NASCIO
Representing Chief Information Officers of the States

NASCIO 2008 Survey of the States

Digital States At Risk!

Modernizing Legacy Systems

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Please direct any questions or comments about "*Digital States at Risk!: Modernizing Legacy Systems*" to Drew Leatherby at dleatherby@amrms.com or (859) 514-9178.

Background & Approach

In 2008, NASCIO asked state CIOs to participate in a Web-based survey regarding the status of "legacy systems" and modernization efforts in their states. The results of this survey serve as the baseline for this report. The online survey was completed by the state Chief Information Officer or other members of the state IT function.

NASCIO does not rank states, but individual responses are available to state members so they may better assess their respective IT modernization initiatives. Many of the states that responded requested that NASCIO keep their identities confidential, so specific state attributions to many comments have been removed. Through this report, NASCIO hopes to establish a baseline for what states consider to be "legacy systems" in their IT operations; assess what impact these systems are having on the operations of critical business applications, and strategies states are utilizing to modernize these systems without interruption to service delivery.

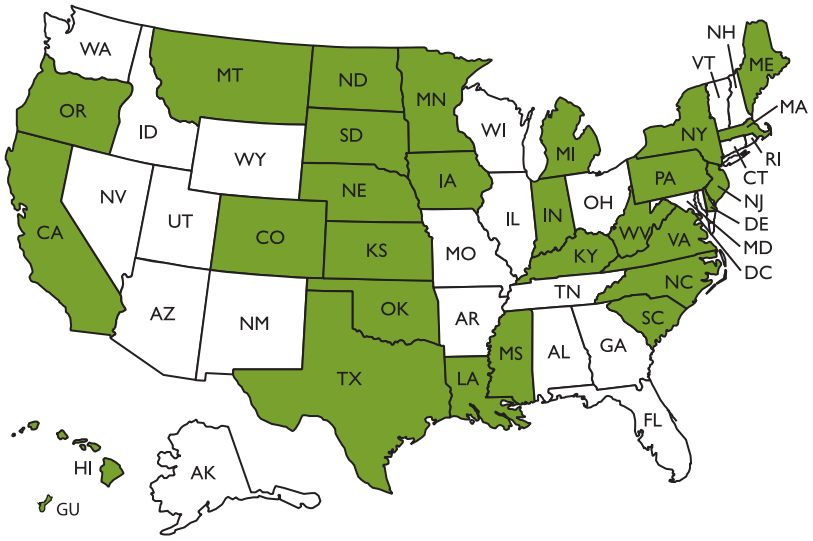
Survey Participants

Twenty-nine states responded to the survey from July 30 through September 5, 2008, representing approximately ***62.72** percent of the nation's population. Participation included a wide distribution in geography, population, and budget.

***Source**: Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to **July 1, 2007** (NST-EST2007-01) <www.**census**.gov/popest/**states**/tables/NST-EST2007-01.xls>

The following states responded *(listed alphabetically)*:

1. California
2. Colorado
3. Delaware
4. Guam
5. Hawaii
6. Indiana
7. Iowa
8. Kansas
9. Kentucky
10. Louisiana
11. Maine
12. Massachusetts
13. Michigan
14. Minnesota
15. Mississippi
16. Montana
17. Nebraska
18. New Jersey
19. New York
20. North Carolina
21. North Dakota
22. Oklahoma
23. Oregon
24. Pennsylvania
25. South Carolina
26. South Dakota
27. Texas
28. Virginia
29. West Virginia



Executive Summary

As economic conditions worsen in late 2008, states are facing conditions that continue to deteriorate. Revenue collection is down and budget cuts are in effect, underway or being proposed to trim state spending. Although the current fiscal crisis in the states is more severe than could be anticipated, State Chief Information Officers (CIOs) are faced with the same continuing pressures. State CIOs are required to streamline IT budgets, justify IT spending and increase service delivery and efficiency to their government, citizen and business customers. The modernization of state IT legacy systems is emerging as a significant financial, technical and programmatic challenge to states' ability to deliver services to citizens, and conduct day-to-day business. Although state governments have advanced their IT environment with investments in new technologies, flexible programming and a portfolio of online services, most still live with legacy. Many state systems have become obsolete, difficult to secure, costly to operate and support. Without investments in legacy system renovation, modernization or replacement, the ability of states to operate as a modern organization and serve its citizens is at risk.

Recognizing this challenge, the National Association of State Chief Information Officer's (NASCIO's) Executive Committee charged the Legacy Systems & Modernization Working Group to address issues related to the many strategies, options and approaches states are considering to modernize state IT legacy systems and legacy applications. The goal of the working group is to provide members of NASCIO with information and tools for the enhancement to the technical environment of existing legacy applications, re-engineering of commercial "off-the-shelf" software, conversion or translation to newer programming languages and technology platforms, extension of existing systems to Web-based applications and other presentation layers, utilization of Enterprise Application Integration (EAI) to encapsulate and link legacy applications, and other approaches such as renovation, extension, Service Oriented Architecture (SOA), data conversion, applications wrapping, and use of automation tools.

NASCIO's Definition of "Legacy System" for the Purposes of this Survey

The working group prepared a baseline definition of "legacy system" for the purpose of keeping responses to this survey uniform. The definition agreed upon reads: "A ***Legacy System*** is not solely defined by the age of IT systems (e.g. 20 years) as there are many systems that were designed for continued upgrades, but the term also focuses on elements such as "**supportability**,""**risk**" and "**agility**," including the availability of software and hardware support, and the ability to acquire either **internal** or **outsourced** staffing, equipment or technical support for the system in question. The term may also describe the system's inability to adequately support "**line-of-business**" requirements or meet expectations for use of modern technologies, such as workflow, instant messaging (IM) and user interface." Respondents affirmed the priority elements of this definition in survey question 2.3.

[**Note**: "Line-of-Business," often referenced in this report refers to states' specific programmatic activities, e.g. specific services provided by a state agency to internal or external citizen customers.]

Key Survey Findings

NASCIO surveyed state CIOs concerning their legacy system modernization status, modernization strategies and initiatives. The trends exposed in responses from 29 states revealed that states' classify approximately half of their IT systems as "legacy systems" and also classified approximately half of those systems as being in critical lines-of-business; see results below:

For updated information on the fiscal condition of the states and projections for 2009 in the coming year, please reference, ***The Fiscal Survey of the States***, <www.nasbo.org/Publications/PDFs/Fall2008FiscalSurvey.pdf>, Copyright December 2008 by the National Governors Association (NGA) <www.nga.org>, and the National Association of State Budget Officers (NASBO) <www.nasbo.org>. All rights reserved.

