needed to fully implement recently enacted legislative reforms such as comprehensive teacher and principal evaluation. None of these can be achieved unless AELAS becomes a reality.

This Business Case proposes a strategic plan and road map for the Arizona Department of Education, in consultation with the Arizona Data Governance Commission, to design, build and deploy a learning and accountability system. The Case outlines the research approach, findings, recommendations and financial justification to enable Arizona to fulfill the AELAS mission.

### 1.2 Research Approach

To understand where Arizona needs to go, we first must determine where we are. Researchers investigated the movement toward education data systems from a national, state, local and legislative perspective. Immediately, it was discovered that Arizona is not alone in this mission. Most State Education Agencies (SEAs) are pursuing a version of a learning and accountability system; however, no single SEA has all the answers, nor has any SEA deployed a comprehensive statewide learning and accountability system to date.

The first step was to define the components of a system: one that supports responsibility based on evidence, facilitates professional learning opportunities and provides actionable feedback to the educator. First, the system defines the context of accountability. Second, the system must be built upon aligned components—objectives, assessments, instruction, resources and rewards or sanctions. Third, the technical aspects of the system must meet high independent standards. Fourth, the system must provide the catalyst for positive change.

Next, the researchers conducted a statewide study of the culture, processes, and technology at the Local Education Agencies (LEAs) and ADE. Research objectives covered LEA software application type, usage, cost, and data, as well as the LEAs' achievements and shortcomings that prevent districts and charter schools from meeting their primary mission—preparing students for college and career success.

LEAs actively contributed to the study through participatory action research, providing specific feedback on the requirements of a learning and accountability system through a variety of research methodologies such as survey, site visits, phone interviews, and focus group sessions. Researchers were co-learners in this process, gathering qualitative and quantitative data about the software applications in the education market. These applications, also known as Commercial Off-The-Shelf (COTS) solutions, were divided into three categories to understand the data collected and reported in each system type:

1. Teaching and learning (e.g., assessment and content management systems)
2. Administrative (e.g., student information system)
3. Back office (e.g., finance and human resource systems)

A convenience and purposive sampling of 187 LEAs was conducted, which is representative of approximately 30 percent of all school districts and charter schools. The LEAs surveyed provide education services to 56 percent of all students statewide. A wide range of LEA size, geographic location, and type (e.g., Accommodation Districts and Joint Technical Education Districts) were represented in the study.

Without exception, researchers heard the ADE has lost credibility and confidence based on past performance (pre-2011), but respondents noted and appreciated recent improvements. This prompted an internal audit of ADE culture, processes and technologies. Research objectives covered legislation, product portfolio, infrastructure, process workflows, and budget allocations.

All ADE program areas, (School Finance, Exceptional Student Services, etc.) were included in the study. Researchers conducted root cause, performance and data error analyses, plus mapped all program workflow processes to understand dependencies and impacts to other program areas and LEAs. Researchers sought evidence of best business practices through documentation, and assessed program area resource and budget allocations.

Lastly, a half dozen of Arizona statutes and federal grant programs were identified as potential drivers for AELAS. Researchers aligned statutes to objectives, benefits, business change, and information technology (IT) enablers, using the Benefits Dependency Network model to interpret drivers for organizational change. All the data collected was processed and analyzed to expose systemic issues across the state at cultural, process, and technology levels.

### 1.3 Current State of Education

Despite the overwhelming apparent desire, Arizona’s current environment is not conducive to data sharing. The state has a system of local control over the delivery of education policies adopted by the Legislature and the State Board of Education (SBE) to ensure the education provided meets the needs of local communities. While this flexibility works well in many respects, from a data perspective, it has led to thousands of software applications statewide that stand independent, disparate, and disconnected. The problem also exists at ADE, which has approximately 150 applications and utilities, in large part on non-supported technologies dating to the early 1990s. One of the most valuable assets, data, is recognized to drive transformative change in education; however, often times data is inaccurate and, at best, mismanaged. There are no real value-added incentives, for LEAs in conjunction with ADE to cooperate, coordinate, and work together on common initiatives across Arizona in regards to data sharing and quality.

### 1.3.1 Local Education Agency Findings

The study found LEAs spend \$281 million annually on software licenses and implementation at the onset of a software rollout if all LEAs deployed the maximum number of systems. When the figures are divided by LEA size as outlined in Chart 1 below, very small- to medium-sized LEAs account for 46 percent of the total spend but only serve 18 percent of the student population. On average, very small to small LEAs procure three to four software systems; whereas, large to very large LEAs procure 9–10 software systems—mostly separate, independent applications, resulting in isolated data.

Chart 1 – School Breakdown and Average System Count and Cost

| LEA Sizes    | Size Ranges    | LEA Counts | Student Counts | Average Number of Systems | Average License Cost per User for One System |
|--------------|----------------|------------|----------------|---------------------------|--|
| Very Small   | <=199          | 245        | 24,115         | 3-4                       | \$57.28                                      |
| Small        | 200 – 599      | 197        | 72,378         | 3-4                       | \$18.07                                      |
| Medium       | 600 – 1,999    | 88         | 93,304         | 5-6                       | \$12.87                                      |
| Medium Large | 2,000 – 7,999  | 58         | 243,388        | 5-6                       | \$8.17                                       |
| Large        | 8,000 – 19,999 | 20         | 246,833        | 9-10                      | \$9.51                                       |
| Very Large   | >=20,000       | 11         | 397,045        | 9-10                      | \$5.33                                       |
| Totals       | --             | 619        | 1,077,063      | --                        | --   |

Source: Arizona Auditor General for LEA size categories and U.S. Department of Education EDData for LEA and Student counts.

As illustrated above, very small LEAs pay ten times more than very large LEAs for software licenses per user. Closer examination of the most prolific COTS application, the Student Information System (SIS), revealed implementing a statewide solution with pricing similar to a very large LEA would enable LEAs to recover \$11.6 million, thereby freeing up money that could be used to hire more teachers, purchase additional software or curriculum materials, or provide better technology in classrooms. This figure only highlights the financial reinvestment for one application that tracks student data (e.g., attendance, demographic, and grades).

In addition to software, infrastructure costs such as servers and network switches are estimated at \$47 million at the time of hardware purchase, amortized over time. There are also costs for desktop computers, laptops and tablets not accounted for in this study. Larger LEAs replace servers on a three- to five-year cycle, while smaller LEAs must extend the normal life an additional three to four years, often times leaving them with unsupported hardware and limited capability. This case does not address infrastructure cost savings because the greatest and most immediate impact is recognized with software licenses; however, future consideration should be given to infrastructure costs.

### 1.3.2 Arizona Department of Education Findings

An internal audit shows systemic and cyclical data issues due to inadequate budgets and resources have led to immature business practices in regards to data management resulting in no 'single source of truth.' The collection of approximately 150 applications and utilities is maintained as minimal stopgaps for legislative compliance and lead to excessive reliance on manual labor, resulting in ADE expending 568,000 man hours annually. Opportunity costs as a lost benefit are the forgone services provided to support LEAs. The downstream impact of these issues permeates throughout the ADE and furthermore impacts LEAs' data management, costing \$12.5 million annually for full-time-equivalent positions to determine data accuracy.

ADE program areas such as School Finance and Exceptional Student Services are at their operational limit because this pattern of data-induced inefficiency repeats across the organization, forcing the ADE to be in a persistent reactive mode. For example, the academic year 2011–2012 school grading was delayed, initially reported inaccurately, then recalculated and resubmitted. This impacts the credibility of the ADE, reputation of schools, and perception of Arizona education. Most disappointingly, as this example illustrates, the expertise, dedication, and quality work of the ADE is overshadowed by the shortcomings and failures of data management.

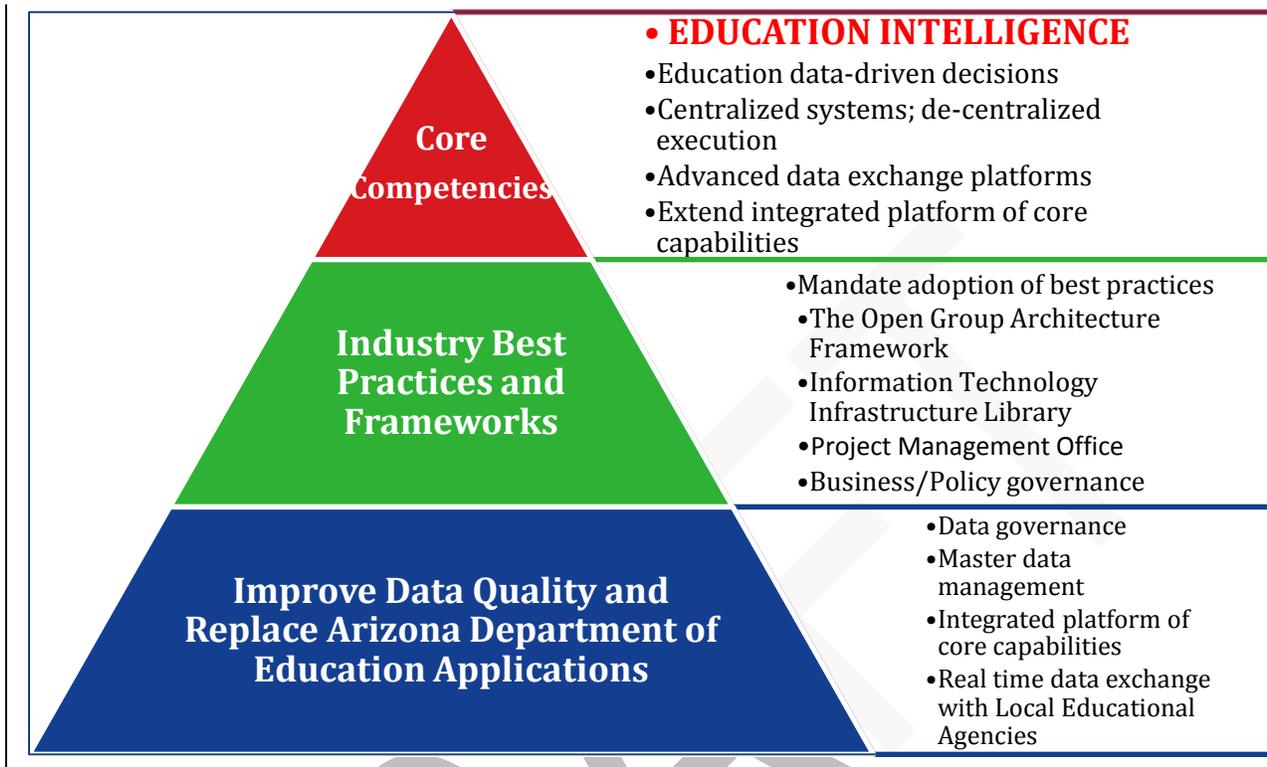
Even though ADE has exhibited successful stabilization and optimization efforts in recent years, a complete overhaul of data management, business practices, and application replacement is mandatory to avoid the highly-probable failure that would result in issues with redistributing the \$5.7 billion in school funding to LEAs each year.

## 1.4 Recommendation Hierarchy

The study yielded 13 recommendations from which a three-level hierarchy was formed to show an order of prioritization to achieve transformative change. The range of issues identified earlier is addressed by implementing the recommendations as illustrated below:

- (1) Improve data quality and replace ADE applications
- (2) Implement and apply industry best practices and enabling frameworks
- (3) Develop and enable core competencies

Figure 1 – AELAS Recommendation Hierarchy



This Business Case reflects and details the new business model for how to conduct a state-led, cooperative education program. The above recommendations align with tangible benefits that will result in cultural, process, and technology changes across the ADE and LEAs. All recommendations lay the foundation and lead to Education Intelligence – integrated data and analytics transformed into actionable information delivered ‘real-time’ to education stakeholders that can contribute to the improved student success.

A key aspect that often occurs in the IT domain is the tendency to overemphasize technology and tools rather than the importance of culture and processes in making sustainable change. It is crucial to address and focus on how culture and processes will change the current ‘as is’ to the ‘to be’ state and, more importantly, to have a strategy for these rather than a reactionary observation of what happened. This is precisely how the value proposition will produce substantial reinvestment opportunity to the state of Arizona.

### 1.4.1 Culture

A change in culture begins with the first recommendation of mandating an internal ADE data governance structure under a state data officer. Second, implementing a master data management policy using the Common Education Data Standards (CEDS), as established by the National Center for Education Statistics, will unify data across the state. Third, ADE will utilize industry best practices and frameworks which will lead to enhanced ADE performance, changing the perception of ADE that internal and external stakeholders currently have. Last, deploying centralized systems at reduced statewide pricing can

change the isolated behavior across the Arizona landscape by enticing LEAs to work collaboratively by sharing resources, ideas, and innovations for education-data-driven decisions.

### 1.4.2 Processes

Adopting and applying formalized frameworks such as the Information Technology Infrastructure Library (ITIL), The Open Group Architecture Framework (TOGAF), and Project Management Organization (PMO) will enable the ADE to reap the benefits of best practices from mature industries that have dealt with data-related issues and their associated processes. New and advanced file interchange platforms will make it easier for the ADE and LEAs to exchange immediate, actionable data to influence and inform decisions at the state, district, school, class and student levels.

Moreover, the improved processes can be integrated and considerate of reporting needs from ADE program areas, within and across the organization, and with LEAs as integrated and interoperable systems further realize the benefits of the new learning and accountability system.

### 1.4.3 Technology

Technology serves both those who use technology to conduct their work as well as the recipients of those work products. This Business Case recommends replacing the entire infrastructure and implementing more up-to-date architecture and platforms. This complete rebuild will introduce an integrated platform to support efficient agency operations. This goal does not rely on 'leading-edge' technology, but rather on the application of rigorous discipline and integration of the cultural and processes described above. The proposed new platform will lead to configurable program area services and the architecture to support new uniform data exchange requirements.

## 1.5 Financial Investment

A state investment in AELAS at this time is critical to maintaining momentum in education reform. Opportunity for systemic change; albeit ambitious, is attainable and sustainable. The financial investment requested is based on the execution of the recommendations outlined in this business case and illustrated in the recommendation hierarchy.

### 1.5.1 Local Education Agencies

At the center of AELAS are the educators and students that will benefit from the overhaul of education. It is important to note that very small and small LEAs currently pay more for less. They are estimated to spend \$25 million for software licenses and implementation on the four systems that they can typically afford to implement. By adopting the AELAS systems instead, they could implement an additional five systems to better support teaching and learning, and reinvest nearly half their current expenditures directly into the classroom.

LEAs will have the ability to configure and use systems in ways that work best for their local needs. No longer will LEAs be required to manage the vendor relationships; the ADE will be poised to manage the service level agreements with the range of education vendors, based on industry best practices and state-adopted data management standards.

Based on ADE-hosted focus groups, a full range of LEA representation identified the systems most needed, which would be supported as a centralized, opt-in model. The cost of implementing these centralized systems was calculated at economies of scale pricing over a five-year period and equals \$87.8 million. See Chart 2 below for the rollout of the nine systems starting in fiscal year 2014, and the breakdown between software license and implementation costs. The approach proposed is that LEAs will eventually discontinue their contract with vendors and convert to the ADE opt-in model, reallocating the cost for software and implementation through ADE, paying the state pricing point, which is lower than their current pricing.

**Chart 2 – Centralized, Opt-In Model Software Systems License and Implementation Costs (\$Millions)**

| <b>Fiscal Year</b>                | <b>FY14</b>  | <b>FY15</b>   | <b>FY16</b>   | <b>FY17</b>   | <b>FY18</b>   | <b>TOTAL</b>  |
|-----------------------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| Number of Systems                 | 5            | 7             | 7             | 9             | 9             | 9             |
| Number of LEAs                    | 20           | 110           | 314           | 555           | 619           | 619           |
| Software License Costs            | 1.1          | 4.0           | 7.8           | 13.7          | 20.7          | \$47.3        |
| Implementation Costs              | 3.8          | 7.1           | 9.3           | 9.6           | 10.7          | \$40.5        |
| <b>Total LEA Investment Costs</b> | <b>\$4.9</b> | <b>\$11.1</b> | <b>\$17.1</b> | <b>\$23.3</b> | <b>\$31.4</b> | <b>\$87.8</b> |

Overall, LEAs of all sizes will realize the benefits of cost reinvestment, improved services and support, and integrated, centralized systems that will support data-driven decision-making all the way down to the individual student level. LEAs can choose to reinvest monies saved on software licenses and implementation in ways that best support their local needs. The total annual LEA cost reinvestment is estimated to be between \$30 and \$60 million annually depending on the number of LEAs that opt-in.

The success of the centralized systems approach is based on several factors including increased investment in local needs, superior services and support from ADE, and offerings of advanced integration and analytics across multiple systems and data sources. A jointly owned, cooperative formation of LEAs is recommended to provide ADE requirements, feedback, and guidance. ADE will work with this group to ensure continuous improvement in services.

### 1.5.2 Arizona Department of Education

The basis of the recommendation hierarchy begins at ADE with improving data quality and replacing applications with an integrated platform to serve the ADE program areas and subsequently the LEAs. Concurrently, ADE will employ industry best practices and frameworks. The ADE has the potential to realize a cost recovery of 568,000 man-hours expended on data management and corrections annually, which would be free to provide service to LEAs. LEAs will also experience a cost recovery or reinvestment of 500,000 hours expended on data management and corrections or \$12.5 million annually due to better data quality at ADE.

A financial investment is required to accomplish these recommendations. See Chart 3 below for the rollout of the recommendations over a five-year period. The recommendation to improve data quality and replace ADE applications with an integrated platform equals \$65.3 million and is divided between software licenses and implementation. The recommendation to implement industry best practices and frameworks equals \$4.4 million. The fiscal year 2014 financial investment request equals \$23.2 million.

**Chart 3 – ADE Financial Investment Request (Costs in \$Millions)**

| Fiscal Year   | FY14          | FY15          | FY16          | FY17         | FY18         | TOTAL         |
|---|---------------|---------------|---------------|--------------|--------------|---------------|
| Recommendation 2: Industry Practices and Frameworks             |               |               |               |              |              |               |
| Implementation Costs  | 3.2           | 0.3           | 0.3           | 0.3          | 0.3          | \$4.4         |
| Recommendation 1: Improve Data Quality and Replace Applications |               |               |               |              |              |               |
| Software Costs  | 3.2           | 0.3           | 0.3           | 0.3          | 0.3          | \$4.4         |
| Implementation Costs  | 16.7          | 10.8          | 18.1          | 6.3          | 9.0          | \$60.9        |
| <b>Total ADE Investment Costs</b>                               | <b>\$23.1</b> | <b>\$11.4</b> | <b>\$18.7</b> | <b>\$6.9</b> | <b>\$9.6</b> | <b>\$69.7</b> |

This financial investment analysis demonstrates that within a short three-year time frame of AELAS implementation, the investment requested under this proposal is recovered in accumulated benefits to the state and LEAs, and that the cumulative benefits outpace the ongoing investment needed to support and maintain all of AELAS. The cumulative benefit calculation includes 2 components: (a) the reinvestment costs from ADE and, (b) the reinvestment costs for the LEAs from the implementation of AELAS systems. In other words, after three years, the investment has fully paid for itself and continues to deliver benefits to both the ADE and LEAs. See Chart 4 for the cumulative financial investment and benefit of AELAS as implemented per the recommendations in this Business Case. It is important to note the LEA investment is a reallocation of current funds, which is less than their current expenditures on data systems. This approach minimizes risk, improves the ability of the organization to adapt to change, and will provide the on-going measurement of success and confidence in ADEs execution and LEA adoption.

**Chart 4 – AELAS Cumulative Financial Investment and Benefit (Investment and Benefit in \$Millions)**

| Fiscal Year                 | FY14            | FY15           | FY16          | FY17           | FY18           | TOTAL          |
|-----------------------------|-----------------|----------------|---------------|----------------|----------------|----------------|
| Cumulative LEA Investment   | 4.9             | 16.0           | 33.1          | 56.4           | 87.8           | \$87.8         |
| Cumulative ADE Investment   | 23.1            | 34.5           | 53.1          | 60.1           | 69.7           | \$69.7         |
| Total Cumulative Investment | 28.0            | 50.5           | 86.2          | 116.5          | 157.5          | \$157.5        |
|                             |                 |                |               |                |                |                |
| Total Cumulative Benefit    |                 | \$45.0         | 133.9         | 222.8          | 334.0          | \$334.0        |
| <b>Net Benefit</b>          | <b>\$(28.0)</b> | <b>\$(5.5)</b> | <b>\$47.7</b> | <b>\$106.3</b> | <b>\$176.5</b> | <b>\$176.5</b> |

Effective measures are critical to ensure the benefits being sought are achieved and will report against the value proposition that justifies the investment. In the past year, the ADE has begun to employ the discipline of industry best practices and frameworks required to improve data quality. The ADE will continue to identify the necessary metrics to measure and monitor benefits, in anticipation of further justifying and providing auditability of success for the financial investment.

## 1.6 Conclusion

The time is now to unite Arizonans on the common mission of AELAS. The stakes are too high to allow 'business as usual' to continue. It is not enough to acknowledge the issues and allow them to go unchecked. The AELAS—an integrated learning and accountability data system—is the opportunity for transformative change from cultural, process, and technology perspectives across all Arizona education agencies.

Since 2011, The Arizona Department of Education has been building the early foundations for transformative change by initiating cultural, process, and technology improvements through past and current projects such as the Student Accountability Information System (SAIS) Stabilization; Student, Teacher, and Course Connection (STC); and Instructional Improvement System (IIS) to name a few. See chart 5 for the project names and descriptions highlighting the improvements and benefits.

Chart 5 – AELAS Projects and Descriptions

| ADE Project                         | Description   |
|-------------------------------------|---|
| SAIS Stabilization                  | Replaced obsolete hardware without interruptions and enabled system availability 99.75% increasing process efficiencies for LEAs and the credibility of ADE   |
| Student, Teacher, Course Connection | Ensure accurate linkage of student performance data to specific classroom and teacher and schools and districts   |
| Instructional Improvement System    | Integrated software systems that will provide portals for students, teachers, parents, and school and district administrators to access data and resources to inform decision-making related to instruction, assessment, and career and college goals – provide instructional support for the implementation of the Arizona’s Common Core Standards, teacher and principal evaluation, and preparation for the Partnership for Assessment of College and Career Readiness |

With this investment, the ADE will complete the foundation for AELAS by completely rebuilding its entire application portfolio and infrastructure; all LEAs will receive a complete family of advanced software

systems that will integrate data across the state, provide new classroom education delivery capabilities and, finally, lead the state toward data-driven decision making that relies on accurate and timely information. More importantly, these recommendations and investment will position the State of Arizona to truly prepare students for future careers and leadership roles.

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## 2.0 Problem Statement

### 2.1 Dilemma

Some of the fundamental problems facing Arizona and the current state of education involve data – one of the most valuable assets recognized as a change agent. Education data in the state is of poor quality, misused, and inaccessible. Software systems which serve as containers to the data exacerbate the problem because the systems are costly to Local Education Agencies, disparate, and non-interoperable. Another problem is the culture has come to reflect isolated and reactive behaviors. Intertwined with this dilemma are issues from culture, process, and technology perspectives across the ecosystem of Arizona education.

#### 2.1.1 Arizona Department of Education

The department has a history of reacting to immediate needs without planning for future needs and long-term success. For various reasons, from the lack of stakeholder involvement, immature business practices to insufficient funding and tight time constraints, the ADE program areas developed or acquired a sizeable portfolio of disparate systems over a decade. These disparate systems are in need of upgrades and, in many cases, unable to efficiently provide the necessary capabilities to districts. The Information Technology (IT) Program has been held accountable for maintaining these stand-alone program applications.

The department's immature business practices in regards to data management and governance have led to no "single source of truth" for data quality and accuracy. The collection of systems, applications and utilities, now reaching over 150, is outdated and exists on non-supported technologies resembling the early 1990's IT environment. The collection is maintained as minimal stop gaps for legislation compliance. These un-integrated systems cause the excessive reliance on manual labor costing the department 568,000 man hours. Opportunity costs as a lost benefit are the forgone services provided to support LEAs.

To further emphasize the lack of quality, many of these systems were identified by the Arizona Auditor General in 2006 as being a significant security risk in terms of vulnerability. A 2011 study of the department's Information Technology indicated the school finance system known as Student Accountability and Information System (SAIS), was not capable of handling either the amount of data or the complexity of the business rules required by state and federal legislation.

The department is perceived by districts primarily as a fiduciary agent rather than an agency that provides core competencies through vision, leadership, and services to Arizona's education community. Unless the department becomes a cooperative partner with LEAs in the joint responsibility of improving the quality of education in Arizona, the biggest losers will continue to be the students and the economy of the state.

#### 2.1.2 Local Education Agencies

Over the years, the problems described at the state level have had downstream implications on districts and charter schools, resulting in dependence on their local expertise and the vendor community rather

than turning to the ADE for guidance and service. Specifically, data errors at the department leave districts managing and reconciling data instead of focusing on educational responsibilities. This comes at a cost to the LEAs estimated at \$12.5M annually. Moreover, the smaller districts have limited staff and lack essential capabilities to effectively manage and support the business of education leaving personnel to focus on manually mapping bus routes, using excel spreadsheet to analyze test scores and paper and pencil to track the professional development of teachers and principals. These districts have limited staff, and this manual work drains those limited resources even further.

Another issue districts and charter schools encounter is with the delay of receiving important data such as student performance and achievement results from outgoing school and the ADE. It is estimated the delay of transferring the student's data accounts for 3-5 weeks of lost, valuable instruction time. LEAs are left with retesting students and manually manipulating the data to obtain meaningful results. LEAs must have their results accessible in a timely and immediate fashion if they are to use them to improve outcomes.

LEAs turn to a vast and fragmented market of education vendors to provide services and systems targeted for teaching and learning, administrative, and back office capabilities. These systems are essential to manage back office, administrative responsibilities as well as enable teachers to effectively instruct and prepare students with 21<sup>st</sup> century skills to be competitive in today's global economy. However, the independent implementations of these systems make them costly, disparate, and non-interoperable. Vendors typically change these systems every few years to newer technologies, and come at a high risk of districts losing valuable data, assets, and intellectual property. Districts haven't had the opportunity or options to procure software systems with robust compliance to industry standards of interoperability and integration.

LEAs struggle to procure data management systems with comprehensive data integration and interoperability that enable education stakeholders to make decisions that lead to improved teacher and student performance. For example, one of the biggest issues facing LEAs is student mobility and the immediacy of accessing student records to provide the necessary services the day the student arrives at the school.

The dilemma that confronts the ADE is how it corrects the multitude of data issues it has while simultaneously improving its education systems and programs that is costing the organization and taxpayer millions of dollars in the face of budget cuts and economic uncertainty.

In summation, the breadth and depth of the problems facing the ADE is extensive and critical because they encompass not only the systems on which the LEAs are reliant; the applications used internally by personnel at the ADE; but the interaction and exchange of data and information between the LEAs and the ADE; and even extends to the way that the ADE conducts its business including but not limited to providing guidance and support for statewide education programs.

### 2.1.3 Background

This situation is further complicated and exacerbated by the following challenges:

- Unfavorable business and economic conditions across the state and nationwide
- Increased global competition for educated resources
- Recent reductions in state aid to education
- Implementation of new, rigorous common core standards and assessments further overloading teachers, administrators, and district staff

- Ever-changing legislative landscape imposing additional mandates
- Complex landscape of districts, in a “local control” state of various sizes totaling six hundred nineteen
- The Superintendent of Public Instruction is an elected position with a four-year term, so it is possible that the ADE may undergo changes in its strategic direction whenever a new official is selected
- Very mobile student/parent population moving from school to school (estimated at over 10% of students annually)
- Diversity of student population and families across the state
- LEAs reluctance and distrust to share data with ADE due to perceived consequences

### 2.1.4 Consequences

The most notable consequences of these issues manifest in national and state research studies and investigations and lead to sensationalized headline stories further drawing negative attention to the current state of education in Arizona.

- ‘Ghost Students’ Cost Arizona Taxpayers \$125 Million Each School Year’ (Butcher)
- ‘Arizona drops in overall education rankings...’ (Reese)
- ‘Former Intel CEO blasts education in Arizona’ (Rough)

Inefficiencies in the state’s student information system (i.e., SAIS) and outdated school finance policies led the Goldwater Institute to conduct an investigation that found in the 2009-10 school year, Arizona overpaid districts \$125M million on approximately 13,500 students in districts with declining enrollments. Jonathan Butcher, education director for the Goldwater Institute, recommends when migrating from the current statewide student information system to the future system, ADE should adopt current year student funding. Overall, Butcher poses to the Arizona legislature to adjust school funding structure from last year enrollment to current year enrollment.

Quality Counts is Education Week’s annual report on the state-level efforts to improve public education published in January 2012. The report, *The Global Challenge*, looks at America’s international standing in education, and lessons to be learned from high-performing countries. The research study measured assessments and standards to school finance and a student's chance of success. News outlets picked up the research and headlines read “Arizona drops in overall education rankings, but 'achievement' on rise” that ranked Arizona in the bottom twenty percent of all states including Washington, D.C. and was given the overall grade of “C-”. A key finding is the increased use of international comparisons by states for assessment and accountability systems.

In 2011, Craig Barrett, former Intel CEO and Board Chairman, made remarks to the Arizona Commerce Authority claiming Arizona's education system is hindering economic-development efforts. ‘Barrett’s comments were echoed by several authority board members, all of whom are executives of leading Arizona businesses. Judy Wood, president of Contact One Call Center Inc., further commented Arizona students are lacking the basic skills needed for entry-level positions.’

## 2.2 Management Question

The management question confronting the ADE is how to efficiently and effectively design, build, and deploy the Arizona Education Learning and Accountability System, otherwise known as AELAS and as

mandated by A.R.S. § 15-249. Central to the research study are seeking answers to resolve the issues described wherein and changing perceptions of Arizona education.

The Business Case proposes a strategic plan and road map to direct the ADE to design, build and deploy a learning and accountability system to maintain accountability and longitudinal information, student level data, including student demographic, grade level, assessment, teacher assignment and other data required to meet state and federal reporting requirements through commonly used internet web browsers. The importance of the project is underscored by the Data Governance Commission, providing ADE oversight and guidance. The Case outlines the research approach, findings, recommendations and financial justification to enable Arizonans to envision and fulfill the AELAS mission. If deployed thoughtfully and with the current dilemmas in mind, AELAS can be the connection between the department and the LEAs that leads to the whole being greater than the sum of its parts, with the students and the state of Arizona the big winners.

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## 3.0 Landscape Review

### 3.1 A Culture of Evidence

The next generation of learning and accountability systems is being ushered in, altering the landscape of education reform, by federal, state, and local initiatives and legislation. State and Local Education Agencies, educational vendors, and organizations are encouraged to share, collaborate and innovate on comprehensive solutions to deliver new instruction and accountability measures, such as the initiatives of Race to the Top program, Common Core State Standards Initiative, Smarter Balanced Assessment Consortium, and Partnership for Assessment Readiness in College and Career.

The challenge of creating a learning and accountability system is not new. What is new – is the ever constant, ever changing regulatory and industry standards, and emerging educational trends and technologies all while attempting to transition from an existing to future environment. The purpose of this research study was to gain a very clear and complete picture of the existing and new evidence of a learning and accountability system from a federal, state and local perspective including the education industry marketplace.

The research team consisted of former educators, industry experts, and Information Technology professionals such as Enterprise Architects and Business Analysts. They gave special consideration to the type, breadth, and quantity of information required for a learning and accountability system covering Arizona's nearly 1.2 million students, 60,000 educators, 2,000 schools, distributed over at least 5,000 disparate systems and thousands of spreadsheets of data going back as far as 10 years and 'simply' attempting to create a clear and complete picture. Although, the researchers investigated national and industry-wide initiatives and legislation, the two main subjects of the research study were Arizona's local education agency stakeholders including teachers, administrators, students, and parents, and the ADE program areas which provide direction, guidance, and services to the LEAs.

Researchers investigated the AELAS mission (i.e., to build the learning and accountability system) from the following perspectives:

- US Department of Education (Federal) Initiatives and Legislation
  - Education Industry Vendor Products and Services
- State Education Agency Initiatives and Legislation
  - Other State Education Agencies
  - Arizona Department of Education
  - Arizona Department of Administration
- Local Education Agency Initiatives and Legislation

### 3.2 Research Objectives

The research was kicked off with a series of initial investigative questions outlined in Chart 6. As the investigation continued, it drilled down into the answers and ultimately more questions. The result of this body of research will be reported in the chapters, Data Analysis and Recommendations.

Chart 6 – Research Objectives by Agency or Entity

| Agency/Entity                                  | Investigative Question  |
|--|---|
| US Department of Education - Federal Level (F) | <p>(F1) How does the federal government, industry, or other entities define a learning and accountability system?</p> <p>(F2) What federal initiatives and legislation contribute to building a learning and accountability system?</p> <p>(F3) Are there nationally recognized standards that should be considered when building a learning and accountability system?</p>   |
| Education Industry Vendors (E)                 | <p>(E1) Are the current vendor software systems compatible with the recognized standards and specifications?</p> <p>(E2) Does the education industry offer a comprehensive, integrated system ADE can procure for the learning and accountability system?</p> <p>(E3) Is the data residing locally in the vendor software systems critical for inclusion in the learning and accountability system?</p>   |
| State Education Agency (S)                     | <p>(S1) Which states have implemented a learning and accountability system and how did the state accomplish this initiative?</p> <p>(S2) How much have other states been awarded from federal programs and initiatives?</p> <p>(S3) What can the Arizona Department of Education learn from other state initiatives and programs?</p>   |
| Arizona Department of Education (A)            | <p>(A1) Which Arizona legislative mandates or programs are driving the mission to build and implement the statewide learning and accountability system and what are the objectives and benefits of these legislative mandates and programs?</p> <p>(A2) Which ADE data is required to support the learning and accountability system?</p> <p>(A3) How does ADE currently treat data and what are the current processes and procedures for data management?</p> <p>(A4) Does ADE have the Information Technology infrastructure to support the learning and accountability system?</p> |
| Local Education Agency (L)                     | <p>(L1) What is the cost of the vendor software systems at the local level?</p> <p>(L1) Which are the top vendor software systems procured by LEAs?</p> <p>(L3) What are the priority capabilities and critical data of those vendor software systems at the local level?</p>   |

### 3.3 Research Design

There were a number of approaches used in conducting the actual research. See Charts 7 – 10 for the research design methods per each type of agency or entity. Generally speaking, a significant amount of data and information was collected by conducting interviews and researching available documentation. But a number of other newer, innovative research methods and frameworks were leveraged for this business case. The Benefits Dependency Network (BDN) model, which is one part of the Benefits Management approach, was used to interpret the drivers of organizational change at the ADE. There were two frameworks used to properly gather, structure, and analyze the data which is the Information Technology Infrastructure Library (ITIL) and The Open Group Architecture Framework (TOGAF®). Methodologies within these frameworks were only employed where they were most appropriate and useful. A third methodology used was nonprobability sampling utilizing purposive and convenience techniques to collect information from LEAs.

**Chart 7 – Research Design Methods: US Department of Education (Federal) and Industry Vendor**

| Research Design   | Approach and Execution   |
|---|--|
| Documentation Reviews   | The business analyst team thoroughly reviewed documentation regarding federal initiatives and legislation on the <a href="http://www.edu.gov">www.edu.gov</a> website and other sources. |
| Request for Information (RFI) and Request for Proposals (RFP) | The business analyst team released RFIs and RFPs and analyzed proposals from the education industry vendors.   |
| Documentation Reviews   | The business analyst team thoroughly reviewed documentation regarding vendor products and services on respective websites and other sources such as Gartner, Inc.                        |
| Product Demonstrations  | The business analyst team invited vendors to conduct product demonstrations.   |

**Chart 8 – Research Design Methods: State Education Agencies**

| Research Design       | Approach & Execution   |
|-----------------------|--|
| Documentation Reviews | The business analyst team thoroughly reviewed documentation on respective websites and other sources. Several RFP documents were analyzed from other state education agencies. |
| Site Visits           | The ADE IT executive team visited another State Education Agency to understand progress on their longitudinal data system.   |
| Interviews            | The enterprise architecture team interviewed other State Education Agency personnel.   |

Chart 9 – Research Design Methods: Arizona Department of Education

| Research Design                         | Approach & Execution   |
|---|--|
| Benefits Dependency Analysis            | The business analyst team analyzed Arizona legislation and programs to define quantifiable benefits and values.  |
| Data Error Analysis                     | The enterprise architecture team conducted a study on the quantity of errors occurred over a time period and within the SAIS system workflow. This error analysis identified the frequency of errors for incoming student records that result in their rejection and the error causes profile.   |
| Performance Analysis                    | The enterprise architecture team conducted a study on the effectiveness of system functional modules which are small applications; usually excel spreadsheets or Microsoft access database forms that are used to automate some manual activities.   |
| Workflow Process Mapping                | The enterprise architecture team produced workflow process maps of numerous program areas in order to completely understand exactly how application needs are articulated, designed, built, deployed and supported. See the Information Technology Infrastructure Library (ITIL) description below.  |
| Reverse Engineering of Application Code | The enterprise architecture team reviewed every individual programming code block, documented each and every module, spreadsheet, Access database utilized, and processes.   |
| Enterprise Architectural Review         | The enterprise architecture team investigated the business, solutions, knowledge and information, and infrastructure architecture across ADE program areas. See The Open Group Architecture Framework (TOGAF) description below.   |
| Data Infrastructure Review              | The enterprise architecture team conducted a detailed analysis of the data assets within the ADE examining volume, size, and types of transactions, high level data flows, database structures, access to databases, and storage policies.   |
| Interviews                              | The enterprise architecture team interviewed ADE personnel on numerous projects, program areas, issues and on-going business as usual activities.  |
| Documentation Reviews                   | The business analyst and enterprise architecture teams thoroughly reviewed documentation written to date by ADE program areas.   |
| Root Cause Analysis (Ishikawa)          | The enterprise architecture team conducted root cause analysis using an Ishikawa diagram process. See the Ishikawa Diagrams.   |
| Physical Inspection                     | The enterprise architecture team conducted a physical inspection of the ADE computer technology systems' architectural infrastructure housed within the department of administration data center to assess its current environmental setting, capacity, and identify any potential risks as well as gauging its potential for expansion to handle future growth. |

Chart 10 – Research Design Methods: Local Education Agency

| Framework / Method                  | Approach & Execution   |
|-------------------------------------|--|
| Online Survey                       | The business analyst team developed and conducted an online survey to understand the vendor product usage, cost, and implementation practices.                           |
| Business Requirements Documentation | The business analyst team conducted face-to-face and phone interviews to elicit, collect, prioritize and document high-level business requirements for software systems. |
| Site Visits                         | The business analyst and enterprise architecture teams conducted face-to-face site visits. See the section, Research Coverage, for details.                              |
| Focus Groups                        | The business analyst team conducted virtual online focus groups using survey and questionnaire methods to gather information.  |
| Phone Surveys                       | The business analyst team conducted phone interviews to collect hardware and manual costs.   |
| Product Demonstrations              | The business analyst team sought product demonstrations from LEAs to understand unique local implementation approaches.  |

### 3.4 Detailed Research Methods

Further explanation and description is provided below on the ITIL, TOGAF, and BDN methods since some of the research designs and methods are fairly new to the application of the education industry; however, these industry standards and frameworks are not new to software development.

#### 3.4.1 Information Technology Infrastructure Library

The approach taken for the ADE research was a ‘service portfolio management’ approach for all services both core and advanced. This was done in order to

- effectively manage information delivery;
- provide a stable core services infrastructure;
- provide the capability to expand to advanced services;
- and more importantly be able to make strategic cost-effective decisions of what advanced services are needed and what are the changes needed to the core services to support these needs.

The overall roadmap for this maturation is the application of Carnegie Mellon’s capability maturity model integration (CMMI) applying the IT service management framework of ITIL. See IT Service Management for more details and illustrations. ITIL relates to the degree of formality and optimization of processes, from ad hoc practices, to formally defined steps, to managed result metrics, to active on-going optimization of the efficiency and effectiveness of the processes.

The remedial method taken to define and address the legislative mandates or customer demands is founded on the diligent and methodical application of two key processes, within the service strategy segment of ITIL. It is essential to ensure and demonstrate sound investigation and research to identify

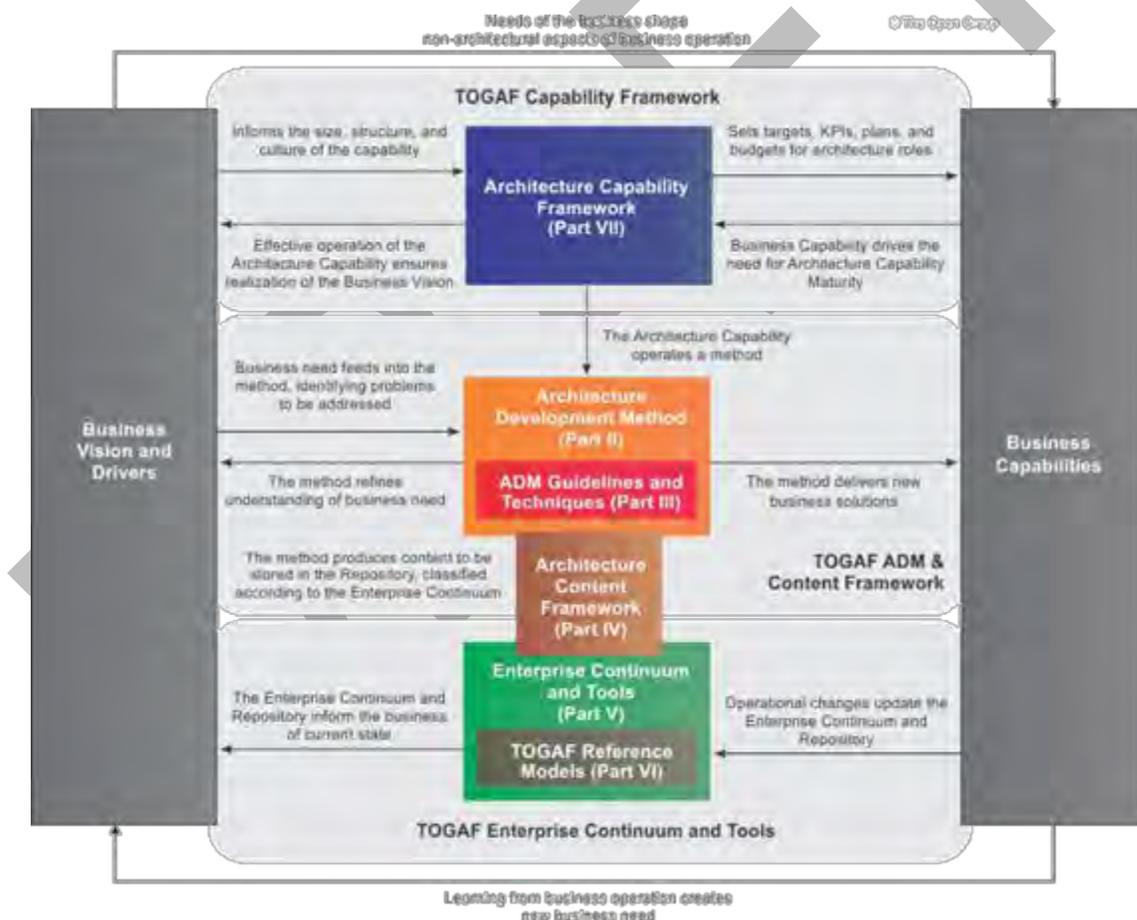
and meet the needs being addressed and support the recommendations made within the business case. The two ITIL processes are those of Demand Management and Service Portfolio Management. See Demand Management and Service Portfolio Management for a full description of these concepts.

Demand Management is an IT governance process that enables IT and the business to optimize the investment in IT through fact-based decisions. Producing deliverable solutions to meet the needed capabilities identified by demand management requires the execution of the second most critical ITIL process of Service Portfolio Management.

### 3.4.2 The Open Group Architecture Framework

TOGAF reflects the structure and content of an architecture capability within an enterprise as well as the process of applying it to the ADE. The documentation associated with the framework guides enterprise practitioners toward creating and implementing a pathway to achieve the business vision and goals. See Figure 2 which illustrates the pathway.

Figure 1 - TOGAF



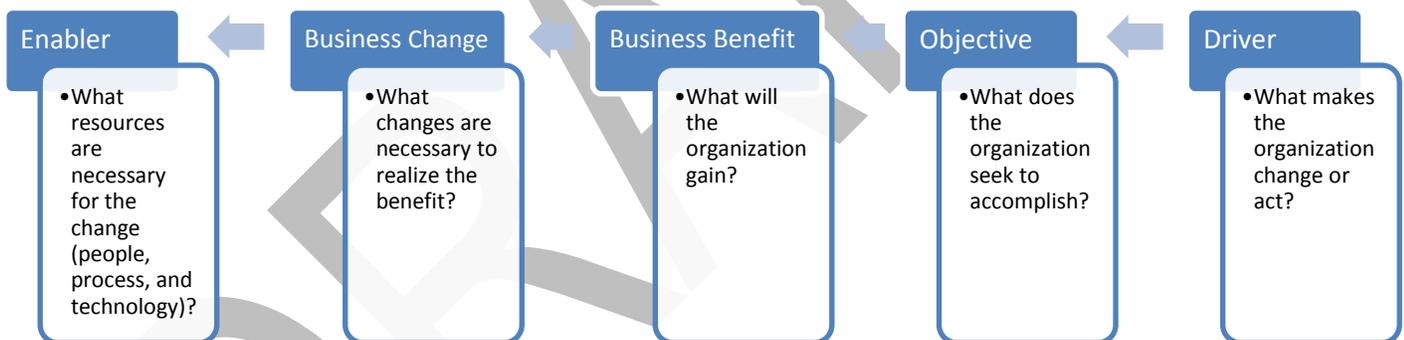
The application of this structured framework reflects and supports ADE’s commitment to improve its overall maturity of capabilities with clear and precise supporting frameworks. Under AELAS business case research, an enterprise architecture team was formed that conducted the analysis presented in the research method in order to produce the recommendations based on sound architectural principles.

### 3.4.3 Benefits Dependency Network

Simply stated, the BDN is a model, usually created on one page that links IT projects to the business activities that are being changed and the reasons behind those changes. The BDN aligns the key drivers for organizational change to objectives, benefits, and changes required to realize the benefits. The identification of Information Technology projects is important and enables changes to make it all a reality. The linked elements are logically related and form a thread that tells the story of how IT enablers will drive or require changes by the business in order to realize associated, measurable business benefits and achieve objectives as defined by the driver.

Therefore it was only logical to conduct a study of legislation, grant applications, and other key documents in order to determine which were actually relevant to AELAS which were then recorded in the BDN model. The model, while very complex, was constructed from right to left as the BDN methodology requires. See Figure 3 for the flow from a driver to enabler. Studying the legislation in detail revealed the objectives and the business benefits that were expected to be achieved. The two three columns to the left of the business benefits column completed the model by identifying the IT enabler's, and business and enabling changes. Each "box" was only linked to other "boxes" to which they were directly related.

Figure 3 – Flow of Organization Change to IT Enabler



### 3.4.4 Purposive Sampling

The variety approaches from an online survey to site visits provided adequate coverage and fair representation of the following aspects for the exercise in collecting LEA product usage and IT implementation and support cost data: The purposive sampling method was employed in a deliberate effort to collect accurate and complete product information and cost data from districts with a fair and reasonable level of coverage and thus reduce the likelihood that districts unable to participate in the study would still have representation by the fact that other districts with similar characteristics were included:

- Districts for each Geographic Area Coverage (i.e. urban/city, suburban, town, rural) represented
- Districts for each Size Category (i.e. six size categories from very small to very large) with between fifteen and twenty percent represented
- Districts with proportional student demographic representation
- Districts from each of the fifteen counties represented

- All types of education institution was represented including public school districts and charter associations and schools, Joint Technical and Education Districts, Career and Technical Education schools, Accommodation Districts, Corrections, Regional Education Centers as well the County Offices of Education.

Other coverage considerations included:

- Education professionals at the LEAs should include at a minimum superintendents, district personnel, principals, and CIO's
- All five regional education centers should be represented

### 3.4.5 Coverage of Arizona Local Education Agencies

In all, 187 LEAs participated in ADE outreach campaigns, which represented approximately 30 percent of all LEAs and 56 percent of all students statewide. While the majority of participants came from the small and very small categories which make up the largest portion of the 619 LEAs, larger LEAs actively participated—with the average larger LEA participating in two or more of the outreach campaigns.

Site visits by research team members were viewed very positively by most of the LEAs that participated. Attendees expressed their appreciation that ADE came out to listen to their input. Small and rural districts as well as charters said that their input often wasn't considered in the past, but that decisions made at ADE affected them greatly. The most common problem regarding current systems had to do with SAIS data redundancy, low accuracy and the level of effort required to cleanse the data. High-level system capabilities previously collected and documented were reviewed at this time to ensure their completeness and priority levels for LEAs not previously involved in the requirements gathering activity. The capabilities validated were for Teaching & Learning systems, as well as Administrative systems. Back Office systems were not reviewed due to the fact that most LEAs rely on one dominant vendor product. See LEA Data Analysis Detail Report for a full report on the LEA research and data analysis.

Chart 11 provides a detail breakdown of LEA coverage in the outreach program per size category and geographic area type.

Chart 11 - School Outreach Coverage

| LEA Size and Student Populations | Geographic Area Coverage  |                           |      |                           | Total # of Districts |
|----------------------------------|---------------------------|---------------------------|------|---------------------------|----------------------|
|                                  | Urban/City                | Suburban                  | Town | Rural                     |                      |
| <b>Very Large (&gt;=20K)</b>     | 4 Public School Districts | 1 Public School District  |      | 1 Public School District  | 6 of 11              |
| <b>Large (8,000 to 19,999)</b>   | 4 Public School Districts | 2 Public School Districts |      | 3 Public School Districts | 9 of 20              |

| LEA Size and Student Populations     | Geographic Area Coverage                              |                                       |                                       |  |                      |
|--------------------------------------|---|---------------------------------------|---------------------------------------|--|----------------------|
|                                      | Urban/City  | Suburban                              | Town                                  | Rural                                  | Total # of Districts |
| <b>Medium-Large (2,000 to 7,999)</b> | 4 Public & 5 Charter School Districts                 | 4 Public & 1 Charter School Districts | 14 Public School Districts            | 18 Public School Districts             | 46 of 58             |
| <b>Medium (600 to 1,999)</b>         | 2 Public School Districts                             |                                       | 5 Public School Districts             | 6 Public School Districts              | 13 of 88             |
| <b>Small (200 to 599)</b>            | 1 Public & 20 Charter School Districts                | 5 Charter School District             | 1 Public School District              | 16 Public & 5 Charter School Districts | 48 of 197            |
| <b>Very Small (&lt;=199)</b>         | 9 Charter School Districts & 5 Public School District | 6 Charter School Districts            | 2 Charter & 4 Public School Districts | 15 Public & 7 Charter School Districts | 48 of 245            |

Source: Arizona AG 12-02, 242 and National Center for Education Statistics, Common Core of Data

**LEGEND:**

|                         |  |
|-------------------------|--|
| No school participation | No school representation in geographic area. |
|-------------------------|--|

DRAFT

## 4.0 Data Findings

The preceding chapter described the key investigative questions that needed to be answered during this research project. And it also described the areas where the research was conducted and what methodologies were employed. This chapter presents pertinent and vital findings organized by the following subsections as also outlined in Landscape Review section:

- US Department of Education (Federal) Initiatives and Legislation
  - Education Industry Vendor Software Systems
- State Education Agency Initiatives and Legislation
  - Other State Education Agencies
  - Arizona Department of Education
  - Arizona Department of Administration
- Local Education Agency Initiatives and Legislation

### 4.1 US Department of Education (Federal) Findings

The researchers sought to answer investigative questions by defining the learning and accountability system based on federal initiatives, legislation, and nationally recognized technology and data standards and specifications. The questions are listed below.

F1) How does the federal government define a learning and accountability system?

(F2) What federal initiatives, legislation, or innovations contribute to building a learning and accountability system?

(F3) Are there nationally recognized standards that should be considered when building a learning and accountability system?

The first step was to define the components of a system: one that supports responsibility based on evidence, facilitates professional learning opportunities and provides actionable feedback to the educator. First, the system defines the context of accountability. Second, the system must be built upon aligned components—objectives, assessments, instruction, resources and rewards or sanctions. Third, the technical aspects of the system must meet high independent standards. Fourth, the system must provide the catalyst for positive change.

Chart 12 aligns federal initiatives to nationally recognized technology standards and specifications that are applicable to building a learning and accountability system. The description notes the benefit to the end user such as teachers, administrators, and other education stakeholders.

Chart 12 – US Department of Education (Federal) Initiatives and National Standards

| Initiative  | Technology Standards   | Description and Benefit   |
|---|--|---|
| Race to the Top – Instruction Improvement System  | Learning Registry<br>Learning Tools Interoperability                       | Learning Registry is a new approach to capturing, sharing, and analyzing learning resource data to broaden the usefulness of digital content to benefit educators and learners.<br><br>Learning Tools Interoperability is a standard for integrating rich learning applications with platforms like learning management systems, portals, or other educational environments |
| Common Core State Standards   | Common Education Data Standards  | Common Education Data Standards is a specified set of the most commonly used education data elements to support the effective exchange of data within and across states, as students transition between educational sectors and levels, and for federal reporting.  |
| Partnership for Assessment of Readiness for College and Careers<br><br>Smarter Balanced Assessment Consortium | School Interoperability Framework<br><br>Accessible Portable Item Protocol | School Interoperability Framework is a data sharing open specification for academic institutions from kindergarten through twelfth grade.<br><br>Accessible Portable Item Protocol standard provides assessment programs and question item developers with a data model for standardizing the interchange file format for digital test items.                               |
| Statewide Longitudinal Data System  | Education Data Fidelity  | The Education Data Fidelity solution is an XML-based set of tools which creates a comprehensive longitudinal superset of student data access and dashboards across schools, districts, and states.  |

Other technology standards and specifications were evaluated and should be considered for state adoption for the purpose of providing a seamless, integrated experience to the end user of the learning and accountability system. See Chart 13. Specifically, essential data resides in many separate, disparate systems and standardized data exchange formats are required.

Chart 13 –National Technology Standards and Specifications

| Technology Standards and Specifications | Description and Benefit  |
|---|--|
| Application Programming Interface       | Application Programming Interface is a specification intended to be used as an interface by software components to communicate with each other   |
| Extract, Transfer, Load                 | Extract, Transfer, Load is a process for database usage: extract data from outside source, transform data to meet operational needs, and load data to the operational database or other end target.                |
| Enterprise Service Bus                  | Enterprise Service Bus is a software architecture model used for designing and implementing the interaction and communication between mutually interacting software applications in Service Oriented Architecture. |
| Single Sign On                          | Single Sign On is a process where a user would only need to login one time but have access to all the systems, to which, they have been granted permission.  |
| Sharable Content Object Reference Model | Sharable Content Object Reference Model is a collection of specifications and standards defining how content can be packaged and transferred from a client site to host site.                                      |

## 4.2 Education Industry Vendor Product Findings

As a result of identifying the technology standards and specifications necessary for the learning and accountability system, vendor software systems were evaluated for compliance or inclusion of these standards when applicable. The researchers released one Request for Information (RFI) and two Requests for Proposal (RFP) for evaluation and procurement purposes. Chart 14 below summarizes the results for the most applicable standards and specifications (i.e., CEDS and SSO). It is noted that education vendors have a lot of work to acknowledge and comply with these national standards and specifications.

(E1) Are the current vendor software systems compatible with the recognized standards and specifications?

Chart 14 –National Technology Standards and Specifications

| Request for Information or Proposal             | Number of Respondents | Number of Respondents Met Requirement | Percent of Respondents Met Requirement |
|---|-----------------------|---------------------------------------|--|
| Assessment System RFI                           | 5                     | --                                    | --                                     |
| Common Education Data Standards                 | --                    | 0                                     | 0%                                     |
| Single Sign On                                  | --                    | 0                                     | 0%                                     |
| Educator Evaluation System Request for Proposal | 8                     | --                                    | --                                     |
| CEDS  | --                    | 4                                     | 50%                                    |
| Common Education Data Standards                 | --                    | 4                                     | 50%                                    |
| Assessment System Request for Proposal          | 5                     | --                                    | --                                     |
| Common Education Data Standards                 | --                    | 2                                     | 40%                                    |
| Single Sign On                                  | --                    | 2                                     | 40%                                    |

Overall, the research team evaluated the education industry and, specifically, those vendors that offer software systems to school districts across the nation. Since software systems provide certain capabilities to the end user, the researchers divided the software systems into three categories: (1) Teaching and Learning Systems, (2) Administrative Systems, and (3) Back Office Systems. Each category is further defined below.

**Teaching and Learning Systems** are those targeted to directly support and improve instruction, student learning and assessment of learning, and teacher effectiveness. The types of capabilities include content creation, management, delivery, and reporting. Content can be instructional resources, lesson plans, questions, and tests. Software systems in this category include but are not limited to Assessment Systems, Content Management Systems, and Learning Management Systems.

**Administrative Systems** support the management of information across the district. These systems manage data including student demographics, attendance, behavior, and grades. Software systems in this category include but are not limited to Student Information Systems, Special Education Systems, and Grade Book Systems.

**Back Office Systems** manage the financial, human resource, grants, and procurement needs of districts. The types of capabilities include managing staff, payroll, and budget. Software systems in this category include but are not limited to Finance Management, Human Resource Management, and Substitute Management Systems.

(E2) Does the education industry offer a comprehensive, integrated system ADE can procure for the learning and accountability system?

(E3) Is the data residing locally in the vendor software systems critical for inclusion in the learning and accountability system?

Figure 4 summarizes the research results of 63 education software system vendors on the market. It should be noted that not one single vendor provides all the necessary software systems, capabilities, and, especially, data required for a comprehensive learning and accountability system. The essential data is spread across all three categories, dozens of systems, and hundreds of vendors. Of the 63 vendors assessed, nearly 17 vendors offer an Assessment System with basically the same capabilities and functionality. Not every education vendor was included in the research study given the vast and fragmented nature of the education industry and the time limited time frame of the study.

Figure 4 –Vendor Product Offerings by Category



In 2012, Gartner, Inc. concluded a study entitled *Closing the Gap: Turning SIS/LMS Data into Action*. The Bill & Melinda Gates Foundation funded the effort with an underlying premise of the study that by capturing and analyzing the data housed in Student Information Systems (SIS) and Learning Management Systems (LMS), the education community can positively impact classroom practice and ultimately student learning. The key findings of this study directly correlate to the research in this business case and have relevance to the mission of building a learning and accountability system.

- Data governance is a critical success factor
- Data has become the currency through which schools secure public support, including funding.
- Educators should make decisions based on information rather than intuition and tradition. However, training for teachers to learn how to gather or use information available in these systems should not be overlooked.
- Capturing, analyzing, and using data can positively impact classroom instructional practice and ultimately student learning when an Student Information System is implemented with an Learning Management System

- Careful consideration should be given when making decisions about the configuration settings and should include appropriate stakeholders

### 4.3 State Education Agency Findings

Research was extended to and conducted outside the state of Arizona. The objective was to answer the following investigative questions.

(S1) What states have implemented a learning and accountability system and how did the state accomplish this initiative?

(S2) How much have other states been awarded from federal programs and initiatives?

(S3) What can the Arizona Department of Education learn from other state initiatives and programs?

It should be noted that there was no additional information provided by the other states that covered systems and products in use by their respective school districts such as usage, data, cost, and implementation. However, as noted earlier an extensive study was conducted on these parameters for the districts and charter schools of Arizona. See the Local Education Agency Findings section.

While, by and large, the external statewide initiatives research began with the National Center for Education Statistics (NCES), there were a few leads or basis for review of other SEAs which included seven states total: Florida, Georgia, Kentucky, Massachusetts, North Carolina, Ohio, and Tennessee. The process that was generally followed was to use the research tools available on the NCES website to identify states which had been awarded grants for statewide data systems, read and study the grant documentation in order to confirm which states had projects actually similar to AELAS, and then reach out to the respective project managers and to see what could be gleaned from their experiences that they were willing to share, such as data models, lessons learned, and other pertinent information.

#### 4.3.1 Comparison of Arizona to Other SEAs

Immediately, it was discovered that Arizona is not alone in this mission to develop a statewide learning and accountability system although other SEAs name the system respective to their state. Most State Education Agencies (SEAs) are pursuing a 'version' of a learning and accountability system; however, no single SEA has all the answers, nor has any SEA deployed a comprehensive statewide learning and accountability system to date. When developing Arizona's requirements for an instructional improvement system, ADE has drawn upon the work previously done in Florida, Ohio, Massachusetts, and North Carolina. These states are among a national consortium of states that make up the Race to the Top IIS Consortium (Delaware, District of Columbia, Georgia, Hawaii, Kentucky, Illinois, Maryland, Massachusetts, North Carolina, New York, Ohio, Pennsylvania, and Rhode Island).

To place Arizona in context to other SEAs, the Chart 15 below provides the awarded funding streams that may contribute to building a statewide learning and accountability system and accomplishments to date. It should be noted that the funding streams Arizona was awarded do not directly contribute to the statewide system known as the Arizona Education Learning and Accountability System (AELAS). The funding streams do however contribute to the rollout of the Arizona Common Core Standards and establishment of Regional Centers to support LEAs. In addition, the Statewide Longitudinal Data System (SLDS) funding is for historical reporting purposes.

Chart 15 –SEA Funding Analysis

| State          | Awarded Funding Streams (in millions)  | Deliverables  |
|----------------|--|---|
| Arizona        | <ul style="list-style-type: none"> <li>• RTTT Phase III - \$25.0</li> <li>• SLDS (2007) - \$6.0</li> <li>• SLDS (2012) - \$7.0</li> </ul>                                | <ul style="list-style-type: none"> <li>• Regional Centers to support Arizona Common Core Implementation</li> <li>• SLDS pilot dashboards</li> <li>• Business Case to define the recommendations for the Arizona Education Learning and Accountability System</li> </ul>   |
| Florida        | <ul style="list-style-type: none"> <li>• RTTT Phase II - \$700</li> <li>• SLDS (2005) - \$1.5</li> <li>• SLDS (2009) - \$2.5</li> <li>• SLDS (2010) - \$10.0</li> </ul>  | <ul style="list-style-type: none"> <li>• Published minimum standards for a Local Instructional Improvement System (LIIS) 1/31/11 (in partnership with Ohio Department of Education, the Gates Foundation, and CELT)</li> <li>• Established 6/30/14 deadline for all LEAs to implement LIIS</li> <li>• Created Local Systems Exchange online network for LEAs to share ideas on meeting LIIS deadline</li> </ul> |
| Georgia        | <ul style="list-style-type: none"> <li>• RTTT Phase II - \$400</li> <li>• SLDS (2009) - \$9.0</li> </ul>   | <ul style="list-style-type: none"> <li>• SLDS solutions with integration to Student Information Systems and identity management</li> <li>• Educator Evaluation System</li> </ul>  |
| Kentucky       | <ul style="list-style-type: none"> <li>• RTTT Phase III - \$17.0</li> <li>• SLDS (2005) - \$5.8</li> <li>• SLDS (2009) - \$2.9</li> <li>• SLDS (2010) - \$3.6</li> </ul> | <ul style="list-style-type: none"> <li>• Instructional Improvement System RFP with SIF-based interoperability solution</li> </ul>   |
| Massachusetts  | <ul style="list-style-type: none"> <li>• RTTT Phase II - \$250</li> <li>• SLDS (2005) - \$5.7</li> <li>• SLDS (2009) - \$13.0</li> <li>• SLDS (2010) - \$19.0</li> </ul> | <ul style="list-style-type: none"> <li>• Instructional Improvement System RFP (i.e. Assessment, Professional Development, Data Management, and Educator Evaluation)</li> </ul>  |
| North Carolina | <ul style="list-style-type: none"> <li>• RTTT Phase II - \$400</li> <li>• SLDS (2007) - \$6.0</li> <li>• SLDS (2012) - \$3.6</li> </ul>                                  | <ul style="list-style-type: none"> <li>• Instructional Improvement System RFP (i.e. Assessment, Professional Development, Data Management, and Educator Evaluation) currently in selection process</li> <li>• Plan to implement for 2013-14 school year</li> </ul>  |

| State     | Awarded Funding Streams (in millions)  | Deliverables   |
|-----------|--|--|
| Ohio      | <ul style="list-style-type: none"> <li>• RTTT Phase II - \$400</li> <li>• SLDS (2005) - \$5.7</li> <li>• SLDS (2009) - \$3.0</li> <li>• SLDS (2010) - \$5.2</li> </ul> | <ul style="list-style-type: none"> <li>• Partnered with Florida Department of Education, the Gates Foundation and CELT to establish minimum standards for a Local Instructional Improvement System 7/2010</li> <li>• Instructional Improvement System RFP (i.e. Assessment, Professional Development, Data Management, and Educator Evaluation)</li> </ul> |
| Tennessee | <ul style="list-style-type: none"> <li>• RTTT Phase I - \$500</li> <li>• SLDS (2007) - \$3.3</li> </ul>  | <ul style="list-style-type: none"> <li>• LEAs required to define local plans for an Instructional Improvement System as part of their RTTT Scope of Work submissions</li> </ul>  |

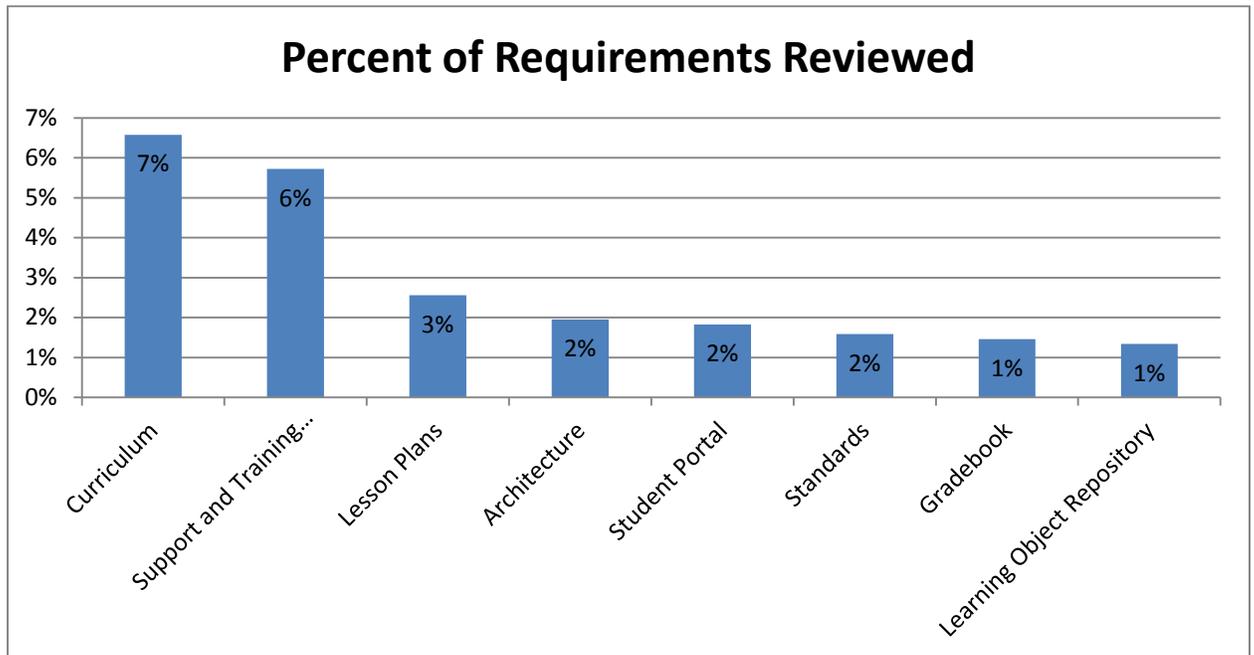
### 4.3.2 Gap Analysis of SEA RFP Requirements to Arizona

The business analyst team conducted a gap analysis of the other SEA requirements to the requirements gathered from Arizona LEAs. For the gap analysis a total of 2,540 requirements were condensed into 821. Many requirements are mapped as one-to-many, meaning that one high level requirement from one source may include multiple detailed requirements from another.

Based on the gap analysis performed among Ohio, Massachusetts and North Carolina, and the new learning and accountability requirements, approximately 45 percent of our requirements aligned or were out of scope along with the other states and approximately 55 percent were not aligned. The primary reason that 55 percent of the requirements were not aligned was that our documented requirements stopped at the teacher level while North Carolina went to the student level. The largest gaps were in the following areas. See Figure 5 for a percentage of the requirements reviewed.

- Curriculum
- Support and Training
- Lesson Plans
- Architecture
- Student Portal
- Standards
- Gradebook
- Learning Object Repository

Figure 5 – Percent of Other SEA Requirements Reviewed



### 4.3.3 SEA Site Visit

A site visit to the Georgia Department of Education resulted in valuable lessons learned from a SLDS perspective. Personnel in the GA IT department delivered the report definition layout including stored procedures to integrate with the visuals (i.e., report and dashboard graphs). The ADE IT department has subsequently utilized the work artifacts from GA to successfully develop and implement the pilot SDLS to a handful of LEAs across Arizona.

## 4.4 Arizona Department of Education Findings

A major focus of the business case was conducted at the Arizona Department of Education for several reasons. Researchers were co-learners in the process when answering investigative questions and listened when Local Education Agencies redirected researchers to conduct an internal audit at ADE. Without exception, researchers heard the ADE lost credibility and confidence based on past performance (pre-2011), but LEAs noted and appreciated recent improvements in the statewide student information system. This prompted an extensive internal audit of ADE covering legislation, application portfolio, process workflows, and infrastructure. These audits were performed as concurrent efforts. The research objectives are listed below.

(A1) Which Arizona legislative mandates or programs are driving the mission to build and implement the statewide learning and accountability system and what are the objectives and benefits of these legislative mandates and programs?

(A2) Which ADE data is required to support the learning and accountability system?

(A3) How does ADE currently treat data and what are the current processes and procedures for data management?

(A4) Does ADE have the Information Technology infrastructure to support the learning and accountability system?

It should also be noted that redirection to conduct the audit by no means indicated sub-par service by the program areas; it was reflective of the data quality. The data results are intended to highlight areas for overall improvement in ADE processes, practices, and services.

#### 4.4.1 Arizona Legislation/Programs and Benefits

By and large, legislation is usually the driver of organizational change for the ADE since it is in fact a government agency and its structure, scope and mandates are summarized in Arizona Revised Statutes - Title 15 Education. In other cases, the ADE submits applications for grant monies and when awarded then this is still another example of an organizational change driver. The specific investigative question about Arizona legislature is below.

(A1) Which Arizona legislative mandates or programs are driving the mission to build and implement the statewide learning and accountability system and what are the objectives and benefits of these legislative mandates and programs?

##### 4.4.1.1 Arizona Legislation

A number of Arizona legislative, federal grant programs, and plans were identified as potential drivers for AELAS. They were then studied in considerable detail in order to understand their true nature and relevance to the ADE agency. The document language which was initially subject to interpretation by the business analysts were reviewed with and validated by subject matter experts from the Policy Development & Government Relations department in order to confirm the relevancy to AELAS of the documents and drivers, along with expected objectives and benefits. Documents that were studied included those listed in Chart 16 below:

**Chart 16 - Legislation, Grant Program, & Plan Research Summary**

| Document                                     | Description   | Document Date        |
|--|---|----------------------|
| A.R.S. § 15-249 & Senate Bill 1529 (SB 1529) | AELAS authorization legislation                             | 2010                 |
| Proposition 301                              | Pay for Teacher Performance                                 | November 2010        |
| Senate Bill 1040 & House Bill 2823           | Educator Observation & Evaluation                           | May 2010             |
| SLDS Grant Programs                          | Statewide Longitudinal Data System                          | June 2007, June 2012 |
| House Bill 2732                              | Move On When Reading (HB 2732)                              | April 2010           |
| House Bill 1286                              | A through F Letter Grade System (SB 1286) (A.R.S. § 15-241) | May 2010             |

| Document                             | Description   | Document Date           |
|--------------------------------------|---|-------------------------|
| Race To The Top (RTTT) Grant Program | A federal grant promoting improvements in state education.          | Phase 3 – December 2011 |
| Arizona’s Education Reform Plan      | Governor’s Office plan including the 4 Pillars as basic components. | January 2011            |

Title 15 covers general provisions; state and local governance of schools; school elections, employees, attendance, district budgeting and financial assistance, district funds and related operations; the Arizona state school for the hearing and sight impaired; the state educational system for committed youth funding; community colleges; universities and related institutions; provisions relating to community colleges, universities and private postsecondary institutions; interstate compacts; school capital finance; local education accountability program and lastly the Arizona empowerment scholarship accounts.

**4.4.1.2 Objectives of AELAS**

Objectives are the organizational targets to achieve by a project or program in relation to the drivers and the desired changes. In this business case, the key objectives are statements as to what is expected to be achieved by the LEAs and the ADE when AELAS has been fully implemented. They are listed along with their descriptions and linked to their respective drivers as shown in Chart 17.

The achievement of these objectives will go a very long way towards addressing the challenges and overall situation that is facing the ADE today. For example, by promoting a Professional Development program, each educator will have the tools and capabilities to help them manage and track their own career so they can realize their aspirations, achieve growth, earn recognition, potentially earn financial awards, while becoming even better educators.

Chart 17 –AELAS Program Objectives

| Driver          |                                    | Objective Description   |
|-----------------|------------------------------------|---|
| A.R.S. § 15-249 | AELAS                              | <ul style="list-style-type: none"> <li>❖ Maintain Student Longitudinal Data</li> <li>❖ Collect Student Accountability Data for P-20 Institutions and Workforce</li> <li>❖ Meet Federal Reporting Requirements</li> <li>❖ Meet State Reporting Requirements</li> <li>❖ Establish Data Governance*</li> </ul>   |
| SLDS Grant      | Statewide Longitudinal Data System | <ul style="list-style-type: none"> <li>❖ Provide Timely Access to Information</li> <li>❖ Increased Volume of Actionable Data to Stakeholders</li> <li>❖ Support Increasing P-20 and Workforce Data Demands</li> <li>❖ Drive Instructional, Program &amp; Policy Decisions, Best Practices, etc.</li> <li>❖ Improve Student Achievement &amp; Educator Performance</li> <li>❖ Improve School, District, &amp; Statewide Performance</li> </ul> |

| Driver                                   |                                   | Objective Description   |
|--|-----------------------------------|---|
| Proposition 301                          | Pay for Teacher Performance       | <ul style="list-style-type: none"> <li>❖ Improve Educator Performance</li> <li>❖ Provide Additional Monies for Local Education Programs &amp; Strategies*:                             <ul style="list-style-type: none"> <li>○ Improve Graduation Rate</li> <li>○ Reduce Class Size</li> <li>○ Encourage Professional Development**</li> </ul> </li> </ul> |
| Senate Bill 1040                         | Educator Observation & Evaluation | <ul style="list-style-type: none"> <li>❖ Adopt &amp; Maintain An Educator Model Framework for Evaluation*</li> <li>❖ Define Educator Performance Classifications*</li> <li>❖ Provide Highly Trained Evaluators</li> <li>❖ Encourage Professional Development**</li> </ul>   |
| Adverse Current Business Climate         |                                   | <ul style="list-style-type: none"> <li>❖ Reduce Program Data Use Costs</li> <li>❖ Reduce Overall IT Total Cost of Ownership</li> </ul>  |
| FERPA & State Confidentiality Compliance |                                   | <ul style="list-style-type: none"> <li>❖ Provide Privacy Protection &amp; Secure Access*</li> </ul>   |
| ADE Strategic Plans                      |                                   | <ul style="list-style-type: none"> <li>❖ Offer Services to Improve &amp; Optimize Education Processes*</li> <li>❖ Positive ADE Cultural Change*</li> <li>❖ Improve IT System Integration between ADE &amp; all Education Institutions</li> </ul>  |

Notes:

1. \* indicates that work activity for an objective is already “in flight.”
2. \*\* Objective was linked to more than one driver, since it was cited as in each.
3. For the full narrative on how an objective will improve an aspect of agency business, or assist the agency to meet its strategic objectives, see [Driver – Objective Linkage](#).

**4.4.1.3 Benefits of AELAS**

Business benefits are defined as an advantage on behalf of a stakeholder or group of stakeholders; are preferably measurable (e.g. financial, quantifiable, measureable, or observable); and the type of business change would be categorized as either to do new things, do things better or stop doing something. Chart 18 below lists the expected business benefits of a full AELAS implementation that have been identified and associated indirectly with its specific driver.

Chart 18 –AELAS Program Benefits

| Driver                                   |                                    | Benefit Description   |
|--|------------------------------------|---|
| A.R.S. § 15-249                          | AELAS                              | <ul style="list-style-type: none"> <li>❖ Increased Visibility To Relevant Data</li> <li>❖ Broader User Access to Data</li> <li>❖ Data Standards &amp; Improved Data Quality</li> <li>❖ Local Data Management Oversight</li> <li>❖ Realized Economic Efficiencies &amp; Savings</li> </ul>   |
| SLDS Grant                               | Statewide Longitudinal Data System | <ul style="list-style-type: none"> <li>❖ Provide Actionable Education Intelligence</li> <li>❖ Improved Throughput &amp; Capacity</li> <li>❖ Real Time Access to Data</li> <li>❖ Increased Visibility To Relevant Data</li> <li>❖ Broader User Access to Data</li> <li>❖ Deploy Best in Class Systems/Products</li> <li>❖ Improve Quality of Education</li> </ul>  |
| Proposition 301                          | Pay for Teacher Performance        | <ul style="list-style-type: none"> <li>❖ Educators incentivized to achieve Superior Performance</li> <li>❖ Flexibility to use monies for Strategies with best payback:                             <ul style="list-style-type: none"> <li>○ Reduced Student Dropout Rates</li> <li>○ Improved Student Achievement</li> <li>○ Promotes Professional Development</li> <li>○ Attracts Quality Staff</li> </ul> </li> </ul> |
| Senate Bill 1040                         | Educator Observation & Evaluation  | <ul style="list-style-type: none"> <li>❖ Increased Access to Student Academic Progress Data</li> <li>❖ Standardized Educator Evaluation Tool</li> <li>❖ Increased Availability of Online Evaluations</li> <li>❖ Identification of Effective Educators</li> <li>❖ Trained Evaluators</li> <li>❖ Promotes Professional Development</li> </ul>   |
| FERPA & State Confidentiality Compliance |                                    | <ul style="list-style-type: none"> <li>❖ Secured Access</li> <li>❖ Data Visibility secured by Role</li> </ul>   |
| ADE Strategic Plans                      |                                    | <ul style="list-style-type: none"> <li>❖ Improved Perception of ADE</li> </ul>  |

**4.4.2 ADE Program Areas Findings**

The internal audit included a drill down on one of the major “pain points” repeatedly mentioned by the LEAs as well as within ADE, which are ‘data errors.’ The data error analysis subsequently rippled and expanded into several efforts. The data findings from the internal audit address the following investigative questions.

(A2) Which ADE data is required to support the learning and accountability system?

(A3) How does ADE currently treat data and what are the current processes and procedures for data management?

#### 4.4.2.1 Data Error Analysis

The performance improvement graph in Figure 10 shows one of the key areas that consume time and effort for ADE and that is the “Validating/Correcting Data” component. More importantly, this element is a common issue for the ADE and all the LEAs. There is a heavy reliance on tribal knowledge to know the data, which data, where the data is, how that piece of data is used, and which rules apply. Very much reflecting the applications development, data development proceeded nearly without any architectural guidance, policies, procedures or documentation. Given that the data ADE collects is responsible for the \$6 billion yearly paid out in education funding it can be argued that ADEs data is the departments single largest asset base far eclipsing its applications and infrastructure portfolio.

The ADE is primarily a data management enterprise whose key central function is to collect data across the state both to enable payment for educational services as well as infer performance to legislation using that data. Much like its application portfolio, ADE's data portfolio has grown inorganically and now consists of some one hundred twenty database systems, nine thousand database tables, and forty-five thousand individual pieces of data within those databases.

To fully understand and clearly articulate the issues around timeliness and data quality a root cause analysis was conducted with the major data consumers within the ADE. The specific target was student-related data and the enterprise data as these are the two largest data holdings that impact the state as a whole and are directly tied to the payments that are streamed to these institutions. The root cause analysis consisted of identifying the major data collection and processing modules, referred to as SAIS and Enterprise, and identifying each and every issue that persists and creates cascaded effects into the program area stakeholder. These effects consisted of errors, inaccuracies, timeliness of data issues, historical loss of information, etc. The reason for the selection of these particular data collection processes is the fact that they are the major data collections and relate to the vast majority of the payments.

Findings show that in spite of recent significant efforts to stabilize and maintain the SAIS related operations, reducing the error rates from over 80% down to less than 3% overall this represents nearly 2M errors per year that must be manually rectified by ADE and/or LEAs. The total effort of these corrections translates into a LEA cost alone of an estimated \$12.5M per year. This cost was borne out by the external analysis conducted at the LEA's directly. Of greater concern are not the identifiable errors that are listed here but more fundamental data errors that are introduced in the system that result directly in the previously stated impact to workflows. Typical profiles of these errors include: ESS students count not being accurate, student information being incomplete or inaccurate, district of residence/education being inaccurately recorded, etc. It is these errors that cause the most significant impacts.

Figure 2 - Data Collection Error Rate

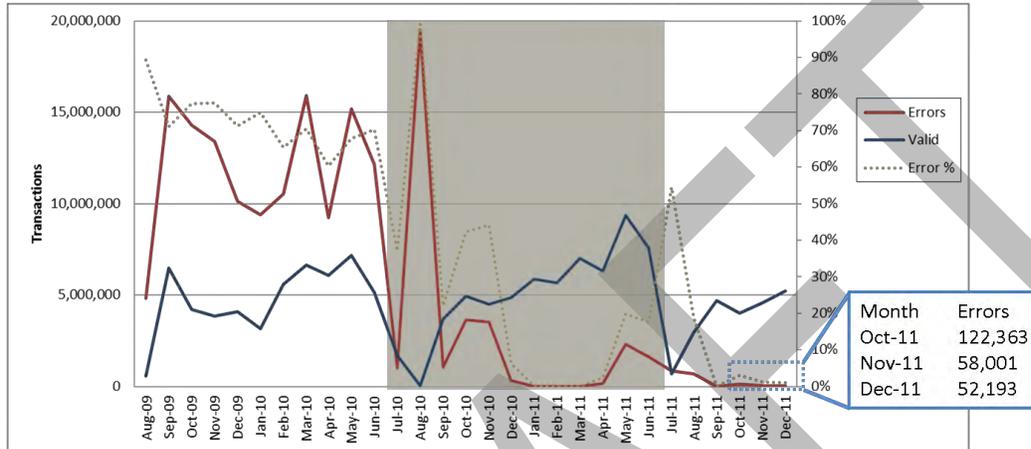
# Student Data Drill Down

FY 2010-2011:

- 61M Valid transactions

H1 FY '11-'12 (6 months):

- 300K errors/mo (avg)
- 2.2 M enrollments



### 4.4.2.2 Performance Analysis

The outgrowth of program-specific functional modules has been a historical legacy at the ADE, where the rapid need for addressing legislative change did not allow for consideration of an enterprise data/system perspective. Moreover system functions were simply added to existing functional modules without an architectural framework to guide their future growth, need, or purpose. As a result, business rules, derived from legislative requirements have been improperly applied, inconsistently implemented, embedded across numerous applications, and simply buried within undocumented workflows across the organization without any centralizing organizing principle or oversight management.

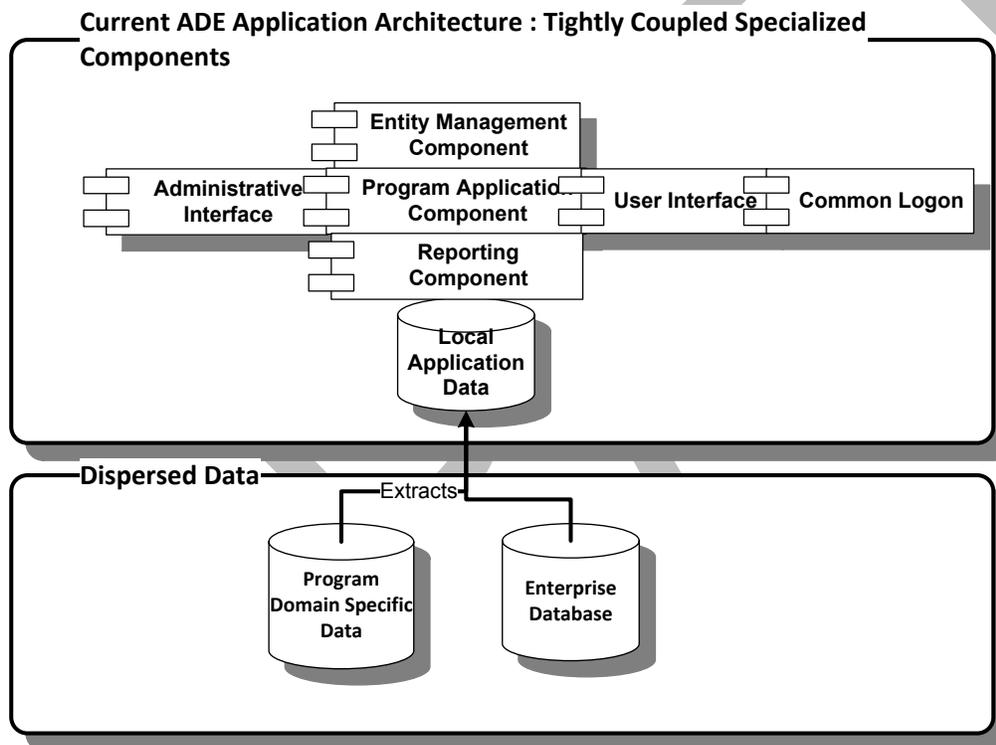
This has numerous effects to ADE as a data/information operation:

- The unrecorded applications produce unregistered information that make it impossible to produce an audit trail of “who performed an operation on the data (i.e. add, change, delete) and when”;
- The unrecorded applications are, as are the majority of recorded applications, poorly if not completely undocumented thereby relying on the actual users to understand how they work and what they produce and that’s assuming the user is still employed here;
- The recorded applications typically serve specific functions to handle data and isolate enterprise data with its associated business rules to the program area;
- The applications require multiple copies of enterprise data across the organization without knowledge-sharing resulting in clients having to submit the same information over and over again to different part of the agencies;
- The spaghetti type of data connections across the organization increase the efforts of data manipulation, verification, validation, cross-checking, etc. needed to produce such information as the Ed Facts reports, ESS Indicators, Student ADM, etc.;

- Most at risk is the concept of “business continuity” that goes beyond simply restoring databases to broader business functions and with all the “hidden” local information, in the event of a disaster, ADE could in all likelihood not fully recover its business.

Figure 7 depicts the overall architecture of each of the ADE applications. The key feature to note is that each of the eighty registered applications follows the same structure but each completely self-enclosed module that offers no interoperability and do not “return” usable data to the enterprise. Each application, for example, consumes data from such sources as the Enterprise or the Student Detail database, then imports the data into a “local copy”, enriches the data to produce whatever needed reports or program offering. However, none of that enrichment is “returned” to or stored in a central location. The behavior across the organization is to use, for example, enterprise as an occasional source to see if anything has been updated by to carry on entities management locally.

Figure 3 - Current ADE Application Architecture



For example in just about each of the program areas the key application executes in the following manner:

- LEA information is extracted from the Enterprise System (the intended master holder of all entity information) and compared to what’s held in the local program area system (or spreadsheet) with identified changes incorporated into the system;
- Program staff can then assign access rights to a person at a district/school, once an authorizing signature has been received, then this person is granted access to common login and have access to the tool;

- Using the tool interface the individual can further grant access to other staff, or submit data through the interface;
- Staff can run reports on submitted data and enable districts/LEA to view reports, for example, on their SAIS counts and their submitted counts (once the SAIS process has been run).

Underscoring the organization-wide data silo issue is the fact that most of the enriched data (in the example above this would be the additions of contact or entity information that should be made to enterprise) is kept in a local database and only through “knowledge” of who does what, can another program area re-use this data. Another significant gap is that all the contacts that are made with the LEAs are not recorded in enterprise, neither is the content and nor is the subject matter of the contact. This condition can result in significant number of program areas contacting districts/LEA with repeat information requests and/or submittals in an uncoordinated manner. As significant is that there is still a paper trail that needed to support many processes (e.g. teacher certification) however the system is incapable of executing, much less supporting, any form of records management.

#### 4.4.2.3 Process Mapping

As a part of the portfolio review effort, the Enterprise Architecture team was tasked to produce the workflow process maps of many program areas, and select a representative sample that were running the largest application pools, in order to completely understand exactly how application needs are articulated, designed and built, consumed and identify shortfalls. Mapping workflow processes is a time intensive and highly interactive facilitated activity that requires the participation of process subject matter experts, owners, analysts, etc. in order to uncover and discover the specific details of “what’s getting done”, “how is it getting done”, “what are the systems/data that help accomplish the process”, “what are the gaps and pain points”, “what functionality in the applications are being used most often”, etc. All told the Enterprise Architecture team produced detailed workflow maps for the following program areas:

- SAIS & School Finance (building on the previous work of the reverse engineering effort);
- Grants Management;
- Exceptional Student Services Yearly Census;
- Exceptional Student Services Alternate Assessments;
- Enterprise on-boarding of new Entities;
- Student Enrollment;

The key findings throughout the workflow exercise was that (1) there is substantial effort expended in all program areas that relates to the overly complex nature of the data architecture and the need to a high level of manual handling of data; (2) most, if not all, program areas have had to develop local management of the entities they interact with within the education environment; (3) most applications are constructed to reflect these very specific weaknesses within the overall IT infrastructure and processes.

As shown in Figure 8, efforts have been undertaken in several of the program areas (e.g. Grants Management, School Finance, Exceptional Student Services - yearly census, and Health and Nutrition). One of the key repeating features across all program areas is the excessive need for manual manipulation, transformation, conversion, transmittal, verification, and correction of data within and across program areas, application functions, etc. The level of effort has been estimated at 568,000 hours in lost productivity to the program areas simply on verifying and correcting data alone. Entire workflows are designed to simply verify, validate, and correct information. If ADE’s data systems were truly integrated

and met sound architectural best practices, then this should be a simple effortless exercise instead of the pain-staking process it is.

This last storyline repeats across the organization whether it's School Finance, Ed Facts reporting, Grants Management, yearly school Letter grade reporting, and every other program. Each and every program area is at the limit of what it can produce and report because of system under-capacity, shortcomings, design flaws, coding errors, on-going legislative changes, new programs, etc. Simply put, the labor intensity of the gaps between applications and data are severe to the point where ADE has no capacity for additional tactical or strategic initiatives. Whenever a new program starts up, then more personnel are required to execute the new mandate and systems quickly altered to accommodate resulting in increasing the overall technical debt and manual intensity.

Figure 4 - Workflow Process Diagram

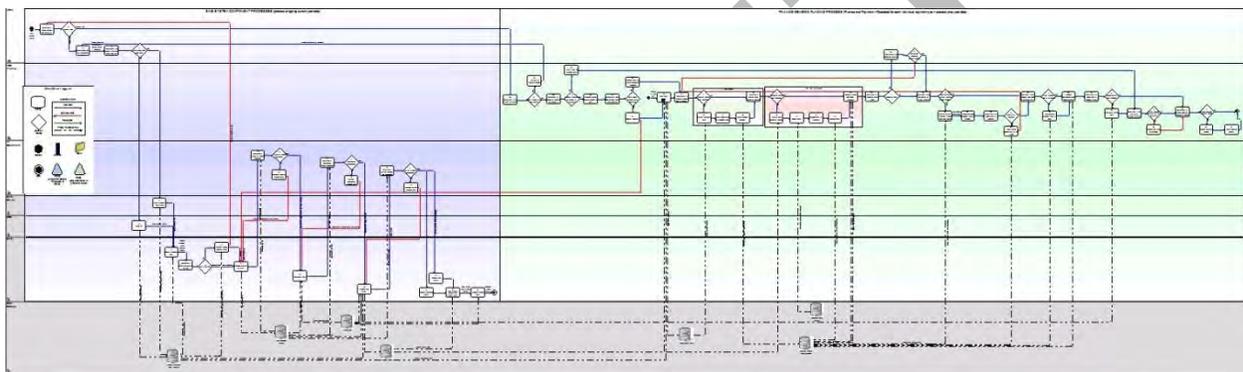
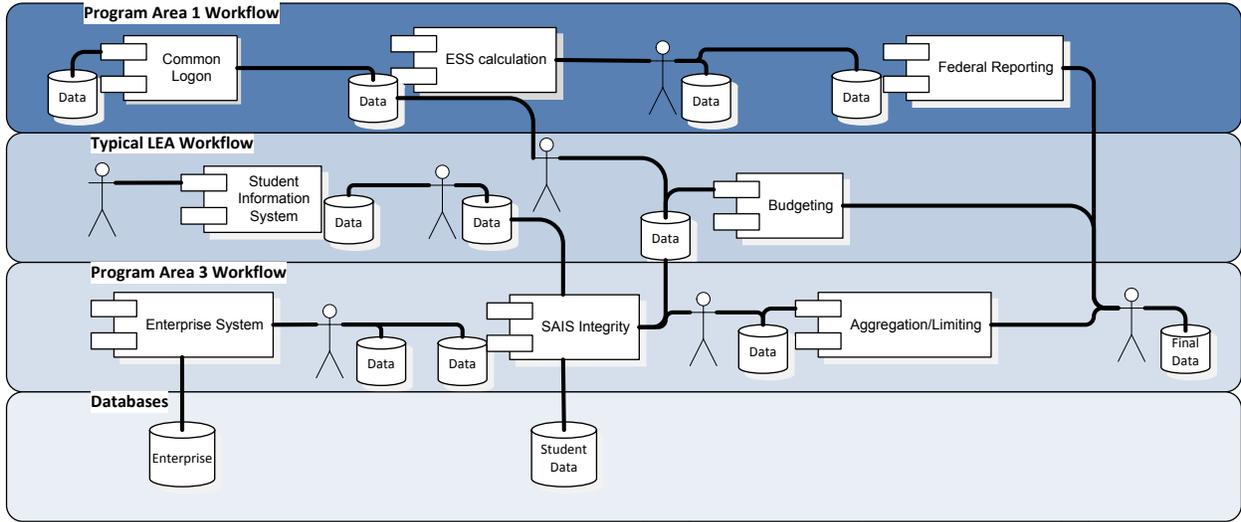


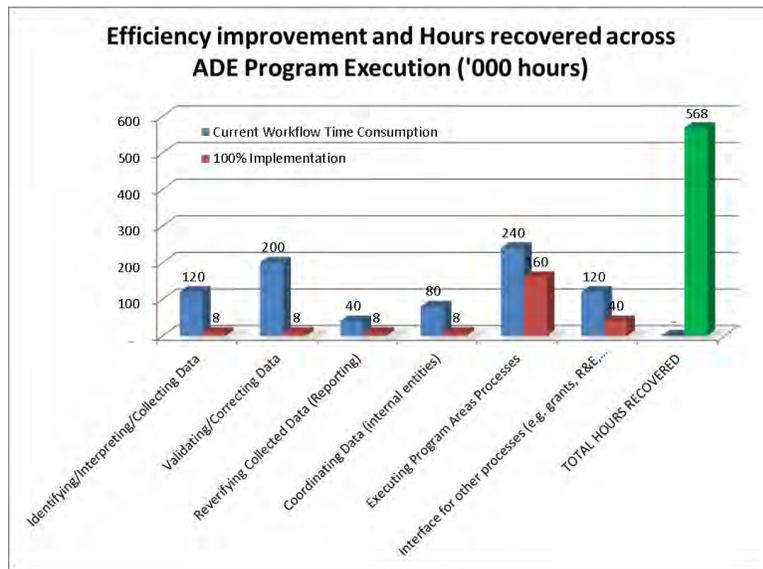
Figure 9 is an example, that best demonstrates the complexity of how program areas must move and obtain data in order to execute their mandates. The point of the illustration is the multiple sources of data scattered throughout ADE for program areas to complete their workflow to execute the mandate. It accurately reflects the actual day to day complexity the staff deals with to accomplish their role functions. It also explains why there are in excess of one hundred twenty applications to conduct simple program functions without end-to-end workflow management.