Excerpt from Table 2. "Drivers" moving states towards modernization of IT systems and applications;" N=29.

Drivers towards modernization	Percentage
Change or re-engineering of business processes	86.2%
Inability to adequately support "line-of-business" requirements	82.8%
Application design limitations	69.0%
"Graying" of IT staff	69.0%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

Excerpt from survey question **2.1**
Percentage of IT systems in your state labeled "Legacy Systems?" (N=29)

35.4% – 40 to 60 percent
31.0% – 60 to 80 percent

Excerpt from survey question **2.2**
Percentage of "Legacy Systems" identified as mission or business critical? (N=29)

34.5% – 40 to 60 percent
27.6% – 60 to 80 percent

It was also evident from the survey results that most states are facing their largest legacy challenges with their Enterprise Resource Planning (ERP) systems, and in their highly siloed federal program management systems. The majority of respondents indicted that the lines-of-business where most of their states' "Legacy Systems" were located, were their Administrative information systems (e.g. finance, human resources (HR), procurement, etc.), and applications that require outside federal interaction, (e.g. health and human service related systems); see results below:

Excerpt from survey question **2.4**
Lines-of-business in which most of your state's "Legacy Systems" are located; (N=29)

86.2% – Administrative information systems (e.g. finance, HR, procurement, etc.)
82.8% – Applications that require outside federal interaction, (e.g. health and human service related systems)

Survey results also indicated that the primary "drivers" moving states towards the modernization of IT systems and applications, are the need to change or re-engineer business processes and the inability to adequately support "line-of-business" requirements. Application design limitations and the "Graying" of IT staff[1] were the next most highly indicated drivers; *see excerpt from table 2.*

Current Trends in State IT Legacy System Modernization

Current trends that emerged from the responses for states' legacy system modernization efforts demonstrated that the utilization of techniques to manage the aging and replacement of systems, including "**life-cycle approaches**" for applications and infrastructure or plans they developed in advance for the "**end-of-life**" of new IT systems were on the rise. For most states, life-cycle planning was a state-wide function; however, five states indicated that life-cycle planning was still a function of the individual agencies. With few states responding, it would appear that end-of-life planning is an emerging trend.

Additional insights from respondents indicated states are utilizing a myriad of **strategies** to mitigate the obstacles and challenges associated with the aging of IT systems; including:

- Overcoming **Cost/Resource Availability** and achieving cost reductions through the use of master contracts to facilitate volume purchasing of hardware and software.

- Addressing **Culture/User Resistance to Change** by involving end-users "early and

often" during business process reviews, and improving communications with affected organization(s) at all levels, agency directors, finance officers and end users.

- Some states are establishing enterprise application program offices to modernize legacy administrative applications, exploring "Shared Services" solutions across agencies to satisfy similar needs and increasing business owner involvement in legacy system replacement decisions to deal with the **Inability to Support Common Approaches**.

- The **Lack of Executive Management Interest and Reluctance to Address Legacy Issues** is being solved through meetings with the legislature to explain issues and gain their support. Working with clients during the budget planning process in an attempt to justify the funding needed to replace the legacy systems is also a technique gaining traction.

- One of the main problems at the heart of advancing the replacement of massive IT systems is the **Lack of Project/Program Management and Adequate Governance**, which many states are addressing through the establishment of program management offices, strategic planning, Enterprise Architecture (EA) and SOA, and the use of outside consultants to drive and manage organizational program-level, and technology change.

- Another major concern of states is the **Risk of Migration** for which many CIOs are utilizing joint application development sessions with business users and legacy IT staff, and clustering agencies to develop common plans to ease integration of modernized applications across agency lines.

Finally, the complex issue of **identifying funding sources**[2], which has slowed many state IT initiatives, is pushing states towards innovative funding practices including an increased focus on justifying IT projects through robust business case development, looking at bond issues, federal funding opportunities and outsourcing strategies as methods to keep IT modernization projects on track. Virtualization and consolidation strategies were also cited.

Detailed Survey Results

This section highlights particular areas of interest from the survey results and provides selected samples of state or national trends as well as observations of those trends and their implications for state CIOs and NASCIO. Survey results are presented in the same order as they appeared in the survey instrument.

Survey Section 2: General Questions

NASCIO's Definition of "Legacy System" for the Purposes of this Survey:

NASCIO's Legacy Systems & Modernization Working Group prepared a baseline definition of "legacy system" for the purpose of keeping responses to this survey uniform. The definition agreed upon reads: "A ***Legacy System*** is not solely defined by the age of IT systems (e.g. 20 years) as there are many systems that were designed for continued upgrades, but the term also focuses on elements such as "**supportability**,""**risk**" and "**agility**," including the availability of software and hardware support, and the ability to acquire either **internal** or **outsourced** staffing, equipment or technical support for the system in question. The term may also describe the systems inability to adequately support "**line-of-business**" requirements or meet expectations for use of modern technologies, such as workflow, instant messaging (IM) and user interface."