Figure 5 - Current Application Workflow Environment



Based on the workflow analysis and its implementation, Figure 10 depicts the work time recovery that is expected to occur. In total, ADE could recover up to approximately five hundred sixty-eight thousand work hours that are currently expended on non-value added efforts.

Figure 6 - ADE Efficiency Improvement Impact



#### 4.4.2.4 Reverse Engineering

During the site visits of the LEAs, SAIS, literally the core data collection system for ADE, was repeatedly identified as the major pain point affecting the LEAs ability to conduct their business; ADE ability to make reliable, timely and accurate payments; most of the ADE program areas ability to execute their mandate in an efficient way; and finally IT's ability to manage this system that has suffered significant and prolonged failures. About a year ago sufficient time and resources were applied in order to stabilize this system enough to enable schools to upload their data, with availability times reaching 99.9% and data error rates went from 80% down less than 3%. However in spite of the stabilization it was identified that the system was completely undocumented, the programming code out of date and highly fragile, and the data produced is unreliable (the 3% error rate is still too high).

The ADE hired a professional firm to conduct a comprehensive in-depth reverse engineering of the entire SAIS and School Finance payment process that is directly tied to and dependent on the SAIS system and relies on complex, convoluted and highly manual processes. Their finding, that reflect most of the organizations current application portfolio, is that there exists numerous unregistered home grown applications (i.e. applications that were built using Microsoft Excel or Access) that are responsible for large portions of mostly manual processes; the SAIS code and the infrastructure it relies on cannot be upgraded or "fixed" owing to legacy operating systems; the rules structure is unreliable, unverifiable against its legislative basis and finally recommended that all of the base SAIS functions (i.e. Validation, Integrity, Aggregation, Limiting modules, and Data Push) must be completely rewritten. The firm produced level of effort and skills required estimates for this system which also included the clean up the manual processes and other applications for the payment system overall. These estimates are used as a part of the baseline against the entire services portfolio review produced in the cost analysis section of this document.

#### 4.4.2.5 Enterprise Architectural Review

The enterprise architectural review consisted of conducting a thorough investigation within and across the ADE in the domains of the Business Architecture, the Solutions Architecture, the Knowledge/Information Architecture and finally the Infrastructure Architecture. From this enterprise architectural review effort numerous key findings were identified that drive the recommendations made relevant to the implementation and execution of the ITIL service management framework; the implementation and execution of Data Governance and Master Data Management; the prioritization of the services upgrades, the implementation of business governance such as policy management process; knowledge management; etc. In addition numerous business processes were also singled out for implementation as well as the identification of the overall necessity for cultural change within ADE towards its IT domain.

The following are some of the key findings that are of significant concern:

- No integrated knowledge management exists for the content of all ADE program area knowledge. The knowledge base is scattered across the “I Drive”, multiple un-architected SharePoint sites, local drives, intranet and external internet, etc.;
- No standards in regards to the main AZED website, User Interface look and feel, location of like information, navigation consistency, data presentation standards, etc.;
- No standards in regards to data or information;
- Extensive siloed systems, applications and business processes;
- Segregation of like data;
- Most of the program areas business processes have evolved over time and attempt to work around many of the data related deficiencies and also have been implemented strictly and solely to fulfill program area mandates without any attempt at an organization-wide perspective;
- Multiple and many times inconsistent contact points between program areas and customers;
- No enterprise-wide perspective of the four domains of architecture other than organizational charts.

#### 4.4.2.6 Data Infrastructure Review

A detailed analysis of the data assets within the ADE were examined looking at key features of a typical organization of this size such as volume of transactions, size of transactions, types of transactions, high level data flows, database structures, access to databases, storage policies, etc. There is no simpler, or more direct, way to describe the state of the data infrastructure than stating that if there were an encyclopedia of “what not to do with enterprise data” the ADE’s data infrastructure would have endless examples of each case. The following is a brief list of the most egregious issues that have to be addressed in the course of this strategic program:

- (1) Overloaded data fields (data fields that have multiple meanings depending on what’s in the field);
- (2) Tables containing transactional data with reporting data;
- (3) Similar data fields within tables with different meanings;
- (4) Little or no naming standard for data fields or tables;
- (5) Little or no documentation, no data dictionary, no table relationship diagram;
- (6) Inconsistently replicated tables i.e. tables that should contain the same data have differing row counts;
- (7) A total count of over forty-five thousand data elements when the education CEDS/Ed-Fi standards suggest the number should range between one-and-three thousand depending on the implementation;

- (8) No data normalization i.e. data repeats, data rows not unique, little or no formal primary or foreign keys, indexes used as “unique id”;
- (9) Data is unretired or no off-lining is executed;
- (10) Duplicated “unique” IDs e.g. single student multiple SAIS IDs, single SAIS IDs multiple students;
- (11) Differing ID structures and IDs for the same data e.g. certified teacher uses 7 digits while highly qualified teacher uses 16 digits;
- (12) Little or no documentation on the business rules associated with the data;
- (13) No business definitions of the data elements that are required for production;
- (14) No data flow diagrams encompassing the totality of data collections, incoming and out-going data, etc.;
- (15) Until recently, developers having full and direct access to production databases to make changes; etc.

Clearly there is a serious and urgent necessity to address these issues in order for ADE to be able to continue executing its current mandate, which grows with every new legislative change, as well as its need to execute AELAS. Correcting the data infrastructure issues is the single highest priority within ADE at this point in time and the key reason for the adoption of the CEDS and Ed-Fi data standards.

#### 4.4.2.7 Interviews of ADE Personnel

The Enterprise Architecture work effort consisted heavily of information gathering by interviewing ADE personnel on numerous projects, program areas, issues and on-going business as usual activities. At each and every meeting the opportunity was taken to query all individuals as to their area of interest, pain points, deficiencies, nice to haves, and on-going needs. Copious notes were recorded and analyzed for content and patterns of issues and needs in order to formulate the overall picture of the enterprise. Each and every program area within ADE was interviewed in this manner and each and every level of management and staff within the program areas provided opportunity for input into the “total picture”. The single most overriding factor that is a significant impediment is the data infrastructure. The ADE is primarily and for all intents and purposes a data management shop that uses this data to execute payment-related processes in the education system. The data issues discussed under the heading of the data infrastructure review have enormous and expensive consequences to the business and these were reiterated time and again across all of ADE. Additionally, the repeating theme was of the poorness of the application assets, the complexity of exchange of identical data, and the sparseness of documentation. Most program areas have resorted to recreating and maintaining their own data and application manuals.

#### 4.4.2.8 Comprehensive Review of ADE Documentation

As was noted earlier, the knowledge infrastructure of ADE is scattered across the organization, and primarily held in silos on private machines or as tribal knowledge within people. In attempting to understand much of the architectural issues within ADE, the Enterprise Architecture team has scoured through the documentation base to identify required information, and determined that most of the documentation assets have accumulated without history or some form of documentation management. It is not unusual to find multiple updated versions of the same document with significant discrepancies and being unable to identify what is the source of truth within the documents.

The key finding of this review is the need to “clean house” and retain only the relevant documentation that is still relevant and accurate. Many of the program areas attempt to cull their documents when time permits or necessity dictates. The key recommendation is to develop documentation management

policies, procedures and standards and more importantly a single well designed data store of enterprise information.

#### 4.4.2.9 Root Cause Analysis: Ishikawa Diagram

One of the key issues across ADE is the quality and timeliness of the data and the impact this causes on program area workflow execution, as well as to the perception of the ADE competence in executing its mandate and supporting the state education environment. To fully understand and clearly articulate the issues around timeliness and data quality, a root cause analysis was conducted with the major data consumers within ADE. The specific target was student related data and the enterprise data as these are the single largest data holdings that impact the state as a whole as they are directly tied to the payment of approximately \$6 billion that are streamed to entities.

The root cause analysis consisted of identifying the major data collection and processing modules, referred to as SAIS and Enterprise, and identifying each and every issue that persists and creates a cascaded effect. These effects consisted of errors, inaccuracies, timeliness of data issues, historical loss of information, etc. A detailed diagram was created that lists all the known errors and identifies the downstream impacts that result. The result of this effort was used to drive the prioritization of the internal application rebuild. Refer to Appendix Q for more detail.

All told the diagram identified over 100 persistent and severe problems and a cluster of 84 problems were focused within the three most critical modules that are responsible for applying the legislation based and derived business rules that prepare the data for all the program area streams and maintaining the funding based rules of the relationships between entities. This is in essence the root cause of the reason why so much effort is expended on verifying and correcting data within all the program areas. Further analysis to understand how this came about found that SAIS as originally built and purposed did its job well however years of additions and changes brought about by legislative requirements and poor system planning resulted in a completely dysfunctional system.

#### 4.4.3 Arizona Department of Administration Findings

Another concurrent work stream track was the study at the Arizona Department of Administration (ADOA) data center. The physical inspection of the ADE computer technology systems' architectural infrastructure housed within the ADOA data center was performed from a perspective of analysis to determine whether the existing resources are sufficient to support the anticipated and potential growth when AELAS is fully implemented. Chart 19 below summarizes the data analysis and findings in each area of coverage such as growth and risk assessment.

Chart 19 –ADOA Data Analysis & Findings

| Coverage                        | Data Analysis & Findings   |
|---------------------------------|--|
| <p><b>Growth Assessment</b></p> | <ul style="list-style-type: none"> <li>• Site Capacity &amp; Space Utilization                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: The current technical strategy of 42U racks and blade servers affords a dense configuration of equipment with a minimal footprint.</li> <li>○ <u>Findings</u>: Based on this configuration, there is sufficient space within the existing data center for growth.</li> </ul> </li> <li>• Power Equipment &amp; Supply                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: Growth suggests additional equipment and therefore additional power demands both for the additional equipment as well as the air conditioning requirements to keep the equipment cool.</li> <li>○ <u>Findings</u>: The inspection as well as a follow up interview of an ADOA manager revealed sufficient electricity to support growth.</li> </ul> </li> </ul> |

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| Coverage                      | Data Analysis & Findings  |
|-------------------------------|---|
| <p><b>Risk Assessment</b></p> | <ul style="list-style-type: none"> <li>• Floor Weight-Bearing Capacity                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: Physical construction of the ADOA building housing the ADE data center is sufficient for current equipment.</li> <li>○ <u>Findings</u>: Because of the weight of new technology equipment that could potentially be installed exceeding the floor weight-bearing capacity in the data center is a risk.</li> </ul> </li> <li>• Bandwidth                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: Existing available bandwidth is sufficient to support current systems and applications.</li> <li>○ <u>Findings</u>: With the potential addition of multimedia applications, specifically video, and hundreds of thousands of simultaneous users, this connection rate would negatively impact the user experience and put the success of AELAS at risk.</li> </ul> </li> <li>• Support Personnel                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: There is enough staff to support current systems and applications.</li> <li>○ <u>Findings</u>: If a software system is not capable of supporting multi-tenancy then there is a risk that even with virtualization in place the existing support team will not be sufficient for creating and managing potentially thousands of virtual server environments.</li> </ul> </li> <li>• Fire Suppression                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: The data center is designed with an adequate wet fire suppression system.</li> <li>○ <u>Findings</u>: A wet fire suppression system is not recommended for computer technology and is a significant risk. Floor penetrations above and below should be assessed as additional risks to prevent external issues impacting the data center.</li> </ul> </li> <li>• Disaster Recovery                             <ul style="list-style-type: none"> <li>○ <u>Current Status</u>: A remote data center does exist in Tucson.</li> <li>○ <u>Findings</u>: There is no disaster recovery/business continuity strategy currently in place for a complete fail over to the remote data center in the event of a local catastrophe.</li> </ul> </li> </ul> |
| <p><b>Costs</b></p>           | <ul style="list-style-type: none"> <li>• ADE pays only “rent” for the ADOA data center.</li> </ul>  |



## 4.5 Local Education Agency Findings

The researchers conducted a 'first-ever' statewide study of the culture, processes, and technology at the Local Education Agencies (LEAs). Research objectives covered LEA software application type, usage, cost, and data, as well as the LEAs' achievements and shortcomings that impede districts and charter schools from meeting their primary mission—preparing students for college and careers.

Participatory action research enabled LEAs to actively contribute to the study, providing specific feedback on the requirements of a learning and accountability system through a variety of research methodologies such as survey, site visits, phone interviews, and focus group sessions. See section 3.4.4 for LEA participation rates and overall statewide coverage. Researchers were co-learners in this process, gathering qualitative and quantitative data about the software applications in the education market. These applications, also known as Commercial Off-The-Shelf (COTS) solutions, were divided into three categories to understand the data collected and reported in each system type:

1. Teaching and learning (e.g., assessment and content management systems)
2. Administrative (e.g., student information system)
3. Back office (e.g., finance and human resource systems)

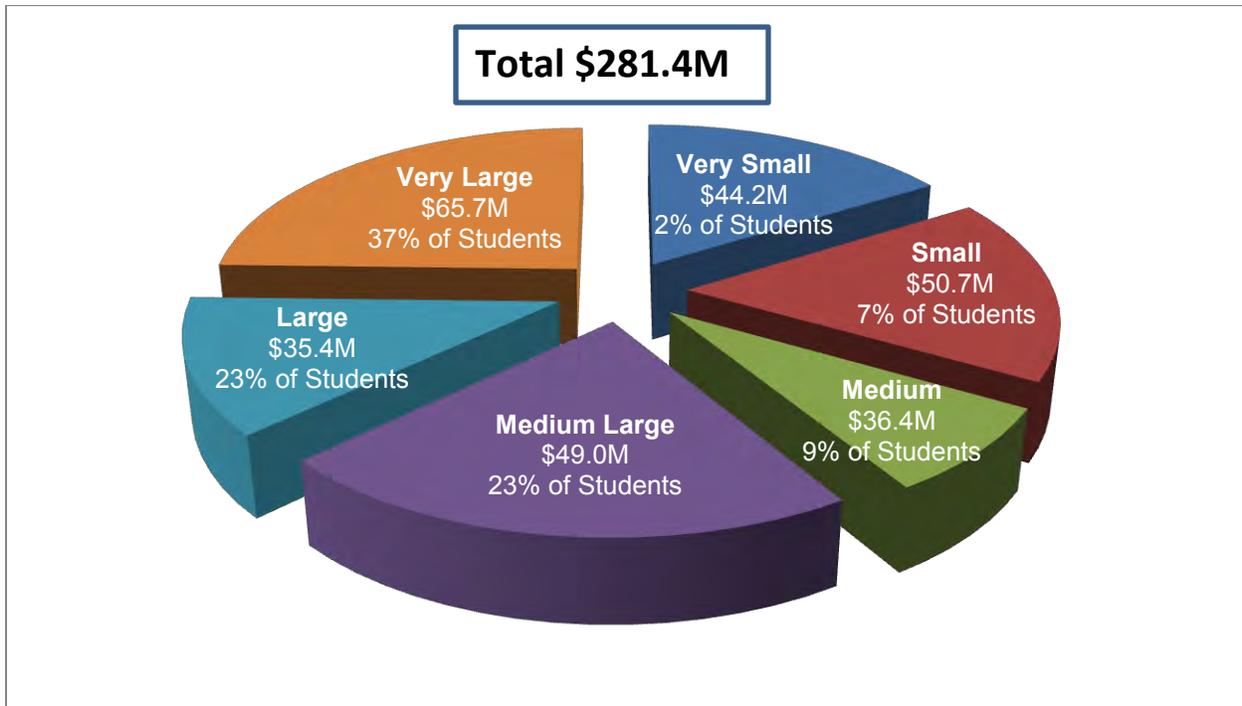
Thus, the resultant analysis of the LEA research data and information collected was broken into the following subsections:

- Software System License and Implementation Spend
  - Average Implementation of Software Systems
- Top Vendor Software Systems Usage
- Core Software System Capabilities

### 4.5.1 Software Systems License and Implementation Spend

The study found LEAs spend \$281M annually on software licenses and implementation at the onset of a software rollout if all LEAs deployed the maximum number of systems. See Figure 11 for the spend breakdown by LEA size.

Figure 11 – Software Systems License and Implementation Spend by LEA Size



When the figures are divided by LEA size as outlined in Chart 20 below, very small- to medium-sized LEAs account for 46 percent of the total spend but only serve 18 percent of the student population. On average, very small to small LEAs procure three to four software systems; whereas, large to very large LEAs procure 9–10 software systems which are mostly separate, independent applications, resulting in isolated data repositories. This figure considered costs associated with manual labor when those LEAs did not have automated processes of a software system to complete the capability.

Chart 20 – LEA Size Categories, Student Counts, and Average Software Systems and Costs/User

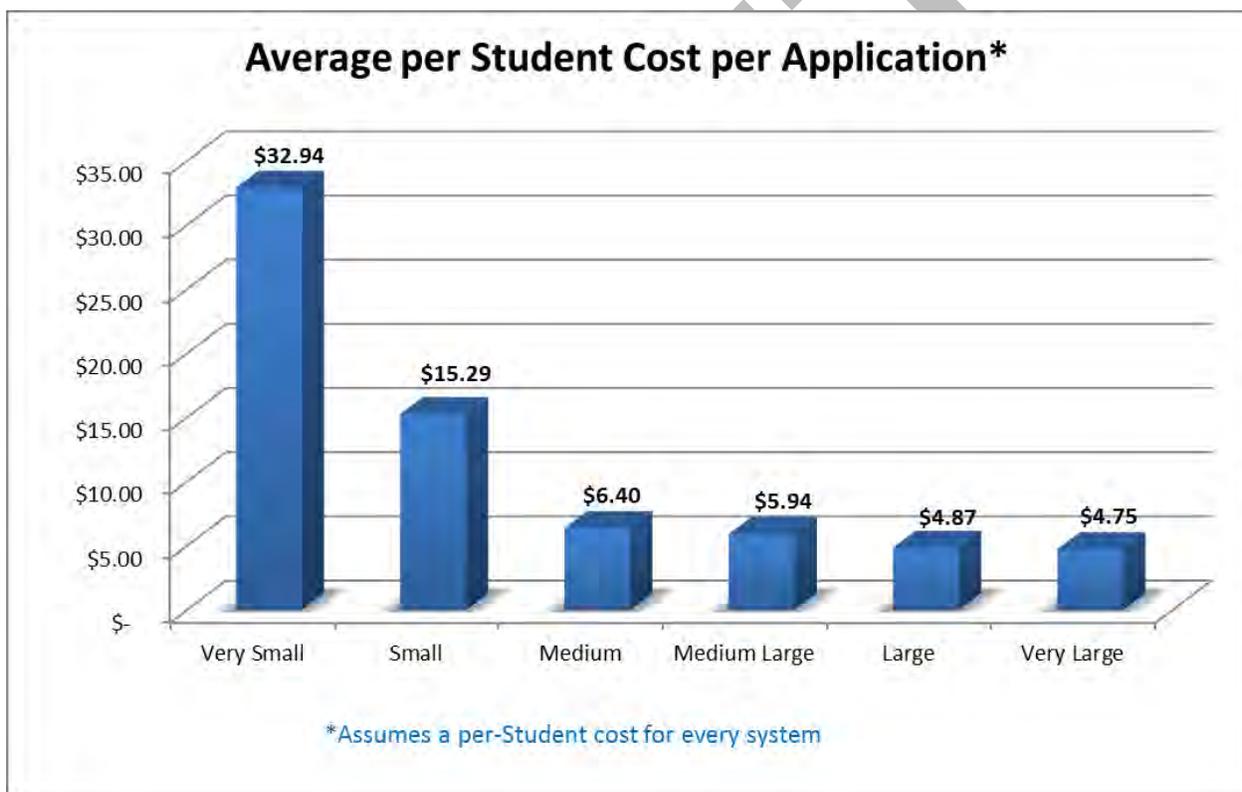
| LEA Sizes    | Size Ranges    | LEA Counts | Student Counts | Average Number of Systems | Average License Cost per User for One System |
|--------------|----------------|------------|----------------|---------------------------|--|
| Very Small   | <=199          | 245        | 24,115         | 3-4                       | \$57.28                                      |
| Small        | 200 – 599      | 197        | 72,378         | 3-4                       | \$18.07                                      |
| Medium       | 600 – 1,999    | 88         | 93,304         | 5-6                       | \$12.87                                      |
| Medium Large | 2,000 – 7,999  | 58         | 243,388        | 5-6                       | \$8.17                                       |
| Large        | 8,000 – 19,999 | 20         | 246,833        | 9-10                      | \$9.51                                       |
| Very Large   | >=20,000       | 11         | 397,045        | 9-10                      | \$5.33                                       |
| Totals       |                | 619        | 1,077,063      |                           |  |

Source: Arizona Auditor General for LEA size categories and U.S. Department of Education ED Facts for LEA and Student counts.

Closer examination of the most prolific COTS, the Student Information System (SIS), revealed very small LEAs pay more than ten times as compared to very large LEAs for software licenses per user. This is for a software system that performs the most basic need of capturing and tracking student data (e.g., attendance, demographic, and grades). LEAs that do not have an average of 9-10 systems are performing the work manually further burdening a staff that is already short-handed.

When a per cost is averaged across all software systems and LEAs in a size category, very small LEAs pay seven times more than very large LEAs. See Figure 12 for the average cost per user per application. This figure highlights the need for change in terms of financial reinvestment for LEAs and leads to one of the recommendations for a centralized, opt-in system. LEA respondents were surveyed to gauge interest of a centralized, opt-in model and the results are in the Recommendation section of this business case.

Figure 12 – LEA Size Categories, Student Counts, and Average Software Systems and Costs/User



To provide a holistic picture of Information Technology spend across state, infrastructure costs such as servers, network, switches, and cabling is estimated at \$47M at the time of hardware purchase, which is amortized over time. Chart 21 does not cover costs for desktop computers, laptops and tablets. Larger LEAs replace servers on a three- to five-year cycle, while smaller LEAs must extend the normal life cycle an additional three to four years, often times leaving them with unsupported hardware and limited capability. This case does not address infrastructure cost savings because the greatest and most immediate impact is recognized with the software licenses; however, future consideration should be given to infrastructure costs to complete the broad view of the AELAS.

Chart 21 – LEA IT Budget and Hardware Summary

| IT BUDGET & HARDWARE SUMMARY   |                |                                |                   |  |
|--------------------------------|----------------|--------------------------------|-------------------|--|
| LEA Size (Student Populations) | Avg. IT Budget | IT Budget as % of Total Budget | Avg. # of Servers | Average LEA Network Costs (excluding staff and Software) |
| Very Large (>=20K)             | \$5,900,000    | 3.0%                           | 350               | \$800,000 - \$1,483,000                                  |
| Large (8,000 to 19,999)        | \$1,384,000    | 2.5%                           | 46                | \$207,500 - \$345,800                                    |
| Medium-Large (2,000 to 7,999)  | \$500,000      | 4.0%                           | 17                | \$75,000 - \$125,000                                     |
| Medium (600 to 1,999)          | \$179,000      | 3.1%                           | 15                | \$26,900 - \$44,750                                      |
| Small (200 to 599)             | \$175,000      | 4.2%                           | 5                 | \$26,200 - \$43,750                                      |
| Very Small (<=199)             | \$59,000*      | 3.1%                           | 2                 | \$8,850 - \$14,750                                       |

\*Very Small LEAs reported that they do not have a hardware budget, and they rely on donated servers as much as possible. This number represents what some VS LEAs reported as actual expenditures that were not budgeted.

#### 4.5.2 Top Vendor Software System Usage

In order to gain a clearer picture about vendor market share across Arizona, respondents replied with the current product in use per each software system category. The findings are reported in Chart 22 of the top vendor products being used from Teaching & Learning, Back Office, and Administrative systems. Since the respondent coverage of the study was not statewide, the intent of these findings were not to address complete market share of vendor system usage in the state.

Chart 22 - LEA Top System & Product Usage

| TEACHING AND LEARNING SYSTEMS       |   |
|-------------------------------------|---|
| Assessment System                   | Galileo   |
| Content Management System           | Beyond Textbooks,                               |
| Learning Management System          | Moodle, A+nywhere Learning System, e2020, PLATO |
| Educator Evaluation System          | TrueNorthLogic, My Learning Plan, TeachScope    |
| ADMINISTRATIVE SYSTEMS              |   |
| Student Information System          | SchoolMaster, Synergy, PowerSchool              |
| Special Education Management System | E-IEPro   |
| Nutrition Management System         | NutriKids                                       |
| Transportation Management System    | VersaTrans, Transfinder                         |
| BACK OFFICE SYSTEMS                 |   |

| TEACHING AND LEARNING SYSTEMS    |                  |
|----------------------------------|------------------|
| Finance Management System        | Infinite Visions |
| Human Resource Management System | Infinite Visions |
| Substitute Management System     | AESOP            |

It was clear that LEAs rarely, if ever design, develop, and implement software systems to support their local education needs. However, there are a few exceptions where very large school districts have decided to build rather than buy software systems. In most cases, maintenance, support, and technical expertise decline while technical advancements increase overtime leading most LEAs to procure systems for replacement. Other instances, force smaller LEAs to heavily rely on Microsoft Access databases and Excel spreadsheets or alternatively on pencil and paper.

The chart further confirms there is not one single vendor providing all the necessary software systems, capabilities, and, especially, data required for the learning and accountability system, and LEAs are forced to cobble together a string of software systems from different vendors to support their needs. At best, a handful of LEAs statewide have a Data Management System bringing together all the necessary data for a comprehensive learning and accountability system.

Procurement of these systems is time consuming and requires expertise in advanced technical standards and specifications to purchase a system from a vendor with sound technical development process and practices. This effort also includes end user input to ensure capabilities match the demand of the users. It is estimated LEAs spend millions annually to just procure the software applications. See Chart 23.

**Chart 23 – Estimated LEA Procurement Expenditures**

| ESTIMATED PROCUREMENT EXPENDITURES                 |                          |
|--|--------------------------|
| (1) LEA Procurement Personnel and (1) LEA End User | \$25 hourly per resource |
| (12) Weeks Process to Procure (1) System           | 480 hours                |
| Number of LEAs                                     | 619                      |
| Total Procurement Effort Cost                      | \$14,856,000.00          |

### 4.5.3 Core Software Systems Capabilities

In order to gain a complete picture of a learning and accountability system from the LEA perspective, the research team conducted discovery tasks as part of the demand management practices to document the capabilities and data currently in the core software systems. Additionally, the researcher worked with regional, county, and local education agencies to understand the future needs of software systems to meet state and/or federal mandates and initiatives. The high level capabilities and accompanying data in those systems are summarized below.

- **Assessment System:** Must offer capabilities to manage formative to summative high-stakes, secure tests for guiding instruction to accountability of teachers in non-core subjects; needs to provide role-based access to creating, administering, and report on assessments (giving administrators and teachers access only to their content); needs to produce statistical values for items and tests (for validating high-stakes tests with impact on educator incentive pay); needs to maintain data on test item usage and teacher rankings of content
- **Educator Evaluation System:** Must offer capabilities that enable each LEA to define their own evaluation rubrics and work flow (to support evaluation processes); needs to integrate with other systems such as professional development, assessment, student information, and human resource systems for data transferability to calculate the overall evaluation score of an educator; needs a high degree of security and measures to gauge usage and accessibility
- **Content Management:** Must offer capabilities to create, edit, store, publish, and deliver all forms of content including instructional resources, lesson plans, and video activities to help educators address deficiencies identified in the observation (to support continuous improvement); needs to maintain data on content usage and teacher rankings of content otherwise known as paradata
- **Learning Management or Professional Development System:** Must offer capabilities to deliver and track learning activities and data per learner; needs capabilities to organize facilities, instructors, and resources of professional development offerings and manage course registration and administration (so educators can complete activities to improve their effectiveness); needs to allow for setting and tracking of annual goals that including individual, team, and school goals (to support continuous improvement and remediation of deficiencies).
- **Data Management System:** Must offer capabilities that provide reporting and analytics that draw data from all of the systems listed above as well as the Student Information System and Human Resource Management System so professional development and student instruction are best aligned with identified needs; needs a means for teachers and administrators to verify the accuracy of the data and report errors for corrections

Vendors in the education industry market have typically responded to a need or funding stream by producing a software system with capabilities that address those needs and requirements. However, over time, as in most industries needs evolve and vendors respond by developing new capabilities and features to extend the lifecycle of the software. What was once very clear delineations between product lines in the market have become blurred due to the need demand for data from multiple systems to work in concert providing a holistic picture of the student, teacher, administrator, school, and district.

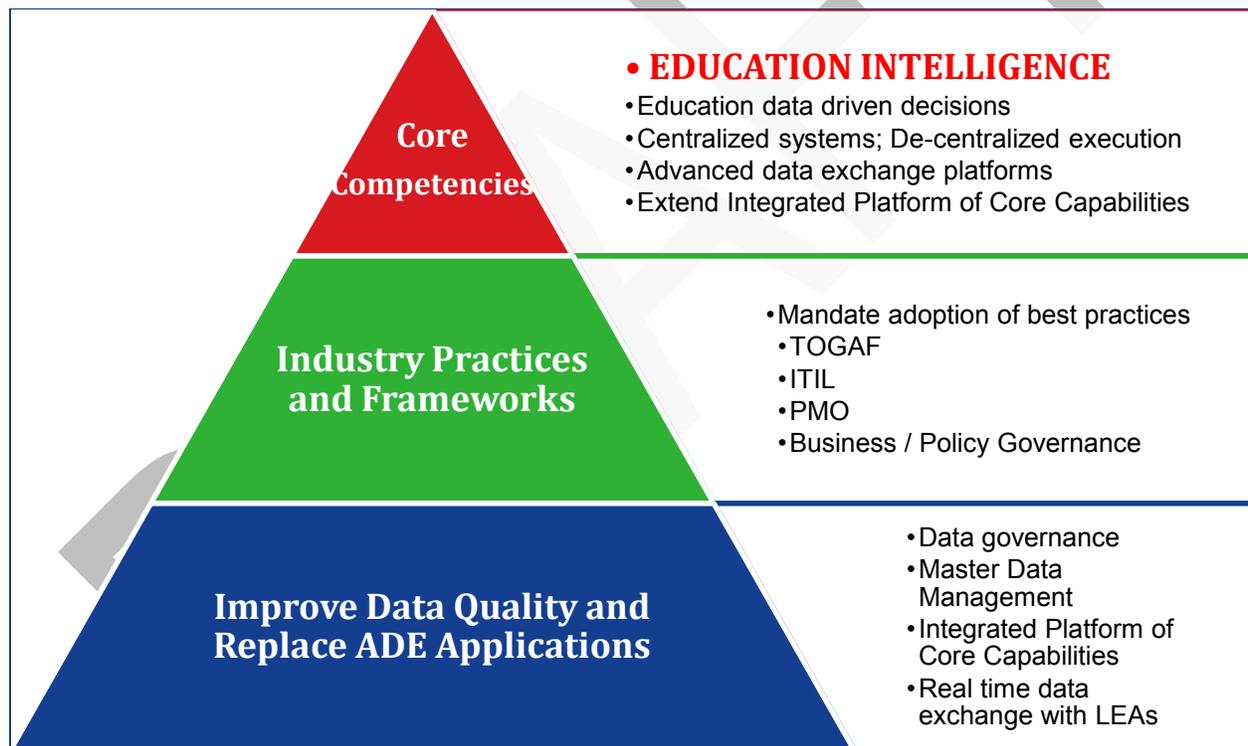
## 5.0 Recommendations

The study yielded 13 recommendations from which a three-level hierarchy was formed to show an order of prioritization and interdependencies to achieve transformative change. More specifically, the range of issues outlined in the Problem Statement will be addressed and resolved by transforming Arizona’s educational culture, process, and technology as proposed by implementing the recommendations. The hierarchy of recommendations is listed below and illustrated in Figure 13.

- (1) Improve data quality and replace ADE applications
- (2) Implement and apply industry best practices and enabling frameworks
- (3) Develop and enable core competencies

### 5.1 Recommendation Hierarchy

Figure 13 – AELAS Recommendation Hierarchy



This Business Case reflects and details the new business model for how to conduct a state-led, cooperative education program. The above recommendations align with tangible benefits that will result in cultural, process, and technology changes across the ADE and LEAs. All recommendations lay the foundation and lead to the tip of the hierarchy – Education Intelligence – integrated data and analytics transformed into actionable information delivered ‘real-time’ to education stakeholders that can contribute to the improved student success.

A key aspect that often occurs in the IT domain is the tendency to overemphasize technology and tools rather than the importance of culture and processes in making sustainable change. It is crucial to address and focus on how culture and processes will change the current 'as is' to the 'to be' state of education and, more importantly, to have a strategy for these rather than a reactionary observation of what happened. This is precisely how the value proposition will produce substantial reinvestment opportunity to the state of Arizona.

### 5.1.1 Culture

A change in culture commences with the first recommendation of mandating an internal structure for ADE data governance under a single entity, namely a state data officer. By implementing a master data management policy using the Common Education Data Standards (CEDS), as established by the National Center for Education Statistics, will unify data across the state. Improvement in utilizing industry best practices and frameworks can lead to enhanced ADE performance through re-defined core competencies focused on service-orientation and change the perception of ADE held by internal and external stakeholders. Deploying centralized systems at a reduced statewide pricing can change the isolated behavior across the Arizona landscape by enticing LEAs to work collaboratively on similar initiatives by sharing resources, ideas, and innovations for education-data-driven decisions.

### 5.1.2 Processes

Adopting and applying formalized frameworks such as the Information Technology Infrastructure Library (ITIL), The Open Group Architecture Framework (TOGAF), and Project Management Office (PMO) will enable the ADE to reap the benefits of tried and tested best practices from mature industries that have dealt with data-related issues and their associated processes. New and advanced file interchange platforms will make it easier for the ADE and LEAs to exchange immediate, actionable data to influence and inform decisions at the state, district, school, class and student levels. Moreover, the improved processes can be integrated and considerate of reporting needs from ADE program areas, within and across the organization, and with LEAs as integrated and interoperable systems further realize the benefits of the new learning and accountability system.

### 5.1.3 Technology

Technology, being a means to an end, serves both those who use technology to conduct their work as well as the recipients of those work products. This Business Case recommends to replace the entire infrastructure and to implement more up-to-date architecture and platforms. This complete rebuild will enable the implementation of a comprehensive statewide learning and accountability system through the introduction of an integrated platform of core capabilities. This goal does not rely on 'leading-edge' technology, but rather on the application of rigorous disciplined technology architecture principles and integration to the cultural and process frameworks described above. The sum of the proposed platform will lead to configurable program area services and the architecture to support centralized systems and advanced data exchange platforms.

## 5.2 Recommendation #1 – Improve Data Quality and Replace ADE’s Applications

The data findings of 2 million data errors per year in SAIS and 568,000 hours expended correcting and cleansing data, led the research team to declare the most fundamental change and recommendation for the state is to improve data quality. The agency is already implementing a cultural change as it relates to the data assets by implementing data governance, master data management and processes, and ensuring all data meets CEDS/Ed-Fi compatibility. Improvements in our data assets will lead to replacing numerous applications with an integrated platform of core capabilities such as identity management, reporting, and a single business rules engine to meet the legislative changes in an efficient manner. Improvements at the agency will enable districts and charter schools to reconsider their resource allocation to data management, cleanup, and reaction to the constant requests from ADE for more data.

### 5.2.1 Master Data Management with CEDS/Ed-Fi Adoption

October 2012, the Data Governance Commission enforced the recommendation to implement master data management policy using the Common Education Data Standards (CEDS) and Ed-Fi as the state adopted standard moving forward for any new development and procurement.

CEDS is a specified set of the most commonly used K-12 education data elements. The standard supports the effective exchange of data within and across states, as students transition between educational sectors and levels, and for federal reporting. This common vocabulary will enable more consistent and comparable data to be used throughout all education levels and sectors necessary to support improved student achievement. The standards were developed by NCES with the assistance of a CEDS Stakeholder Group that included representatives from states, districts, institutions of higher education, state higher education agencies, early childhood organizations, federal program offices, interoperability standards organizations, and key education associations and non-profit organizations. CEDS is a voluntary effort and will increase data interoperability, portability, and comparability across states, districts, and higher education organizations.

The Ed-Fi solution is a universal educational data standard and tool suite that enables vital academic information on K-12 students to be consolidated from the different data systems of school districts while leaving the management and governance of data within those districts and states. The standard and tool suite include a unifying data model, data exchange framework, application framework, and sample dashboard source code. The Ed-Fi solution is open, XML-based, and CEDS-aligned to integrate information from a broad range of existing sources so it can be sifted, analyzed and put to use every day. Ed-Fi components act as a universal translator of academic data, integrating and organizing information so that educators can start addressing the individual needs of each student from day one, and can measure progress and refine action plans throughout the school year.

### 5.2.2 Integrated Platform of Core Capabilities

It is clear that ADE cannot progress effectively and efficiently to deliver new advanced services unless and until the current information technology environment is replaced with a more up to date architecture and platform. This complete rebuild will enable the implementation of a comprehensive statewide learning and accountability system through the introduction of an integrated platform of core capabilities.

The proposed new architectural design is intended to revamp the disjointed applications within ADE. The premise is that there is functionally nothing recoverable from existing applications other than the knowledge they provide for requirements analysis as well as how workflows are organized within ADE. However this is a contribution in and of itself. Program areas are well aware of what works and what does not work and the spectrum of shortcomings that existing infrastructure holds.

### 5.2.2.1 High Level Capabilities of the New Architecture

The following are the key criteria established to define the new architecture:

- (1) Must provide for growth of new services seamlessly;
- (2) Must provide interoperability between the numerous program areas;
- (3) Must enable data sharing in such a way as to minimize replication and errors;
- (4) Must enable the management of business rules centrally in such a way as to provide governance and determine legislative impact and to adapt easily to legislative changes;
- (5) Must follow practices of master data management and data governance to the organization;
- (6) Must provide a common look and feel of interfaces, where possible, and data exchange across the organization;
- (7) Must reduce manual data transfer;
- (8) Must reduce/eliminate paper based processes and items;
- (9) Must enable business continuity planning and implementation;
- (10) Must implement, as far as possible data standards that are related to education data;
- (11) Must enable a staged migration of all ADE applications;
- (12) Must enable future changes and growth in technology and be possible to migrate to cloud based infrastructure.

### 5.2.2.2 Proposed Architecture

To this end a service-based architecture is proposed and is outlined in Figure 14, using a capabilities-based platform configuration. This architecture relies on industry best practices for the integration of functional services that are configured to deliver program specific services. The key platforms are the following:

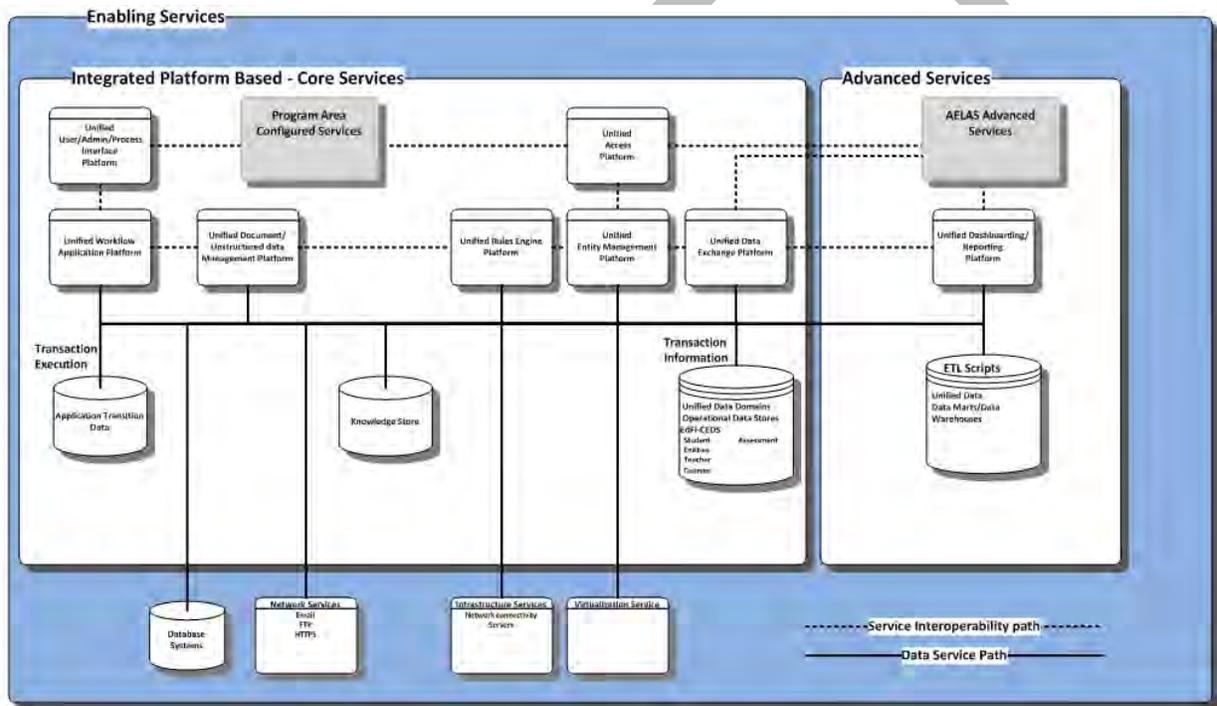
- (1) A unified user interface platform that integrates look and feel across all interfaces and a common code repository for all interfaces;
- (2) A unified workflow based application platform that, like (1), provides for a common coding approach and common code for all applications;
- (3) A unified data collection platform through and from which all data exchange is managed and moderated up to and include between program areas;
- (4) A unified dashboard/report platform from which all dashboards and reports consume the data exchange service, rely upon and are called by needed applications;
- (5) A unified rules engine platform the centralizes all business rules that are consumed by applications, reports, dashboards as well as help in the production of data marts and data warehouses and data requests;
- (6) A unified entity management platform that enables the creation and maintenance of the numerous entity types that program areas consume and manage as well as the complex and rich relationship between these entities;
- (7) A Unified Document/Unstructured data management that holds all forms, paperwork, and information such as glossaries, letters, reports, etc. platform;

- (8) Finally, a unified access platform (identity management system) that manages all user access to all system components and functionalities.

The sum of these platforms will lead to the capability to configure program area services that consume these capabilities through sound and governed development processes. The architecture also provides for Commercial-Off-The-Shelf (COTS) solutions to be used so long as the requirements of data exchange based on program specific data and managed through governance are applied and integrate in the RFP process.

The totality of the architecture rests on governance processes and discipline being implemented across ADE, development and/or acquisition best practices and policies, data exchanges policies with all stakeholders well defined and documented. For a conceptual design of the proposed architecture, see Appendix F.

Figure 14 - Proposed Solution Services Architecture



### 5.3 Recommendation #2 – Implement Industry Best Practices and Frameworks

The data findings conclude ADE is an organization with Level 1 maturity of 5 levels. Level 1 is the lowest level where processes are described as “chaotic”, “non-existent”, or “initial”. ADE program areas have no formal process of documentation management, and most program areas have historical, in-house knowledge of documentation without formal process. This led the research team to recommend the formal implementation and execution of industry best practices and frameworks. ADE is already in the process of implementing and executing ITIL, TOGAF, and a mature PMO. The cultural and process

changes will enable the agency and the state to establish new core competencies leading to recommendation 3.

### 5.3.1 Information Technology Infrastructure Library

The ADE has recognized that it can no longer incidentally manage its IT environment and must mature its overall capability to a higher level of performance both to minimize its operational costs and enable it to support and sustain the advanced educational services that are needed to advance Arizona's position as an education leader in the US. The formal and practice-based framework chosen to achieve the maturation, and the strategic direction taken by ADE, are:

- To implement the ITIL framework which is a set of practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business. Specifically, the framework consists of twenty-six formal and well defined processes and four service functions, contained within five service groups, which are service strategy, service design, service transition, service operation, and continual service improvement; and,
- To implement a formal Data Governance and Master Data Management capability to support data as a statewide service.

More importantly the approach taken to fulfill the AELAS mandate requires that ADE take a service portfolio managed approach to all services both core and advanced. This must be done in order to:

- effectively manage information delivery;
- provide a stable core services infrastructure;
- provide the capability to expand to advanced services; and more importantly; and,
- be able to make strategic cost-effective decisions of what advanced services are needed and what are the changes needed to the core services to support these needs.

The service strategy segment of ITIL will enable ADE to demonstrate sound investigative and research method to identify and meet the needs being addressed and support the recommendations made within this business case. The two ITIL processes are those of Demand Management and Service Portfolio Management. Demand Management is an IT governance process that enables IT and the business to optimize the investment in IT through fact-based decisions. The end result of understanding the actual capabilities demand addressed by AELAS, and framing them into deliverable solutions, requires the execution of the second most critical ITIL process, Service Portfolio Management.

Service Portfolio Management is a singular process executed to enable a comprehensive perspective of the ADEs existing IT service assets and combine them with the proposed services needed and identified by Demand Management. Next, a systematic and justifiable supporting rationalization for the proposed investment is performed based on:

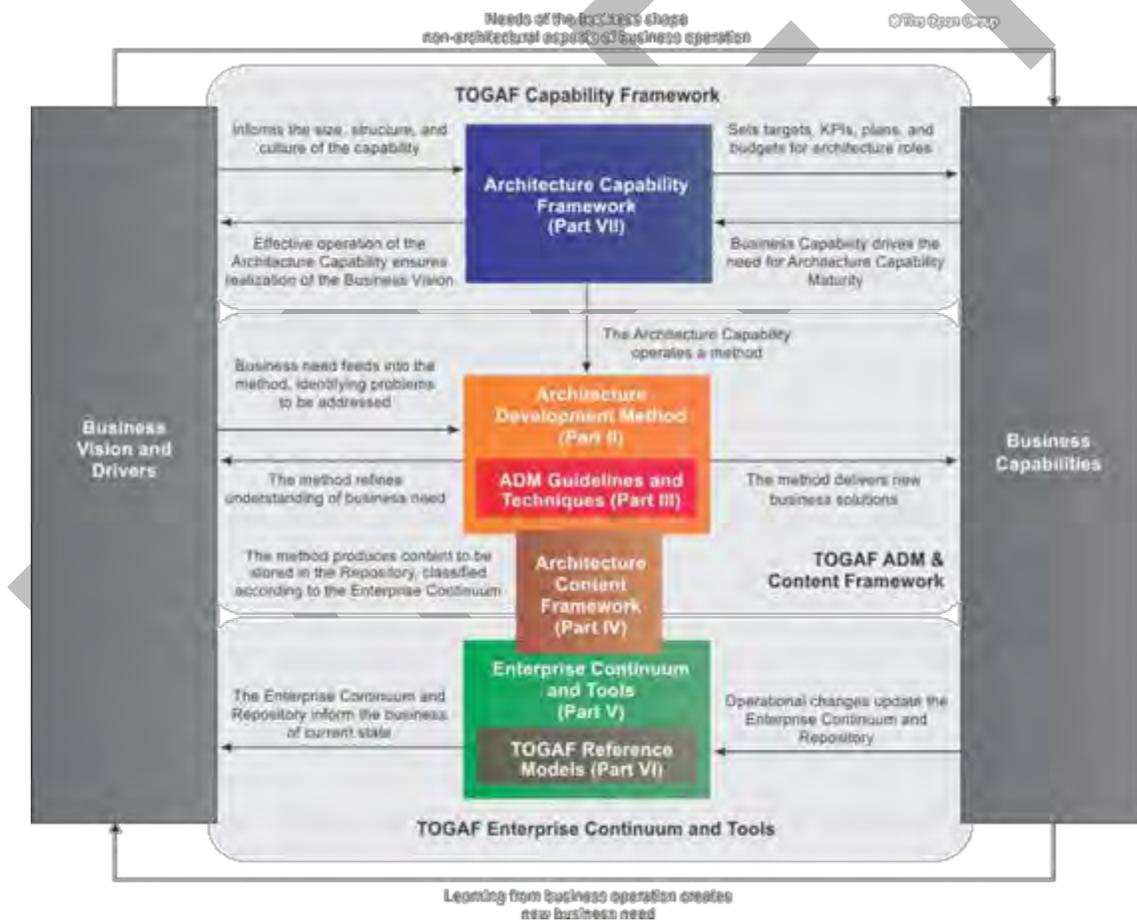
- the investment criteria of allocated/available funds;
- criticality of services;
- dependency of services;
- mandated services;
- ability to roll-out the services; and,
- legislative action.

The roadmap for this maturation is the application of Carnegie Mellon's capability maturity model applying the IT service management framework of ITIL which relates to the degree of formality and optimization of processes, from ad hoc practices, to formally defined steps, to managed result metrics, to active and on-going optimization of the efficiency and effectiveness of the processes. See Appendix B for a complete assessment of ADE's current capability maturity levels.

### 5.3.2 The Open Group Architecture Framework

TOGAF®, an Open Group Standard, is a proven enterprise architecture methodology and framework that ensures consistent standards, methods, and communication for enterprise architecture professionals within an organization. Figure 15 reflects the structure and content of an architecture capability within an enterprise as well as the process of applying it to the ADE. The documentation associated with the framework guides enterprise practitioners toward creating and implementing a pathway to achieve the business vision and goals.

Figure 75 - TOGAF Capability Framework



The application of this structured framework reflects and supports ADE's commitment to improve its overall capability's maturity with clear and precise supporting frameworks. Under AELAS an enterprise architecture team was formed that conducted the analysis presented in this business case in order to produce the recommendations based on sound architectural principles.

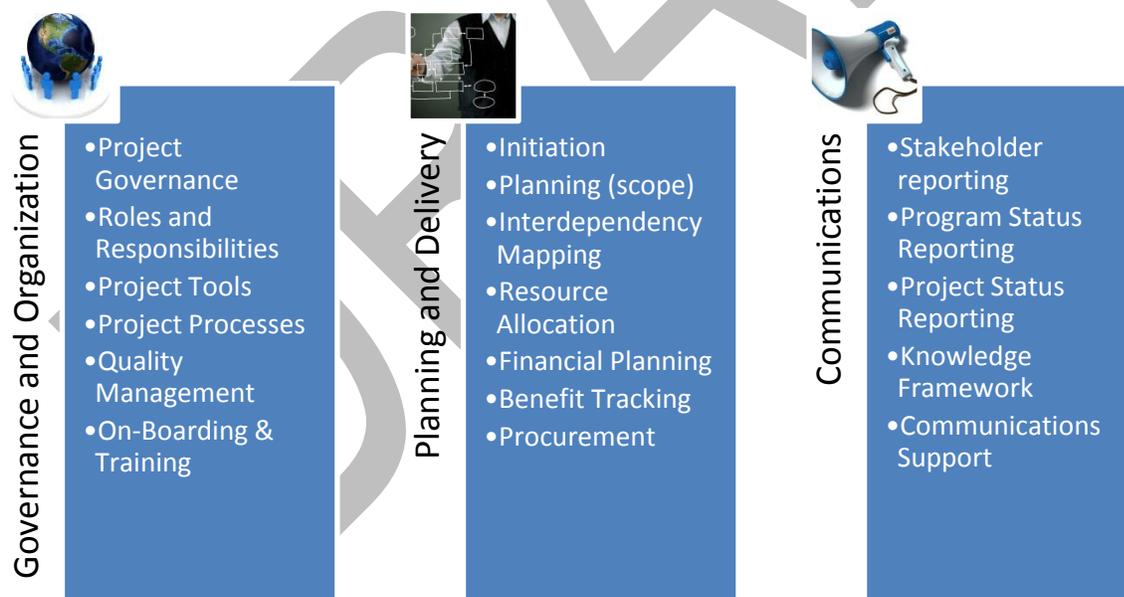
### 5.3.3 Project Management Office

The Project Management Office (PMO) is a department within the agency that defines and maintains standards for project management. Thorough understanding and knowledge of the project lifecycle is essential to this office. Initially, this office was formed in October 2012 with the understanding that all projects have interdependencies with other projects. For example, the completion of the Student Teacher Course Connection project is a precursor for the Student Longitudinal Data System project. These interdependencies must be owned and managed for successful completion, and this is where PMO plays a major role.

The primary goal of a PMO is to achieve benefits from standardizing and following project management policies, processes and methods. Over time, the PMO will become the source for guidance, documentation, and metrics related to the practices involved in managing and implementing projects within the organization. A project charter is essential to the success for it defines and identifies the key sponsorship and involvement to support the project. Communication is a key process for the office. PMO will report on project activities, risks, issues, budget, and requirements to executive management as a strategic tool in keeping decision makers informed and moving toward consistent, business- or mission-focused goals and objectives.

The PMO structure has three components: Governance and Organization, Planning and Delivery, and Communication. Figure 16 delineates the components and outlines the objectives.

Figure 16 – Project Management Office Structure and Objectives



## 5.4 Recommendation #3 – Core Competencies

Establish new core competencies to better serve districts and charter schools.

Several data findings of the study led the researchers to the recommendation of ADE redefining core competencies with a more service-oriented focus. The findings included the scattered sources of data, lack of data and software system integration, and cost of disparate software systems incurred by the Local Education Agencies. Annually, districts and charter schools spend \$281M on software systems licenses and implementation at the onset of initial implementation. Very small LEAs pay seven times more than very large LEAs for software licenses per user. The researchers concluded that if ADE were to offer the most demanded systems as a centralized, opt-in solution with reduced statewide pricing, annually, LEAs of all sizes can realize benefits of cost reinvestment. By extending the integrated platform of core capabilities will support data-driven decision-making all the way down to the individual student level.

#### 5.4.1 Centralized Systems; De-centralized Execution

The ADE centralized system model provides software systems procured at the state level with reduced pricing based on statewide user counts. The de-centralized execution model enables LEAs to implement the software systems to meet local needs through configuration measures. The approach proposed is LEAs will discontinue their contract with vendors, given the appropriate timing, and convert to the ADE centralized systems, opt-in model reallocating the cost for software and implementation through ADE, given the state pricing point is reduced from their current pricing point.

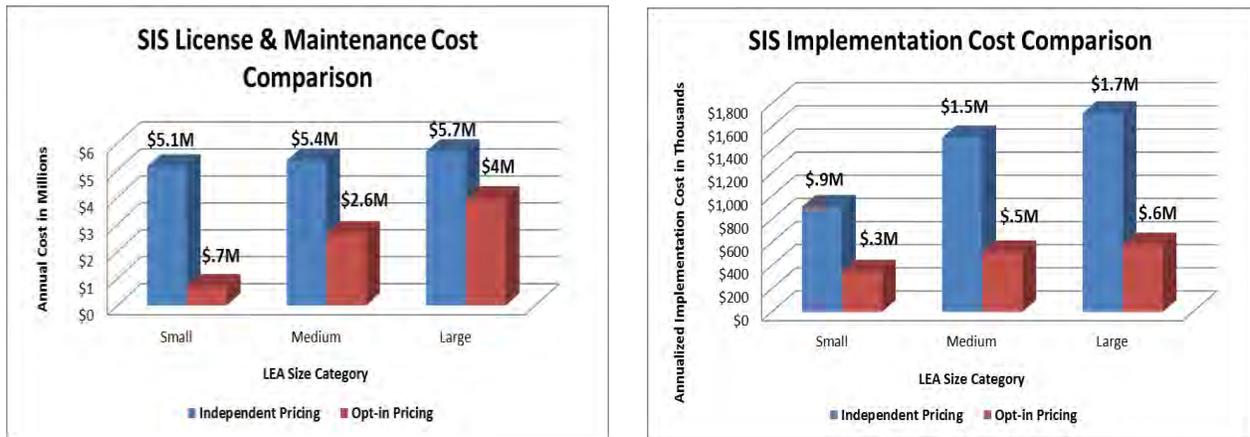
Through the extension of the Integrated Platform of Core Capabilities, systems will become interoperable, data will be integrated across multiple sources, and identity, audit, and security measures will be executed. Data-driven decision reporting and analytics will be provided too.

A cost analysis was completed to determine the potential reinvestment if ADE were to offer centralized systems with reduced statewide pricing. Initial analysis of the cost data provided by LEAs for their systems revealed a wide range of prices paid by different LEAs for the very same product. Very small LEAs (fewer than 200 students) often have to pay a minimum cost for systems which is substantially more than they would pay simply based on the number of students they have. LEAs often settle for a less than optimal system for their needs simply because they cannot afford the system that does meet their needs. Large and very large LEAs often stick with a specific system when it doesn't meet their needs simply because it is too costly to go through the process of selecting, procuring, and implementing a new system. These are all examples of limitations on the ability of LEAs in all size categories to procure, implement, and use high quality systems that support efficiency and effectiveness.

The figure below shows a very clear example of the level of savings associated with applying economies of scale to the purchase of one common LEA system, the Student Information System (SIS). Of the 619 LEAs in Arizona, each has their own SIS. Each one of them negotiates pricing separately, and most of the 445 smallest LEAs have to pay a vendor minimum cost that is much higher than the per-student cost would be based on their enrollment. Centralizing the purchase of licenses, maintenance, and the implementation process statewide for Student Information System (SIS) would recover costs for LEAs in all size categories.

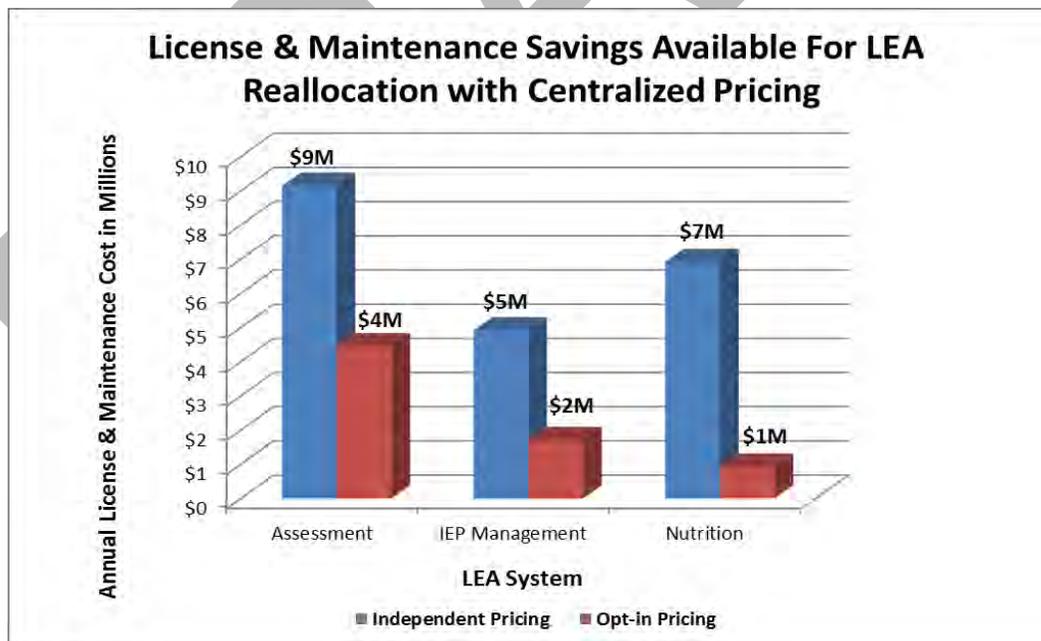
For example, Small LEAs (below 600 students) currently spend \$5.1 million collectively for licensing and maintenance costs for their SIS. With the centralized purchasing model, their collective annual cost would reduce to \$700,000, freeing up valuable dollars for reinvestment into other areas in those LEAs. Implementation managed centrally would save LEAs in all size categories two-thirds of what they are currently spending for implementation of a SIS. See Figure 17.

Figure 17 – SIS Cost Comparisons



If we consider the systems that make up the majority of those that LEAs use to operate their schools, we see significant savings for all of them when adopted as part of a centralized system, freeing up dollars that could be used to hire more teachers, provide more relevant professional development, or provide better technology in classrooms. Figure 18 below shows current annual license and maintenance costs for three other common LEA systems as compared with the potential future annual license and maintenance costs for those systems in a centralized AELAS purchasing model.

Figure 18 – Centralized, Opt-In Pricing and Reinvestment



The potential savings at the LEA level for the centralized purchasing model are clear, but will LEAs choose to opt-in to the centralized model? To help determine the systems that were of the highest interest to LEAs for this model, focus groups were held with representation of LEAs from all size

categories, types, and geographic areas. Figure 19 below represents the preferences for top systems that could potentially motivate an LEA or charter organization to be an early adopter of AELAS. The top three systems included Assessment, High Stakes Test Analysis, IEP Management followed by Credit Accrual/Credit Recovery and Professional Development. It is important to note, that although we heard from LEAs that they had concerns about ADE’s ability to effectively implement this centralized system model, there is definite interest in accessing at least some of their systems in a centralized model.

Figure 19 - Top System Adoption Ranking

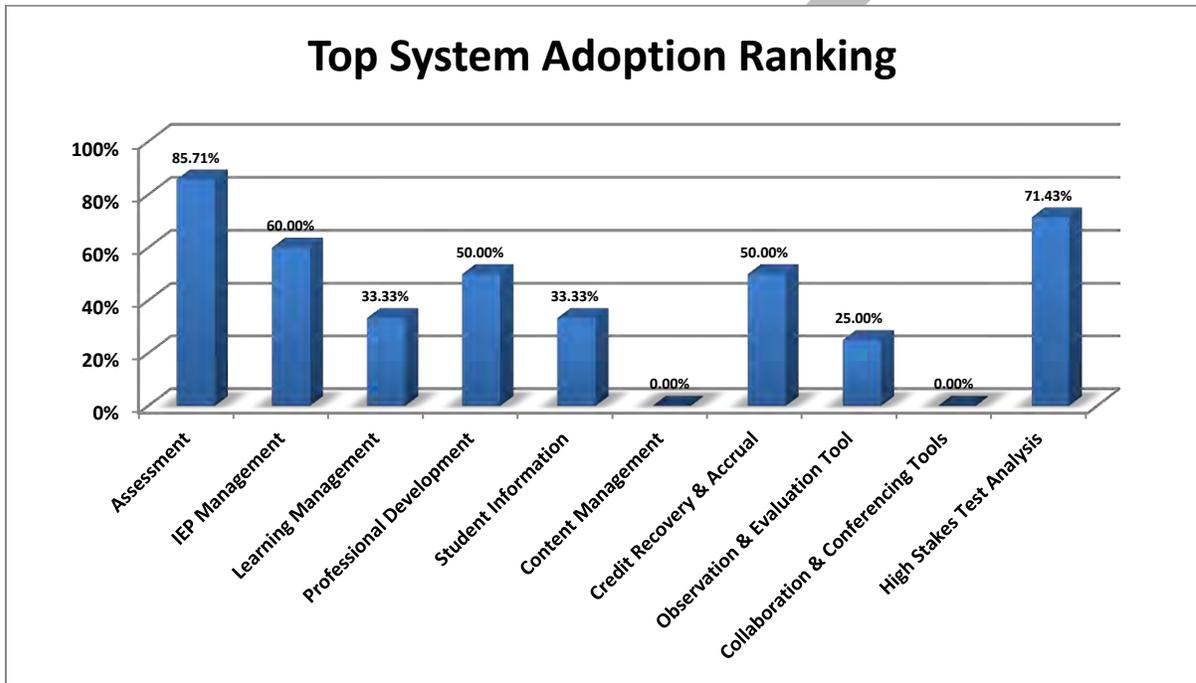
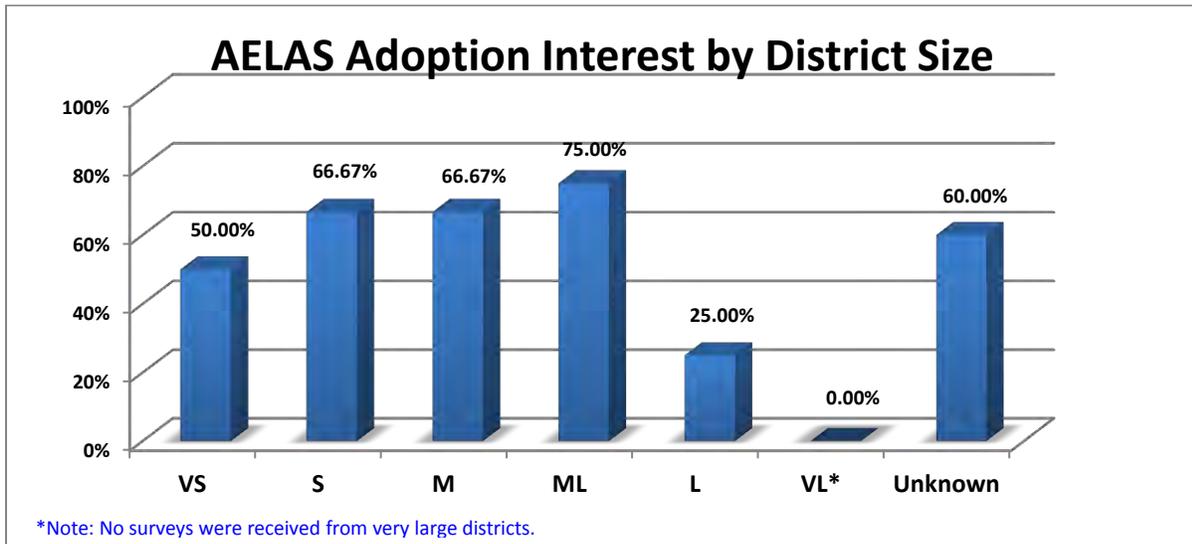


Figure 20 below represents the size of the LEA or charter organization segment that is likely to be an early adopter of AELAS. Medium-large (75%), medium and small (67%) followed by very small (50%) sized education institutions expressed the most interest at present.

Figure 20 - AELAS Adoption Interest by District Size



Important motivational factors that could influence a district to opt-in to AELAS included:

- Significant decrease in cost over their current solution
- Significant improvements in operational efficiency
- Significant improvements in interfaces with state systems

But, according to LEAs, there are a number of factors would be working against adoption of AELAS, and that would need to be addressed by the ADE:

- Lack of trust in ADE, IT solutions, and state professional development support
- Sunk costs in existing systems and products
- Loyalty to existing systems and products
- Cost and effort to change products (conversion costs, training staff)
- Lack of funding
- Connectivity concerns
- Concerns over ADE having access to all of their data
- Resistance to change in general

The combined results from the LEA outreach activities showed that there is interest in an opt-in centralized model for LEA systems, but that more work is needed with at ADE to build confidence with the LEAs, that the timing of a roll-out would need to factor in the implementation cycle that each LEA is on with their current systems, and to identify from a practical perspective which systems maximized LEA interest for adoption with the least amount of LEA concerns.

Note: See Appendix D – LEA Data Analysis Detail Report and Appendix E – LEA Outreach Summaries for a set of charts that presents reports on these findings from this research in total.

## 5.4.2 Extend Integrated Platform of Core Capabilities

Arizona Department of Education will adopt an Integration Strategy as a means to achieve interoperability between future systems, applications and the core operational data store – the one source of truth. Export, upload, error report, and edit techniques of the past decade are creating intensive and expensive work efforts on the part of LEA's and schools consuming valuable resources that would better profit the education process for students versus performing administrative tasks at the level of counting students.

Newly implemented data governance policies and procedures will address past behaviors that allowed poor data collaboration processes across program areas. Effective data governance will provide the framework to effectively utilize a different integration approach. The new integration strategy will highly value active integration via an integration engine. The heart of this technology will be XML based contracts and web services to receive the XML packages to transfer data. Active integration allows error conditions to be detected sooner in the transfer process and would be one of the preferred mechanisms. Primarily, this would be the preferred mechanism utilized internally by ADE when integrating both internally and externally hosted vendor systems to achieve automated data transfers. Industry standards will be utilized where possible to reduce development cost and simplify complexity in both internal and AELAS Opt-In applications.

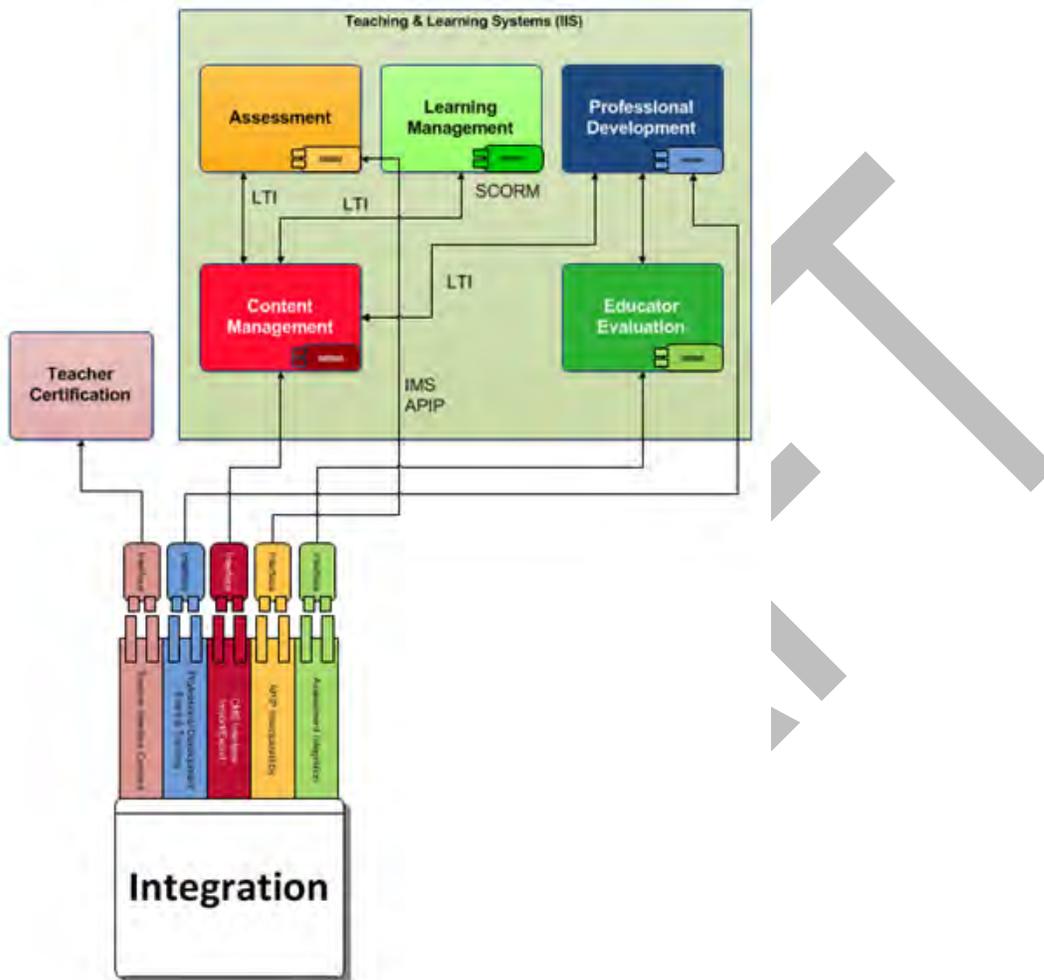
Understandably, it may not be possible to achieve all external data transfers through active mechanisms. When necessary, HTTP, Secure FTP and batch file transfer can be used to move data to ADE staging areas where ETL (extract, transform, and load) will be used to stage and load the data. This will become the least preferably integration mechanism moving forward.

All of the approaches require an active participation of the Data Governance Board to simply achieve the best data quality at the lowest cost possible. Technical analysis of each project and system will determine the optimum transfer mechanism

ADE has licensed to use Ed-Fi as a core definition for the educational domain as Ed-Fi is tracking to CEDS standards. ADE is targeting Ed-Fi 1.1 as the basis for the Operational Data Store (ODS). Data Governance approval and processes will determine what relevant data will be mapped to the desired Entities. A technical analysis will result in identifying the best integration approach to Create, Update Delete and synchronize relevant data between the systems.

See Figure 21 for a piece of the integration conceptual architecture for Teaching and Learning systems that will be offered through the Centralized, Opt-In Model. See Appendix F or a full conceptual architecture design of AELAS.

Figure 21 – Integration Conceptual Architecture



### 5.4.3 Education Data-Driven Decision System

Arizona’s version of the Education Data-Driven Decision System (i.e., AZ ed<sup>3</sup>s) is proposed as a real-time decision support system through the learning and accountability system.

Student data is entered at the LEA in software systems such as Teaching and Learning, Administrative, and Back Office. In the future, through a centralized, opt-in model some of those systems will be offered as a service by ADE.

The daily data captured in these systems is valuable and covers student formative assessment performance (Assessment System) and instructional performance (Learning Management System).

This information is combined with student demographics, attendance, and behavior records (Student Information System) and daily classroom or homework grades (Grade Book), aligned to teacher

information (Human Resource System), and then collected and integrated with data from ADE such as high-stakes assessment.

The data then moves to the ADE systems so program areas such as Research and Evaluation or Exceptional Student Services can use the data for state and federal reporting reducing the constant requests from ADE for local information. In the Operational Data Store, student data is housed as the 'single source of truth' and then placed in the data warehouse for longitudinal purpose.

Just like Business intelligence (BI) promotes the ability of an organization to collect, maintain, and organize knowledge to further new opportunities such as a competitive market advantage and long-term stability, Education Intelligence (EI) promotes the collection, integration, and display of education information into timely, actionable data in the support of educators. This data is further transformed into actionable reporting and analytics delivered 'real-time' to education stakeholders to increase learning opportunities for teachers and students.

Ultimately, the data is elevated to new usage, reporting, and analytics models through AZ ed<sup>3</sup>s. Personalized learning dashboards provide immediate feedback based on student performance from a variety of data sources. Assessment Comparison dashboards enable educators to view past and current student performance across high-stakes assessments to district interim assessments. Student profile dashboards serve as an early warning system providing real-time and longitudinal views from a holistic perspective including attendance, behavior, homework, and overall readiness for college and career indicators.

The education stakeholders that benefit from these advanced analytics include the educators, families, and most importantly students increasing not only their accountability of their education and their entire support system.

DRAFT

## 6.0 Financial Investment

### 6.1 Cost Benefit Analysis

Research shows organizations are two-three times more likely to succeed in realizing the value of the financial investment when the business case is not only a way of obtaining funding but it also serves as a means of (1) demonstrating how the benefits depend on business changes as well as technology enablers, (2) gaining commitment to achieve the benefits, and (3) enabling the success of the investment to be judged objectively. It is necessary to understand for all Arizona education stakeholders to realize the benefits of the learning and accountability system outlined in this business case, business and organizational changes are required. The conventional method of projecting the costs and financial returns follow in this section. Additionally, a more unconventional method of structuring the benefits to be measured and owned follows in the next section, Benefit Analysis.

### 6.2 AELAS Appropriations to Date

AELAS appropriations to date corrected problems that were not addressed in this business case such as replacing obsolete hardware, increasing system availability, and addressing over 800 unresolved customer service issues. These improvements are noted earlier in the business case as SAIS optimization and stabilizations efforts, but go well beyond SAIS. See Appendix N for a complete list of the issues and resolutions corrected by the IT management since January 2011. In addition, the appropriations laid the foundations for ultimate systemic change and execution of the recommendations proposed in this business case. Some of these early projects include implementing the first stage of ITIL and an identity management solution, and establishing data governance practices and standards.

AELAS funding to date have been derived from legislative appropriations and a \$6 per pupil transfer from universities and community colleges equaling \$6.2M. Additional funding streams were received from federal grant programs such as Race To The Top (RTTT) and Statewide Longitudinal Data Systems (SLDS). However, these funds are tied to specific project deliverables such as ultimately connecting student, teacher, and course data.

### 6.3 AELAS Appropriation Request

Opportunity for systemic change; albeit ambitious, is attainable, sustainable and will transform education in Arizona. The financial investment requested is based on the execution of the recommendation outlined in this business case and illustrated in the recommendation hierarchy. The financial investment will be addressed starting with the Local Education Agencies and recommendation 3 and work backwards to the Arizona Department of Education and recommendations 2 and 1.

#### 6.3.1 Local Education Agencies

At the center of the AELAS are the Arizona administrators, teachers and students that will benefit from the overhaul of education. It is important to note that very small and small LEAs currently pay more for less. They are estimated to spend \$25M for software licenses and implementation on the four systems

that these LEAs can afford to implement. By adopting the AELAS centralized systems, they could implement an additional five systems to better support teaching and learning, and reinvest nearly half the current expenditures directly into their classrooms.

LEAs will have the ability to configure the workflow and use systems in ways that work best for the individual needs of those teachers and students locally through de-centralized execution of the software systems. No longer will LEAs be required to manage the vendor relationships; whereas, the ADE will be poised to manage the service level agreements with the range of education vendors, based on best industry practices and state-adopted data management standards.

Based on ADE-hosted focus groups, a full range of LEA representation identified the systems most needed, which would be supported as a centralized, opt-in model. The cost of implementing these centralized systems was calculated at economies of scale pricing over a five-year period and equals \$87.8M. See Chart 24 below for the rollout of the nine software systems across all LEAs, and breakdown between software license and implementation costs. The approach proposed is LEAs will discontinue their contract with vendors, given the appropriate timing, and convert to the ADE centralized systems, opt-in model reallocating the cost for software and implementation through ADE, given the state pricing point is reduced from their current pricing point.

**Chart 24 –Centralized, Opt-In Model Software Systems License and Implementation Costs (\$Millions)**

| <b>Fiscal Year</b>                                 | <b>FY14</b>  | <b>FY15</b>   | <b>FY16</b>   | <b>FY17</b>   | <b>FY18</b>   | <b>TOTAL</b>  |
|--|--------------|---------------|---------------|---------------|---------------|---------------|
| <b>Recommendation 3: Centralized, Opt-In Model</b> |              |               |               |               |               |               |
| Number of Software Systems                         | 5            | 7             | 7             | 9             | 9             | 9             |
| Number of LEAs                                     | 20           | 110           | 314           | 555           | 619           | 619           |
| Software License Costs                             | 1.1          | 4.0           | 7.8           | 13.7          | 20.7          | \$47.3        |
| Implementation Costs                               | 3.8          | 7.1           | 9.3           | 9.6           | 10.7          | \$40.5        |
| <b>Total LEA Investment Costs</b>                  | <b>\$4.9</b> | <b>\$11.1</b> | <b>\$17.1</b> | <b>\$23.3</b> | <b>\$31.4</b> | <b>\$87.8</b> |

Overall, LEAs of all sizes will realize benefits of cost reinvestment, improved services and support, and capabilities of integrated, centralized systems to support data-driven decision-making all the way down to the individual student level. LEAs can choose to reinvest monies saved on software licenses and implementation in ways that best support their local needs. The total annual LEA cost reinvestment is estimated to be between \$30 and \$60M annually depending on the number of LEAs that opt-in. See Figures 22 and 23.

Figure 22 – LEA Reinvestment with 42% Opt-In

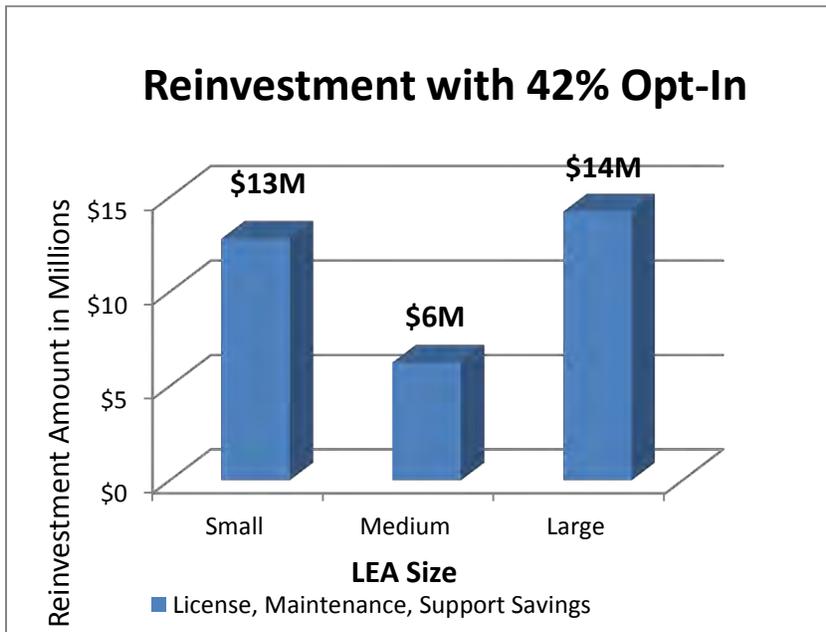
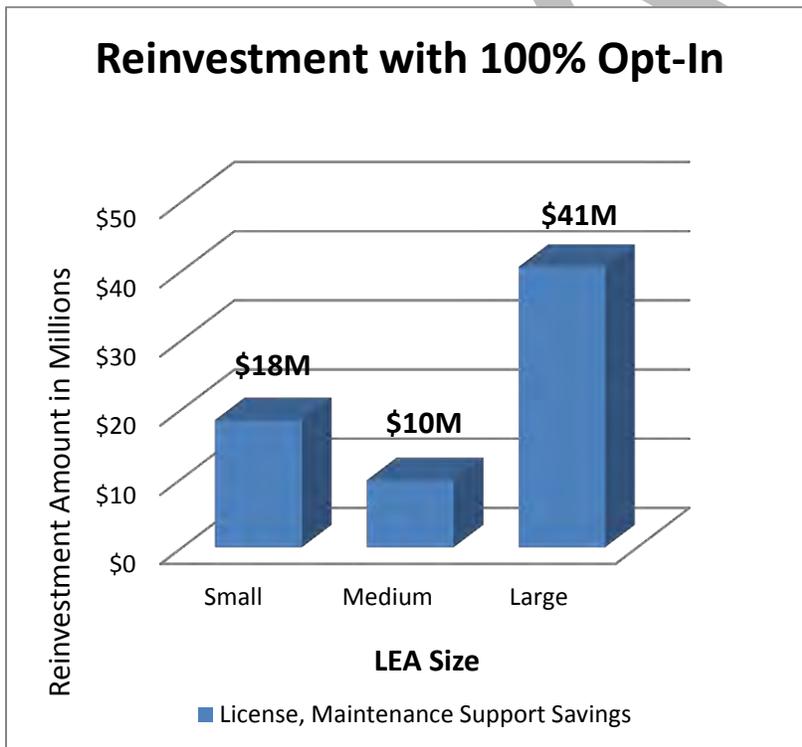


Figure 23 – LEA Reinvestment with 100% Opt-In



Success of the centralized systems approach is based on several factors including, but not limited to, LEAs realizing a cost reinvestment to other local needs, superior services and support from ADE, and

offerings of advanced integration and analytics across multiple systems and data sources. A jointly owned, cooperative formation of LEAs is recommended to provide ADE requirements, feedback, and guidance so that ADE can provide exceptional services through this approach. The ADE will continue to hone and enhance core competencies in this area initiated within that last few years.

### 6.3.2 Arizona Department of Education

The basis of the recommendation hierarchy begins at the ADE with improving data quality and replacing applications with an integrated platform of core capabilities to service the ADE program areas and subsequently the LEAs'. Concurrently, the ADE will employ industry best practices and frameworks. The ADE has the potential to realize a cost recovery of 568,000 man-hours expended on data management and corrections annually. Due to the downstream impact of improved data quality, LEAs will also experience a cost recovery or reinvestment of 500,000 hours expended on data management and corrections or \$12.5M annually.

A financial investment is required to accomplish these recommendations. See Chart 25 below for the rollout of the recommendations over a five-year period. The recommendation to improve data quality and replace ADE applications with an integrated platform of core capabilities equals \$65.3M and is divided between software licenses and implementation. The recommendation to implement industry best practices and frameworks equals \$4.4M. The fiscal year 2014 financial investment request equals \$23.1M.

Chart 25 –ADE Financial Investment Request (\$Millions)

| Fiscal Year   | FY14          | FY15          | FY16          | FY17         | FY18         | TOTAL         |
|---|---------------|---------------|---------------|--------------|--------------|---------------|
| Recommendation 2: Industry Practices and Frameworks             |               |               |               |              |              |               |
| Implementation Costs  | 3.2           | 0.3           | 0.3           | 0.3          | 0.3          | \$4.4         |
| Recommendation 1: Improve Data Quality and Replace Applications |               |               |               |              |              |               |
| Software Costs  | 3.2           | 0.3           | 0.3           | 0.3          | 0.3          | \$4.4         |
| Implementation Costs  | 16.7          | 10.8          | 18.1          | 6.3          | 9.0          | \$60.9        |
| <b>Total ADE Investment Costs</b>                               | <b>\$23.1</b> | <b>\$11.4</b> | <b>\$18.7</b> | <b>\$6.9</b> | <b>\$9.6</b> | <b>\$69.7</b> |

The key findings of this financial investment analysis demonstrates that within a short, three-year time frame of AELAS implementation, the investment requested under this proposal triggers a return on investment that is equal to the accumulated benefits and, more importantly, that the cumulative benefits outpace the ongoing investment needed to support and maintain all of AELAS. The cumulative benefit calculation includes 2 components: (a) the reinvestment costs from ADE and, (b) the reinvestment costs for the LEAs from the implementation of AELAS centralized systems. In other words, after three years, the investment has fully paid for itself and continues to deliver benefits to both the ADE and LEAs. See Chart 26 for the cumulative financial investment and benefit of AELAS as implemented per the recommendations in this Business Case. It is important to note, the LEA investment is a reallocation of current funds. This approach minimizes risk, improves the ability of the organization to adapt to change, and will provide the on-going measurement of success and confidence in ADEs execution and LEA adoption.

Chart 26 –AELAS Cumulative Financial Investment and Benefit (\$Millions)

| Fiscal Year                 | FY14            | FY15           | FY16          | FY17           | FY18           | TOTAL          |
|-----------------------------|-----------------|----------------|---------------|----------------|----------------|----------------|
| Cumulative LEA Investment   | 4.9             | 16.0           | 33.1          | 56.4           | 87.8           | \$87.8         |
| Cumulative ADE Investment   | 23.1            | 34.5           | 53.1          | 60.1           | 69.7           | \$69.7         |
| Total Cumulative Investment | 28.0            | 50.5           | 86.2          | 116.5          | 157.5          | \$157.5        |
|                             |                 |                |               |                |                |                |
| Total Cumulative Benefit    |                 | \$45.0         | 133.9         | 222.8          | 334.0          | \$334.0        |
| <b>Net Benefit</b>          | <b>\$(28.0)</b> | <b>\$(5.5)</b> | <b>\$47.7</b> | <b>\$106.3</b> | <b>\$176.5</b> | <b>\$176.5</b> |

Effective measures are critical to ensure the benefits being sought are achieved and will report against the value proposition that justifies the investment. In the past year, the ADE has begun to initiate and employ the disciplines of industry best practices and frameworks required to improve data quality and move toward applications with an integrated platform of core capabilities. The ADE will continue to identify the necessary metrics to measures and monitor benefits over the next months, in anticipation of further justifying and providing auditability of success for the financial investment.

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## 7.0 Benefit Analysis

The Benefits Dependency Network model was utilized to identify the key drivers for organizational change, the objectives and the expected business benefits, the business changes, and IT enablers. The linked elements are logically related and form a thread that tells the story of how IT enables the business to change in order to realize the associated, measurable business benefits to justify the financial investment.

Previously in the business case, the drivers, objectives, and benefits were outlined for the learning and accountability system (AELAS); however, through the BDN model, again, the researchers conducted a rigorous and systematic exploration of the benefits in the following ways and illustrated in Chart 27:

- Benefits types recognized outside of financial benefits (Quantitative, Measurable, and Observable)
- Measures for all benefits are identified including subjective and qualitative
- Evidence is sought for the size of magnitude of the benefit
- Ownership is selected for each benefit to ensure commitment and aid benefit delivery
- Risk assessment value assigned to each benefit

Chart 27 –AELAS Transformative Business Benefits

| Explicitness Degree | Type         | Business Benefits   |  |   |
|---------------------|--------------|---------------------|--|---|
|                     |              | Start Doing Things  | Continue Doing Things                            | Stop Doing Things                               |
| High                | Financial    | Centralized Systems | Project Budgeting                                | Cleansing data                                  |
|                     | Quantitative | Data governance     | Gauge customer satisfaction                      | Maintain current data elements and applications |
|                     | Measurable   | Timely data access  | Influence national standards                     | Multiple data requests                          |
| Low                 | Observable   | Advanced analytics  | LEA participation in ADE surveys and initiatives | Reactive, firefighting mode                     |

The following are samples of business benefits and the identification of measures, evidence, ownership and risks. The samples serve as a starting point, because the researchers of this business case should not work alone in this process. Overall, this process should be owned by the educational stakeholders who will own and those who will gain value from the benefit.

Sample 1: 'START' Centralized, Opt-In Services (Financial Benefit)

A centralized system, opt-in model is a service and activity proposed in this business case for ADE to 'start' as a transformative business benefit. This benefit has a high degree of explicitness because it can be measured in financial terms. See the Financial Investment section of this business case for details. However, the risks associated with obtaining the financial benefit is directly associated to a number of factors including the statewide rate obtained for software system licenses and implementation and

adoption rate of Local Education Agencies. The risk assessment values assigned are low and medium respectively. The owners of the benefit are assigned through a Project Management Office work artifact such as a Project Charter. In this case, the owner is dependent on the type of centralized system being offered. For example, the owner of a Special Education Software System would be identified as executive sponsor in the Exceptional Student Services program area; whereas, the owners for an Instructional Improvement Software System would be identified across multiple programs areas including Highly Effective Teachers and Leaders, High Academic Standards for Student, and Accountability and Assessment. A jointly owned, cooperative formation of LEAs is recommended to provide ADE requirements, feedback, and guidance to provide exceptional services through this business benefit. LEAs will be required to engage in an Intergovernmental Agreement with ADE for the execution and implementation of the centralized systems.

### Sample 2: 'CONTINUE' Gauging Customer Satisfaction (Quantitative Benefit)

Gauging customer satisfaction is currently an effective procedure conducted by the ADE program area of Strategic Planning. The value this practice brings to ADE can be currently measured by each program area and typically becomes part of the annual strategic planning process when program areas define annual goals to achieve. For example, the IT program has written a goal to increase customer survey results by a certain point value. Since this benefit is already quantifiable, it has a slightly lesser degree of explicitness as compared to the financial type. Working with the Strategic Planning program area, a forecast should be made to determine how much value will be a result from achieving the benefit

### Sample 3: 'STOP' Multiple Data Requests (Measurable Benefit)

Requiring LEAs to comply with multiple and redundant data requests is a business practice proposed in this business case for ADE to 'stop' as a transformative business benefit. ADE cannot stop all data requests; however, the practice and process should be managed by a State Data Officer. This benefit has a lesser degree of explicitness because it is not measured in financial terms. The benefit can be measured through regularly scheduled customer satisfaction initiatives. The risks associated with reducing the overall number of data requests from the LEAs is extremely low. The owners of the benefit include the State Data Officer and Data Governance Commission which serves as the governing body to assist ADE and LEAs comply with data policies.

## 8.0 Qualification of Researchers

### 8.1 LearningMate Solutions, LLC

The IT landscape of the 21<sup>st</sup> century education world is changing rapidly. Student identity is increasingly digital, hand held devices are proliferating, applications and data storage are moving to the cloud and our computing and network infrastructure is being taxed to it's capacity. While students and teachers are consuming digital content at a rapid pace, teachers faced with larger class sizes and greater regulatory oversight have an urgent need for better teaching and learning analytics that can help them make a difference in every students life. At the same time administrators are demanding more insight into the business processes that keep our schools running.

LearningMate works here

LearningMate helps customers streamline their Information, Billing, Grade Management, Teacher Management, Performance Tracking and Infrastructure management processes and then find ways to bring their spends down. Clients' portfolio of IT assets and applications are reviewed to make recommendations about what to keep, replace, retire, improve, build or buy.

LearningMate believes in making our customers independent and putting them back in the drivers seat on the information highway. The company has specialized in developing federated architectures that allow local independence in application deployment while centralizing enterprise data and ensuring data integrity across statewide systems. Supporting open standards is essential in our work so our customer's technology and application portfolios stay relevant and current for a long time.

Building a unified data model is a pointless exercise if you don't have ways to leverage it. The LearningMate business intelligence and learning analytics team is tasked with developing meaningful views of teaching, learning and administrative data. From financial dashboards for the CFO to real time classroom dashboards for teachers and individual student systems for parents and learners ensure that everyone in the education system has the insight they need to succeed.

You don't get to be a world-class education-technology consulting firm without world-class processes. LearningMate has adopted the capability maturity model from Carnegie Mellon Universities Software Engineering Institute. Today, LearningMate is one of a handful of education technology companies that has been certified at Level 5 - the highest level of performance measured by this model. By this commitment, our customers know LearningMate is constantly learning and improving in the quest for excellence in education.

LearningMate Solutions, Inc. is a US owned company with a global footprint. Headquartered in New York the company employs over 500 engineers, learning psychologists, designers and business analysts in four countries. In partnership with valued clients, LearningMate is committed to improving the lives of students, teachers and administrators across the world.