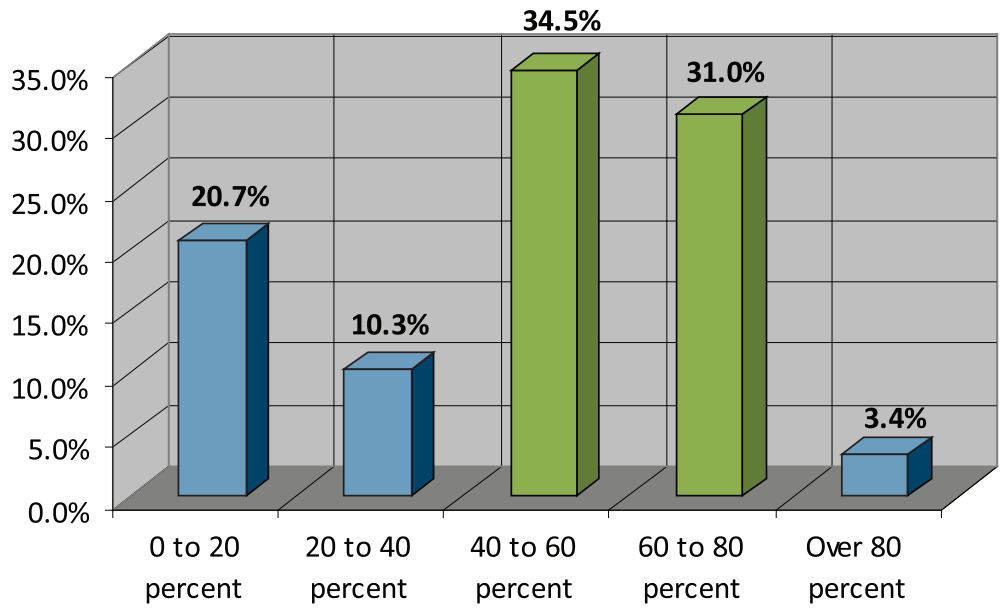
2.1 Based on the definition provided above, please estimate the percentage of IT systems in your state you would label "Legacy Systems;" these could include: mainframe, midrange and server based applications or systems.

States were asked, using the survey's baseline definition of a "Legacy System," to indicate what percentage of IT systems in their states they would label as legacy. Responses revealed that states estimated over 50 percent of their IT systems to be legacy; with 35.4 percent of respondents estimating 40 to 60 percent, and 31.0 percent estimating 60 to 80 percent. Combined with additional findings in this survey, this statistic paints a clear picture that legacy system modernization is a serious problem facing many states; ***see figure 1 below***.

2.2 What percentage of the "Legacy Systems" you've identified would you consider mission or business critical?

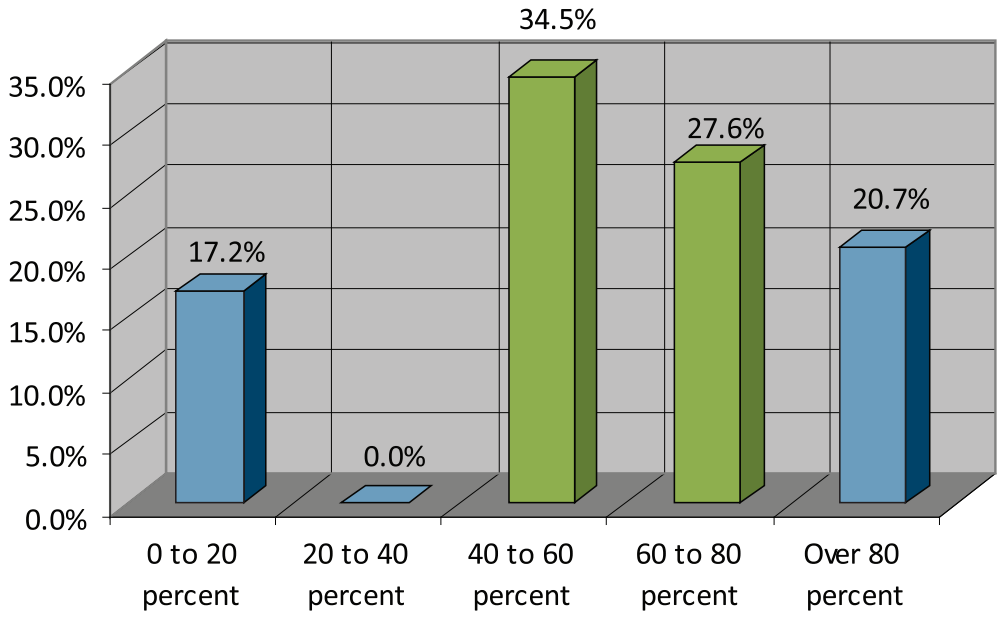
States were also asked to indicate what percentage of those IT systems in their states they labeled as legacy that they would also consider to be **mission** or **business critical**. As in question 2.1, states

Figure 1. Percentage of IT systems states label as "Legacy Systems; N=29



Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

Figure 2. Percentage of legacy IT systems states consider mission or business critical; N=29



Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

estimated over 50 percent of their IT legacy systems to be mission or business critical; with 34.5 percent of respondents estimating 40 to 60 percent, and 27.6 percent estimating 60 to 80 percent. Combining the findings from questions 2.1 and 2.2, we are beginning to see the potential for disruption to states' day-to-day business operations on par with a disaster event. Business critical IT systems that shut down due to the lack of available support for obsolete hardware or applications, combined with the lack of planning for their replacement, presents just as much risk to state IT operations as a man-made or natural disaster; ***see figure 2***.

Table 1. Criteria by which states define "Legacy Systems;" N=29.

Criteria States Use to Define a "Legacy System"	Percentage
Inability to be adequately supported, maintained, or enhanced	82.8%
Inability to meet business needs or system not agile enough to continually meet the challenging needs of the organization.	79.3%
Obsolete hardware or software components	79.3%
Incompatibility with current and/or future intended enterprise architecture	72.4%
Enterprise information security risk and/or non-compliance concerns (e.g., data security, integrity, privacy, system access controls).	48.3%
Unavailability of adequate documentation	44.8%
Performance degradation or abilities to handle required volume/load	34.5%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

2.3 By what criteria do you define "Legacy Systems" in your state? (*Please check all that apply*)

Although NASCIO prepared a baseline definition of "legacy system" for the purposes of this survey, states were asked to choose the components that best fit their concept of what constitutes a legacy system. States' responses focused mainly on a systems inability to be adequately supported, maintained, or enhanced. A system's inability to meet business needs or incompatibility with current and/or future intended enterprise architecture were highly indicated. Obsolete hardware or software components were also viewed by states as important elements of a legacy system; *see table 1*.

2.4 Please indicate in what lines-of-business most of your state's "Legacy Systems" are located. (*Please check all that apply*)

States were asked to indicate in what lines-of-business most of their state's "Legacy Systems" were located. The majority of responses focused on state Administrative information systems (e.g. finance, HR, procurement, etc.), and applications that require outside federal interaction, (e.g. health and human service related systems), which would indicate that most states are facing challenges with their ERP systems and highly siloed federal program management systems. A large number of respondents also indicated that internal client facing applications were a legacy challenge as well. There was a significant drop in responses focused on transportation information systems, and public safety/law enforcement information systems, which would seem to indicate that these areas are staying ahead of the curve in regard to application modernization. Citizen facing applications received the lowest response rate which is a reflection of the focus and advancement that states are making in modern web-based applications that involve citizen-to-government and government-to-citizen interaction; ***see figure 3***.