### 8.2 Bios of Researchers

#### 8.2.1 Jolene Newton

Jolene Newton is an education executive and advocate with nearly twenty years of broad experience from classroom instruction and online educator to managing innovative educational products for state

education agencies and K-12 districts. Jolene earned her undergraduate degree in Education from Northern Arizona University and taught in the Washington Elementary School District in Phoenix, Arizona. While teaching, she earned a Master degree in Education with a Concentration in Technology from Arizona State University, enabling her to implement and utilize technologies with the students she taught.

Prior to joining Learning Mate and becoming a consultant for the Arizona Department of Education, Jolene worked at a few leading, educational companies where she displayed a strong record for managing and implementing educational products while ensuring client satisfaction. Jolene earned a Master degree in Business Administration from the Arizona State University. Her expertise includes customer-focused and quality-minded product development and implementation, effective management of multiple projects simultaneously, extensive experience in public speaking and demonstrations, and instructional and assessment content development.

### **8.2.1 Ed Jung**

Ed Jung is currently the CTO for the Arizona Department of Education. Ed partners with ADE leadership to set technology product direction, guide the development of robust, scalable applications, and drives Enterprise Architecture.

Ed is a hands-on software product development executive, focusing on the education market during the last decade. He has deep knowledge of Learning Management Systems, assessment solutions, and adaptive content and remediation. He has extensive experience building and growing technology organizations that span architecture, engineering, quality assurance, and infrastructure. During his career he has built products using Java, C++, .NET, SQL, and Javascript, running on Solaris, Linux, and Windows platforms.

While heading up K12 Curriculum development at Pearson he started with an 80 person team consisting of employees, onshore and offshore consultants, then trimmed, reorganized, and recruited to build a series of focused, high-performance teams. Ed created Pearson SuccessNet, the K-12 interactive textbook and formative assessment system for Pearson servicing over 6 million students.

Ed's last assignment to kick-start mobile development at Pearson exemplifies his qualities: Ed taught himself iOS application development and used that knowledge to hire qualified contractors to work with him and build Pearson's first iPhone application. As interest grew in Ed's work, he identified an off-shore talent pool and built a remote development team one designer, developer, and tester at a time, hiring an offshore project manager when there were too many staff for him to directly manage.

Ed's principles at the core of his management style are 1) know the tools and technology used by your staff as well as they do, 2) make a good decision quickly rather than make the optimal decision slowly, and 3) set clear expectations for all those you work with. At ease in organizations large and small, he effectively takes the entrepreneurial spirit required to innovate and invigorate, and blends them with proven veteran skills in software product development and technology personnel management.

### **8.2.1 Debbie Stirling, Ph.D.**

Deborah has more than 15 years of proven leadership directing research and development projects, designing online learning environments, and conducting large scale evaluations. She formerly served as Senior Director of Research and Development for Sebit, where she focused on developing the next

generation of assessments and personalized learning environments for an international eLearning company as well as investigating interactive technologies to improve global STEM education. Deborah previously worked for Pearson Education. At Pearson, she directed the research portfolio for digital products and the development of learning models, the usability of products, and the design and development of adaptive technologies for the curriculum group. She has particular expertise in user-centered design activities, large-scale curriculum design and development efforts, and large-scale evaluation efforts related to digital learning programs. Before Pearson, Deborah directed research and evaluation efforts at an Arizona State University research lab. She earned her doctorate at Arizona State University in Curriculum and Instruction with an emphasis in Educational Technology and has a Master's degree in Language, Reading and Culture.

### **8.2.1 Amit Soman**

Amit Soman, Learning Mate Vice President Enterprise Solutions, brings technical sophistication and business-savvy management to his work with the Arizona Department of Education. His 17-year consulting career has focused on software engineering in the Education, Publishing, Transportation, E-Learning and Financial Services sectors. He has architected, developed and managed critical educational services such as Learning Management Systems, Assessment Systems, Education Portals, Student Information Systems, Content Management Systems, Reporting/Analytics Systems and Mobile Apps.

Amit's superior record of delivering simultaneous, top-priority projects on time and under budget is driven by his expertise in managing knowledge transition, service transition from one location to another location and reverse knowledge transition from vendors to internal employees. He has worked with various top 10 education and publishing companies like Pearson, McGraw-Hill, Harcourt, Scholastic and Elsevier in the US and Europe.

### **8.2.1 Marc Morin**

With over 20 years of experience in Enterprise Architecture, Marc has spanned multiple industries in his career as a professional IT/IS consultant. He has spent over 15 years as an IT Executive with profit and loss financial responsibilities in industries ranging from High Tech, to Pharmaceutical, to Government. Marc has a successful background working with executives and stakeholders to develop architecture framework that aligns strategy, processes, and IT assets with business goals. He has worked closely with C-level executives, project managers, developers, and focus groups to avoid redundancy, minimize expenditures, and improve overall performance within organization. Marc is a business savvy expert in establishing best practices and guidelines for modeling, selecting, developing, and implementing information ecosystems spanning enterprise boundaries. He has acute hands-on knowledge of hardware, software, networking, applications, and systems engineering and is an expert in the architectural applications of Information Technology Infrastructure Library (ITIL), The Open Group Architecture Framework (TOGAF), Institute of Electrical and Electronics Engineers, et al.

### **8.2.1 Loren Sucher**

Loren is a former educator and a proven educational publishing professional with expertise overseeing marketing, product development, business development, and management of technology-based products. He has extensive knowledge of the education market and a proven track record of developing requirements, products, support materials, and marketing campaigns. Loren has contributed his talents to

a variety of education-centric companies nationwide, including executive positions where he oversaw research activities, guided technology development, and developed critical business relationships and strategic alliances. During his career, Loren has conducted field product research, focus group research, and surveys with teachers, principals, district staff, and superintendents nationwide.

### **8.2.1 Don Hiatt**

Donald Hiatt has over 30 years of executive and technology management experience architecting and leading large, award-winning projects. He has implemented a wide range of solutions including business intelligence, documents and records management, and line-of-business applications development. Within Microsoft, he helped lead the Worldwide and US Technical Communities Documents and Records Management (DRM) Special Interest Group, was active in the Enterprise Strategy Technical Community as an Enterprise Architect, and frequently spoke at technical conferences on IT Strategy and Enterprise Content Management (ECM) subjects. Don has significant experience in business process re-engineering, document imaging and workflow projects valued over \$4,000,000, and projects lasting more than 18 months in duration.

### **8.2.1 Lisa McClure**

Lisa is an education leader with over 25 years of experience in a wide variety of educational settings including online and blended learning, traditional K-12 education, and adult and alternative education. She has a track record of successful implementations of education programs for hard-to-serve populations nationwide. As Education Director for the State of Wisconsin Department of Corrections, she was responsible for the academic programming in all adult correctional institutions across the state and led the development of the Employability Skills curriculum, which was later implemented across the state as part of Wisconsin's pre-release planning. As an Operations Director, she successfully led the launch and provided ongoing program oversight of 11 statewide virtual schools across nine states. Lisa is a highly skilled strategic manager with experience assessing program needs and developing efficient strategies to meet those needs.

### **8.2.1 Rich Schnettler**

Rich Schnettler is a senior consultant with over thirty years of information technology implementation experience including custom systems design and development as well as vendor software package selection and implementations in a wide variety of environments such as mainframe, mid-range, and mini computers, client servers, and the web while serving in the role of computer operator, help desk support; trainer; developer; system, product and business analyst; or project manager in industries including Education (K-12); e-Learning, e-Publishing, Consumer Goods, and several others throughout his career.

Rich earned his undergraduate degree in Business Administration specializing in Operations Management at the University of Missouri at St. Louis with a minor in Quantitative Computer Science and had previously earned certifications as a Siebel 2000 Certified Consultant and Certified Production Inventory & Management sponsored by APICS.

In recent years prior to joining Learning Mate and the Arizona Department of Education, Rich has been primarily served in the role of a business analyst and/or project manager depending upon the need at Elsevier Health Sciences in an effort to launch a series of strategic web product initiatives including Mosby's Nursing Consult, Mosby's Nursing Skills, Procedures Consult, Mosby's Imaging Suite which was the first integrated solution with its custom developed Learning Management System, and lastly

Performance Management also built on the LMS platform. This series of education and health content-laden products was launched in period spanning only five years and with the exception of Procedures Consult targeted Nursing professionals providing them with the tools for continuing education and professional development.

Rich, with his “hands-on” career experience and ability to juggle both roles and projects, coupled with his extensive and deep understanding of systems design and implementation strives to provide the highest levels of quality and customer service possible for each and every client project.

### **8.2.1 Joe Frost**

Joe Frost has over 20 years of IT experience in Arizona. He earned a Master of Science in Computer Information Systems from the University of Phoenix.

Prior to joining the Arizona Department of Education, he has had extensive experience and roles ranging from technology teacher to department chair to director of technology. His Fortune 500 Company IT experience includes Intel, Honeywell, Apollo Group, and Pearson.

### **8.2.2 John Bulwer**

John Bulwer is an experienced IT professional with 10 years of customer-facing experience in a broad range of industries like parks and recreation, aviation, and education. As a business analyst and IT liaison to the Accounting, Financial Aid, and HR functional areas, John worked directly with functional leaders and application developers to prioritize production support tasks in Agile/Scrum and Waterfall environments. His direct partnership with business stakeholders created business requirements, functional specifications, wireframes, flow charts, test cases, and user training documentation.

John, a college entrepreneur, designed and launched his company website, created marketing materials and utilized social media as a means of promotion for the business. His successes include the design and implementation of a custom task management system and the implementation of the Sallie Mae Disbursement Program for more than 6,000 financial aid students at an online university.

He has earned a BS in Aeronautics and a BS in Aviation Business Administration from Embry-Riddle Aeronautical University in Prescott, AZ.

### **8.2.3 Tara Sprouse**

Tara is an experienced IT professional with over ten years of increasingly technical and managerial responsibilities. She has managed all aspects of Information Technology (including hardware, software, and technical support) for a national membership organization with over 500,000 members. She also has project experience throughout the entire Software Development Life Cycle including requirements gathering, documentation, conversion, implementation, systems integration, and acceptance testing. Tara has an extensive background in both Network and Database administration, as well as in end-user support and vendor relationship management.

In her role prior to joining LearningMate and becoming a consultant to the Arizona Department of Education, Tara served as her company’s first Enterprise Services Business Systems Analyst in which she created business requirements documents for undocumented historical and current projects, resulting in an 800% increase in technical documentation within a year.

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**Source:** [Microsoft](#)

PMO <http://searchcio.techtarget.com/definition/Project-Management-Office>

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# 10.0 Appendix A – Glossary of Terms

Chart 28 –AELAS Business Case Glossary of Terms

This section provides a list of key terms, acronyms, and abbreviations presented within this document.

| Terms  | Definitions   |
|--|---|
| Arizona’s Instrument to Measure Standards (AIMS)                     | Arizona’s Instrument to Measure Standards is a Standards Based Assessment that measures student proficiency of the Arizona Academic Content Standards in writing, reading, mathematics, and science and is required by state and federal law.   |
| Arizona Local Education Agency Tracker (ALEAT)                       | Local Education Agencies examine multiple aspects of their programs using a self-assessment tool in order to determine compliance with the requirements of the law. All Local Education Agencies that receive Title I funds are included in the 6-year cycle on Arizona’s Local Educational Agency Tracker.   |
| Arizona Department of Education (ADE)                                | The Arizona Department of Education and its chief position, a publicly elected state Superintendent of Public Instruction, were created upon the ratification of the Arizona Constitution. Its mission is to “serve Arizona’s education community, ensuring every child has access to an excellent education.”  |
| Cloud computing  | Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models. |
| Arizona Education Data Driven Decision System (AZ ed <sup>3</sup> s) | As part of the Statewide Longitudinal Data System implementation the Arizona Education Data Decision Driven System will enable educators to make decisions based on longitudinal data   |
| Commercially available Off The Shelf (COTS)                          | Commercial Off-The-Shelf (COTS) refers to items readily available in quantity that can be implemented with the hope of reducing time and cost when compared to developing the same item completely in-house.  |
| Common Education Data Standards (CEDS)                               | CEDS is a set of agreed upon names and definitions for data elements. Without this common vocabulary, or data standards, data sharing is slow, labor intensive and fraught with errors. A project to streamline our databases and implement a common dictionary to use within ADE is underway. CEDS has also been introduced to the Board of Education and the Data Governance Commission for possible adoption for external use.           |
| Career & Technical Education (CTE)                                   | CTE programs prepare students to enter the workforce with the academic and vocational skills needed to compete successfully in the job market. CTE courses typically include competency-based learning.   |

| Terms  | Definitions  |
|--|--|
| Data Integrity                                       | Data Integrity in its broadest meaning refers to the trustworthiness of information over its entire life cycle.  |
| Data Redundancy                                      | Data redundancy occurs in database systems which have a field that is repeated in two or more tables. For instance, in case when customer data is duplicated and attached with each product bought then redundancy of data is a known source of inconsistency, since customer might appear with different values for given attribute   |
| Digital Arizona Program                              | The Digital Arizona Program is on a mission to facilitate better broadband in Arizona, which in turn will expedite our economic recovery, transform our lives, and become a model for other States. The objective is to develop a leveraged plan for broadband in Arizona, and to demonstrate how Digital Arizona will retain or create new jobs, grow new markets, and create new ways to do business.        |
| Enterprise Resource Planning (ERP)                   | Enterprise level financial software for a company or district. Teacher pay and attendance is recorded here.  |
| ESP Solutions Group                                  | ADE Vendor being utilized to perform the course mapping.   |
| Information Technology Infrastructure Library (ITIL) | Information Technology Infrastructure Library are comprehensive set of practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business detailing a rich and detailed framework of interconnected processes. Information Technology Infrastructure Library is a globally recognized collection of best practices for information technology (IT) service management. |
| Joint Technical Education District (JTED)            | Joint Technical Education District is a public high school district that provides career and technical education to students. These programs provide an unique opportunity for Arizona secondary students to be better prepared for highly technical, high skill occupations, and for future careers in Arizona.   |
| Private Cloud  | Private cloud is a computing model that uses resources dedicated to your organization yet shares many of the characteristics of public cloud computing including resource pooling, self-service, elasticity and pay-by-use delivered in a standardized manner.   |
| Local Education Agency (LEA)                         | A school district or a charter organization.   |
| School Codes for the Exchange of Data (SCED)         | National Standardized course codes and descriptions to be able to exchange data about courses across the country.  |
| Student Accountability Information System (SAIS)     | Reporting system capturing student enrollment numbers from the districts to the state in order to receive funding.   |

| Terms   | Definitions  |
|---|--|
| Student Information System (SIS)              | District system that captures student attendance information.  |
| Statewide Longitudinal Data System (SLDS)     | The Arizona Student Longitudinal Data System (AZ-SLDS) is intended to enhance the ability of Local Education and State Agencies to efficiently and accurately manage, analyze, and use education data, including individual student records. The AZ-SLDS developed will help state government, districts, schools, and teachers make data-driven decisions to improve student learning, as well as facilitate research to increase student achievement and close achievement gaps. |
| Student Teacher Link (STL)                    | The concept capturing the relationship between Students, Courses, and Teachers   |
| The Open Group Architecture Framework (TOGAF) | TOGAF is a methodology for analyzing the overall business architecture. Its particular richness is that the method is intended to lead to specific actionable artifacts.   |

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## 11.0 Appendix B – IT Service Management

The ADE has recognized that it can no longer incidentally manage its IT environment and must mature its overall capability to a higher level of performance both to minimize its operational costs and enable it to support and sustain the advanced educational services that are needed to advance Arizona’s position as an education leader in the US. The formal and practice-based framework chosen to achieve the maturation, and the strategic direction proposed by ADE, are:

- To implement the ITIL framework which is a set of practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business. Specifically, the framework consists of twenty-six formal and well defined processes and four service functions, contained within five service groups, which are service strategy, service design, service transition, service operation, and continual service improvement; and,
- To implement a formal Data Governance and Master Data Management capability to support data as a statewide service.

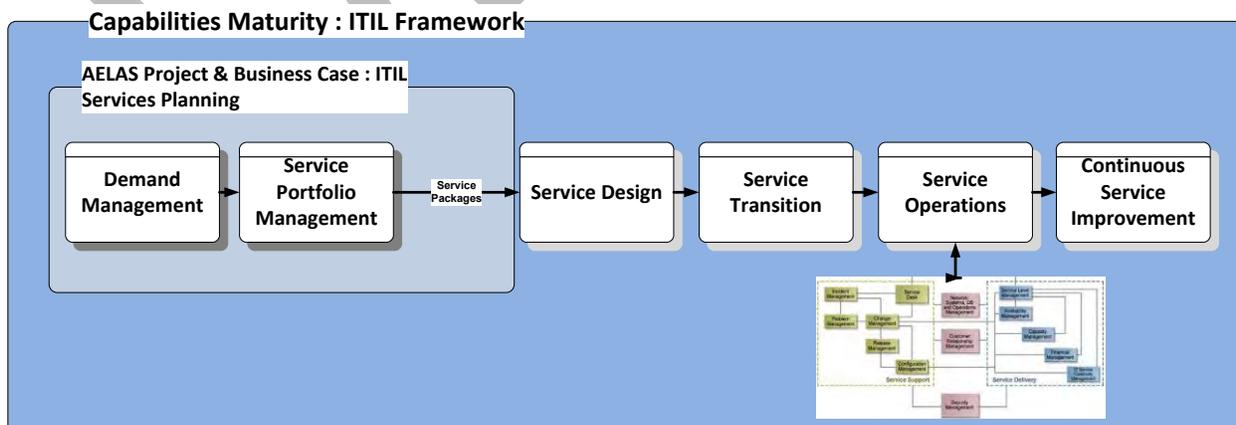
More importantly the approach taken to fulfill the AELAS mandate requires that ADE take a service portfolio managed approach to all services both core and advanced. This must be done in order to:

- effectively manage information delivery;
- provide a stable core services infrastructure;
- provide the capability to expand to advanced services; and more importantly; and,
- be able to make strategic cost-effective decisions of what advanced services are needed and what are the changes needed to the core services to support these needs.

### 11.1 ITIL Framework

The roadmap for this maturation is the application of Carnegie Mellon’s capability maturity model applying the IT service management framework of ITIL which relates to the degree of formality and optimization of processes, from ad hoc practices, to formally defined steps, to managed result metrics, to active and on-going optimization of the efficiency and effectiveness of the processes.

Figure 24 - Capabilities Maturity - ITIL Framework



The ADE recognizes that the adoption of a comprehensive and formal framework such as ITIL and Data Governance in order to mature its capability will not occur overnight. Their implementation and effectiveness will ensue over time with ever-increasing implementation of, application of, exposure to and repetition of the detailed practices, policies, procedures, and workflows associated with the framework.

The ADE is primarily a data management enterprise whose key central function is to collect data across the state both to enable payment for educational services as well as infer performance to legislation using that data. Much like its application portfolio, ADE's data portfolio has grown inorganically and now consists of some one-hundred twenty database systems, nine thousand data tables, and forty-five thousand individual pieces of data within those databases. This does not include the uncounted Access databases and Excel spreadsheets that also store enterprise data. The complexity of the data can be compared to a large library where the index cards are in random order and the books are not tagged in accordance with the index card. There is a heavy reliance on tribal knowledge to know the data, which data, where the data is, how that piece of data is used and which rules apply. Very much reflecting the applications development, data development proceeded nearly without any architectural guidance, policies, procedures or documentation. Given that the data ADE collects is responsible for the approximately \$6 billion yearly paid out in education funding it can be argued that ADE's data is the department's single largest asset base far eclipsing its applications and infrastructure portfolio.

Therefore the purpose of this the business case is to provide an assessment of the capabilities and expenses associated with fulfilling the educational technology requirements; produce a feasible roadmap for the implementation and maintenance of the AELAS system services; and overhaul ADE's existing service portfolio to both modernize and meet its existing mandates as well as provide the necessary services platform to implement that advanced capabilities contemplated by AELAS.

The approach taken to define and address the mandate of AELAS is founded on the diligent and methodical application of two key processes, within the service strategy segment of ITIL, to ensure and demonstrate sound investigation and research to identify and meet the needs being addressed and support the recommendations made within the business case. The two processes are those of Demand Management and Service Portfolio Management.

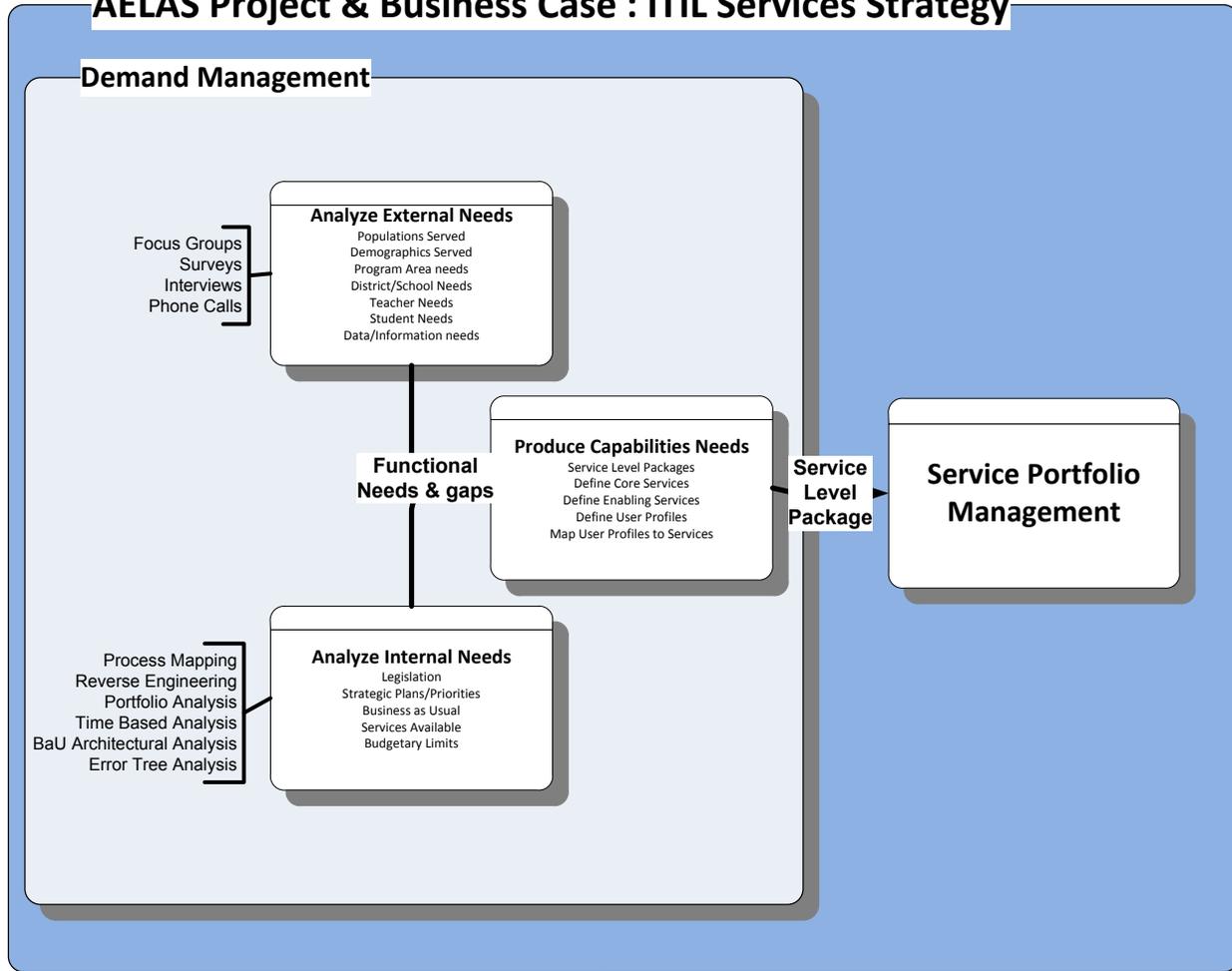
## 11.2 Demand Management

Demand Management is an IT governance process that enables IT and the business to optimize the investment in IT through fact-based decisions. This is the fundamental operating basis of this business case which is concerned with researching and codifying the education environment in order to identify patterns of education activity and the resultant specific demands to IT. Patterns of education activity analysis is the formal codification of what people do, their roles, the processes they support and execute, and the requirements that need to be addressed through IT capabilities.

Demand Management considers and analyzes external and internal organizational needs in order to produce a business capabilities needs assessment that addresses functional needs and gaps as noted in the figure below.

**Figure 85 - ITIL Services Strategy for Demand & Service Portfolio Management**

## AELAS Project & Business Case : ITIL Services Strategy

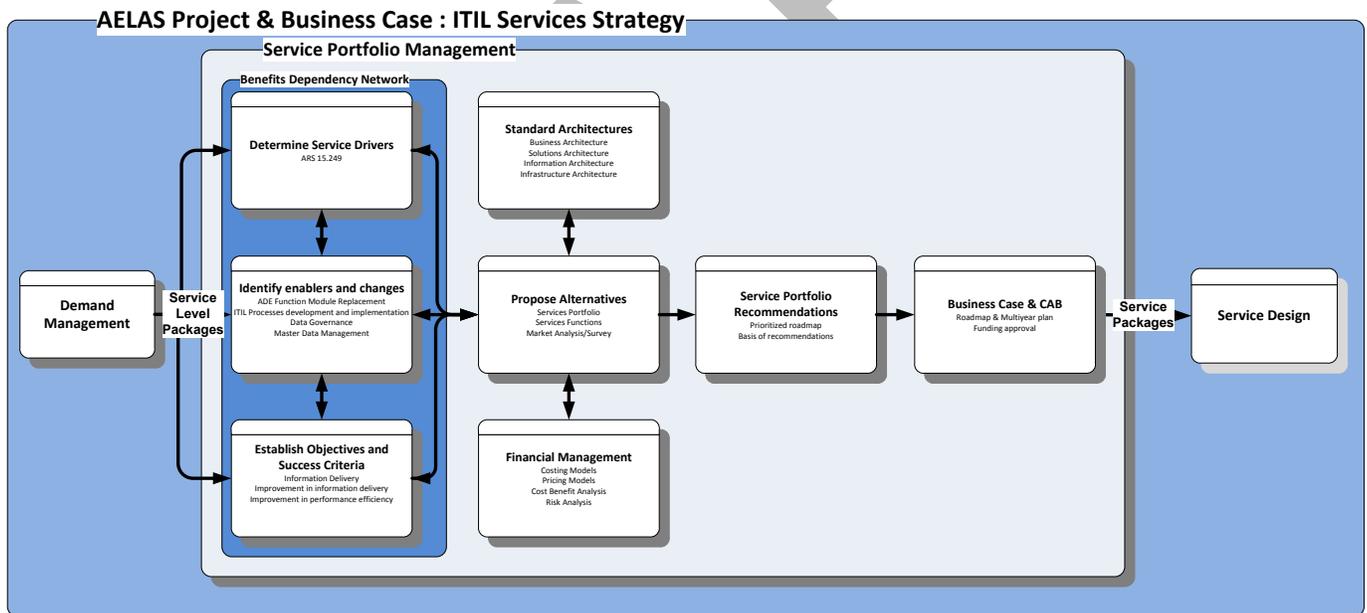


## 11.3 Service Portfolio Management

The end result of understanding the actual capabilities demand addressed by AELAS, and framing them into deliverable solutions, requires the execution of the second most critical ITIL process that of Service Portfolio Management. This is the singular process execution that enables this business case to:

- Take a comprehensive perspective of the ADEs existing IT service assets;
- Combine them with the proposed services needed and identified by demand; and,
- Perform a systematic and justifiable supporting rationalization for the proposed investment into the service technology based on:
  - the investment criteria of allocated/available funds;
  - criticality of services;
  - dependency of services;
  - mandated services;
  - ability to roll-out the services; and,
  - legislated action.

Figure 26 - ITIL Services Strategy Model



## 11.4 ITIL Deployment Status

The following is the current Capability Maturity Model Integration level of the efforts to implement ITIL processes across the ADE as of October of 2012:

Chart 29 – ADE ITIL Deployment Status

| Service Stage              | ITIL Process                         | Definition of Process  | ADE Current CMM Level | ADE Status Explanation and Strategy  |
|----------------------------|--------------------------------------|--|-----------------------|--|
| Service Strategy Processes | Demand Management                    | Demand Management is the supply chain management process that balances the customers' requirements with the capacity of the infrastructure. Management can match supply with demand proactively and execute the plan with minimal disruptions. | 1                     | Demand Management is being applied as a part of the AELAS project and is thus enabling ADE to reach the first level of maturity by executing the process completely. The formal process documents will be produced as part of this exercise and will enable ADE to grow to the 2 <sup>nd</sup> level of maturity.            |
|                            | Service Portfolio Management         | Service Portfolio Management ensures that the service provider has the right mix of services to meet required business outcomes at an appropriate level of investment.   | 1                     | Service Portfolio Management is being applied as a part of the AELAS project and is thus enabling ADE to reach the first level of maturity by executing the process completely. The formal process documents will be produced as part of this exercise and will enable ADE to grow to the 2 <sup>nd</sup> level of maturity. |
|                            | Financial Management for IT Services | To provide cost-effective stewardship of the IT assets and resources used in providing IT Services   | 0                     | At this point in time this process is under review and analysis and has not been prioritized. ADE is still operating user normal index funds and spreadsheet-based financial budgeting and management.   |

| Service Stage            | ITIL Process                    | Definition of Process   | ADE Current CMM Level | ADE Status Explanation and Strategy   |
|--------------------------|---------------------------------|---|-----------------------|---|
| Service Design Processes | Capacity Management             | Capacity Management supports the optimum and cost-effective provision of IT services by helping organizations match their IT resources to business demands                                  | 1                     | Capacity Management in terms of infrastructure is currently being done in anticipation of AELAS and formal process documentation is scheduled to be developed.  |
|                          | Availability Management         | Availability Management targets allowing organizations to sustain the IT service-availability to support the business at a justifiable cost.  | 0                     | Availability Management is still loosely defined and highly manual apart from basic SLA information and schedules being produced as it relates to individual services.  |
|                          | Information Security Management | The ITIL-process Security Management describes the structured fitting of information security in the management organization.   | 1                     | This process is currently under review and development.   |
|                          | IT Service Continuity           | IT Service Continuity Management covers the processes by which plans are put in place and managed to ensure that IT Services can recover and continue even after a serious incident occurs. | 0                     | Awareness of the need to manage from a continuity perspective has occurred and information is being gathered sporadically and incorporated with minimal formal structure but with the full intent to achieve business continuity of the implementation life of the AELAS project. |
|                          | Supplier Management             | Supplier Management is to ensure that all contracts with suppliers support the needs of the business, and that all suppliers meet their contractual commitments.                            | 0                     | Currently the Supplier Management process is still in inception as there is much control that is the result of the state and not ADE. Within ADE however, policies and procedures are being developed.  |
|                          | Service Level Management        | Service-Level Management provides for continual identification, monitoring and review of the levels of IT services specified  | 0                     | Service-Level Management is still loosely defined and highly manual apart from basic SLA information and schedules being  |

| Service Stage                | ITIL Process                             | Definition of Process  | ADE Current CMM Level | ADE Status Explanation and Strategy   |
|------------------------------|--|--|-----------------------|---|
|                              |  | in the Service-level agreements (SLAs).  |                       | produced as it relates to individual services.  |
| Service Transition Processes | Knowledge Management                     | Knowledge Management aims to gather, analyze, store and share knowledge and information within an organization. The primary purpose of Knowledge Management is to improve efficiency by reducing the need to rediscover knowledge. | 1                     | This process is currently under review and development.   |
|                              | Change Management                        | Change Management aims to ensure that standardized methods and procedures are used for efficient handling of all changes.  | 1                     | This process has been fully developed and documented to suit the processes within ADE. A formal Change Approval Board has been established and weekly review of projects being released within the environment occur as well as changes to existing applications. The ChangeGear application is used, for the moment, to track change with a conversion to Microsoft Service Manager. |
|                              | Release & Deployment Management          | Release & Deployment Management is used by the software migration team for platform-independent and automated distribution of software and hardware, including license controls across the entire IT infrastructure.               | 1                     | Release & Deployment Management is currently under review and development. At the moment it is rolled into Change Management and is loosely addressed by the operations team.   |
|                              | Service Asset & Configuration Management | Service Asset & Configuration Management (SACM) is primarily focused on maintaining information (i.e., configurations) about Configuration Items (i.e., assets) required to deliver an IT service, including their                 | 1                     | SACM is currently under review and development. ChangeGear is currently being used as an interim tool to begin the socialization of SACM process.   |

| Service Stage               | ITIL Process                    | Definition of Process   | ADE Current CMM Level | ADE Status Explanation and Strategy   |
|-----------------------------|---------------------------------|---|-----------------------|---|
|                             |                                 | relationships. Configuration Management is the management and traceability of every aspect of a configuration from beginning to end.  |                       |   |
|                             | Service Validation & Testing    | Service Validation & Testing is to ensure that deployed Releases and the resulting services meet customer expectations, and to verify that IT operations are able to support the new service.   | 0                     | This process is still fully ad hoc and relies on either project teams for new releases, development team for existing applications, and/or operations team prior to production release. |
| Service Operation Functions | Service Desk function           | The Service Desk is one of four ITIL functions and is primarily associated with the Service Operation lifecycle stage.  | 1                     | This process, while not yet fully and formally documented, is part of the change management process and formal development is under way.  |
|                             | Technical Management function   | Technical Management function management processes recommend best practice for requirements analysis, planning, design, deployment and ongoing operations management and technical support of an infrastructure.  | 1                     | This process is currently under review and development as part of the enterprise architecture analysis and review.  |
|                             | Application Management function | ITIL Application Management encompasses a set of best practices proposed to improve the overall quality of IT software development and support through the life-cycle of software development projects, with particular attention to gathering and defining requirements that meet business objectives. | 0                     | This process is currently under review and development as part of the enterprise architecture analysis and review.  |

| Service Stage | ITIL Process                      | Definition of Process   | ADE Current CMM Level | ADE Status Explanation and Strategy  |
|---------------|-----------------------------------|---|-----------------------|--|
|               | IT Operations Management function | Operations Management function provides the day-to-day technical supervision of the infrastructure.   | 1                     | This process is currently under review and development as part of the enterprise architecture analysis and review.   |
|               | Request Fulfillment               | Request Fulfillment (a.k.a. Request Management) focuses on fulfilling Service Requests, which are often minor (standard) changes (e.g., requests to change a password) or requests for information.   | 0                     | This process, while not yet fully and formally documented, is part of the change process and formal development is under way.  |
|               | Incident Management               | Incident Management aims to restore normal service operation as quickly as possible and minimize the adverse effect on business operations, thus ensuring that the best possible levels of service quality and availability are maintained.                           | 1                     | This process, while not yet fully and formally documented, is part of the change process and formal development is under way.  |
|               | Problem Management                | Problem Management aims to resolve the root causes of incidents and thus to minimize the adverse impact of incidents and problems on business that are caused by errors within the IT infrastructure, and to prevent recurrence of incidents related to these errors. | 1                     | This process, while not yet fully and formally documented, is part of the change process and formal development is under way.  |
|               | Access Management                 | Identity Management, less commonly called Access and Identity Management (AIM), as a process focuses on granting authorized users the right to use a service, while preventing access to non-authorized users.  | 1                     | This process is currently under review and development as part of the enterprise architecture analysis and review. This is part of the Identity Management System project. |

| Service Stage | ITIL Process               | Definition of Process  | ADE Current CMM Level | ADE Status Explanation and Strategy  |
|---------------|----------------------------|--|-----------------------|--|
|               | Event Management           | Event Management is the process that monitors all events that occur through the IT infrastructure. | 0                     | This process is currently under review and development as part of the enterprise architecture analysis and review. |
| CSI Processes | Service Reporting          |  | 1                     | Not under consideration at this moment.  |
|               | Service Measurement        |  | 1                     | Not under consideration at this moment.  |
|               | 7 step improvement process |  | 0                     | Not under consideration at this moment.  |

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## 12.0 Appendix C – Data Governance

The Data Governance mission is to achieve flawless data such that each program area, external entity, and the Education community as a whole acknowledge that, in terms of data quality, ADE is the people, processes and technologies gold standard. To date, numerous steps have been accomplished within ADE to roll out Data Governance and Master Data Management.

### 12.1 Current Status

The following lists the items completed to date:

- 1) Produced and submitted the Data Governance Charter to senior leadership;
- 2) Produced Data Governance Policy;
- 3) Produced Master Data Management Policy;
- 4) Produced Data Governance Procedures Manual outline;
- 5) Produced Data Dictionary Standards;
- 6) Produced Data Governance Process Workflow (Capability Maturity Model Level 5 Goal);
- 7) Produced Data Governance Cultural Ritual Strategy;
- 8) Developed a Communication Plan;
- 9) Implemented a Data Governance and Master Data Management SharePoint repository to begin centralizing all related information in accordance with policies and procedures;
- 10) Began producing models of program area conceptual data, data flows, collections and rules repository;
- 11) Established CEDS/Ed-Fi as target data model standards for data collections;
- 12) Established coaching program areas through the process of mapping all data collections;
- 13) Delivered several Data Governance and Master Data Management awareness presentation;
- 14) Incorporated and reinforce in all process modeling efforts and all program interaction the concepts of organization wide data, data modeling standards, ownership, custodianship, and stewardship, separating the “what data” from the “how is data kept”.

### 12.2 Data Governance On-Going Efforts

- 1) Meet and present with the ADE program leaders for support and guidance/feedback;
- 2) Obtain formal sign off of the Data Governance Charter;
- 3) Produce and execute the organizational communication plan;
- 4) Create the Data Governance Board and begin the assignment of resources;
- 5) Develop the detailed Procedures Manuals to support Data Governance and Master Data Management;
- 6) Report on the results of the pilot projects and lessons learned; and,

- 7) Continue to gather information and suggestions and address questions.

## 12.3 Data Governance Objectives and Goals

The following lists out the specific targets that Data Governance is charged with in driving strategic and operational objectives:

- 1) Implement a complete set of Ed-Fi/CEDS based Operational Data Store for all ADE Data;
- 2) Advance the Ed-Fi/CEDS data model standard by becoming the leader in its on-going development;
- 3) Measure and reduce the cost of on-going and post processing data corrections, isolated data collections, and re-processing of data by adhering to data retention, data governance policies and master data management policies;
- 4) Centralize all shared data and provide capability;
- 5) Implement formal and stringent Configuration Management of all data entities, data elements, business rules, legislative rules, and their interrelationship each of which is deemed as an ADE configuration item;
- 6) Implement formal and stringent Change Management process to any and all changes that relate to all data Configuration Items;
- 7) Achieve a data audit exception of zero;
- 8) Integrate data governance oversight within each and every data handling application project/acquisition;
- 9) Achieve 100% compliance with the data dictionary standard where each and every data element within ADE is formally defined and an owner designated;
- 10) Achieve 100% compliance with the data modeling standards for each and every data subject area that relates to the program areas;
- 11) Achieve 100% elimination of all production data being held 'offline' as local data stores that are subject to audit exceptions;
- 12) Achieve "push button" capability of the production of all legislated reporting requirements;
- 13) Achieve complete oversight and management of incoming data requests; and,
- 14) Enable the ability to capture, retain and utilize P-20W data.

The Establishment of a Data Governance program within the AZ Department of Education's program areas, the agency as an enterprise, and data stakeholder groups and partnerships, targets these goals:

- 1) Better decision-making anchored in the integration of available data assets into a single version of reality.
- 2) Reduced operational friction between the agency's business units through an agency-wide adoption of an enterprise view of all data assets.

- 3) A commitment to the needs and a clarification of the responsibilities of all data stakeholders whether they are data providers, data consumers, or both.
- 4) An agency-wide culture that moves all levels of management and staff to seek out and adopt common approaches to data issues.
- 5) Standardized, repeatable, and auditable data processes.
- 6) Reduced costs and increased effectiveness in the data arena through the coordinated efforts of all business units and stakeholders.
- 7) Transparency of all data related business rules and the processes that execute them.
- 8) Standardized data definitions across the complete data domain, with input from internal and external Subject Matter Experts.
- 9) Transition of business units from narrow-use data silo operations to broad-use enterprise data systems, and the evolution of their role as “data owners” to stewards and suppliers of quality data.
- 10) Establishment of direction and measurement of Data Quality initiatives, including the definition of responsibilities and accountabilities of business units and their Data Stewards.
- 11) Creation of roles and their decision rights and accountabilities to: a) establish safeguards and controls for Data Privacy compliance, and b) control Access Management to meet usage standards.
- 12) Centralized technology architecture to mitigate data integration challenges between cross-functional business units in order to meet the data and information needs of all education stakeholders.
- 13) Maintenance of the operational integrity of the Education Data Warehouse through the enforcement of Change Management standards and rules for all data processes that support this and other longitudinal data system components.

## 13.0 Appendix D – LEA Data Analysis Detail Report

### 13.1 Survey

An electronic survey was developed to gather cost data and information from LEA’s regarding systems and products that they were using that are classified as either Teaching and Learning, Back Office, or Administrative. The survey was disseminated to forty-four LEAs who were identified by the Governor’s Office for Education Innovation as leaders in integrating new technologies into their educational practices.

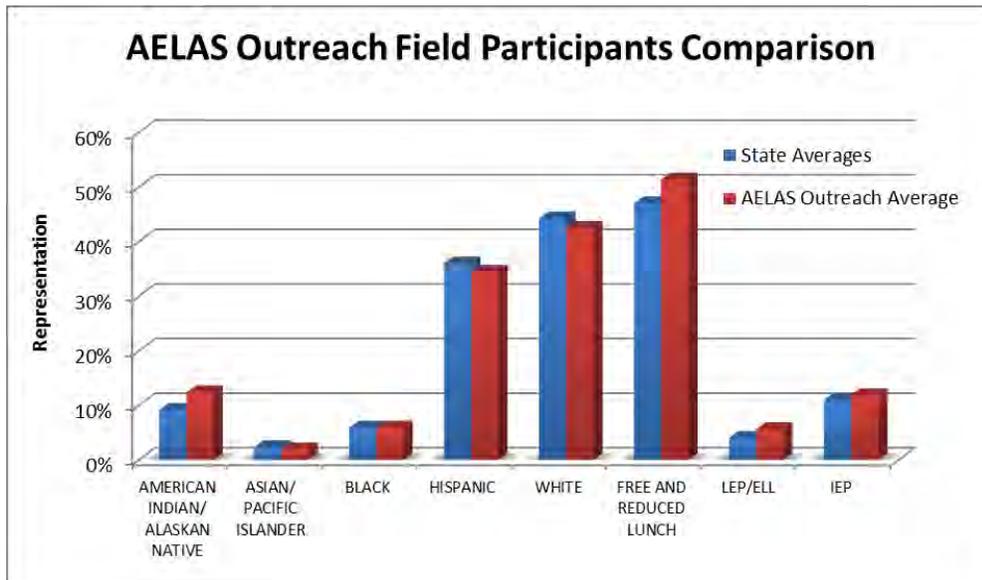
### 13.2 On-Site Visits

As a follow up to the surveys, site visits were scheduled to gain clarification on the survey responses and to gain insight on the needs of LEAs. The list of forty-four LEAs supplied by the Governor’s Office of Education Innovation also provided a starting point for LEA site visits. Nearby LEAs who had not participated in the original survey were either invited to participate in the discussion or had a separate visit scheduled where they then completed the survey and gave feedback on their needs. The feedback obtained during the site visits enabled the researchers to develop a list of ten most used and needed systems to an LEA.

Figure 27 – LEA Outreach and Participation by LEA Size



Figure 29 – State and AELAS Outreach Averages by Demographic



### 13.3 Focus Groups

Five focus group sessions were conducted via online webinars. Each focus group session was centered on two of the top ten systems identified in the site visits. The majority of participants were selected based on their subject matter expertise identified during site visits or as recommended by fellow team members. LEA representatives that were not able to participate in the first two outreach campaigns were also invited to attend the focus group sessions in which they felt they could contribute most. Participants were asked to validate a list of high level system capabilities and rank each system in accordance to priority and likelihood of adoption as part of an AELAS Phase I implementation.

### 13.4 Phone Interviews

Thirty phone interviews were conducted to gather hardware and infrastructure costs. As part of the interviews, LEA representatives were asked about the number of servers, service costs, overall IT budget, and time investment involved in correcting SAIS data.

### 13.5 Summary of Findings

The combination of these four methods allowed the researchers to collect data from urban/city, suburban, town, and rural LEAs of all size categories across the state. As evidenced by the chart above, the geographic coverage of these LEAs allowed us to solicit information from a demographic population that closely matches the average of students across the state.

Chart 30 –Local Education Outreach Coverage

| LEA Size and Student Populations     | Geographic Area Coverage                              |                                       |                                       |  |                      |
|--------------------------------------|---|---------------------------------------|---------------------------------------|--|----------------------|
|                                      | Urban/City  | Suburban                              | Town                                  | Rural                                  | Total # of Districts |
| <b>Very Large (&gt;=20K)</b>         | 4 Public School Districts                             | 1 Public School District              |                                       | 1 Public School District               | 6 of 11              |
| <b>Large (8,000 to 19,999)</b>       | 4 Public School Districts                             | 2 Public School Districts             |                                       | 3 Public School Districts              | 9 of 20              |
| <b>Medium-Large (2,000 to 7,999)</b> | 4 Public & 5 Charter School Districts                 | 4 Public & 1 Charter School Districts | 14 Public School Districts            | 18 Public School Districts             | 46 of 58             |
| <b>Medium (600 to 1,999)</b>         | 2 Public School Districts                             |                                       | 5 Public School Districts             | 6 Public School Districts              | 13 of 88             |
| <b>Small (200 to 599)</b>            | 1 Public & 20 Charter School Districts                | 5 Charter School District             | 1 Public School District              | 16 Public & 5 Charter School Districts | 48 of 197            |
| <b>Very Small (&lt;=199)</b>         | 9 Charter School Districts & 5 Public School District | 6 Charter School Districts            | 2 Charter & 4 Public School Districts | 15 Public & 7 Charter School Districts | 48 of 245            |

Source: Arizona AG 12-02, 242 and National Center for Education Statistics, Common Core of Data

**LEGEND:**

|                         |   |
|-------------------------|---|
| No school participation | No school representation in geographic area |
|-------------------------|---|

In all, 187 LEAs participated in our outreach campaigns, which represents approximately 30% of all LEAs and 56% of all students statewide. While the majority of participants came from the Small and Very Small

categories, larger LEAs actively participated—with the average larger LEA participating in two or more of the outreach campaigns.

## 14.0 Appendix E – LEA Outreach Reports

### 14.1 Site Visits Report

At the outset of the site visits, the ADE research team presented the LEA Research Strategy and data collection plan that was reviewed and refined prior to its execution. The strategy included the research focus, framework/method as well as approach. The strategy and associated plan put forth goals regarding the coverage of visits in addition to the data and information to be collected. Goals for site visit coverage included the following:

1. Collect data from a representative sampling of educational groups in the state. The plan called for representation by
  - a. **Institution type** - Every type of education facility or institution including Public & Charter School Districts, JTED & CTE, Accommodation Districts, Corrections, all five of the newly-formed Regional Education Centers and County Offices of Education
  - b. **LEA Size** - Very small, small, medium, medium-large, large, and very large
  - c. **Geographic Area** - Urban/City, Suburban, Town and Rural
  - d. **Demographics** - a general match to state demographics, with intentional representation of key sub-groups such as high Native American or Hispanic populations
  - e. **Job Titles** – superintendents, LEA leaders of instruction, finance/HR, special populations, and technology, principals, and teachers
2. Collect a broad set of data and information to support preparation of the AELAS business case that would address the following:
  - a. Identify current software systems, vendor products, and/or manual processes
  - b. Identify initial and on-going investments in software systems including implementation, maintenance, and support costs
  - c. Obtain feedback on ADE software applications and data systems
  - d. Assess connectivity capabilities
  - e. Gauge interest in adopting new, centralized, cloud-based systems from ADE
  - f. Gauge interest in further on-going AELAS research participation

To maximize the available time, the ADE research team offered individual visits to the regional service centers, larger districts, and larger charter organizations. Medium to small districts and small charters received invitations to regional site visits where the research team met with multiple organizations at the same time. The analysis of visits completed relative to goals follows.

#### 14.1.1 Data Collection by Institution Type

##### Regional Service Centers

All five of the newly formed regions received invitations for site visit meetings. Response varied greatly by region. Maricopa County Education Service Agency (MCESA) was represented extensively through meetings for the REIL grant and through focused meetings with their finance team. Southern Arizona Regional Education Center (SAREC), the region anchored by Pima County, hosted a meeting that was attended by representatives of their three counties. North Eastern Arizona Regional Service Center

(NCESAZ) , anchored by Navajo County, declined a joint meeting, but all three county superintendents attended regional focus groups with districts in their counties. East Central Regional Service Center (ECRSC), anchored by Pinal County accepted the invitation and scheduled a live meeting with a teleconference for their four counties. Only Pinal County attended the meeting; however, one of their counties, Graham County, was represented at a separate focus group by their Deputy Superintendent. West Central Regional Service Center (WCRSC), centered in Yavapai County, was unable to schedule a joint meeting of their four county superintendents’ offices; however, their Deputy Superintendent met with the AELAS team and attended a focus group.

**Public School Districts**

As of June 30, the AELAS team conducted a total of fifteen visits focused on school districts, seven visits focused on charter schools, and one visit to the AZ Department of Corrections. The visits have resulted in coverage of 21% of school districts, representing 33% of students:

Chart 31 –Public School Districts Visits

| Total Districts | District Visits | % Districts Visited | Students Served by Size Statewide | Students Served by Visits | % Students Represented |
|-----------------|-----------------|---------------------|-----------------------------------|---------------------------|------------------------|
| 228             | 48              | 21%                 | 960,012                           | 315,528                   | 33%                    |

**Charter Schools**

A total of nine meetings with charters collected information from eight charter organizations and nine independent charters. While charter representation as a percentage is lower than for school districts, the AELAS team believes that the feedback from charters is consistent, and additional meetings are unlikely to reveal new information. Visits to charter schools have resulted in coverage of 15% of charter schools, representing 8% of charter students.

Chart 32 - Charter School Visits

| Total Charter Schools | AELAS Charter School Visits | % Charter Schools Visited | Students in Charters Statewide | Students in Charters by AELAS Visits | % Students Represented |
|-----------------------|-----------------------------|---------------------------|--------------------------------|--------------------------------------|------------------------|
| 408                   | 60                          | 15%                       | 113,369                        | 8,954                                | 8%                     |

**Other Educational Institutions**

The ADE research team completed a visit to the Arizona Department of Corrections, with another visit underway for local correctional facilities that serve incarcerated students. A visit also was completed to East Valley Institute of Technology (EVIT) to gather information on software systems used in Career Technical Education (CTE) programs. No visit has been made to the Arizona School for the Deaf and Blind which may be another visit that should be scheduled if time permits.

**14.1.2 Data Collection by Size**

For purposes of this process, public school districts were divided into just three categories since this report was created before going to the six size categories. The categories here are small with under 1,500 students; medium with student counts between 1,500 and 14,999, and large with student counts over 15,000. Based on this, the representation for public school districts was as follows:

**Chart 33 - Data Collection by District Size**

| District Size                  | Total Districts in Arizona | District Visits | % Districts Visited | Students Served by Size Statewide | Students Served by Visits | % Students Represented |
|--------------------------------|----------------------------|-----------------|---------------------|-----------------------------------|---------------------------|------------------------|
| Large 15,000+ Students         | 15                         | 4               | 27%                 | 474,791                           | 186,174                   | 39%                    |
| Medium 1,500 – 14,999 Students | 79                         | 25              | 32%                 | 433,139                           | 116,956                   | 27%                    |
| Small >1,500 Students          | 134                        | 19              | 14%                 | 52,082                            | 12398                     | 24%                    |

Visits to charter schools also covered a broad range of organizations based on size. As noted previously, visits to charters included visits to both charter organizations and individual charter schools. The largest organization, Leona Group, served over six thousand students in twenty-four schools. The largest independent charter was Primavera, serving over three thousand students online. Among brick and mortar charters, Noah Webster Basic School served over a thousand students in K-6. The majority of charter schools are between one hundred fifty and four hundred students in size.

### 14.1.3 Data Collection by Geographic Area

The categories assigned by the National Center for Education Statistics indicate that Arizona educational institutions are weighted toward City and Rural locations. Percentages by category are somewhat over-weighted for City because individual charters are counted equally with school districts (and charters are more common in larger cities). With that caveat, it still appears that the percentages of visits to date are within range of state representation, and in fact are a bit higher in rural areas which are a location we especially wanted to represent.

**Chart 34 - Data Collection by Geographic Classification**

| Geographic Classification | AZ State % | Visit % |
|---------------------------|------------|---------|
| City                      | 43%        | 30%     |
| Suburb                    | 11%        | 6%      |
| Town                      | 14%        | 23%     |
| Rural                     | 31%        | 41%     |

Another way to view geographic location is by looking at the visits by county. ADE researched to date have visited ten of the fifteen counties in the state. The counties not visited were Gila, Greenlee, La Paz, Mohave, and Santa Cruz. Collectively these five counties represent 4.8% of the state student population. Mohave represents half of that amount and should possibly be targeted during any additional visits.

Chart 35 - District Representation by County

| County            | # of Students | % of total in AZ | # Students Represented | % Students Represented | # of Districts | # of Districts Visited | % Districts Represented |
|-------------------|---------------|------------------|------------------------|------------------------|----------------|------------------------|-------------------------|
| APACHE COUNTY     | 13087         | 1.4%             | 12975                  | 99.1%                  | 12             | 10                     | 83.3%                   |
| COCHISE COUNTY    | 18560         | 1.9%             | 6396                   | 34.5%                  | 25             | 4                      | 16.0%                   |
| COCONINO COUNTY   | 18219         | 1.9%             | 15256                  | 83.7%                  | 16             | 4                      | 25.0%                   |
| GILA COUNTY       | 7698          | 0.8%             | 0                      | 0.0%                   | 8              | 0                      | 0.0%                    |
| GRAHAM COUNTY     | 6160          | 0.6%             | 5813                   | 94.4%                  | 9              | 4                      | 44.4%                   |
| GREENLEE COUNTY   | 1609          | 0.2%             | 0                      | 0.0%                   | 5              | 0                      | 0.0%                    |
| LA PAZ COUNTY     | 2416          | 0.3%             | 0                      | 0.0%                   | 6              | 0                      | 0.0%                    |
| MARICOPA COUNTY   | 603691        | 62.9%            | 172736                 | 28.6%                  | 66             | 8                      | 12.1%                   |
| MOHAVE COUNTY     | 22803         | 2.4%             | 0                      | 0.0%                   | 13             | 0                      | 0.0%                    |
| NAVAJO COUNTY     | 18751         | 2.0%             | 17877                  | 95.3%                  | 13             | 9                      | 69.2%                   |
| PIMA COUNTY       | 130784        | 13.6%            | 65572                  | 50.1%                  | 17             | 2                      | 11.8%                   |
| PINAL COUNTY      | 47999         | 5.0%             | 7950                   | 16.6%                  | 21             | 1                      | 4.8%                    |
| SANTA CRUZ COUNTY | 10160         | 1.1%             | 170                    | 1.7%                   | 8              | 0                      | 0.0%                    |
| YAVAPAI COUNTY    | 22141         | 2.3%             | 16734                  | 75.6%                  | 23             | 5                      | 21.7%                   |
| YUMA COUNTY       | 35815         | 3.7%             | 10216                  | 28.5%                  | 12             | 1                      | 8.3%                    |

#### 14.1.4 Data Collection by Demographics

Visits to districts and charters reflect fairly closely the demographics of students by ethnicity and special classifications statewide for all districts and all charters as shown below:

Chart 36 - District and Charter School Visits by Student Demographics

|   | State Average | Visit Average |
|---|---------------|---------------|
| American Indian/ Alaskan Native Students (School) | 5%            | 10%           |
| Asian/ Pacific Islander Students (School)         | 3%            | 3%            |
| Black Students (School)                           | 6%            | 6%            |
| Hispanic Students (School)                        | 41%           | 40%           |
| White Students (School)                           | 44%           | 41%           |
| Free And Reduced Lunch (School)                   | 47%           | 51%           |
| Lep/ELL Students (District)                       | 8%            | 8%            |
| Individualized Education Program (District)       | 12%           | 12%           |

While the site visit numbers match up quite closely with state averages, it should be noted that emphasis was placed on collecting information from areas with high Native American and border area Hispanic populations.

Demographics for charter school who participated in site visits are likewise reflective of the state averages of demographics for charter schools.

Chart 37 - Charter Visits Student Demographics

|   | State Average | Visit Average |
|---|---------------|---------------|
| American Indian/ Alaskan Native Students (School) | 4%            | 2%            |
| Asian/ Pacific Islander Students (School)         | 4%            | 7%            |
| Black Students (School)                           | 8%            | 6%            |
| Hispanic Students (School)                        | 35%           | 29%           |
| White Students (School)                           | 50%           | 54%           |
| Free And Reduced Lunch (School)                   | 43%           | 17%           |
| Lep/ELL Students (District)                       | 4%            | 3%            |
| Individualized Education Program (District)       | 9%            | 4%            |

### 14.1.5 Data Collection by Job Title

The visits to date have included one hundred ninety-nine participants. The visits have included a number of superintendents and assistant superintendents; primarily LEA leaders of instruction, finance/HR, special populations, and technology; and fewer than twenty principals (including charter operators). Although invitations have asked that teachers be included, only a few have been in attendance at site visits.

### 14.1.6 Recommendations

The site visit research completed represents a comprehensive baseline of Arizona schools. While additional visits might not yield new findings, scheduling visits should be considered to Mohave and Gila Counties to involve them in the process. Kingman USD and Payson USD are likely targets as well. It is recommended that a meeting be scheduled with Yavapai County superintendents if the opportunity arises.

Chart 38 - Site Visit Data Collection Overview

| Category   | Current Status  | Next Steps  |
|--|---|---|
| Current LEA software applications                    | There are some trends and common applications being used which could translate into acceptance of those common applications in a private cloud environment.   | Schedule focus groups: <ul style="list-style-type: none"> <li>• Validate high level requirements for applications</li> <li>• Clarify status of additional potential “early adopters”</li> </ul>   |
| Initial and on-going investments in LEA applications | Financial/Cost information received from: <ul style="list-style-type: none"> <li>• Survey respondents</li> <li>• Some site visits</li> <li>• Vendor materials</li> </ul>  | <ul style="list-style-type: none"> <li>• Analyze coverage of cost information for a representative sampling of districts and charters.</li> </ul>   |
| Interest in adopting new, cloud-based applications   | Interest in the overall benefit of the AELAS private cloud solution was neutral. Without specific information to provide to districts regarding exact cost, roll-out timeline, and specific applications available, no districts were willing to commit to be early adopters. <ul style="list-style-type: none"> <li>• Small districts and charters were open to changing applications if efficiencies were possible.</li> <li>• Certain applications such as Special Education Management software had broad appeal for AELAS because of the ability to share IEPs easily when students moved.</li> <li>• There are 3 or 4 common SIS applications utilized the state</li> </ul> | <ul style="list-style-type: none"> <li>• Maintain contact with districts following focus groups to better gauge interest in early adoption of AELAS.</li> <li>• Identify applications that could be “easy wins” for building trust in ADE</li> <li>• Move ahead with interim solutions such as an RFP for Special Education software</li> <li>• Use focus groups to better understand the drivers and barriers to adoption of AELAS.</li> </ul> |

| Category  | Current Status   | Next Steps   |
|---|--|--|
| Connectivity capabilities                         | <p>Internet connectivity issues were not as widespread as we had anticipated. Even rural areas are improving their bandwidth and reliability through federal programs such as GovNet and E-Rate. Concerns were expressed, however, about internet service loss because of power failures in remote areas, and infrastructure issues in older school buildings.</p>   | <ul style="list-style-type: none"> <li>• Continue to follow up on district concerns about the reliability of cloud-based solutions for systems that are essential to daily school operation.</li> <li>• Update information about connectivity as improvements are identified.</li> </ul> |
| Interest in on-going AELAS research participation | <p>Part of the site visit process included asking participants for their willingness to participate in future focus groups and other input and review opportunities. This information and personal knowledge of individuals with an interest in the benefits of AELAS will be used to develop focus group participant lists.</p>   | <ul style="list-style-type: none"> <li>• Conduct Focus Groups</li> <li>• Follow up with districts that expressed interest about AELAS participation to cultivate relationships and look for ways to bring them into the process.</li> </ul>  |
| Feedback on ADE Data Systems                      | <p>Participants were all given the opportunity to give feedback on their experiences with ADE data systems. Many viewed our presence in the site visit as the only time they have had the opportunity to be heard by ADE. We collected all of their feedback and are in the process of organizing it in a way that will be shared to relevant teams in ADE.</p> <p>Some of the most common feedback included:</p> <ul style="list-style-type: none"> <li>• SAIS is improving but still requires significant resources</li> <li>• ADE needs to streamline state system workflows to eliminate the need for redundant data</li> <li>• All LEAs would like to have historical data follow students real-time</li> <li>• All LEAs want dashboards and tools to assist in analyzing data</li> <li>• All participants support implementation of Single-Sign-On to state systems</li> </ul> | <ul style="list-style-type: none"> <li>• Feedback to be compiled and ready for distribution</li> </ul>   |

\*Complete findings for Specific applications will be included as part of Arizona Market Research.

\*\*Complete financial findings will be reported as part of the Findings on LEA IT Spend.

Chart 39 - Categories of Systems Discussed

| Teaching & Learning  | Administrative  | Back Office   |
|--|---|---|
| <ul style="list-style-type: none"> <li>Assessment</li> <li>Learning Management System (LMS)</li> <li>Content Management System (CMS)</li> <li>Progress Monitoring/Response to Intervention</li> <li>Credit Recovery</li> <li>Social Networking</li> <li>Lesson Planning (included with CMS)</li> </ul> | <ul style="list-style-type: none"> <li>SIS (Included functions for Gradebook, Scheduling, Parent Portal, ELL, Health/Medical)</li> <li>IEP Management</li> <li>High Stakes Test Analysis</li> <li>Curriculum Mapping</li> <li>Nutrition/Food Management</li> <li>Transportation</li> <li>Library (Not added until later in our visits)</li> </ul> | <ul style="list-style-type: none"> <li>Finance</li> <li>Purchasing</li> <li>Warehouse/Inventory</li> <li>Payroll</li> <li>Human Resource Mgmt.</li> <li>HQT</li> <li>Substitute Management</li> <li>Professional Development</li> <li>Teacher &amp; Principal Evaluation</li> <li>Staff Collaboration and Conferencing</li> </ul> |

Chart 40 - Potential by Specific Application

| Potential  | Systems   |
|--|---|
| Common Applications Identified                         | SIS, IEP, Progress Monitoring/ Response to Intervention, Professional Development, Credit Recovery, Formative Assessment  |
| Commonly addressed with manual solutions or not at all | High Stakes Test Analysis, Learning Management System, content Management System (including Lesson Planning and Content mapping), Substitute Management, Staff Collaboration/Conferencing, Teacher and Principal Evaluation and Goals |
| Districts were satisfied with their current solutions  | Nutrition/Food Management, Transportation, Finance, Purchasing Payroll, Human Resource, Warehouse/Inventory   |
| Districts are not looking for options                  | Social Networking, HQT  |

Chart 41 - Potential by LEA Size/Type

| LEA Size/Type                    | Greatest Potential Drivers to AELAS  |
|----------------------------------|--|
| Large Districts (< 15,000)       | Having one source of truth for student data; providing districts with vendor solution analysis; Scalability of solutions |
| Medium Districts (1500 – 14,999) | Cost Savings, Electronic Transfer of Records, Transition to using tools rather than manual solutions                     |

|                                       |  |
|---------------------------------------|--|
| Small Districts (> 1500) and Charters | Cost Savings, Fewer Local Resources Needed, Electronic Transfer of Student Records |
|---------------------------------------|--|

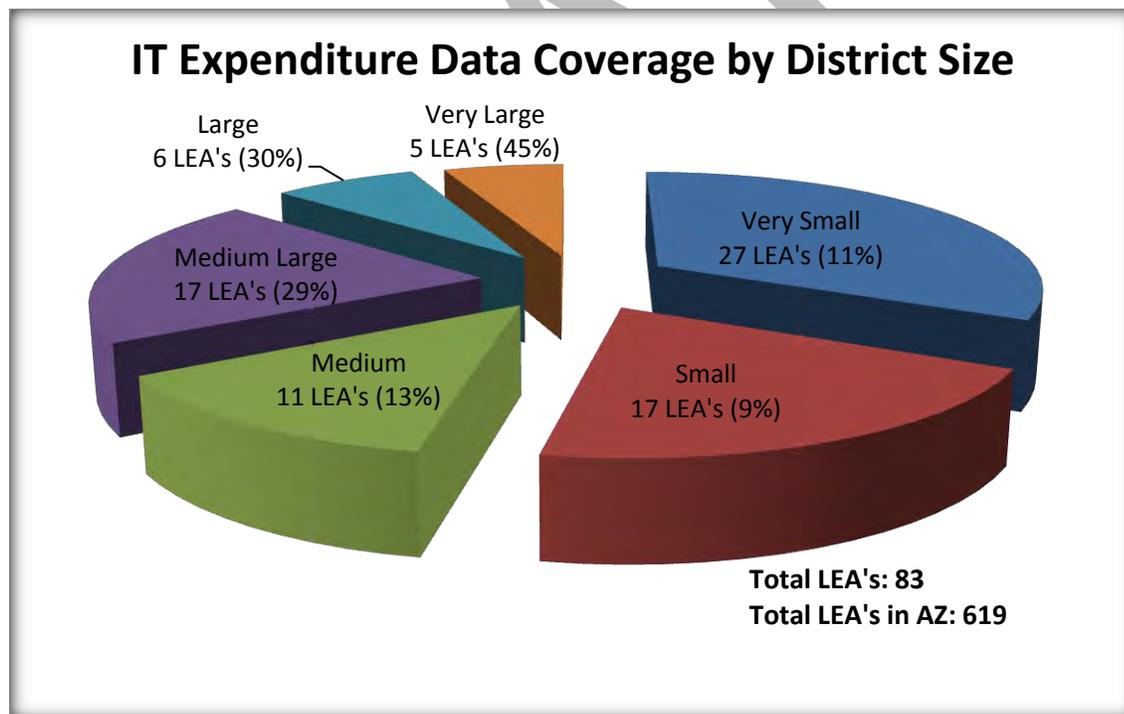
### 14.1.7 Data Collection

The figure below highlights the results of the LEA phone surveys.

Chart 42 - LEA Phone Survey Results

| Criteria                              | Results                               |
|---------------------------------------|---------------------------------------|
| Total Contacts Made                   | 120                                   |
| Number providing Information          | 31                                    |
| New Survey Responses                  | 24 (14 Very small, 8 Small, 2 Medium) |
| Clarification of original survey data | 7                                     |

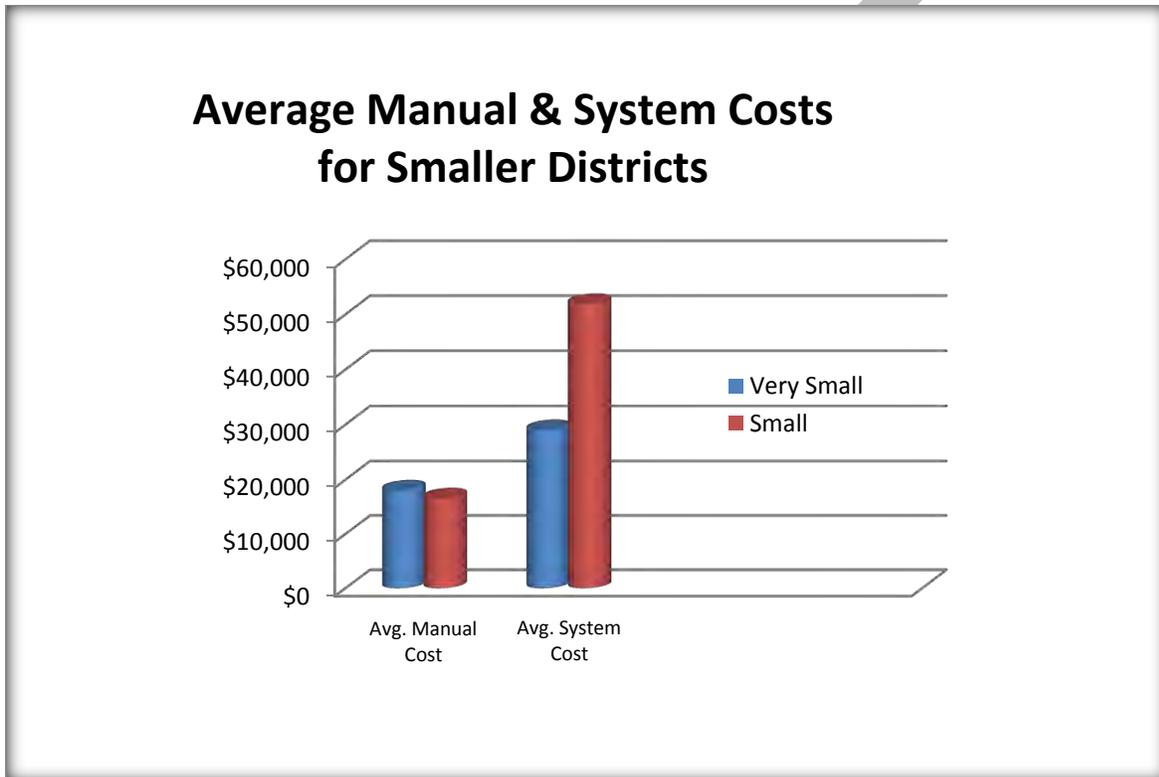
Figure 9 - LEA IT Expenditure Data coverage by District Size



Although the goal was to get survey responses up to a minimum threshold between 15 and 20% of the LEAs in each of the smallest size categories, the goal was not quite reached. The phone survey lasted two weeks. And although the calling team had other responsibilities during that time, the majority of time for the two Business Analysts was dedicated to preparing, calling, re-calling, e-mailing, and documenting the responses.

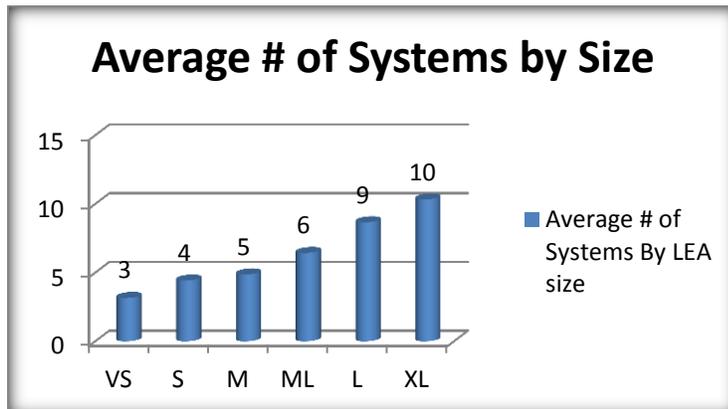
An important outcome of the follow-up phone survey is the documentation of the amount of manual work in areas where systems were not used. The following chart quantifies the tasks that are completed manually as opposed to purchasing a technology solution. Manual costs were not included in the original survey, but they were collected in the follow-up phone calls. Although there is not a budgetary line item for the manual costs, there is a cost of manpower that could be re-deployed to other education-related tasks.

Figure 101 - Average Manual & System Costs for Smaller Districts



Another way to look at the role of manual labor in smaller LEAs is shown in the following figure. Very small LEAs have a few “systems” on which they rely. Typically, they have a Student Information System, some formative assessment tools, and some sort of finance tool. Other business needs are completed manually.

Figure 11 – Avg. Number of Systems by Size Category



### 14.1.8 Summary of Findings

Although it was not possible to get responses from enough districts to reach the lower end of the range of 15% representation for each of the LEA size categories, the number of responding districts did double the number of responses. It also resulted in the necessary information on hardware costs for all six LEA size categories, calculated costs for manual efforts in very small and small LEAs, and information from districts in all size categories to quantify the “cost” to LEAs for SAIS submissions.

Through this exercise, a more critical look at the original survey results was taken in relation to the phone survey information obtained, and resulted in the ability to make more appropriate decisions as to the accuracy of some of the data submitted in the survey and how best to handle data that fell into the category of being an outlier. This has led to an increased level of confidence in the cost data that was collected for the AELAS Business Case.

## 14.2 Focus Group Report

Following the site visits that were conducted in May thru July, focus groups were facilitated to further refine the LEA needs and priorities of systems within AELAS. By the time the site visits were completed and the focus groups were scheduled, it was nearing the time that the new school year was starting for many districts, and availability for participation in the groups would be limited. To mitigate this challenge the sessions were held online using the ADE licensed **GoToWebinar** tool and multiple methods were utilized in order to gather input: discussion, online polling, and post-webinar surveys. The goals of the focus groups were to:

- Validate high level capabilities for systems that could be accessed through AELAS
- Prioritize systems needed in early phases of an AELAS implementation
- Identify districts interested in an early adoption of AELAS statewide opt-in systems

Focus group participants represented LEAs in all six of the district size categories that have been identified in this business case. Each of the five focus group sessions was hosted online, and covered two systems that were identified in site visits as having a higher potential for early adoption of AELAS. A

total of ten systems were covered in the five sessions. Participants provided input via discussion, online polling, and post meeting surveys.

### 14.2.1 Objectives & Strategy

The focus groups targeted the ten systems that showed the greatest potential cost savings, and those that were identified during site visits as popular systems for adoption through AELAS. The systems were: Assessment, Content Management, Credit Recovery / Credit Accrual, IEP Management, Learning Management, Professional Development, Collaboration & Conferencing Tools, Student Information, Observation and Evaluation Tools for Teachers and Principals, and High Stakes Test Analysis.

Only two systems were presented at a time for each focus group to minimize the number of participants that would be needed and ensure that the right participants attended the right focus groups. Questions relating to the Identity Management System (IMS) project were also collected on behalf of a separate initiative to consolidate what would have been a separate effort to collect some information. IMS was not originally in the focus group meeting scope, but that topic was added to three focus group sessions as follows:

- Professional Development and Teacher/Principal Observation & Evaluation
- Learning Management System and Credit Recovery/Credit Accrual (plus IMS)
- Assessment System and Test Analysis (plus IMS)
- Student Information System and Content Management System
- IEP Management and Staff Collaboration & Conferencing (plus IMS)

Analysis of the site visits identified a number of districts and charter organizations that provided good input and/or identified a need for AELAS systems. These same institutions were targeted for focus group invitations. Within these organizations, potential participants for the focus groups were identified based upon their knowledge of the specific systems or tasks that the systems support. Invitations were sent to eighty potential participants. Each invitee was given the option to select a different focus group if they felt they could better contribute to other topics. In some cases there were multiple staff in a room participating, but they did not each have their own computer to add to the poll results however they contributed as a group.

Chart 43 - LEA Focus Group Participation by Size Category

| Size Categories               | # of LEAs |
|-------------------------------|-----------|
| Very Large (>=20K)            | 3         |
| Large (8,000 to 19,999)       | 4         |
| Medium-Large (2,000 to 7,999) | 9         |
| Medium (600 to 1,999)         | 5         |
| Small (200 to 599)            | 3         |
| Very Small (<=199)            | 2         |
| Other Education Agency        | 2         |

### 14.2.2 Agenda Template

The focus group meetings were hosted on **GoToWebinar**. Participants were able to contribute to the discussion and ask questions by use of this technology. The slide deck that was used to guide the sessions is included in the appendix. All sessions were ninety minutes in length.

- I. Introductions, Purpose, Background (5 minutes)
- II. Topic 1 (30 minutes)
  - a. Discussion Questions
  - b. Online Poll Questions
  - c. Rating of high level requirements
- III. Topic 2 (30 minutes)
  - a. Discussion Questions
  - b. Online Poll Questions
  - c. Rating of high level requirements – This will be done in the same way as for Topic 1.
- IV. Q & A – follow up from typed questions; new questions, wrap-up and closing
- V. Direct feedback via post session survey questions

### 14.2.3 Focus Group Participation

Eighty individuals from fifty-three school districts/charters were invited to attend one of the five focus group sessions. Final attendance was forty individuals from twenty-six districts and charters, plus two attendees from other education agencies (i.e. county office of education plus an education technology consortium), a 50% attendance rate. A few individuals responded that they had to miss the sessions because of other higher priorities in their districts, but still took the time to complete the rating sheets after the sessions were held. Most of the participating LEAS were also part of the site visits with the exception of two districts. The focus group sessions were recorded online through the software. Links to the recorded sessions are in Windows Media Player format and are available with the other supporting documentation.

Participation during the focus groups was very positive. Participants that had access to a microphone for the session were able to participate more fully, but even those without a microphone still entered questions and provided valuable input. The questions and input were read aloud and incorporated into the meeting. Feedback during and after the session was very positive in that people felt that their voices were being heard, and how positive it was that there were districts of all sizes included in the discussion.

**Chart 44 - LEA Focus Group Participation & Response Rate**

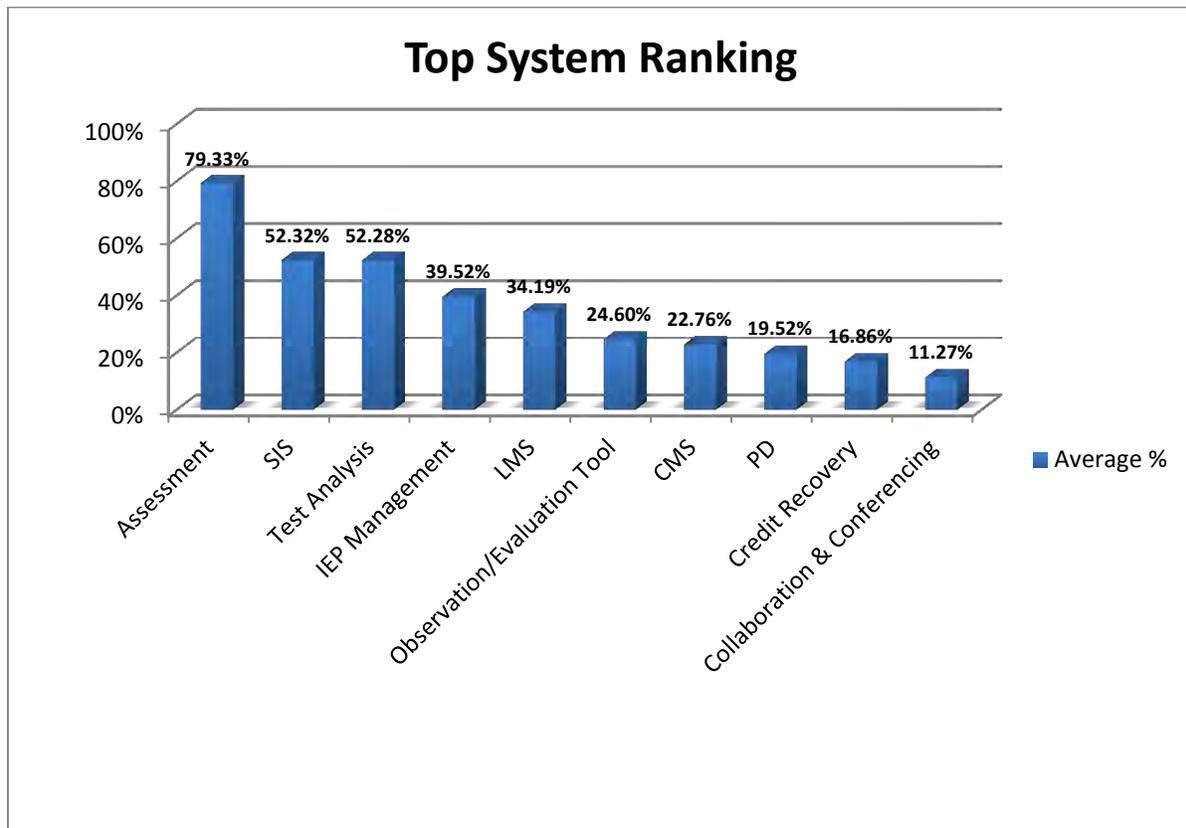
| Session | Systems                  | # Invited | Participation Rate | Rating Sheets Response Rate | Survey Response Rate |
|---------|--------------------------|-----------|--------------------|-----------------------------|----------------------|
| 1       | Assessment System & Test | 18        | 50.00%             | 100.00%                     | 66.67%               |

|   |  |    |        |        |        |
|---|--|----|--------|--------|--------|
|   | Analysis, IMS  |    |        |        |        |
| 2 | Individualized Education Plan Management & Staff Collaboration and Conferencing, IMS | 18 | 55.56% | 60.00% | 50.00% |
| 3 | Learning Management System and Credit Recovery, IMS                                  | 14 | 50.00% | 28.57% | 85.71% |
| 4 | Professional Development and Teacher & Principal Observation/Evaluation              | 20 | 45.00% | 33.33% | 44.44% |
| 5 | Student Information System & Content Management System                               | 15 | 33.33% | 60.00% | 60.00% |

To meet the goals of the focus groups, four information gathering techniques were employed: Capability Rating Worksheets, Discussion, Interactive Polling, and a Survey Questionnaire completed and submitted after the focus group session was completed.

The polls focused on the prioritization of software systems desired as a statewide centralized solution. For the purpose of ranking applications, participants were presented with two lists of five applications, and asked to select their top two from each list. **Note: The webinar tool did not allow more than seven items to be in a poll, so we chose to break the list into two groups of 5 applications.** The results reflect how many times an application was identified as a top choice, and are summarized in the following figure.

Figure 33 - LEA Top Systems Ranking

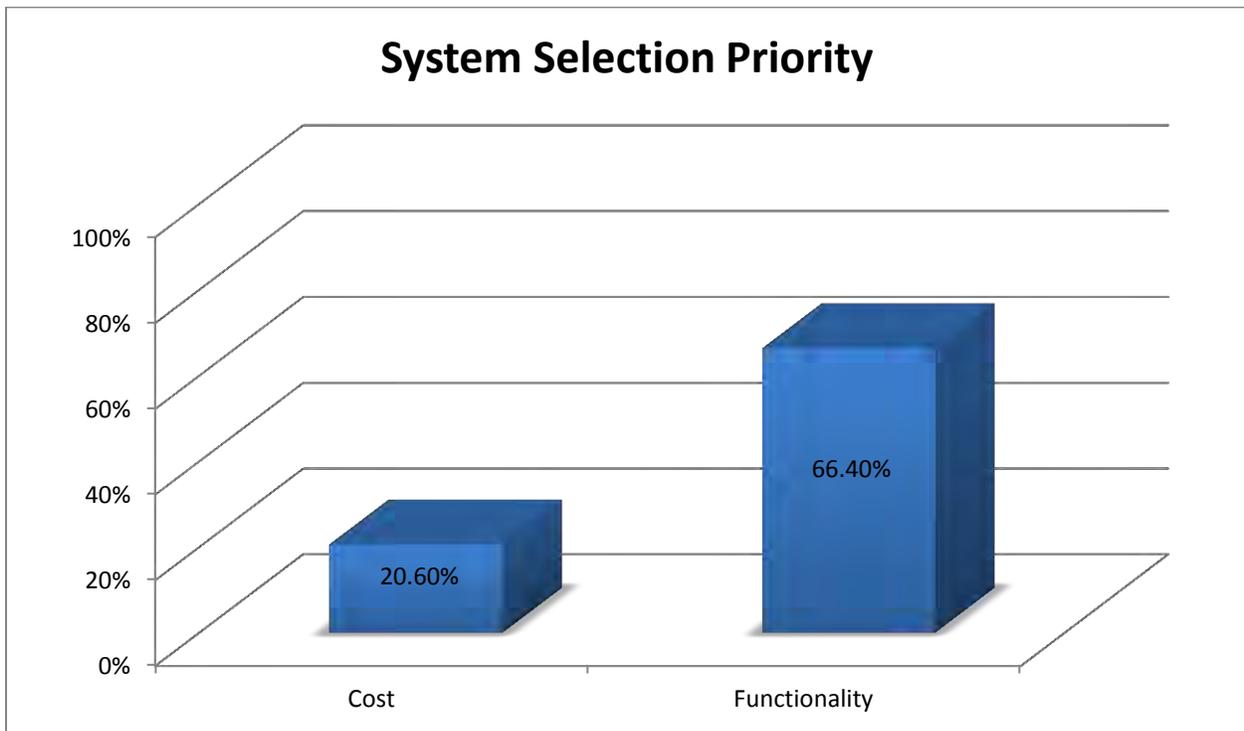


The fact that the Assessment System was ranked as a top choice by nearly 80% of the participants is significant considering the fact that only one focus group session had it as a topic. This means that the majority of the participants, regardless of which two topics their group discussed, view an Assessment System positively as a statewide opt-in solution. Some of the systems such as Professional Development that maybe should have received a higher ranking likely did not because there are greater needs and desire for systems that benefit student learning more directly. Even Collaboration and Conferencing, with its low ranking, could still be a powerful system for supporting student success, but was ranked as a lower priority because participants could only choose two systems from each list.

Another important outcome from the polling was that the most important reason that the participants choose a particular system was its functionality followed by cost. ADE does understand that cost savings would be important to all LEAs, but if the systems do not meet their functional needs, and are not easy to use, interest in early adoption will more than likely not be there.

Most participants indicated that they were happy with their current systems and did not plan to make a change within the next twelve months. But that does not necessarily mean they would not be interested in accessing that same system through AELAS if there were meaningful cost savings. If the functionality of the current system meets their needs, is commonly used by many LEAs, and the functionality requirement is satisfied, then the last criteria for consideration is the potential for cost savings.

Figure 34 - LEA System Selection Priority



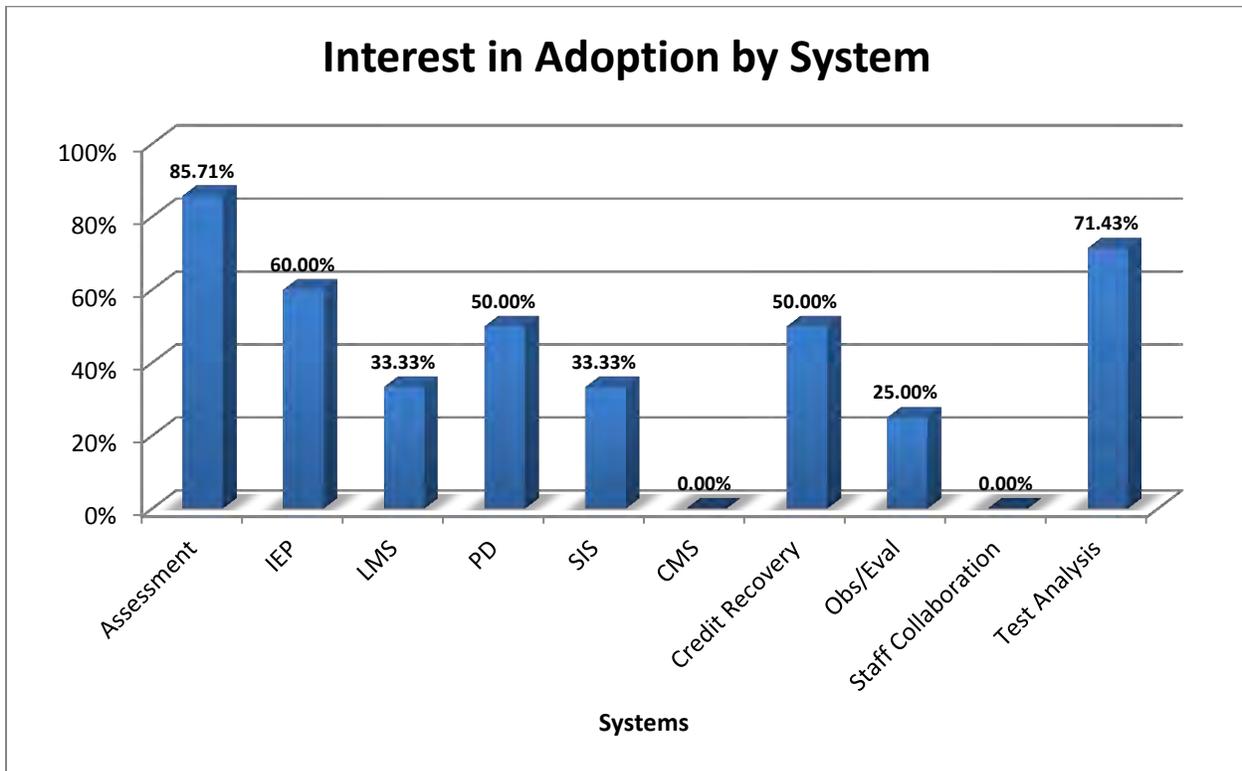
Additional information was gathered with a survey that was available to participants after each focus group session. The webinar tool did not have a way to give a survey during the session, so participants were sent an e-mail automatically after the session that contained a link to the survey. This limitation contributed to a lower than expected participation and reduced number of surveys received. Subsequently, several reminders were issued as well as another attached copy of the survey but still only received twenty-four surveys were received from participants.

The survey questions asked participants specifically about their likelihood of moving to a statewide opt-in solution for the two systems that were discussed during their focus group session. Additional survey questions were specific to the Identity Management System (IMS) and any responses were forwarded to the IMS project manager.

In the survey, participants were asked the following question: “On a scale of 1-5, with 5 being high, rate your district’s interest in using a statewide opt-in solution for \_\_\_\_\_.” They were asked this question for each of the two systems discussed in their focus group session.

The chart below shows the percent of survey respondents that answered the question with a “4” or “5” ranking, indicating a moderate to high interest in using the system in AELAS.

Figure 35 - LEA Interest Level in System Adoption

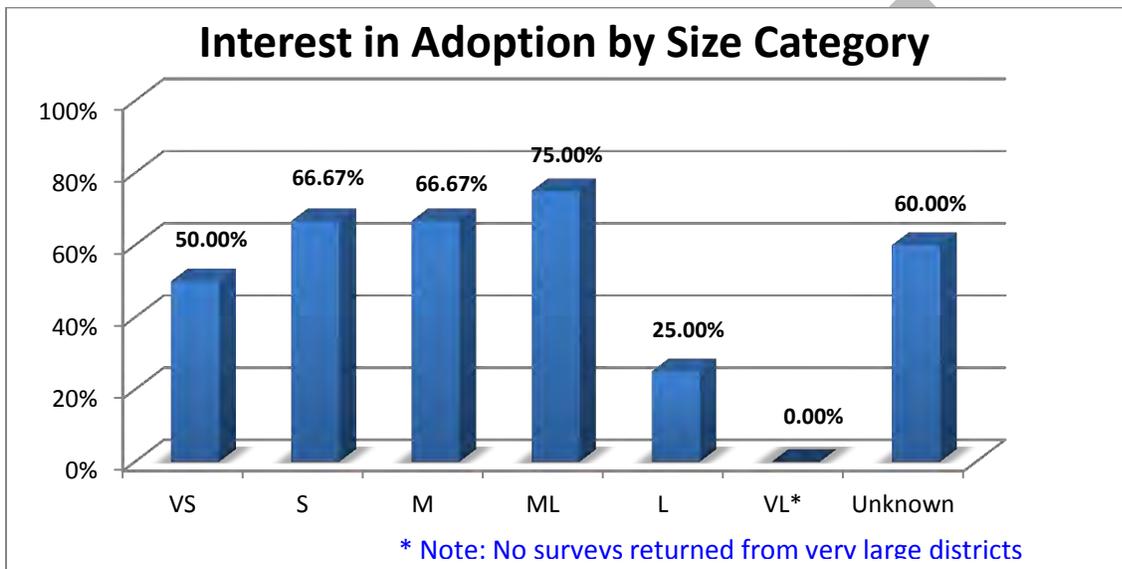


These results differ from the ranking that was done through the polling feature in that participants were only asked about the two systems they were discussing in their focus group session. In most cases, the participants were directors or assistant superintendents, and therefore in a position to understand the needs of their districts making these results more meaningful. Comments provided in the survey, however, also indicated a reluctance to trust that these systems could be implemented on a statewide scale successfully, given ADE’s previous track record. These comments speak to the need to implement successful system pilots with willing participants before expecting larger numbers of districts to opt-in.

Another observation is that two systems that were not ranked with a “4” or “5” for adoption are systems that very few LEAs currently have, namely Content Management System and Staff Collaboration. Consequently, adopting these systems in AELAS would be a new expense that would be incurred. The systems are critical, however, in improving instruction and breaking down barriers of time and space that limit communication and sharing of resources and information. Implementation planning for these systems would need to include explaining about the importance of these systems and possible financial support or incentives for initial implementation. Once use of these systems is part of the normal education work flow, the systems would likely become part of the standard IT opt-in package for all LEAs.