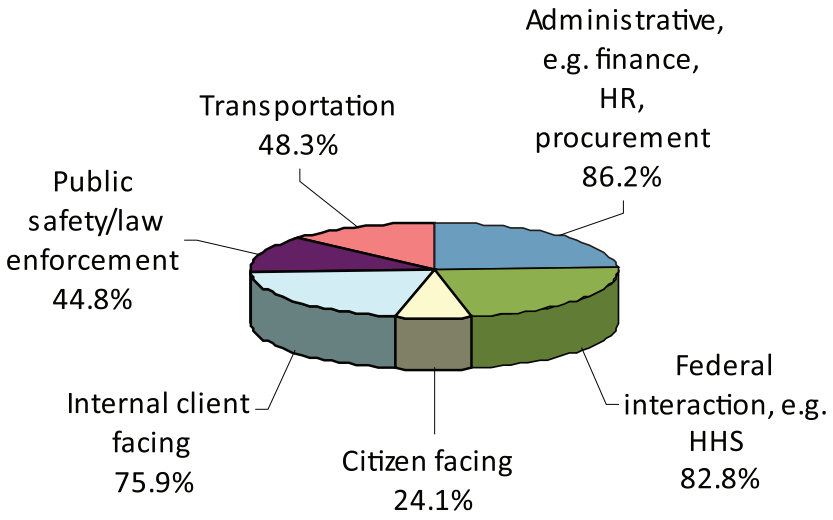
Other legacy lines-of-business systems states selected included:

- Elections
- Vehicle registration and taxation
- Third party interfaces
- Tax/Revenue
- Taxes, Motor Vehicles
- Corrections Management System
- Education
- Early IT adopters

2.5 Please indicate which "drivers" are moving your state towards modernization of IT systems and applications. (*Please check all that apply*)

States were asked to indicate the primary "drivers" which are moving them towards the modernization of IT systems and applications. Over 80 percent of respondents indicated the most

Figure 3. Lines-of-business where most state legacy systems are located; N=29



Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

Table 2. "Drivers" moving states towards modernization of IT systems and applications;" N=29.

Drivers towards modernization	Percentage
Change or re-engineering of business processes	86.2%
Inability to adequately support "line-of-business" requirements	82.8%
Application design limitations	69.0%
"Graying" of IT staff	69.0%
Support costs beyond an acceptable range	65.5%
Inability to meet expectations for use of modern technologies, such as workflow, IM, and user interface	62.1%
Skills shortages	55.2%
Lack of real-time data analysis and decision support	55.2%
End user demand	51.7%
Availability of newer products	48.3%
Code fragility	48.3%
Legislative mandates	41.4%
Regulations, both state and federal	41.4%
Budget constraints	31.0%
Security risks within the application	31.0%
Vendor stability issues	31.0%
Green IT initiatives	27.6%
Security risks in underlying infrastructure	27.6%
Staff reductions	3.4%
Other: "The need to better interface and share data across state agencies."	3.4%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

significant drivers were the need to change or re-engineer business processes, and the inability to adequately support "line-of-business" requirements. Application design limitations and the "Graying" of IT staff[3] were the next most highly indicated drivers; ***see table 2***.

2.6 Please rank on a scale of 1-5, the following concerns around "Legacy Systems" relative to issues you are facing in your state. (1 being least critical; 5 being most critical); [*See Appendix 1 at the end of this report for complete responses to question 2.6.*]

Similar to question 2.5 where states were asked to indicate the drivers towards legacy modernization, states in question 2.6 were asked to rank concerns

Table 3. States' Ranking of Concerns around "Legacy Systems;" N=29.

States' Ranking of Concerns around "Legacy Systems"	Ranking	Percentage
Software Maintenance/Upgrades – limited or unavailable	4	58.6%
Extensibility, Adaptability, Agility – inability to enhance or revise	4	51.7%
Application Development tools – limited expertise ('dead' languages)	4	48.3%
Documentation – non-existent or out-of-date	3	58.6%
Security – ability to enhance, revise to meet changing security guidelines (e.g. passwords)	3	37.9%
Software – no longer available, limited or no support	3	37.9%
Technical Support – unavailable or difficult to obtain	3	37.9%
Hardware Maintenance – limited or unavailable	4	31.0%
Hardware – no longer available, limited or no support	1 and 4 tie	27.6%
Recoverability – uncertain how or where to recover	2 and 4 tie	24.1%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

they are experiencing around legacy systems on a scale of 1-5, (1 being least critical; 5 being most critical.) Based on states' rakings, the primary concerns - with a high percentage concern ranking of "**4**" - are Software Maintenance/Upgrades – limited or unavailable; Extensibility, Adaptability, Agility – inability to enhance or revise; and Application Development tools – limited expertise ('dead' languages). This appears to demonstrate that states' primary concerns are centered on application software and its ability to be adapted, upgraded and maintained. To a lesser degree, but with a high percentage response, the lack of documentation was also a significant concern; ***see table 3***.

2.7 Please indicate the most common method(s) your state is utilizing for the modernization of "Legacy Systems." (Please check all that apply)
[See Appendix 2 at the end of this report for response definitions to Question 2.7, and Appendix 3 for complete responses to question 2.7.]

States were asked to indicate the most common method(s) they utilize for the modernization of "Legacy Systems," either in the past, present, or planned in the future, and whether the methods had been utilized successfully. The differing response rate for each method, and the need to combine "used in the past" with "currently using" figures to compare against the success level, make ranking these methods problematic. However, complete responses to this question can be viewed in ***appendix 3*** of this report.

Based on analysis of responses, level of usage and indications of success, it would appear that states have found the most success utilizing "**data conversion**" and "**extension.**" With the exception of Enterprise Application Integration (EAI) and Service Oriented Architecture (SOA), all other methods also received a high rate of usage and indication of success. What would appear as an emerging trend, based on the high rates indicated of planning to use in the future, are **(1)** SOA integration, with a **53.8%** (N=26) response; and **(2)** Utilize EAI to encapsulate and link legacy applications with a **42.1%** (N=19) response. Along with their high figures for successful use, these two methods are demonstrating a higher rate of adoption; ***see table 4***.