The chart below shows the percentage of districts that gave either of their systems a rating of “4” or “5”, broken down by size category of the district. For example, for small districts that submitted a survey, two out of three of them gave this “high” rating for at least one of the system they discussed in their session, indicating a moderate to high interest in AELAS adoption. *Note: Some surveys were received but it was not possible to determine which district from which it was submitted which are counted in the “Unknown” column.*

Figure 36- LEA Interest in System Adoption by Size Category



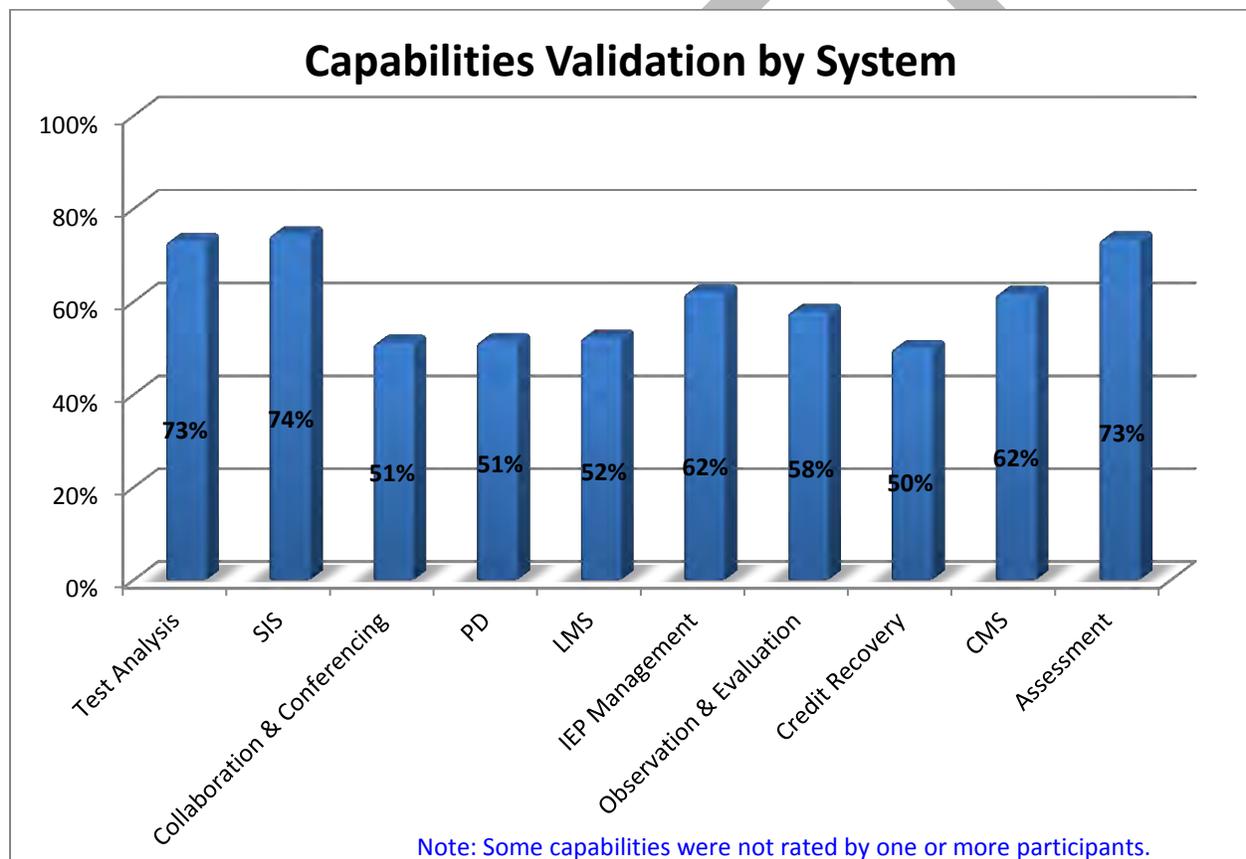
The data shows that depending on the system, there is opportunity for cultivating interest in AELAS in most of the size categories. If the large size categories are a desired target for an early phase implementation, for example, it would be important to include systems, in which, they were interested in. However, the higher levels of interest in the very small to medium-large categories speak to not only a higher level of interest, but potentially a broader list of systems. Prior to developing an implementation strategy, it would be important to confirm these results with a larger group of LEAs, but the potential for pilot implementations among very small to medium-large size categories appears to be favorable.

\* \* \* \* \*

Survey participants rated a listing of high level capabilities for the two systems discussed in their respective focus group session. The purpose of this exercise was to obtain broader confirmation about each capability and its associated priority for each of these systems. Each system being evaluated contained a list of high-level capabilities or features that are being sought by LEAs. The system capabilities documented during the MCESA REIL effort was included in this exercise. Each participant assigned a priority rating that correlated as follows: 4 - critical, 3 - high, 2 - medium, or 1 - low.

This information was collected, analyzed and summarized with the results being incorporated into a master list of system requirements that is being documented for AELAS. The figure below provides the level of coverage that the capabilities provides for each respective system. Thus, the capabilities for SIS, Test Analysis, and Assessment graded the highest in terms of level of coverage while four systems graded the lowest.

Figure 37 - LEA Capabilities Validation by System



### 14.2.4 Comments & Feedback

Participants were given the opportunity and encouraged to include questions or comments along with their survey responses. Though many did not comment, those that did are listed below and providing important insight into the future of AELAS adoption.

- “I would like to see how all of the systems will interact.”

- “The concept of bringing all those systems together in one place that does almost everything a school is required to do by the state is ideal. The roll out and management is a big concern from several people that I've discussed this with. ADE's data systems management and support have not instilled much confidence in many staff. The fact that you are gathering this information and getting people involved is a good sign that the future may hold a different level of quality of service.”
- “With the challenges found in implementing AZ SAFE, the district is a bit leery in a new state system since the current SIS is working.”
- “My primary concern is the quality of the technical infrastructure necessary to support the systems. I would love to have options for our district but have concerns about systems that grow ever larger.”
- “My biggest concern is that the systems have some default so that you can work offline of the internet is down, and then easily upload the files when possible.”
- “A statewide system that is reliable and has the functionality of our current system would be very desirable.”
- “I think this is going to be a huge project for the state to take on and is concerned about the manpower. Currently, systems that have a more narrow focus on data they provide have a fair amount of support and data analysis that has been pretty well thought through.”
- “It would be nice to have systems that talk to each other and does all the things we end up doing manually.”

#### 14.2.5 Summary of Findings

This following are the highlights of the findings from all of the focus group sessions:

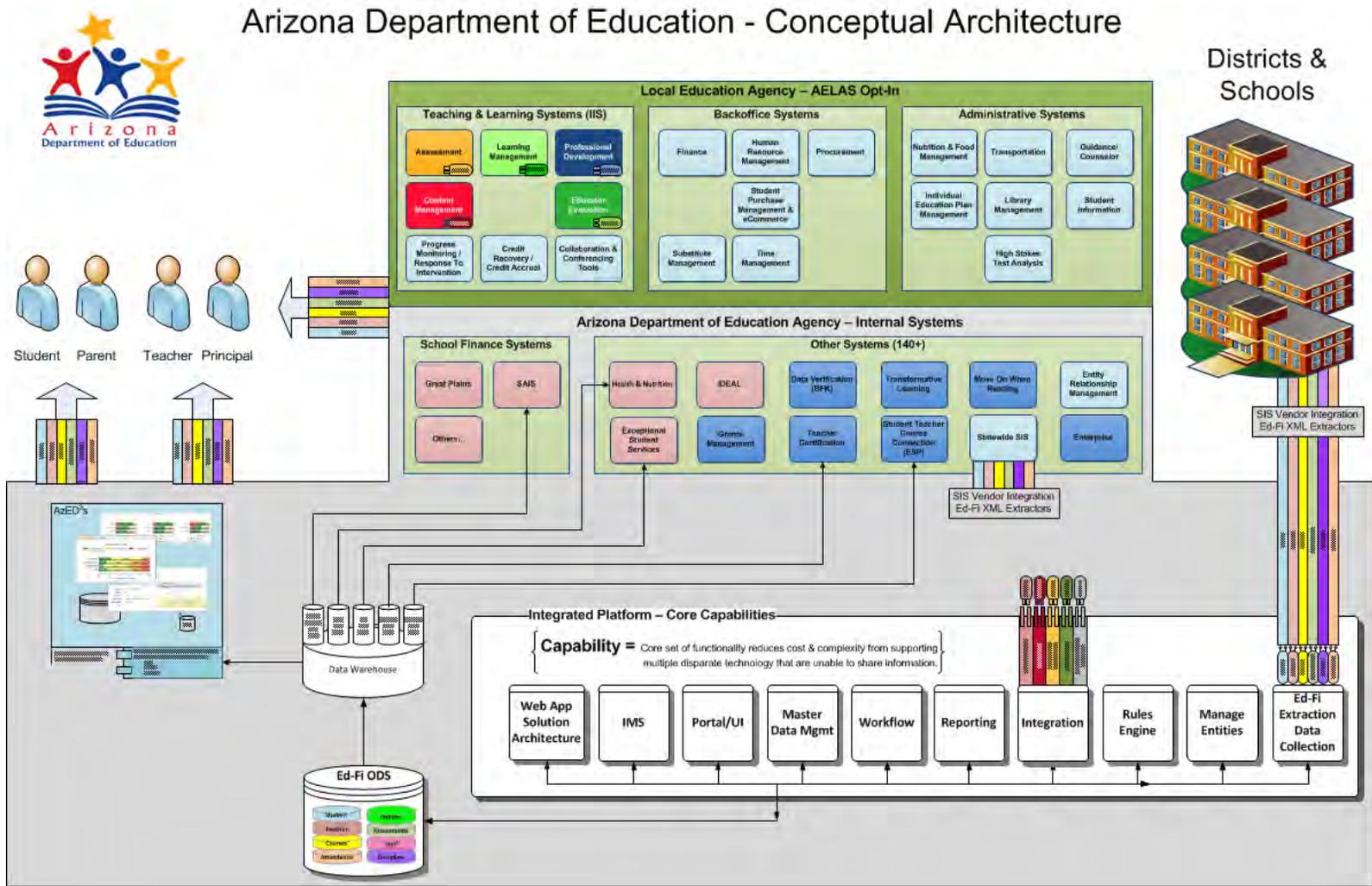
- Interest in systems as part of a statewide centralized, opt-in systems:
  - The following systems have a significant amount of support in a first phase: Assessment, Professional Development, Teacher/Principal Observation and Evaluation, Credit Recovery/Credit Accrual, Individual Education Plan Management, and High-Stakes Test Analysis
  - The remaining systems, while they had a lower ranking, still held some level of interest in adoption in a second phase: Student Information System, Content Management, Learning Management, and Collaboration & Conferencing
  - Many very small and small districts indicated that they would be very interested in accessing a SIS as part of a statewide opt-in solution, especially if it meant that they would not have to deal with submission of data to SAIS. They would see an immediate benefit in the ability to shift more of their resources into instructional areas
  - Four out of the six size categories showed a 50% or greater interest in adopting one or more systems
- Ranking of high-level capabilities for all ten systems was completed by the focus group participants, providing broader LEA validation from the field, the importance of key system capabilities
- Online focus groups were well received by the participants, and should be considered in the future as good ways to get feedback from the field. Interaction and engagement of participants were key factors to success

- Based on Focus Group participation and input, a core group of LEAs were identified that ADE could work closely with to build upon their early interest in AELAS
- Although LEAs want to benefit from AELAS, there is skepticism that ADE is capable of implementing AELAS and doing it well. At the same time, written comments were made that simply the fact that site visits and focus groups are being held gives them hope that this could be "...a sign that the future may hold a different level of quality of service"

DRAFT

# 15.0 Appendix F – AELAS Architecture Conceptual Design

Figure 38 – AELAS Architecture Conceptual Design

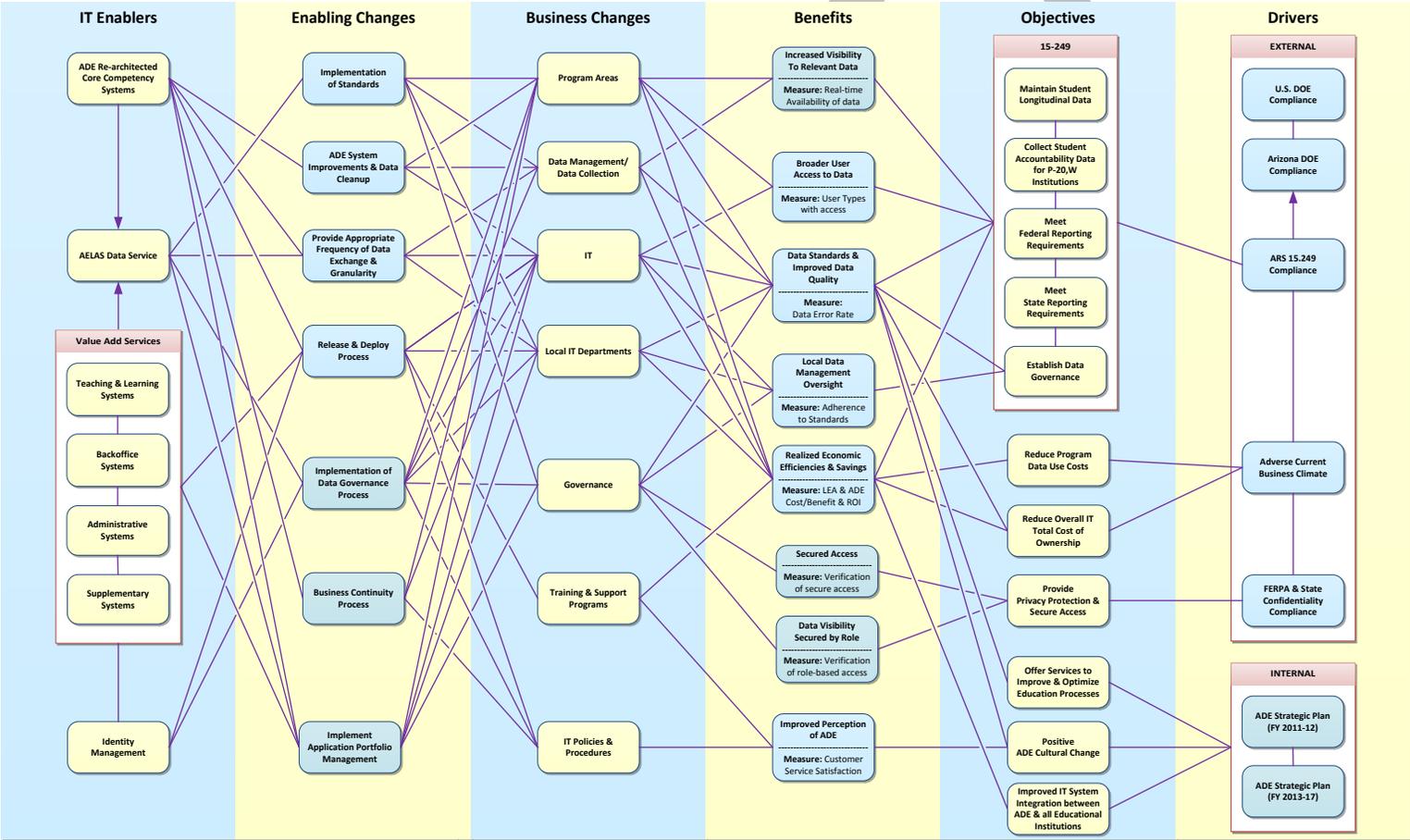


# 16.0 Appendix G – BDN Model Diagrams

## 16.1 BDN - A.R.S. § 15-249 (AELAS)



A.R.S. 15-249 – Arizona Education, Learning & Accountability System (AELAS)



# 16.2 BDN - Statewide Longitudinal Data System Grant Program (SLDS)



## AZ SLDS Grant – Statewide Longitudinal Data System

Parent Driver

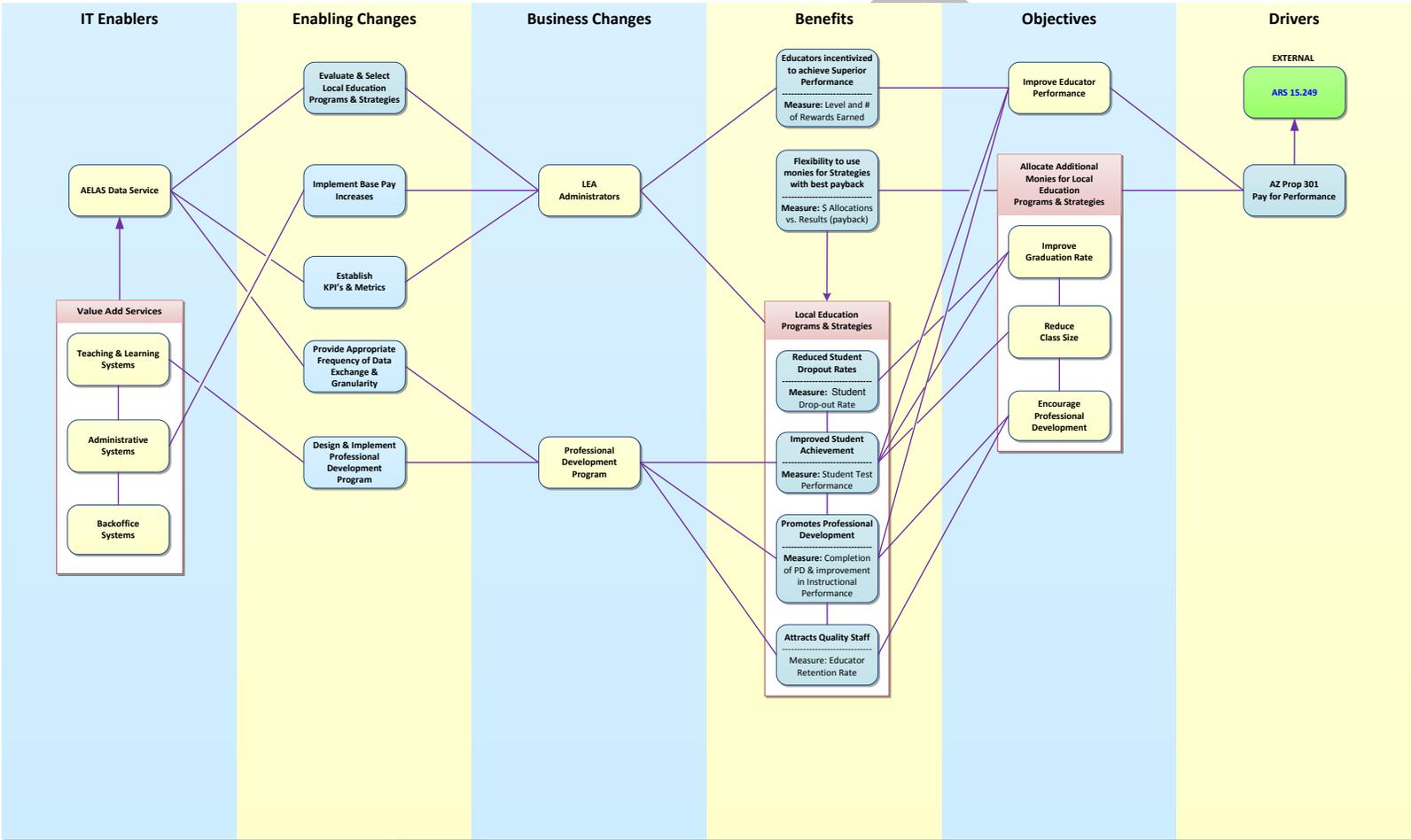


# 16.3 BDN - Arizona Proposition 301 (Pay for Performance)



## AZ Prop 301 – Pay for Performance

Parent Driver

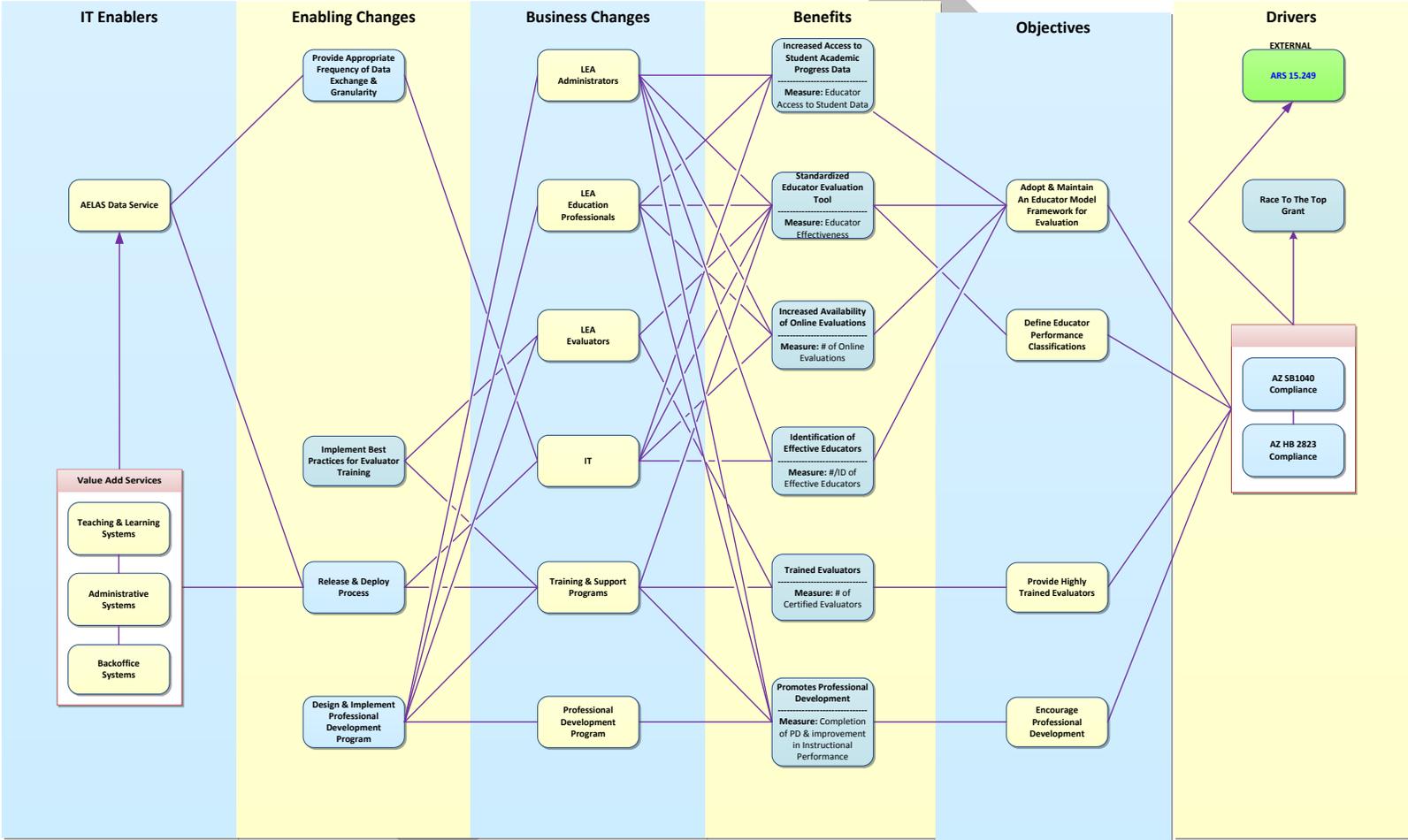


# 16.4 BDN - Arizona SB 1040 & HB 2823 (Educator Observation & Evaluation)



## AZ Senate Bill 1040 & House Bill 2823 – Educator Observation & Evaluation

Parent Driver

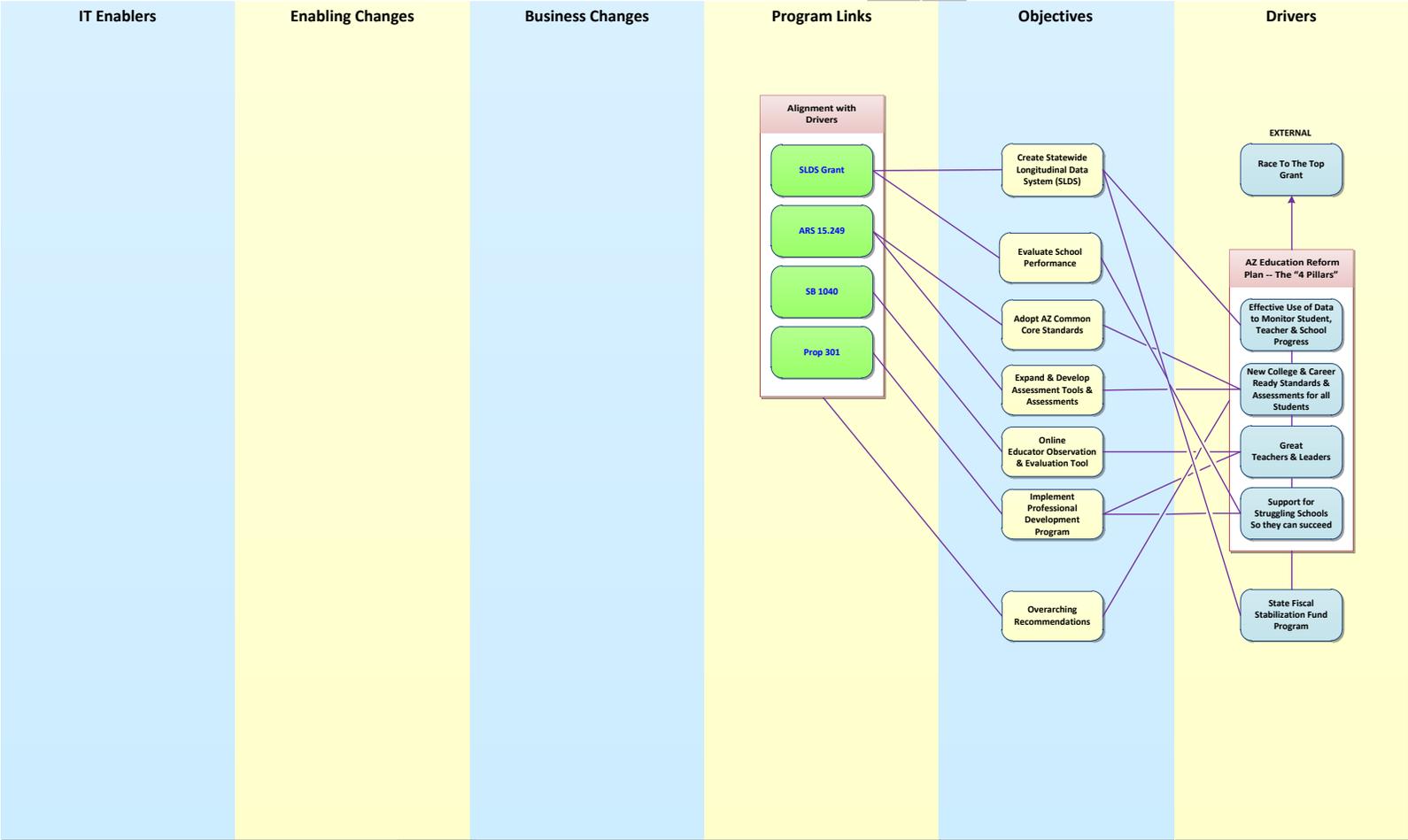


# 16.5 BDN - Arizona Education Reform Plan – “4 Pillars”



AZ Education Reform Plan (a.k.a. “4 Pillars”)

Parent Driver



## 17.0 Appendix H – A.R.S. § 15-249 - AELAS

Arizona Revised Statutes § 15-249, also known as “AELAS” is considered to be the key driver for organizational change at the ADE. It is the Arizona legislative mandate to develop and implement an “enterprise-wide” education learning and accountability system. AELAS ultimately will also support compliance and alignment with both state and federal reporting requirements.

Secondary drivers for the AELAS program include the adverse current business climate; FERPA & state confidentiality compliance; as well as ADE Strategic Plans for the fiscal years 2011-2012 and the five year plan for fiscal years covering 2013-2017. AELAS is expected to conform to Information Technology (IT) strategies, as well as their department policies, guidelines, and procedures.

See the model diagram, to which, the narrative in the following sections pertain.

### 17.1 Drivers – Objectives Linkage

The following objectives are directly linked to the A.R.S. § 15-249 which is indirectly linked or associated with US DOE compliance and ADE Title 15 compliance. There are other drivers that have been included with the A.R.S. § 15-249 driver since they cover some crucial aspects that may have been implied but not clearly specified in the legislation.

#### ❖ **Maintain Student Longitudinal Data**

By maintaining and collecting student longitudinal data there should be more visibility to each student's complete historical record including schools attended within the state of Arizona, attendance, testing, and progress as well as their performance and educational achievements.

#### ❖ **Collect Student Accountability Data for P-20, Workforce Institutions**

By collecting student accountability data for P-20 and into the workforce, there should be more visibility to each student's historical record from preschool to post-secondary education and into the workforce within the state of Arizona.

#### ❖ **Meet Federal Reporting Requirements**

While A.R.S. § 15-249 contains a reference to satisfy federal reporting requirements there is nothing specific. The assumption being made is that the federal requirement is for longitudinal student-level data, but it could also be one of the many files created by ADE and submitted to EdFacts, etc. EdFacts is the system through which state education agencies (SEAs) report the majority of their data.

#### ❖ **Meet State Reporting Requirements**

This legislation also contains a reference to “satisfy state reporting requirements” but again, there is nothing specific. The state reporting requirements may include but is not necessarily limited to school report card grades.

#### ❖ **Establish Data Governance**

Setup a Data Governance Commission which has the capability to enforce adherence to data quality and other related standards by the LEAs as well as at the ADE.

The following objectives while linked to the adverse current business climate driver should always be a consideration when there is a need for a technology solution to improve or enable a business capability or solve a business problem.

❖ **Reduce Program Data Use Costs**

Reduce the data use costs within program areas, where possible.

❖ **Reduce Overall IT Total Cost of Ownership**

Reduce the total cost of ownership for various education technology products and systems, both internal and external, as well as infrastructure, maintenance, and support costs, where and as applicable.

The following objective is linked to the FERPA and State Confidentiality Compliance driver.

❖ **Provide Privacy Protection & Secure Access**

To provide privacy protection and secure access to Users, where and as applicable, in order to maintain compliance with FERPA and state confidentiality policy guidelines.

The following objectives are linked to the internal drivers, the ADE Strategic Plans for the fiscal years covering 2011-12 and 2013-17.

❖ **Offer Services to Improve & Optimize Education Processes**

Offer appropriate level of customer service and support in order to improve and optimize educational processes.

❖ **Positive ADE Cultural Change**

Implement positive cultural changes in the way ADE is perceived by all its customers.

❖ **Improved IT System Integration between ADE & all Educational Institutions**

Provide improved seamless integration and interoperability between the various systems and products, of which AELAS may be comprised (e.g. Between the LEAs external systems and internal systems at the ADE).

## 17.2 Objectives – Benefits Linkage

The benefits are described in more detail along with their expected measurement. They are then linked to associated objectives that were fully described in the previous section. For a given objective to be fully realized, it may require that all benefits, to which, it is linked to have been achieved.

❖ **Increased Visibility to Relevant Data**

Benefit: By achieving the benefit of increased visibility to relevant data the objectives of meeting local, federal and state reporting requirements with respect to student longitudinal and accountability data may be realized.

Measurement: Real-time availability of data

❖ **Broader User Access to Data**

Benefit: By achieving the benefit of broader user access to data then the objectives of meeting local, federal and state reporting requirements with respect to student longitudinal and accountability data may be realized.

Measurement: User Types with access

❖ **Data Standards & Improved Data Quality**

Benefit: By achieving the benefit of data standards in place and improved data quality then the objectives of maintaining and collecting student longitudinal and accountability data, meeting local, federal and state reporting requirements, as well the establishment of data governance, reduction in overall IT total cost of ownership, services to improve and optimize educational processes, and positive ADE cultural change may be realized.

Measurement: Data error rate

❖ **Local Data Management Oversight**

Benefit: By achieving the benefit of local data management oversight then the objective of the establishment of data governance may be met.

Measurement: Adherence to standards

❖ **Realized Economic Efficiencies & Savings**

Benefit: By achieving the benefit of realized economic efficiencies and savings then the objectives of maintaining and collecting student longitudinal data, meeting local, federal and state reporting requirements, the reduction of program data use costs and overall IT total cost of ownership, as well as improved IT system integration between the ADE and all educational institutions may be realized.

Measurement: LEA & ADE Cost/Benefit and ROI

❖ **Secured Access**

Benefit: By achieving the benefit of secured access then the objective of provide privacy protection & secure access may be realized.

Measurement: Verification of secure access

❖ **Data Visibility Secured by Role**

Benefit: By achieving the benefit of data visibility secured by role then the objective of provide privacy protection & secure access may be realized.

Measurement: Verification of role-based access

❖ **Improved Perception of ADE**

Benefit: By achieving the benefit of improved perception of ADE then the objective of positive ADE cultural change may be realized.

Measurement: Customer Service Satisfaction Rating

## 17.3 Benefits – Business Changes Linkage

This section lists the business process changes and links them to their associated benefits.

### ❖ Program Areas

By enabling business changes in Program Areas then the benefit of increased visibility to relevant data, broader user access to data, data standards in place and improved data quality, local data management oversight and realized economic efficiencies and savings may be achieved. Note: Program areas are referred to Business Units in the private sector.

### ❖ Data Management/Data Collection

By enabling business changes in Data Management/Data Collection then the benefit of increased visibility to relevant data, broader user access to data, data standards in place and improved data quality, and realized economic efficiencies and savings may be achieved. Note: Data Management/Data Collection manages the collections and exchange of all data.

### ❖ IT

By enabling business changes in Information Technology then the benefit of broader user access to data, data standards in place and improved data quality, local data management oversight, as well as realized economic efficiencies and savings may be achieved.

### ❖ Local IT Departments

By enabling business changes in Local IT Departments then the benefit of data standards in place and improved data quality, local data management, as well as realized economic efficiencies and savings may be achieved.

### ❖ Governance

By enabling business changes in Governance then the benefit of data standards in place and improved data quality, local data management oversight, secured access and data visibility secure by role may be achieved. Note: Governance also manages awards and sanctions for data accuracy.

### ❖ Training & Support Programs

By enabling business changes in Training & Support Programs then the benefit of realized economic efficiencies and savings and improved perception of ADE may be achieved.

### ❖ IT Policies & Procedures

By enabling business changes in IT Policies & Procedures then the benefit of improved perception of ADE may be achieved. Note: KPI - Customer service ratings.

## 17.4 Enabling Changes – Business Changes Linkage

This section lists the enabling changes and links them to their associated business process changes.

❖ **Implementation of Standards**

The implementation of standards (e.g. CEDS and ED-FI) must be completed in order to effect business changes in Program Areas, Data Management/Data Collection, Local IT Departments, and Governance since they will all rely on or monitor the consistent and universal language of data.

❖ **ADE System Improvements & Data Cleanup**

ADE system improvements & data cleanup changes must be completed in order to effect business changes in Program Areas, Data Management/Data Collection, and IT since they each will all rely on improved system functionality, workflow management, data accuracy, etc.

❖ **Provide Appropriate Frequency of Data Exchange & Granularity**

Appropriate frequency of data exchange & granularity must be completed in order to effect business changes in Data Management/Data Collection, IT, and Local IT Departments since they each will rely on the delivery of the right amount and level of data at the right time to the right audience.

❖ **Release & Deploy Process**

Release and deploy process documentation must be completed in order to effect business changes in IT, Local IT Departments, Training & Support Programs, and IT Policies & Procedures since they will be guided by this set of organizational policies.

❖ **Implementation of Data Governance Process**

Implementation of the data governance process, including the establishment of a Data Governance Board, must be completed in order to effect business changes in Program Areas, Data Management/Data Collection, IT, Local IT Departments, and Governance since they will all need to be compliant with the data governance process.

❖ **Business Continuity Process**

Business continuity process must be completed in order to effect business changes in Program Areas, IT, Local IT Departments, and IT Policies & Procedures since they each must conform with these new processes.

❖ **Implement Application Portfolio Management**

Implementation of application portfolio management must be completed in order to effect business changes in Program Areas, IT, Local IT Departments, and Governance since they each must conform to this new process.

## 17.5 IT Enablers

The following Information Technology enablers are necessary to enable changes to the business in order and ultimately achieve the benefits and objectives linked to their respective drivers.

❖ **ADE Re-architected Core Competency Systems**

ADE re-architected core competency systems refer to central foundation and support systems (e.g. SAIS, Grants Management, Teacher Certification, etc.) that will undergo a significant transformation or replacement as part of the AELAS program.

❖ **AELAS Data Service**

The AELAS Data Service generally refers to the ADE central data warehouse system known as Education Data Driven Decision Systems (ED<sup>3</sup>S) but which includes a data management component that allows the exchange of data between systems used by the LEAs and the ADE.

❖ **Value Add Services:**

Value add services refer to those systems, applications and/or products utilized by educational institutions (i.e. districts, charters, etc.) outside of the ADE and which included supplementary systems (e.g. DES, ASU, etc.). LEA systems are categorized in either of the following areas:

- Teaching & Learning Systems
- Back Office Systems
- Administrative Systems
- Supplementary Systems

❖ **Identity Management**

IMS should provide and support SSO/Interoperability.

## 18.0 Appendix I – SLDS Grant Program

The Student Longitudinal Data System is a secondary driver that aligns within the overall AELAS program that is associated with the U.S. DOE SLDS Grant Program.

The Arizona Student Longitudinal Data System (AZ-SLDS) is intended to enhance the ability of LEAs to efficiently and accurately manage, analyze, and use education data, including individual student records. AZ-SLDS will help state government, districts, schools, and teachers make data-driven decisions to improve student learning, as well as facilitate research to increase student achievement and close achievement gaps.

The ADE will develop and implement a statewide longitudinal education data system called ED<sup>3</sup>S. This student data system will provide teachers and school leaders with the information they need to make the informed, strategic decisions necessary to increase student academic growth and enhance student learning environments.

Once launched, this redesigned student data system will provide parents, teachers and school leaders with the information they need to make the informed, strategic decisions necessary to increase student academic growth and enhance student learning environments. Better information leads to better decisions, which ultimately will lead to a better education for all of Arizona’s children.

See the model diagram, to which, the narrative in the following sections pertain.

### 18.1 Drivers – Objectives Linkage

The following objectives are linked to the SLDS grant.

❖ **Provide Timely Access to Information**

Provide timely access to information to statewide longitudinal data system.

❖ **Increased Volume of Actionable Data to Stakeholders**

Provide increased volume of actionable data to stakeholders of the statewide longitudinal data system.

❖ **Support Increasing P-20, W Data Demands**

Support the increasing P-20, Workforce data demands on the statewide longitudinal data system.

❖ **Drive Instructional, Program & Policy Decisions, Best Practices, etc.**

Drive instructional, program & policy decisions, as well as best practices for a statewide longitudinal data system.

❖ **Improve Student Achievement & Educator Performance**

Improve student achievement and educator performance.

❖ **Improve School, District, & Statewide Performance**

Improve school, district and statewide education achievements and performance.

## 18.2 Objectives – Benefits Linkage

The benefits are described in more detail along with their expected measurement. They are then linked to associated objectives that were fully described in the previous section. For a given objective to be fully realized, it may require that all benefits, to which, it is linked to have been achieved.

❖ **Provide Actionable Education Decision Support Data**

Benefit: By providing actionable education decision driven support data the objectives of increased volume of actionable data to stakeholders and instructional, program & policy, and best practices may be realized.

Measurement: Ability to make strategic and tactical decisions

❖ **Improved Throughput & Capacity**

Benefit: By providing improved throughput and capacity the objectives of timely access to information, increased volume of actionable data to stakeholders and support of increasing P-20, W data demands may be realized.

Measurement: System Performance & Throughput

❖ **Real Time Access to Data**

Benefit: By providing real time access to data the objectives of timely access to up-to-date information may be realized.

Measurement: Availability of up-to-date data

❖ **Increased Visibility To Relevant Data**

Benefit: By providing increased visibility to relevant data the objectives of increased volume of actionable data to stakeholders; support of increasing P-20, W data demands; instructional, program & policy, decisions, and best practices; improved student achievement & educator performance; and improved school, district and statewide performance may be realized.

Measurement: Availability of performance data

❖ **Broader User Access to Data**

Benefit: By providing broader user access to data the objective of support of increasing P-20, W data demands may be realized.

Measurement: User Types with access

❖ **Deploy Superior Systems/Products**

Benefit: By deploying superior-performing systems and products then the objectives of improved student achievement & educator performance as well as improved school, district and statewide performance may be realized.

Measurement: Product Capability Scorecard

❖ **Improve Quality of Education**

Benefit: By improving the quality of education then the objectives of improved student achievement & educator performance as well as improved school, district and statewide performance may be realized.

Measurement: Education Performance Improvement

## 18.3 Benefits – Business Changes Linkage

This section lists the business process changes and links them to their associated benefits.

❖ **Application Portfolio Management**

By the execution of diligent application portfolio management, then it should be possible to achieve the benefit of providing actionable education decision support data; improved throughput and capacity; ensure real time access to data; ensure the deployment of superior-performing systems and products; and improve the quality of education.

❖ **Service Level Agreements (SLAs)**

By creating service level agreements, then it should be possible to achieve the benefit of ensuring real time access to data, broader user access to data, and ensuring the deployment of superior-performing systems and products.

❖ **IT Master Data Management Policies & Procedures**

By the implementation of IT master data management policies and procedures, then it should be possible to achieve the benefit of providing actionable education decision support data; increased visibility to relevant data; broader user access to data; and improved quality of education.

❖ **Training & Support Programs**

By enabling business changes in Training & Support Programs then the benefit of improved quality of education may be achieved.

❖ **Regional Education Centers**

By the establishment of Regional Education Centers (REC), then it should be possible to achieve the benefit of improved quality of education since these structures provide supplemental, but locally defined and accessible professional development, educational services and technical services for high priority initiatives. Note: Each REC will also manage capacity issues within their region.

❖ **Centers of Education Excellence**

By the establishment of Centers of Education Excellence, then it should be possible to achieve the benefit of improved quality of education since these institutions excel in their delivery of education whether or not they utilize a significant level of technology.

## 18.4 Enabling Changes – Business Changes Linkage

This section lists the enabling changes and links them to their associated business process changes.

❖ **Deploy & Manage Data Service Program**

The deployment and management of a data service program must be completed in order to effect business changes in Application Portfolio Management, Service Level Agreements (SLAs), IT Master Data Management Policies & Procedures as well as Training & Support Programs.

❖ **Create Regional Education Centers**

The creation of the regional education centers must be completed in order to effect business changes owned by these same entities.

❖ **Identify Centers of Excellence**

By identifying or establishing Centers of Excellence, ADE could leverage LEA or other education institutions unique and demonstrated capabilities, systems, and/or processes for others within the state.

## 18.5 IT Enablers

The following Information Technology enablers are necessary to enable changes to the business in order and ultimately achieve the benefits and objectives linked to their respective drivers.

❖ **AELAS Data Service**

The AELAS Data Service generally refers to the ADE central data warehouse system known as Education Data Driven Decision Systems (ED<sup>3</sup>S) but which includes a data management component that allows the exchange of data between systems used by the LEAs and the ADE.

- Supporting network capacity for LEA's and ADE

- Information visualization platform (e.g. Dashboard & Reporting)
- Arizona Operational Data Store Infrastructure
- Data Service Platform

## 19.0 Appendix J – Arizona Proposition 301

Arizona Proposition 301 (“Prop 301”) is a secondary driver that aligns within the overall AELAS program. It was the proposition for Educator Performance-Based Pay that was voter approved in November of 2000. Arizona Proposition 204 is on the ballot in November 6, 2012 to make permanent a one-cent tax that includes some monies for education.

See the model diagram, to which, the narrative in the following sections pertain.

### 19.1 Drivers – Objectives linkage

The following objectives are linked to Arizona Proposition 301. There were two overarching objectives of this legislation.

#### ❖ Improve Educator Performance

Improve the performance of education professionals such as teachers and principals.

#### ❖ Allocate Additional Monies for Local Programs & Strategies

Provide additional monies for programs and strategies that could be determined by each local school district constrained by the allocation percentages as noted in parentheses. The additional monies for LEAs were dedicated for three main purposes:

- Teacher base pay increases (20%);
- Teacher performance pay (40%);
- Maintenance and operations menu options (40%)
  - Increase graduation rate and reduce dropout rate
  - To reduce the ratio of the number of students under the direction of a teacher in a class/section
  - To encourage educators to strive for professional development

### 19.2 Objective – Benefits Linkage

The benefits are described in more detail along with their expected measurement. They are then linked to associated objectives that were fully described in the previous section. For a given objective to be fully realized, it may require that all benefits, to which, it is linked to have been achieved.

#### ❖ Educators incentivized to achieve Superior Performance

Benefit: By achieving the benefit of educators achieving superior performance incentivized by bonuses and reward then the objective of improved educator performance may be realized.

Measurement: Level and number of Rewards Earned by an Educator

❖ **Flexibility to use monies for Strategies with best payback**

Benefit: To provide the LEAs with the flexibility to use monies for programs and strategies with the best payback for their situation using either of the following Maintenance and Operations options for local education strategies: AIMS Intervention, Class Size Reduction, Dropout Prevention, Teacher Compensation, Teacher Development, and Teacher Liability Insurance. Since "Teacher" was not defined, districts have determined that librarian, counselors and even others were included. The three most targeted choices were:

- Improved Graduation Rate
- To reduce the ratio of the number of students under the direction of a teacher in a class/section
- To encourage educators to strive for professional development

Measurement: \$ Allocations vs. \$ Results (Payback)

❖ **Reduced Student Dropout Rates**

Benefit: By achieving the benefit of reduced student dropout rates the objective of improved graduation rate as part of a local education programs & strategies may be realized.

Measurement: Student Drop-out rate

❖ **Improved Student Achievement**

Benefit: By achieving the benefit of improved student achievement the objective of improved graduation rate and class size as part of a local education programs & strategies may be realized.

Measurement: Student Test Performance and Achievement

❖ **Promotes Professional Development**

Benefit: By achieving the benefit of active promotion of professional development the objective of encouraging professional development as part of a local education program & strategy may be realized.

Measurement: Completion of PD and improvement in Instructional Performance

❖ **Attracts Quality Staff**

Benefit: By achieving the benefit of attracting quality staff the objective of encouraging professional development as part of a local education program & strategy may be realized.

Measurement: Educator Retention Rate

## 19.3 Benefits – Business Changes Linkage

This section lists the business process changes and links them to their associated benefits.

### ❖ LEA Administrators

By enabling business changes for the LEA Administrators then the benefit of educators incentivized to achieve superior performance and the flexibility to use monies for local education programs and strategies with the best payback may be achieved.

### ❖ Professional Development Program

By enabling business changes to the Professional Development Program then either of the following benefit(s) may be realized:

- Improved Student Achievement
- Promotes Professional Development
- Attracts Quality Staff

## 19.4 Enabling Changes – Business Changes Linkage

This section lists the enabling changes and links them to their associated business process changes.

### ❖ Evaluate & Select Local Education Programs & Strategies

The enabling change of the evaluation and selection of local education programs and strategies for spending additional Prop 301 monies must be completed and approved before the business change can be utilized by LEA Administrators or the appropriate authorized personnel.

### ❖ Implement Base Pay Increases

An enabling change to determine and implement base pay increases will need to be completed in order before the business change can be utilized by LEA Administrators or the appropriate authorized personnel.

### ❖ Establish KPI's & Metrics

The enabling change of establishing key performance indicators and metrics covering educator pay and performance; student achievement, attendance, and performance; as well as school and district performance must be completed and approved before the business change can be utilized by LEA Administrators or the appropriate authorized personnel.

### ❖ Provide Appropriate Frequency of Data Exchange & Granularity

Appropriate frequency of data exchange & granularity must be completed in order to effect business changes to the Professional Development Program since it will rely on the delivery of the right amount and level of data at the right time to the right audience.

### ❖ Design & Implement Professional Development Program

An enabling change to design and implement a professional development program will need to be completed in order for the business changes to be available to the LEA Administrators and the Professional Development Program.

## 19.5 IT Enablers

The following Information Technology enablers are necessary to enable changes to the business in order and ultimately achieve the benefits and objectives linked to their respective drivers.

### ❖ AELAS Data Service

The AELAS Data Service generally refers to the ADE central data warehouse system known as Education Data Driven Decision Systems (ED<sup>3</sup>S) but which includes a data management component that allows the exchange of data between systems used by the LEAs and the ADE.

### ❖ Value Add Services:

Value add services refer to those systems, applications and/or products utilized by educational institutions (i.e. districts, charters, etc.) outside of the ADE and which may include supplementary systems (e.g. DES, ASU, etc.). LEA systems are categorized in either of the following areas:

- Teaching & Learning Systems
- Administrative Systems
- Back Office Systems

## 20.0 Appendix K – SB 1040 & HB 2823

Arizona Senate Bill 1040 and House Bill amendment 2823, collectively referred to as “SB 1040”, is another secondary driver that fits within the overall AELAS program. It aligned Arizona with the necessary requirements in its application for the Race-To-The-Top grant program and mandated the adoption and maintenance of an educator model framework for evaluation of teachers and principals.

Through Race to the Top, the US DOE was asking states to advance reforms around four specific areas:

- ❖ Adopting standards and assessments that prepare students to succeed in college and the workplace and to compete in the global economy;
- ❖ Building data systems that measure student growth and success, and inform teachers and principals about how they can improve instruction;
- ❖ Recruiting, developing, rewarding, and retaining effective teachers and principals, especially where they are needed most; and
- ❖ Turning around the lowest-achieving schools.

### 20.1 Drivers – Objectives linkage

The following objectives are linked to the SB 1040 legislation including its associated HB 2823 amendment.

- ❖ **Adopt & Maintain An Educator Model Framework for Evaluation**

By adopting and maintaining an educator model framework for evaluation there should be more emphasis on including quantitative data on student academic progress for at least 33-50% of the evaluation outcomes and best practices for professional development and evaluator training.

- ❖ **Define Educator Performance Classifications**

Requires the State Board of Education (SBE) by December 1, 2012, to include four performance classifications for the model framework for teacher and principal evaluations and provide guidelines for school districts and charter schools to use in their evaluation instruments. These four performance classifications are designated as highly effective, effective, developing and ineffective.

- ❖ **Provide Highly Trained Evaluators**

To provide highly trained evaluators to ensure fair, accurate and complete educator evaluations.

- ❖ **Encourage Professional Development**

Encourage the professional development of teachers and principals in order to increase their effectiveness and performance.

### 20.2 Objective – Benefits Linkage

The benefits are described in more detail along with their expected measurement. They are then linked to associated objectives that were fully described in the previous section. For a given objective to be fully realized, it may require that all benefits, to which, it is linked to have been achieved.

❖ **Increased Access to Student Academic Progress Data**

Benefit: By achieving the benefit of increased access to student academic data that is accurate, timely, and complete then the objective of its inclusion in an educator model framework may be realized.

Measurement: Educator Access to Student Data

❖ **Standardized Educator Evaluation Tool**

Benefit: By achieving the benefit of a standardized educator evaluation tool then the objective of the educator model framework as well as the implementation of the educator performance classifications may be realized.

Measurement: Educator Effectiveness

❖ **Increased Availability of Online Evaluations**

Benefit: By achieving the benefit of increased availability of online evaluations, but only to those that should have access, then the objective of an educator model framework may be realized.

Measurement: # of Online Evaluations

❖ **Identification of Effective Educators**

Benefit: By achieving the benefit of the identification of effective educators, then the objective of the adopted educator model framework may be realized.

Measurement: #/ID of Effective Educators

❖ **Trained Evaluators**

Benefit: By achieving the benefit of providing a sufficient number of certified evaluators that can complete fair and objective online evaluations for teachers and principals then the objective of the providing highly qualified evaluators may be realized.

Measurement: # of Certified Evaluators

❖ **Promotes Professional Development**

Benefit: By achieving the benefit of active promotion of professional development the objective of encouraging professional development may be realized.

Measurement: Completion of PD and improvement in Instructional Performance

## 20.3 Benefits – Business Changes Linkage

This section lists the business process changes and links them to their associated benefits.

❖ **LEA Administrators**

By enabling business changes in LEA Administrators (e.g. district personnel, superintendent, etc.) then the benefit of increased access to student academic progress data, access to a standardized educator evaluation tool, increased availability of online evaluations, the identification of the number and identity of effective educators, as well as the promotion of professional development may be achieved.

❖ **LEA Education Professionals**

By enabling business changes for the LEA Education Professionals (e.g. Principals & Teachers) then the benefit of increased access to student academic progress data, access to a standardized educator evaluation tool, increased availability of online evaluations, the identification of the number and identity of effective educators, as well as the promotion of professional development may be achieved.

❖ **LEA Evaluators**

By enabling business changes for the LEA Evaluators then the benefit of access to a standardized educator evaluation tool and trained evaluators may be achieved.

❖ **IT**

By enabling business changes in IT then the benefit of increased access to student academic progress data, standardized educator evaluation tool, increased availability of online evaluations, as well as the identification of the number and identity of effective educators may be achieved.

❖ **Training & Support Programs**

By enabling business changes in Training & Support Programs then the benefit of training and supporting the educator evaluation tool and professional development program as well as trained and certified evaluators may be achieved.

❖ **Professional Development Program**

By enabling business changes for the Professional Development Program that includes best practices, then the benefit of promoting professional development of teachers and principals may be achieved.

## 20.4 Enabling Changes – Business Changes Linkage

This section lists the enabling changes and links them to their associated business process changes.

❖ **Provide Appropriate Frequency of Data Exchange & Granularity**

Appropriate frequency of data exchange & granularity must be completed in order to effect business changes in IT.

❖ **Implement Best Practices for Evaluator Training**

Implementing the best practices for evaluator training must be completed in order to effect business changes for LEA evaluators and for its inclusion in training and support programs.

❖ **Release & Deploy Process**

Release and deploy process documentation must be completed in order to effect business changes in IT and Training & Support Programs since they will be guided by this new set of organizational policies.

❖ **Design & Implement Professional Development Program**

An enabling change to design and implement a professional development program will need to be completed in order for the business changes to be available to the LEA Administrators and the Professional Development Program.

## 20.5 IT Enablers

The following Information Technology enablers are necessary to enable changes to the business in order and ultimately achieve the benefits and objectives linked to their respective drivers.

❖ **AELAS Data Service**

The AELAS Data Service generally refers to the ADE central data warehouse system known as Education Data Driven Decision Systems (ED<sup>3</sup>S) but which includes a data management component that allows the exchange of data between systems used by the LEAs and the ADE.

❖ **Value Add Services:**

Value add services refer to those systems, applications and/or products utilized by educational institutions (i.e. districts, charters, etc.) outside of the. LEA systems are categorized in either of the following areas:

- Teaching & Learning Systems
- Administrative Systems
- Back Office Systems

## 21.0 Appendix L – Arizona Education Reform Plan

Governor Jan Brewer’s Education Reform plan, also known as the “4 Pillars”, has this vision statement, “A future where all Arizona students are prepared to succeed in college and careers and lead this state in the next 100 years and beyond.” The “4 Pillars” is clearly aligned with ARD 15-249, SLDS Grant Programs, Prop 301, and SB 1040. Thus the focal point of the plan is for Arizona students prepared to succeed in college and careers around these key areas:

- ❖ Effective Use of Data to Monitor Student, Teacher & School Progress
- ❖ New College & Career Ready Standards & Assessments for all Students
- ❖ Great Teachers & Leaders
- ❖ Support for Struggling Schools so they can succeed

See the model diagram, to which, the narrative in the following sections pertain.

### 21.1 Drivers-Objectives linkage

The following objectives, referred to here as recommendations, are linked to the “4 Pillars” and aligned to drivers of organizational change where noted in parenthesis.

- ❖ **Create Statewide Longitudinal Data System (SLDS Grant)**

Recommendation #1: Create a Statewide Longitudinal Data System (SLDS) that spans P-20 and beyond.

Recommendation #2: Expand SLDS reach into the workforce, and support more than P-20.

Recommendation #3: Move data systems from compliance to use with a focus on teachers and teacher leaders.

Recommendation #4: Ensure that the SLDS links student performance data to specific classrooms and teachers, districts and schools, and teacher preparation programs.

- ❖ **Evaluate School Performance (SLDS Grant)**

Recommendation 13: Create a unified accountability system.

Recommendation 14: Evaluate the need to modify the academic receivership statutes to ensure that the state has sufficient remediation authority at the school and district level.

- ❖ **Adopt AZ Common Core Standards (ARS 15-249)**

Recommendation 5: Make the Common Core State Standards and the accompanying assessment a high priority.

Recommendation 6: Communicate to LEAs the transition plan from current AIMS items based on state standards to assessments based on the CCSS.

❖ **Expand & Develop Assessment Tools & Assessments (ARS 15-249)**

Recommendation 7: Expand formative assessment tools and development of interim assessments. This may be accomplished through IDEAL, the PARCC consortium, current district systems. etc.

❖ **Online Educator Observation & Evaluation Tool (SB 1040)**

Recommendation 8: Establish the use of educator evaluations to facilitate continuous improvement at all levels of a school.

❖ **Implement Professional Development Program (Prop 301)**

Professional development will be particularly focused on maximizing the use of assessment data to improve instructional practice:

Recommendation 9: Enhance incentives for alternative pathways.

Recommendation 10: Provide pre-service and new teachers and administrators with meaningful mentorship and induction experiences.

Recommendation 11: Provide incentives for highly effective educators to work in struggling schools.

Recommendation 12: Grow a cadre of turnaround experts at the teacher, principal, and district levels through a turnaround leadership training program that coordinates various leadership training opportunities.

❖ **Overarching Recommendations (All Drivers)**

Recommendation 15: Support Arizona's Education Reform Plan through reallocation and multi-purpose funding.

Recommendation 16: Create Regional Centers to address and support LEA capacity issues.

Recommendation 17: Engage higher education at a deep level in the implementation of the Arizona reform plan.

Recommendation 18: Establish, monitor and report performance measures and benchmarks that are public and transparent.

Recommendation 19: Clearly articulate the role of the P-20 Coordinating Council in implementing Arizona's education reform plan.

## 22.0 Appendix M – High Level Capabilities

This section summarizes the high-level list of capabilities for Teaching & Learning, Administrative, and Back Office systems are desired by LEAs in the state of Arizona. These systems would ultimately be found in the new ADE application portfolio.

There are some general features and high-level capabilities that should be available in any system that won't be included in the set of capabilities in each system in the subsections that follow. Capabilities of this type may include a single sign-on/ interoperability such as found in an Identity Management System (IMS) component, seamless integration with other systems where appropriate, a standard set of reports, browse and search capability for items and/or content in libraries, manage the configuration options if there are any, electronic or email alert notifications, and lastly the ability to exchange data with a centralized data management system repository or data warehouse to the extent necessary sometimes referred to as a Data Management System (DMS).

### 22.1 Core Services

#### 22.1.1 Identity Management System (IMS)

- Provide user and data security across all systems
- User and password management
- Role based user access across all systems

#### 22.1.2 Data Management System (DMS)

- Able to load and update content data from any system
- Search, index, browse, and retrieve content data elements
- Analysis of education data from other systems
- Maintain auditing data across systems
- Reporting with education data from other systems

### 22.2 Teaching & Learning Systems

#### 22.2.1 Instructional Improvement System (IIS)

For purposes of the ADE, an Instructional Improvement System will consist of Assessment System, Learning Management System, Professional Development, Content Management System, Educator Evaluation, and Data Management System and generally provides the following features:

- Technology-based tools providing teachers, principals, and administrators with actionable data
- Systemically manages continuous instructional improvement
- Promotes collaborative problem-solving and action planning
- Integrates instructional data with student-level data
- Provides early warning indicators of a student's risk of educational failure

**22.2.1.1 Assessment System (AS) – Student centric**

- Manage, assign, deliver, and score assessments
- Manage test items and forms including question types, questions, answers, rationale, etc.
- Authoring, reviewer, and approver workflows and tools
- Scoring tools
- Manage test setup options

**22.2.1.2 Learning Management System (LMS) – Teacher centric**

- Browse/Search course catalog and view course description/content
- Complete Pretest/Posttest
- Complete course evaluation
- View/Print transcript and certificate
- Manage learning activities (e.g. online courses, training, webinars, etc.) assign/schedule or publish, and archive
- Course/section self-registration and payment

**22.2.1.3 Professional Development (PD)**

- View/Print calendar including scheduled and completed evaluations, course sections, etc.
- Brick and mortar classroom, online, and asynchronous learning
- View/Print Certificate and Transcripts
- Progress Reports
- Override Class Enrollment
- Manage educator goal plans and coaching plans

**22.2.1.4 Content Management System (CMS)**

- Manage content and content types (e.g. videos, illustrations, textual, etc.)
- Upload external files (e.g. videos, illustrations, attachments, etc.)
- Publish, deliver, and archive content
- Authoring, reviewer, and approver workflows and tools

**22.2.1.5 Educator Evaluation (EE)**

- View, complete, submit and approve an evaluation
- Create and schedule cycles and individual evaluations for educators (i.e. teachers and principals)
- Manage evaluation model frameworks and tools
- Manage and deliver surveys
- Administer and assign evaluations to Educators
- Monitor progress

**22.2.2 Progress Monitoring / Response To Intervention**

- Student progress monitoring tools by stage of intervention
- Set intervention levels of intensity
- Manage resources: General education teachers, special educations and specialists
- Monitor learning rate and level of performance of individual students
- High-quality classroom instruction

- Ongoing student assessment
- Tiered instruction
- Parental reports on student progress

### **22.2.3 Credit Recovery / Credit Accrual**

- Section scheduling supports students across multiple districts or schools, students within same district only, or students within same school only
- Pre-Test/Post Test
- Face-to-face student-teacher interaction
- Manage course catalog including core and elective
- Independent completion option
- Accreditations

### **22.2.4 Collaboration & Conferencing Tools**

- Chat, Wiki, Blogs
- Discussion Boards
- Staff Collaboration & Conferencing

## **22.3 Back Office Systems**

### **22.3.1 Finance (FIN)**

- General Ledger capabilities
- Accounts Payable capabilities
- Accounts Receivable capabilities
- Controlling / Budgeting capabilities
- Fixed Assets Management capabilities
- Other capabilities include calendar and support for parent & child account codes

### **22.3.2 Human Resource Management (HRM)**

- Personnel/employee administration including personal information, benefits and termination
- Time Management (e.g. time clocks, etc.)
- Organization Management
- Recruitment/Talent Management
- Training & Development
- Payroll Management
- Self Service Center
- Manager Center

### **22.3.3 Procurement**

- Purchasing
- Inventory Management
- Vendor Management

- Materials Planning
- Warehouse Management
- Workflow/Approval
- Plant Maintenance

#### 22.3.4 Substitute Management

- Substitute pool management
- Manage absences & substitute assignments
- Communication tools

## 22.4 Administrative Systems

### 22.4.1 Nutrition and Food Management

- Manage menus
- Manage inventory
- Manage costs & income

### 22.4.2 Transportation Management

- Manage drivers
- Manage buses & maintenance
- Manage students & routes
- Manage extracurricular activities traffic

### 22.4.3 Guidance/Counselor

- Manage and track each counseling contact including reason and outcome, anecdotal comments, etc. over the course of a school year including history
- Configuration options including contact reasons, outcomes, follow-up date, etc.
- View/print cumulative counselor contact history for any student
- View/Manage counseling records
- Print list of contacts
- Permit a follow-up date for any counseling contact
- Manage Rules & Guidelines
- Incident reports

### 22.4.4 Individual Education Plan Management

- Forms management including referrals, meeting notes, prior written notices (PWN) as well as e-signatures, evaluations report forms, and design forms
- Manage library content including goals and prescriptions
- Manage plans such as student accommodation plan, individual language learner plan, individual compensatory plan, etc.
- 504 management compliance
- Monitor individual student progress

### 22.4.5 Library Management

- Acquisitions
- Book and Content Cataloging
- Circulation
- Serials: periodicals and other subscriptions
- Multi Media
- Overdue materials tracking
- Barcoding

### 22.4.6 Student Information System (SIS)

- Components or modules should include the following features and capabilities:
  - Discipline & Behavior Management
  - Gradebook
    - Lessons
    - Assignments
    - Progress
    - Grades reporting and transcripts management
  - Health & Immunization records management
  - Class scheduling management
  - Parent portal
- Student personal information
- Manage student absences
- Messaging among stakeholders
- School calendar functions

### 22.4.7 High-Stakes Test Analysis

- Robust import capability (i.e. national, state, and local assessments; information from a SIS; and student academic grades and attendance)
- Support report format and styles such as dashboards with drill-down, text, charts, graphs, etc.
- Support report groupings such as district, school, teacher, class, student; demographics or programs; cohorts; custom groupings; standards
- Support reporting periods such as single year, multi-year, custom date ranges, etc.
- Support output medium for reports including print, PDF, Excel CSV, and SAS

## 23.0 Appendix N – AELAS Appropriations & Efforts

The figure below details all the previous issues across ADE but specifically in relation to the Information Technology department supporting ADE program areas, legislative mandates, and LEAs. The left column outlines the issues when new management took over in January 2011. The right column outlines the resolutions executed to date to correct the problems with the AELAS appropriations.

Chart 44 –Performance Improvement Comparison from January 2011 to November 2012

| January 2011  | November 2012   |
|---|---|
| <p><b>No ADE Program IT strategy alignment</b></p> <ul style="list-style-type: none"> <li>IT set business priorities</li> <li>Not aligned to Agency goals</li> </ul>  | <p>Tech alignment with a purpose</p> <ul style="list-style-type: none"> <li>Aligned to Arizona Ready and ADE program areas</li> <li>Program areas dictate IT work priorities</li> </ul>   |
| <p><b>Nearly \$6B student payments processed with obsolete/inadequate infrastructure and software</b></p> <ul style="list-style-type: none"> <li>Unavailable 50% of the time</li> <li>Unsupported systems</li> <li>Agency vulnerable to cyber attacks (Network, servers never patched)</li> <li>&lt;30% systems patched</li> <li>Manual processes caused LEAs significant payment delays</li> </ul> | <p>Institute</p> <ul style="list-style-type: none"> <li>Obsolete SAIS hardware replaced without interruption</li> <li>Customer availability now at 99.75%</li> <li>FY Rollover completed in 6 days (down from 6 months)</li> <li>Supporting additional 73 School Finance systems without additional manpower</li> <li>Integrity increased to twice/week (from once/month)</li> <li>90% of databases updated to supportable platform                             <ul style="list-style-type: none"> <li>Security and Patch manager enables 98% of all systems patched November 2012</li> </ul> </li> </ul> |
| <p><b>No customer service</b></p> <ul style="list-style-type: none"> <li>800+ open customer issues</li> <li>Outstanding issues not addressed</li> <li>Phones never answered</li> </ul>  | <p>Created SMART objectives for Service Center</p> <ul style="list-style-type: none"> <li>Open customer issues reduced to 92</li> <li>98% of phone calls are answered within 45 seconds</li> <li>Team answered 1,247 customer calls with 44% customer issues resolved immediately</li> </ul>  |
| <p><b>Inflexible systems that could not anticipate change</b></p> <ul style="list-style-type: none"> <li>Legislative changes implemented late or never completed.</li> <li>LEA requests never addressed</li> </ul>  | <p>Systems</p> <ul style="list-style-type: none"> <li>Legislative changes implemented on time, as directed</li> <li>LEAs data needs are being studied to ensure proper deployment of systems</li> </ul>   |
| <p><b>Non-compliant software licensing put Agency at risk</b></p>   | <p>Inventoried Agency software use and purchased adequate licensing to support needs</p>  |
| <p><b>State Auditor/Attorney General findings never addressed</b></p> <ul style="list-style-type: none"> <li>Email was not searchable</li> <li>Identity Management at Risk (3 separate</li> </ul>   | <p>Findings</p> <ul style="list-style-type: none"> <li>Upgraded email (Exchange) to ensure eDiscovery</li> <li>Extensive work underway to replace ADE</li> </ul>  |

|   |   |
|---|---|
| <p>hardcoded security systems)</p> <ul style="list-style-type: none"> <li>Any developer could make any change to any system without traceability</li> </ul>   | <p>security systems</p> <ul style="list-style-type: none"> <li>Controlled access limiting to only what the user/system</li> </ul>   |
| <p><b>IT Costs not evident to program areas</b></p> <ul style="list-style-type: none"> <li>Funding does not meet demand</li> </ul>  | <p>Shifted to a product-based model</p> <ul style="list-style-type: none"> <li>Identified full service cost to be transparent to all customers and program areas</li> </ul>   |
| <p><b>IT lacked process and accountability</b></p> <ul style="list-style-type: none"> <li>&gt; 86 % of all changes failed</li> <li>Software never tested (coded in production)</li> <li>90% IT labor not tracked</li> <li>Extensive labor just to keep lights on</li> <li>Customers had to notify ADE when systems went down</li> </ul> | <p>Process and Accountability</p> <ul style="list-style-type: none"> <li>Automated system monitoring proactive reaction to system outages</li> <li>First state agency to use ITIL (best-in-class processes)</li> <li>Change management procedures leading to 125% increase in software change success                             <ul style="list-style-type: none"> <li>Increase to 79 changes a month with less than 3% failure (Above Industry Standard)</li> </ul> </li> <li>Implemented Capacity Management now able to predict server and storage capacity</li> </ul> |
| <p><b>Software Development did not follow standard methodologies</b></p> <ul style="list-style-type: none"> <li>Developers used non-standard coding practices</li> <li>Software was not internally documented</li> <li>Quality Assurance never conducted</li> </ul>   | <p>Software Development</p> <ul style="list-style-type: none"> <li>Creating common best practice standards allowing for consistent support models and lower maintenance costs</li> <li>Extensive implementation of a shared, locked down development tools (TFS)</li> <li>All software documented, tested and verified before put into production</li> </ul>  |
| <p><b>No Data Governance</b></p> <ul style="list-style-type: none"> <li>LEAs constantly asked for duplicate data that agency multiple copies of                             <ul style="list-style-type: none"> <li>57,000 Data Entities vs. 1500?</li> </ul> </li> </ul>  | <p>Complete data governance assessment underway</p> <ul style="list-style-type: none"> <li>State Data Governance Commission launched</li> <li>Common Education Data Standards adopted</li> <li>Created Data Officer position</li> <li>Hired industry-expert to build Data Governance roadmap</li> </ul>   |
| <p><b>Systems were not Documented</b></p> <ul style="list-style-type: none"> <li>Extensive time to repair</li> </ul>  | <p>Documenting all IT systems</p> <ul style="list-style-type: none"> <li>Reversed Engineered SAIS</li> <li>Increases ability to support and build future roadmap</li> </ul>   |
| <p><b>Obsolete website</b></p> <ul style="list-style-type: none"> <li>Out-of-date content</li> <li>Lacked user-friendly design</li> </ul>   | <p>Deployed open source website for less than \$180k</p> <ul style="list-style-type: none"> <li>Ability to provide immediate content updates</li> <li>Redesigned layout for easier customer use</li> </ul>  |
| <p><b>Legacy financial system did not provide timely payments</b></p>   | <p>New system enables daily grant payments and other disbursements</p> <ul style="list-style-type: none"> <li>Easier agency reporting</li> </ul>  |

## 24.0 Appendix O – Financial Assumptions

### 24.1 Assumptions, Drivers & Assertions

- Within each ADE Program Area the individual application/utility are grouped in accordance to program specific dependency prioritized as that combined group where needed, to assure a single workflow based end to end service is developed;
- The projects related to the IT areas, e.g. Data Governance, are run in parallel or prior to the ADE program area rebuilds as necessary. For example ADE has begun Data Governance and Data Management however this is predominantly in the socialization stage with its actual execution will occur in parallel with the rebuild of SAIS;
- The SAIS reverse engineering undertaken by ADE in 2012 identified numerous gaps of knowledge, documentation, hidden applications which is believed to be a consistent issue across all program areas;
- The SAIS reverse engineering assessment was conducted at a cost of approximately \$1.5 million to document and identify its twenty functional modules, and numerous related hidden modules, used in SAIS and School Finance. It is assumed that this represents a sufficiently accurate cost basis in which to estimate the needed reverse engineering of each and every function module across ADEs internal systems;
- The reverse engineering of existing Program Area applications/utilities will identify the requirements, the business rules, and determine the needed data. It will also serve to drive the correction to the existing data infrastructure to conform to the Ed-Fi standard;
- The estimated cost to rebuild SAIS modules, excluding School Finance function modules, in accordance with the Architecture proposition can be applied across the each and every function module within ADE;
- The annual cost of Business as Usual (BaU) maintenance and modifications of existing function modules reflects the investment costs made into the existing function module portfolio;
- The cost of implementing Data Governance includes the necessity of documenting the data assets across the department and represents approximately 15% of utility investment costs. This investment cost is comprised of the costs of assigning and training dedicated personal to data collection, the cost of rebuilding existing databases and migrating data to operational data stores from extensive isolated sources;
- The costs associated with implementing the platform architecture requires only a few specific components (specifically: the workflow management capability and rules engines management capability) to be added as a result of ADEs existing Microsoft investments;
- The costs of implementing the ITIL framework requires supporting technologies (e.g. environment monitoring system), as well as training, coaching and procedural developments;
- Several in-flight application replacements, Teacher Certification, Grants Management, et al, provide representative baseline typical costs for application replacement within ADE that are reflected within the cost estimates provided;
- Costs for virtualizing/clouding applications and data will significantly reduce the costs and risks associated with business continuity planning. The goal of which will be to virtualize and replicate as much of the infrastructure as possible which is only applied to data with ADE at this point in time;

- Applications/Utilities that are 'in flight' for replacement, although not meeting the all the desired and target architectural requirements, will not be considered for replacement within the horizon of this business case but will form part of the next 5 year strategic review and will remain in the service catalog pipeline e.g. grants management, teacher certification, etc.;
- A significant part of the existing data cost base includes a data footprint in excess of 14Terabytes as a result of data duplication where estimates show that the total footprint, based on data profiling, should be in the neighborhood of 2 to 3 Terabytes which is part of the data cleanup effort contained within Data Governance and Master Data Management;
- The service cost includes the following tasks or activities in Project Management
  - i. Requirements Analysis
  - ii. Design
  - iii. Development
  - iv. Testing
  - v. Defect removal
  - vi. Implementation
  - vii. Training
  - viii. 5 year on-going support (BaU);
- System or application costs are assumed to follow a "build and replace" approach as much as possible. A different roll out strategy could drive prices upward when needing to extend current application life spans and run in parallel to build out efforts;
- A bucket approach to the portfolio categories consisting 'simple', average and complex are used for which timeline and base replacement costs (using numerous in flight and prior estimates) are applied;
- Validation of the cost basis – several independent baseline were taken the cost model was constructed that included (1) elements of the Certification program that are being replaced by the in-flight application resulted in the same cost estimate as the actual project costs; (2) the replacement of the SAIS and School finance modules yielded the same estimate as that provided during the re-engineering effort; and, (3) the cost of the grants management application
- Savings are anticipated, and evaluated, to accrue only after the expected release of e-architected applications although there will be benefits during their replacement by new systems;
- Costs are assumed to be consistent across all application and utility replacement however it is anticipated that improved learning, such as the improved maturity, procurement process, advanced tools, etc, will enable ADE to reduce some costs over the five year investment period.

In developing the AELAS costs the team used three estimation techniques to derive the overall costs :

- 1) Analogous approach: actual costs of previous and similar projects were used as the basis for the "replace" estimates;
- 2) Bottom-up: estimated individual work items and aggregated them in order to achieve the targeted service configurations; and,
- 3) Parametric: project characteristics, using (1) and (2), were injected within mathematical models to estimate costs.

The justification for using these three approaches is that there is a patchwork of existing applications/utilities costs, in flights development/implementation costs, blended applications/utilities costs (indices that cover several applications/utilities), as well as new capabilities for which costs can be derived based on anticipated adoption patterns using the focus group, survey, and on-site visit data to determine.

- The investment estimates provided reflect an accuracy of  $\pm 20\%$  which reflects a class b estimate; (In business case analysis there are typically 3 classes :C- approximate estimate which is  $\pm 30-40\%$ , class B which is 15-20% and class A, this is the final go ahead at  $\pm 5\%$ ) (Fursov)
- The planning and strategic horizon of the ADE core services is limited to the next five years, however, the investment model projects out ten years to include the full maturation of the benefits realized;
- Each ADE Program Area is prioritized for replacement to ensure that the data streams collected aligns with the needs of and provide the highest value proposition for SLDS-AED<sup>3</sup>S efforts
- Inflation rate of 3% is used in net present value calculations
- The current operational costs to support and sustain the environment is anticipated to shift from “emergency repair improvement” towards a “sustain and improve” however little or no costs savings are anticipated given that the current budget barely allows the ability to support the current environment.

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## 25.0 Appendix P – Detailed Portfolio Roadmap

The following table lists the five year roadmap for each and every application across the business units. The priority reflects the year at which the particular application/utility is scheduled for replacement. Note that the ordering is based on the strategic priority of the impact to the value proposition that the given data stream can provide to both ADE as well as the LEAs. To provide a more condensed and readable version of these details, the applications/utilities are grouped by Program Area Units however this table should be referred to for the specific task execution sequence.

Chart 45 –ADE Portfolio of Applications

| TASK ID  | Priority  | Program Area Unit                        | Current Application Name                             |
|----------|-----------|--|--|
|          | In-flight | Certification                            | Title II Higher Education Act                        |
|          | In-flight | Certification                            | Certification Search                                 |
|          | In-flight | Certification                            | DPS File Import Service                              |
|          | In-flight | Certification                            | Institutional Recommendations                        |
|          | In-flight | Exceptional Student Services             | Transition Outcomes Project                          |
|          | In-flight | Exceptional Student Services             | EAPN Calendar Setup                                  |
|          | In-flight | Grants Management                        | Grants Management                                    |
|          | In-flight | Grants Management                        | ARRA Recipient Reporting                             |
|          | In-flight | Maricopa County Education Service Agency | MCESA REIL - Observation Data Capture Tool           |
|          | In-flight | Statewide Longitudinal Data System       | Arizona Education Data Warehouse                     |
| <b>1</b> | 1         | Agency                                   | Enterprise   |
| <b>2</b> | 1         | Agency                                   | Education Directory / School Search                  |
| <b>3</b> | 1         | Agency                                   | Online Registration Internal Web-Online Registration |
| <b>4</b> | 1         | Agency                                   | SelectSurvey.NET                                     |
| <b>5</b> | 1         | Agency                                   | Request Logins                                       |
| <b>6</b> | 1         | Assessment                               | AIMS SAIS Matching                                   |
| <b>7</b> | 1         | ASU/Educational Technology               | IDEAL Admin (there are 6 applications in here)       |

| TASK ID | Priority | Program Area Unit              | Current Application Name               |
|---------|----------|--------------------------------|--|
| 8       | 1        | Communications                 | AZED.GOV Website                       |
| 9       | 1        | Professional Development       | CSPD Event Scheduling                  |
| 10      | 1        | Exceptional Student Services   | Alternate Assessments                  |
| 11      | 1        | Exceptional Student Services   | Exception to the 1% Cap                |
| 12      | 1        | Exceptional Student Services   | Alternate Assessments Report Utilities |
| 13      | 1        | Exceptional Student Services   | Annual Site Visit                      |
| 14      | 1        | Exceptional Student Services   | ESS Monitoring (Legacy)                |
| 15      | 1        | Exceptional Student Services   | ESS Monitoring + Admin Module          |
| 16      | 1        | Exceptional Student Services   | ESS Specialist                         |
| 17      | 1        | Exceptional Student Services   | ESS Annual Data                        |
| 18      | 1        | Exceptional Student Services   | ESS Census Verification                |
| 19      | 1        | Exceptional Student Services   | Post-School Outcomes Survey            |
| 20      | 1        | Highly Qualified Professionals | Highly Qualified Teacher Application   |
| 21      | 1        | Information Technology         | Data Governance                        |
| 22      | 1        | Information Technology         | Master Data Management                 |
| 23      | 1        | Information Technology         | Network upgrade                        |
| 24      | 1        | Information Technology         | ITIL Framework                         |
| 25      | 1        | Information Technology         | Platforms Architecture build           |
| 26      | 1        | Information Technology         | Knowledge Platform build               |
| 27      | 1        | Information Technology         | Rules Engine build                     |
| 28      | 1        | No Child Left Behind           | NCLB-Monitoring                        |
| 29      | 1        | No Child Left Behind           | No Child Left Behind Plans and Reports |
| 30      | 1        | School Finance                 | SAIS Integrity                         |
| 31      | 1        | School Finance                 | SAIS Transactions                      |
| 32      | 1        | School Finance                 | Student Detail Application Console     |

| TASK ID | Priority | Program Area Unit            | Current Application Name                    |
|---------|----------|------------------------------|---|
| 33      | 1        | School Finance               | School Finance File Upload (Student Counts) |
| 34      | 1        | School Finance               | SaisOnline                                  |
| 35      | 1        | School Finance               | SAIS ID Number Search                       |
| 36      | 1        | School Finance               | SAIS Aggregation                            |
| 37      | 1        | School Finance               | Student Details Split and Merge             |
| 38      | 1        | School Finance               | Charter Estimated Counts                    |
| 39      | 1        | School Finance               | Cutoff Maintenance                          |
| 40      | 1        | School Finance               | Student Counts Administration               |
| 41      | 1        | School Finance               | Student Counts Systems                      |
| 42      | 1        | School Finance               | LEA Calendar                                |
| 43      | 1        | School Finance               | LEA Profile                                 |
| 44      | 1        | School Finance               | October Enrollment Aggregation Requestor    |
| 45      | 1        | School Finance               | SDER  |
| 46      | 2        | Academic Achievement         | Adult Education (AES)                       |
| 47      | 2        | Academic Achievement         | High Honors Tuition                         |
| 48      | 2        | Academic Achievement         | Student Detail Data Interchange (SDDI)      |
| 49      | 2        | Academic Achievement         | Academic Achievement Reports                |
| 50      | 2        | Academic Achievement         | ADE FormBuilder                             |
| 51      | 2        | Assessment                   | Testing Data Correction                     |
| 52      | 2        | Assessment                   | Student Demographics for Test Labels        |
| 53      | 2        | Exceptional Student Services | CSPD Coaching and SUPPORT Cadre Management  |
| 54      | 2        | Exceptional Student Services | CSPD Evaluation Tracking                    |
| 55      | 2        | Exceptional Student Services | ESS Dispute Tracking                        |
| 56      | 2        | Exceptional Student Services | ESS Grants                                  |
| 57      | 2        | Exceptional Student Services | EssSurrogate                                |

| TASK ID | Priority | Program Area Unit              | Current Application Name                    |
|---------|----------|--------------------------------|---|
| 58      | 2        | Exceptional Student Services   | Parent Involvement Survey (ParIS)           |
| 59      | 2        | Exceptional Student Services   | Parent Survey Acct Allocator                |
| 60      | 2        | Exceptional Student Services   | ESS Vouchers + Admin Module                 |
| 61      | 2        | Exceptional Student Services   | Educational Vouchers                        |
| 62      | 2        | Research and Evaluation        | Arizona Growth Model Chart                  |
| 63      | 2        | Research and Evaluation        | AZ LEARNS / Adequate Yearly Progress (NCLB) |
| 64      | 2        | Research and Evaluation        | R & E Administration                        |
| 65      | 2        | Research and Evaluation        | School Report Card                          |
| 66      | 2        | Research and Evaluation        | SchoolReportCards datacollection            |
| 67      | 2        | Research and Evaluation        | State Report Card                           |
| 68      | 2        | School Finance                 | Transportation Routes                       |
| 69      | 2        | School Finance                 | Vehicle Inventory                           |
| 70      | 2        | School Finance                 | Budget Tools                                |
| 71      | 2        | School Finance                 | Budget Error / Suspense Maintenance         |
| 72      | 2        | School Finance                 | School Finance File Upload (Budget/AFR)     |
| 73      | 2        | School Finance                 | Object Run Manager                          |
| 74      | 2        | Special Populations / Projects | AIMS Certificate Generation                 |
| 75      | 2        | Standards and Assessments      | AZSafe                                      |
| 76      | 2        | Standards and Assessments      | Online Prevention Training                  |
| 77      | 2        | Standards and Assessments      | AIMS / Data Extract                         |
| 78      | 2        | Standards and Assessments      | Assessments Administration                  |
| 79      | 2        | Standards and Assessments      | Graduation Rate / Dropout Rate Calculator   |
| 80      | 2        | Standards and Assessments      | Assessments Reports in SDDI                 |
| 81      | 2        | Standards and Assessments      | Assessments StudentSelector                 |
| 82      | 2        | Title I                        | Title I School Status                       |

| TASK ID | Priority | Program Area Unit                               | Current Application Name           |
|---------|----------|---|------------------------------------|
| 83      | 2        | Title I   | State Tutor Fund                   |
| 84      | 3        | Audit Unit                                      | Single Audit Tracking Database     |
| 85      | 3        | Audit Unit                                      | Indirect Costs                     |
| 86      | 3        | Career and Technical Education                  | CTE Assessment                     |
| 87      | 3        | Career and Technical Education                  | AZ Heat                            |
| 88      | 3        | Career and Technical Education                  | Performance Measures               |
| 89      | 3        | Early Childhood                                 | Early Childhood Data Collection    |
| 90      | 3        | Early Childhood                                 | Even Start Family Literacy         |
| 91      | 3        | Educational Technology                          | ALEAT                              |
| 92      | 3        | Educational Technology                          | ALEAT SharePoint Portal            |
| 93      | 3        | Educational Technology                          | Ed Tech Survey                     |
| 94      | 3        | Educational Technology                          | Ideal                              |
| 95      | 3        | Human Resources                                 | Timesheets                         |
| 96      | 4        | Office of English Language Acquisition Services | OELAS                              |
| 97      | 4        | Office of English Language Acquisition Services | AMAO Admin Comments                |
| 98      | 4        | Office of English Language Acquisition Services | AMAO Profiles                      |
| 99      | 4        | Office of English Language Acquisition Services | OELAS Common Logon Application     |
| 100     | 4        | Office of English Language Acquisition Services | SEI Budget                         |
| 101     | 4        | Office of English Language Acquisition Services | SEI Budget Request Application 2.0 |

| TASK ID | Priority | Program Area Unit    | Current Application Name                       |
|---------|----------|----------------------|--|
| 102     | 5        | Health and Nutrition | Food Distribution Program                      |
| 103     | 5        | Health and Nutrition | NSLP Nutrition Calculator                      |
| 104     | 5        | Health and Nutrition | CACFP Nutrition Calculator                     |
| 105     | 5        | Health and Nutrition | CNP Annual Financial Report                    |
| 106     | 5        | Health and Nutrition | CNP Direct Certification / Direct Verification |
| 107     | 5        | Health and Nutrition | CNP Direct Verification                        |
| 108     | 5        | Health and Nutrition | CNPWeb   |
| 109     | 5        | Health and Nutrition | CRE/SFSP Review Forms - SharePoint             |
| 110     | 5        | Health and Nutrition | SFSP External Information Web                  |
| 111     | 5        | Human Resources      | HR Online Registration                         |
| 112     | 5        | Human Resources      | Intranet (Legacy)                              |

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## 26.0 Appendix Q – Ishikawa Diagram

The following figure depicts the root-cause analysis of the preponderance of data related issues that occur within the ADE. The analysis was conducted by asking the entire consumer and support community about the 'errors' and 'inaccuracies' and their observed sources across the entire set of program area groups. These data issues were then mapped to the specific source modules within the SAIS data collection system to identify the specific pieces that are responsible for causing the problems.

The conclusion reached from this analysis, as well as the main priority to drive the ADE program replacement initiative in the AELAS roadmap, is the fact that the SAIS collection system, and in particular the first two main modules, known as Validation and Integrity, are the primary root causes of the majority of issues within and across ADE program areas. This is particularly critical as it this is the data source for 90%+ of all payments made by the ADE.

The end result is the prioritization of the replacement of the SAIS and subsequent finance capability as being the most critical and near term benefit that can be derived across all the programs in ADE. The result of this analysis ties to the process maps that were created across ADE that indicates how much manual work results due to the poor data quality at this stage.

See Appendix Q.

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## 27.0 Appendix R - Hosting Services & Private Cloud

Current research revealed that if storage and computing requirements are not proactively managed then they have the potential to cause unnecessary sprawl within the data center which in turn exacerbates the usually lean technical support team required to maintain a pre-specified level of service (Microsoft, 4).

A recent visit to the Arizona Department of Administration (ADOA) data center where the ADE servers and over one hundred twenty applications are hosted revealed they are experiencing the same issue with varying types of servers housed within a number of storage racks. One method of addressing this issue of server sprawl, application management, and other technical support issues would be to implement virtualization & private cloud technologies.

“The public cloud and private cloud share a key characteristic server virtualization at scale. No other technology has provided the data center with greater cost savings (in terms of increased hardware utilization) and agility (in terms of moving and scaling workloads) than server virtualization, but at a certain point, perhaps when hundreds of physical hosts and thousands of VMs are reached, virtualization becomes hard to manage with default virtualization management software.” (Knorr)

Thus, alternative hosting service solutions other than ADOA, offering virtualization and cloud solutions were evaluated. Only three vendors responded correctly to the issued RFI and its requirements. As a result, additional research was performed to identify additional, well-established vendors that were identified as “leaders” in the Gartner Magic Quadrant for managed hosting and public cloud IaaS categories. See Figure 12. Each vendor was then invited to demonstrate their respective solutions based on the following general criteria; Private Cloud, Data Store, Middleware, Infrastructure, Microsoft SLA, and Support SLA.

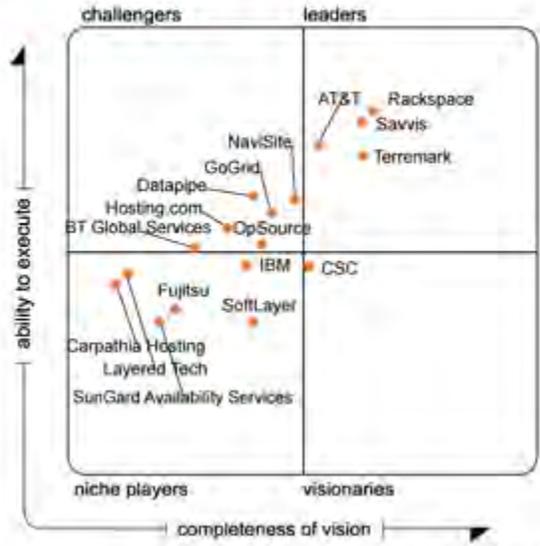
Other key considerations included:

- Sustainability;
- Interoperability
- Scalability
- High Availability
- Business Continuity
- Security
- Infrastructure Architecture

Of the five vendors only three chose to make presentations: Amazon Web Services, Savvis, and Terremark. AT & T and RackSpace declined to present their solutions. For the full report see chart 46.

Figure 12 - Gartner MQ Reports

**Magic Quadrant for Managed Hosting**



**Magic Quadrant for Public Cloud Infrastructure as a Service**



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The figure below summarizes the findings from this series of vendor demonstrations:

**Chart 46 – Vendor Private Cloud Analysis**

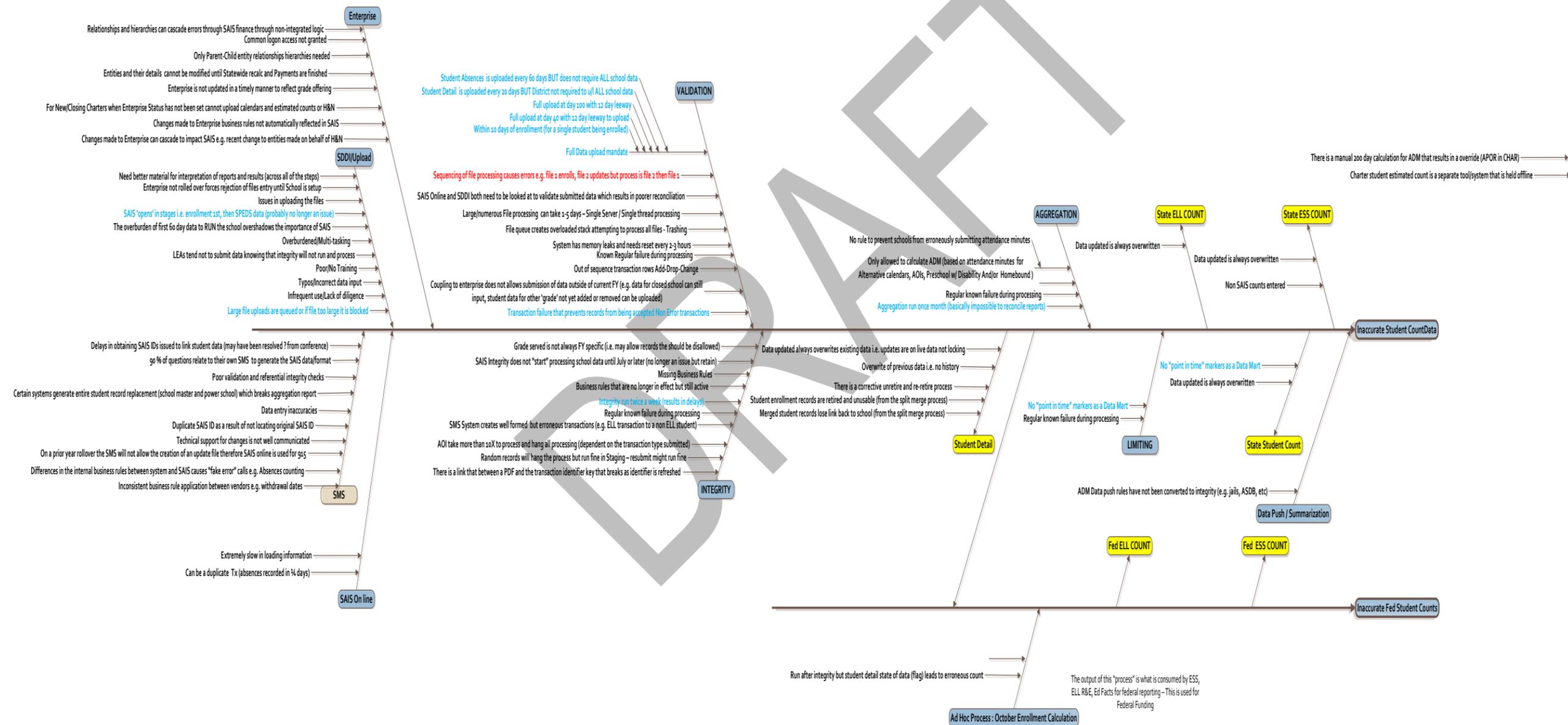
| Vendor               | Pluses   | Minuses   |
|----------------------|--|---|
| Amazon Web Services  | <ul style="list-style-type: none"> <li>• #1 ranking - IaaS</li> <li>• Data centers: CA, OR, and VA</li> <li>• Least expensive</li> </ul>   | <ul style="list-style-type: none"> <li>• Unranked - Managed Hosting</li> <li>• ADE responsible for any hosted application</li> <li>• Presentation only covered infrastructure and pricing but no management portal</li> </ul> |
| CenturyLink / Savvis | <ul style="list-style-type: none"> <li>• #2 ranking - IaaS</li> <li>• #2 ranking - Managed Hosting</li> <li>• #2 regarding cost</li> <li>• 50+ data centers nationwide</li> <li>• Management portal very intuitive with easy-to-use tools</li> <li>• Solution includes Managed Applications, Web Hosting, SaaS enablement, Business Continuity, Content Management, and Proximity Hosting</li> </ul> | <ul style="list-style-type: none"> <li>• None identified</li> </ul>   |
| Verizon / Terremark  | <ul style="list-style-type: none"> <li>• #4 ranking - Public Cloud IaaS</li> <li>• #4 ranking - Managed Hosting</li> <li>• #3 regarding costs</li> <li>• 20+ data centers nationwide</li> </ul>  | <ul style="list-style-type: none"> <li>• Unclear position “Anything as a Service”</li> <li>• Unable to discuss Managed Applications</li> </ul>  |



Figure 13 - SAIS Ishikawa Diagram

# SAIS -- ISHIKAWA DIAGRAM

- Assumptions :
- (1) Errors that are accepted by the system
  - (2) Errors that are caused by the system
  - (3) Inaccuracies that result from timing issues
  - (4) Interested in 'errors' that still result in data load



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