Table 4. Most common methods utilized by states for the modernization of "Legacy Systems."

Modernization Methods	Timing – Used in the Past/Currently Using	Experience – Used/ Using Successfully
Data conversion	90.9% (N = 22)	100.0% (N = 19)
Extension	90.5% (N = 21)	100.0% (N = 17)
Virtualization/ Emulation	82.6% (N = 23)	94.1% (N = 17)
Re-engineer or replace with a COTS software	82.1% (N = 28)	91.3% (N = 23)
Applications wrapping	81.8% (N = 22)	70.0% (N = 20)
Re-hosting/ Re-platforming	80.0% (N = 25)	89.5% (N = 19)
Automated migration	73.3% (N = 15)	81.8% (N = 11)
Renovation/ Re-architecting	72.0% (N = 25)	87.5% (N = 16)
* Utilize EAI to encapsulate and link legacy applications	57.9% (N = 19)	90.9% (N = 11)
* SOA integration	46.1% (N = 26)	84.6% (N = 13)

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

** = Highest percentage reported of planning to use in the future: (1) SOA integration, 53.8% (N=26); (2) Utilize EAI to encapsulate and link legacy applications, 42.1% (N=19).*

2.8 If your state has a "life-cycle approach" for applications and infrastructure, or plans in advance for the "end-of-life" for new systems, please describe below:

States were asked to describe "life-cycle approaches" for applications and infrastructure, or plans they developed in advance for the "end-of-life" of new IT systems. **Three states indicated** that there is **no formal state-wide approach**; **five states indicated** that **life-cycle planning was a function of the individual agencies**; **11 states indicated life-cycle planning was a state-wide function**; **two states indicated** they utilize **end-of-life planning;** and **two states** provided **other** responses.

End-of-life plans:

- Every biennium, all the agencies submit a plan to the state CIO for new initiatives or end-of-life replacement of the existing legacy systems due to either prohibitive maintenance costs or because the application no longer serves the business needs of the agencies, or both. **(KY)**
- There is no single lifecycle approach in New York state agencies for either applications or infrastructure. However, in the CIO/Office for Technology (CIO/OFT) we generally refresh infrastructure every 5 years. **(NY)**

Function of individual agencies:

- Individual agencies own their own strategy just like they own the applications. **(IA)**
- Each agency includes an "Asset Management Plan" in the IT planning/budgeting process. **(ND)**
- In early 2006 the state implemented a centralized applications portfolio management (APM) software tool for use by agencies to inventory and analyze the approximately 1,300 applications currently in production. **(NC)**
- Individual executive branch agencies are currently responsible for their respective application lifecycle approach. The state has centralized all IT infrastructure under a Private-Public Partnership which is responsible for infrastructure lifecycles. **(VA)**

- Oregon is a decentralized state with agencies having the primary responsibility for application development/acquisition, implementation, maintenance and long-term support. **(OR)**

Life-cycle approaches:

- The state has an annual evaluation of system functionality and risk which is reported to the legislature. **(IN)**
- The approach for applications is determined by business needs. The approach for infrastructure is to try to stay on supported hardware and software, upgrading or replacing as needed. **(KS)**
- We have established technology refresh programs for the infrastructure, but nothing for applications. Although we have established a life-cycle refresh for the infrastructure, we are having difficulty getting the program funded. **(WV)**
- Annual evaluation of critical applications is encouraged through the state's IT planning process. **(MS)**
- The state of South Carolina has an Enterprise Architecture (SCEA) committee to oversee new, emerging, and legacy technologies. The SCEA provides a framework for making strategic technology investment decisions on a cost-effective, enterprise basis. **(SC)**
- Our EA group has identified software/hardware product life-cycles. This information is used in planning for application replacement. **(MI)**
- There are two primary life-cycle processes in use in Pennsylvania. The Enterprise Project Management Methodology has a formal closeout practice. The Commonwealth's Software Engineering Process (SEP) has enterprise practices for maintenance and re-factoring for the life of any application, legacy or non-legacy. **(PA)**
- For Louisiana's Enterprise Resource Planning (ERP) project, we use the following steps: (1) Explore – what problems we are trying to solve; (2) Assessment – what technologies are available; (3) Develop – design and develop the new system; and, (4) Conversion/Transition – testing and converting over to the new system. **(LA)**
- All IT infrastructure has a designated life-cycle in years which we use to determine refresh cycles. **(SD)**
- The state uses portfolio management to look across agencies to identify opportunities for multi-agency applications. The state also has identified an information management life-cycle approach utilizing business case development and decision gates. **(MN)**
- We utilize a standard System Development Life-Cycle (SDLC) approach. EA is in its initial stages state-wide and will begin to impact strategic information decisions going forward. **(MT)**

Other:

- Please view our IT Strategic Plan at: <**http://maine.gov/oit/strategic/index.htm**>. **(ME)**
- California's approach utilizes the following steps: (1) Strategic Planning; (2) Business Requirements Definition; (3) Project Initiation; (4) Planning; (5) Procurement; (6) Selection; (7) System/Architecture Development; (8) System/Architecture Deployment; (9) Maintenance and Operations; (10) Project Close Out; (11) Enhancement/Refresh; and (12) Improvement Planning. **(CA)**

2.9 Please indicate obstacles or challenges your state has experienced with the modernization of "Legacy Systems," and rank on a scale of 1-5. (1 being not challenging; 5 being extremely challenging) [*See Appendix 4 at the end of this report for complete responses to question 2.9.*]

Similar to question 2.6, states were asked to rank obstacles or challenges their state has experienced with the modernization of "Legacy Systems," and rank on a scale of 1-5; (1 being not challenging; 5 being extremely challenging.) Responses varied widely; however, based on states' rakings, the **most critical obstacles or challenge** cited with a "5" ranking and the highest percentage of responses was **funding**.[4] With a slightly lower percentage of respondents and a challenging ranking of "3" were **data migration** and **risk of failure versus tolerance or appetite for failure.** Rankings for all other responses, with a lower percentage indicated, were most prevalent in the "3" to "4" range; ***see table 5***.

Table 5. States' Ranking of Obstacles or Challenges around "Legacy Systems;" N=29.

States' ranking of obstacles or challenges experienced with the modernization of "Legacy Systems"	Ranking	Percentage
Funding	5	55.2%
Lack of source code	2	55.2%
Data migration	3	53.6%
Risk of failure versus tolerance or appetite for failure	3	44.8%
Resistance (or lack of internal support) from internal end users	3	41.4%
Out-side vendor support	3	37.9%
System availability during transition period	3	37.9%
Staff support (including both state and contracted staff)	3 and 4 tie	34.5%
Lack of documentation	2 and 4 tie	31.0%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

2.10 Please indicate other obstacles or challenges your state has experienced with the modernization of "Legacy Systems," and describe below:

States were asked to describe in an open response format, other obstacles or challenges their state has experienced with the modernization of "Legacy Systems." Similar to question 2.9, some states ranked their responses on a scale of 1-5; (1 being not challenging; 5 being extremely challenging.)

2.11 Please describe strategies or tactics your state has employed to overcome the obstacles or challenges indicated in questions 2.9 and 2.10.

States were asked to describe strategies or tactics they have employed to overcome the obstacles or challenges they indicated in questions 2.9 and 2.10.

[**Note**: Question 2.10, "Obstacles or challenges" and Question 2.11, "Strategies or tactics," have been combined for analytical purposes. In some cases states responded to one but not the other, and in other cases states were responding to obstacles or challenges they indicated in question 2.9. State responses have been divided up and organized under different topical categories.]

<u>Cost/ Resource Availability:</u>

- Obstacles – Costs and price estimates **(MA)** Strategies – Maximize federal funds (grants, federally funded programs); targeted capital investments for modernization of critical systems. **(MA)**
- Strategies – For funding, we have performed a variety of studies and assessments for problematic or high-risk applications in order to present responsive and convincing business cases (with valid problems, challenges, and benefits). **(NC)**
- Obstacles – Replacing a highly customized legacy application with a similarly customized modern application in a timely manner is very difficult and expensive. **(VA)** Strategies – Created public-private-partnerships that reduce the initial costs of legacy application and infrastructure upgrades. **(VA)**
- Obstacles – Funding; budget cycle **(CA)**
- Obstacles – Pressure to lower costs; competing resource demands – the ever increasing number of competing demands outstrips the organization's capacity to staff, manage, implement modernization efforts and/or required legacy system changes. **(OR)**
- Strategies – Master contracts have been set up to facilitate volume purchasing of hardware

and software to achieve cost reduction. A Technology Governance Board has been set up to address many issues facing enterprise systems across the state to reduce duplicative efforts and focus vendor support. **(IA)**

- Strategies – Funding is always a challenge. We focus business cases on applications functionality and/or risk mitigation, not on technology. Agency business folks, not the office of the CIO, have the lead role in advocating for funding. We are very involved but do not take the lead. **(NE)**

Culture/ User Resistance to Change:

- Obstacles – User resistance to change **(DE)** Strategies – Heavy involvement of our Organizational Change Management team so that end-users can be prepared for the changes coming. **(DE)**
- Obstacles – Culture change **(KY)** Strategies – Planning and a lot of stress on all directional communication. **(KY)**
- Obstacles – Resistance to change **(HI)** Strategies – Independent department implementations versus state-wide initiatives. **(HI)**
- Obstacles – Cultural change **(Guam)** Strategies – More stakeholder involvement; identify funding sources. **(Guam)**
- Strategies – Involved end-users "early and often" during business process reviews, fit-gaps, configuration and testing. Communications with affected organization(s) at all levels – agency directors, finance officers and end users. **(OK)**

Inability to Support Common Approaches:

- Obstacles – Inability to leverage federally funded projects/solutions across the enterprise or to support common approaches. **(NJ)** Strategies – Currently working on a process, with the assistance of an outside vendor, to analyze legacy applications and provide a prioritized list of applications that need to be addressed. The list would then be used to secure a dedicated enterprise funding source to begin the renovation process. Focus will be on applications which are unstable and offer the highest reward if modernized. **(NJ)**
- Obstacles – Agencies, policies and legislation are difficult to 'fit' in pre-packaged or off-the-shelf modern hardware/software. **(VA)**

Strategies – (1) Established an enterprise application program office to modernize legacy administrative applications. (2) Explore "Shared Services" solutions across agencies to satisfy similar needs. (3) Increase business owner involvement in legacy system replacement decisions. (4) Gain top-level executive support for modernization efforts. **(VA)**

- Obstacles – Demand for quality and speed; Service requirements increasing; Rise of customer expectations **(OR)** Strategies – Strategies or tactics involve: (1) Electronic Data Exchange; (2) Collaboration Tools; (3) Access Architecture; (4) Enterprise Architecture; (5) Data Management; (6) Process Modeling Services and Skills; (7) Document Management and Workflow Strategy; (8) IS Service Model; (9) GIS Application Integration; (10) Wireless Infrastructure; and (11) Research and Development. **(OR)**

Lack of Executive Management Interest/ Reluctance:

- Obstacles – Lack of executive business management interest in potential problems and related risks with legacy applications. **(NC)**
- Obstacles – Business stakeholders are often reluctant to re-architect and sponsor new applications or technologies to replace legacy systems or expand the effort to automate their business processes. This discourages reinvestment in new technologies and modernization projects. **(PA)**
- Obstacles – Intentional stalling to wait out current administrations. **(HI)**
- Strategies – Meetings with the legislature to explain issues and gain their support. Also working with our clients during the budget planning process in an attempt to justify the funding needed to replace the legacy systems. **(MI)**

Lack of Project/ Program Management/ Governance:

- Obstacles – Lack of acceptable program management **(IN)** Strategies – Established a program management office to lead major applications development and tightened up the language of the replacement Request for Proposals (RFP's). **(IN)**
- Obstacles – Project risks **(MA)**

- Obstacles – IT Governance; Enterprise perspective **(MN)** Strategies – Enterprise architecture; Portfolio management; Addressing information life-cycle definition and related IT governance. **(MN)**
- Obstacles – Strategic planning and commitment **(CA)** Strategies – Improved governance process; Recommitment to strategic planning **(CA)**
- Obstacles – Competing pressures of short-term automation improvements to extend the life of legacy systems versus long-term improvements involving full system replacement strategies – Automation improvements provide tangible benefits to users, while modernization improvements take much longer and not all of the value is driven by user benefit. **(OR)** Strategies – (1) One strategy or tactic involves the use of a Program Management Model for our modernization efforts. With a Program Model, there are multiple projects, each with its own goals and methodology. This allows for separate teams driven by different objectives and deliverables. (2) Another strategy or tactic involves the use of outside consultants to drive and manage change, organizational and management changes, and creation of cross-divisional and/or multi-agency advisory groups fostering an enterprise perspective. **(OR)**
- Strategies – Our general direction is to use COTS packages to replace legacy applications. We sometimes engage consultants to perform business needs and fit gap analysis. For most major application overhauls, we undertake large change management efforts and train the business users on the new systems. **(KS)**
- Strategies – North Dakota uses an EA process to identify our future state needs which helps build support for modernization projects. In addition, we have used a central services approach when possible. Most of the efforts have been on a case-by-case basis – each application/agency is unique and needs to be handled as such. **(ND)**
- Strategies – South Carolina has an Enterprise Architecture (SCEA) Committee to oversee new, emerging, and legacy technologies. The SCEA provides a framework for making strategic technology investment decisions on a cost-effective, enterprise basis. **(SC)** [**Note**: Directed from question 2.8]
- Strategies – It has been recognized by key stakeholders that an enterprise architecture approach implemented with SOA is the way to move the infrastructure forward while cost effectively maintaining IT alignment with the various agencies strategic business goals. **(MT)**

Large Scope:

- Obstacles – Enterprise solutions delay smaller stove-piped solutions. **(VA)** Strategies – Instituted rigorous IT program management oversight for all large-scale IT projects. **(VA)**
- Obstacles – Resource availability – both business and IT **(CA)** Strategies – Collaboration; Shared services **(CA)**
- Strategies – Texas State Data Center Consolidation initiative; and Texas state-wide cooperative contracts for IT hardware, software and services. **(TX)**

Migration/ Risk:

- Obstacles – Balanced allocation of risk between vendors and the state. **(MA)** Strategies – Solicit vendor/consultant input regarding options and approaches prior to procurement; many joint application development sessions with business users and legacy IT staff. **(MA)**
- Obstacles – Lack of products on the market to ease the migration off of proprietary platforms. **(NY)** Strategies – Several cluster agencies, for example, agencies that support Public Safety or Human Services, have joined together to develop common plans to ease integration of modernized applications. **(NY)**
- Obstacles – Legacy application and data architectures are at odds with modern distributed and Service Oriented Architectures. The transformation of legacy architectures to modern architectures when legacy architectures have been heavily enhanced over a long period of time and users include multiple organizations is a difficult hurdle in modernization. **(PA)** Strategies – Pennsylvania has four Communities of Practice (CoPs), each that govern IT in multiple agencies. Agencies within a CoP are organized by similar lines of business, e.g., public safety, and heath and human services. The CoPs have a broader view of business and IT challenges than a single organization and work to identify opportunities to break down agency silos and develop shared services. CoPs coordinate, prioritize, and approve projects that aid in the transformation of legacy architectures to

modern distributed architectures. All IT procurements must comply with the Commonwealth's IT standards and policies. **(PA)**

- Obstacles – Legacy systems built in the past were not built for flexibility: (1) Incompatible data and file formats; (2) Hardware incompatibility; (3) Software tied to hardware; (4) Proprietary protocols and networks; and (5) Single system design. **(LA)** Strategies – Standardization; Interoperability facilities; Better interfacing between systems **(LA)**
- Strategies – Customer Client Reviews/Surveys to better understand the underlying problems with migration to newer platforms; also, utilized functional and technical contractor help. **(OK)**
- Strategies – For data migration we emphasize attention to detail at the technical level along with extensive testing. We also attempt to limit changes to data schemas (within reason) to reduce the risk of conversion. **(NE)**

Staffing/ Knowledge Transfer/ Institutional Knowledge:

- Obstacles – Training, knowledge transfer and implementation **(KY)** Strategies – Planning and a lot of stress on all directional communication **(KY)**
- Obstacles – Lack of institutional knowledge of both the program and the application supporting that program in addition to the complex coding and interdependencies of the legacy systems. **(NY)**
- Obstacles – Large number of IT staff are eligible for retirement in the next 5 to 10 years. **(OR)**

Survey Section 3: Funding

3.1 In light of the current fiscal downturn in many states, please describe to what degree the availability of funding vehicles has influenced your ability to modernize "Legacy Systems" in your state, and what tactics you are utilizing to overcome funding concerns.

States were asked to describe the degree to which the availability of funding vehicles has influenced their ability to modernize "Legacy Systems" in their state, and what tactics they are utilizing to overcome those funding concerns.[5]

The overarching theme in this section focused on tightening state budgets, and although several respondents said state budget problems have slowed IT initiatives, most states indicated that various strategies and **increased focus on justifying IT projects** has kept most state-wide IT initiatives on course. Many states are looking at **bond issues**, **federal funding opportunities** and **outsourcing strategies** as methods to keep IT modernization projects on track. **Virtualization and consolidation strategies** were also cited. States that gain a large portion of state revenue from energy resources have been impacted very little by recent downturns in overall state revenues.

[**Note**: This survey was conducted before the recent credit crisis on Wall Street, national recession and revenue shortfalls that many states are experiencing as a result, so state comments, opinions and funding strategies presented in this survey may be affected.[6]]

State comments:

- Funding is unavailable so we are trying to get out in front of the issues; we have been intensively planning modernization efforts for over a year and are now aggressively underway; partnering with our vendor for some "no cost" proofs of concept. **(DE)**
- No problem where business justification supports the funding. **(IN)**
- The competing funding priorities have always played a role in such decisions. The modernization of systems and infrastructure are planned, to the extent possible, in the normal course of upgrades and maintenance. We are **considering the implementation of depreciation funds across an array of hardware and software expenditures** in an attempt to stabilize the funding. **(IA)**
- Generally, if it isn't broken, we don't fix it. Unless the application isn't meeting business requirements, or is becoming too expensive to maintain, we do not prioritize its replacement. **(KS)**
- North Dakota currently has a large budget surplus, which has helped overcome some funding concerns. However, the state continues to be a fiscally conservative state, and each project is judged on its merit and must show a strong justification before it will be funded. **(ND)**
- The state is currently working on a process, with the assistance of an outside vendor, to **analyze legacy applications and provide a prioritized list of applications** that need to be addressed. The list would then be used to secure a dedicated enterprise funding source to begin the renovation process. Focus will be on applications which are unstable and offer the highest reward if modernized. **(NJ)**
- The current fiscal downturn has impacted almost all agencies in the Commonwealth, resulting in budget cuts from 2 to 20 percent. These cuts have put new initiatives on hold. The progress on any pre-approved initiatives and those already underway are being reviewed to ensure they are in the Commonwealth's best interest. **(KY)**
- During the last legislative session, West Virginia approved funding to pursue an **ERP solution**. We expect the ERP initiative will replace approximately 92 legacy applications used across various agencies and departments. **(WV)**
- Funding has always been tight, and we have simply tried to present our business cases in a more convincing manner than other requests for scarce fiscal resources. Even under past and more favorable economic situations, the competition for funds was extremely competitive, so we have tried to raise the level of awareness and need to work harder to justify requests. **Planning must be more thorough**, **justifications more persuasive**, and links to business strategies and IT plans must be direct and clear (line-of-sight). **(NC)**
- Lack of funding has slowed the process of modernization. One of the alternative funding approaches for shared enterprise applications is through the **issuance of government bonds**. **(MS)**
- We have been successful in **leveraging vendor**

software contracts to include low or no cost software that will assist many agencies to Web-enable or upgrade their current legacy applications. Total re-writes will be necessary for many other agency applications with funding as a major issue. **(SC)**

- A **$450 million capital investment** for information technology has recently been approved which will in part be used to modernize critical state systems. The current fiscal downturn will affect operating budgets which may in turn impact funds available for the maintenance and support of existing applications. **(MA)**
- **Systems are being prioritized** with top priorities being worked first and other systems being "held" together. One strategy is the extension of current legacy systems for at least 5 years until funds become available. **(MI)**
- While the current fiscal downturn has not affected Texas as much as many other states, funding for needed technology initiatives such as modernization is an ongoing constraint. One tactic being deployed in our state is to **centralize the state's data centers** and **outsource their operations**. This will in time improve our opportunities for rationalization and modernization of our legacy systems. **(TX)**
- The advent of **virtualization** has helped to drive down costs of modernizing as less hardware is required; software costs are somewhat reduced and server support costs are reduced. The use of server consolidation studies, savings in power and cooling and good cost benefit analysis have proven effective in overcoming initial funding concerns. **(NY)**
- As funding has become tighter in every agency in the Commonwealth, funding for large IT modernization projects has been much more difficult. Some agencies that receive large amounts of federal funding (e.g. PENNDOT) have been able to move forward with large legacy modernization projects, but most agencies that have asked for new general funds from the Governor's Budget Office have been denied over the past four years. A **"productivity bank" loan fund has been established that agencies can utilize to implement projects**, if they can establish a payback strategy over a multi-year period. Most agencies have a difficult time establishing new revenue streams with their IT modernization projects in order to pay back the loan. The Commonwealth has turned towards realizing technology innovation savings. For example, we will be **investing in virtualization technology to reduce infrastructure costs**. The savings can be applied towards modernizing legacy systems. Likewise our newly negotiated Data PowerHouse (DPH) outsourcing contract will result in significant savings that could be directed to application upgrades. **(PA)**
- Louisiana has utilized both state general dollars and federally matched funding in order to address some of the redesign issues. **The state has a self-administered internally financed program to provide state agencies the means to acquire equipment on an installment purchase basis**. The program is the **Louisiana Equipment Acquisition Fund** (LEAF). Agencies are researching a variety of sources to provide the services once provided by internal, legacy systems, including Active Server Pages (ASP) and (SaaS). **(LA)**
- We are delaying many legacy system migration efforts due to reduced funding. We are seeking **Private-Public Partnerships** that will bring in private capital that will be repaid when actual savings are realized. We are selecting more affordable COTS software; also, we are evaluating ways we can capitalize the large IT costs of legacy system modernization. **(VA)**
- Most modernizations come out of the base funding we have. Hence, the pace of change has slowed down. **(SD)**
- Funding has not affected the state significantly in the past three years, but could be an issue in the next couple of years. **(OK)**
- "If it ain't broke don't fix it." We budget only to keep the place running. **(HI)**
- The tolerance/appetite for failure has been a greater challenge than funding for the modernization of our legacy systems. **(ME)**
- There's no magic formula, just clear communication with the administration and legislature. **Our migration projects originate for business reasons and not for technology reasons**. The availability of high federal matching fund rates and federal mandates also influences the business case. **(NE)**
- We attempt to be creative to **use multiple funding vehicles** to fund implementation costs for new systems that will ultimately result in cost savings. **(MN)**
- The availability of funding vehicles has driven California to seek large statewide initiatives which are being promoted to modernize and

consolidate aging ERP functions, thus benefiting the enterprise as a whole. **(CA)**

- We are utilizing a **more aggressive pursuit of federal funds** and exploring **self-funded models**. **(Guam)**
- Oregon polled several large agencies on this and other questions throughout the survey. One large agency indicated that funding for modernization is a combination of general funds, federal funds and public bond offerings. **By combining modernization and automation objectives, we are able to insure tangible benefits to our citizens, making this initiative more attractive**. We have also combined our objectives with other initiatives with similar technology goals, **increasing synergy and benefit and minimizing total costs**. Another mid-sized agency indicated: Funding is one of many constraints restricting agency capacity for modernization efforts. Even when needed, and funding is secured, underlying constraints are revealed in other areas such as management, technical staff, operations staff, need to accommodate seasonal workloads, etc. **(OR)**

Survey Section 4: Security and Enterprise Risk

4.1 Please indicate which of the following "Security" concerns have driven the move to modernize legacy systems in your state. (*Please check all that apply*)

Issues related to security and enterprise risk are important drivers for states as they move to modernize their legacy IT systems. In question 4.1, states were asked to indicate which "Security" concerns have driven their move to modernization. Not surprisingly, a high percentage of states indicated all available choices as issues of concern and significant drivers towards legacy modernization, including Application and/or Platform Access Controls, Information/Data Privacy, and Information/Data Integrity. However, **Information/Data Security** was the highest point of concern for states, with 72.4 percent of respondents indicating this as the most significant security driver towards modernization; ***see figure 4***.

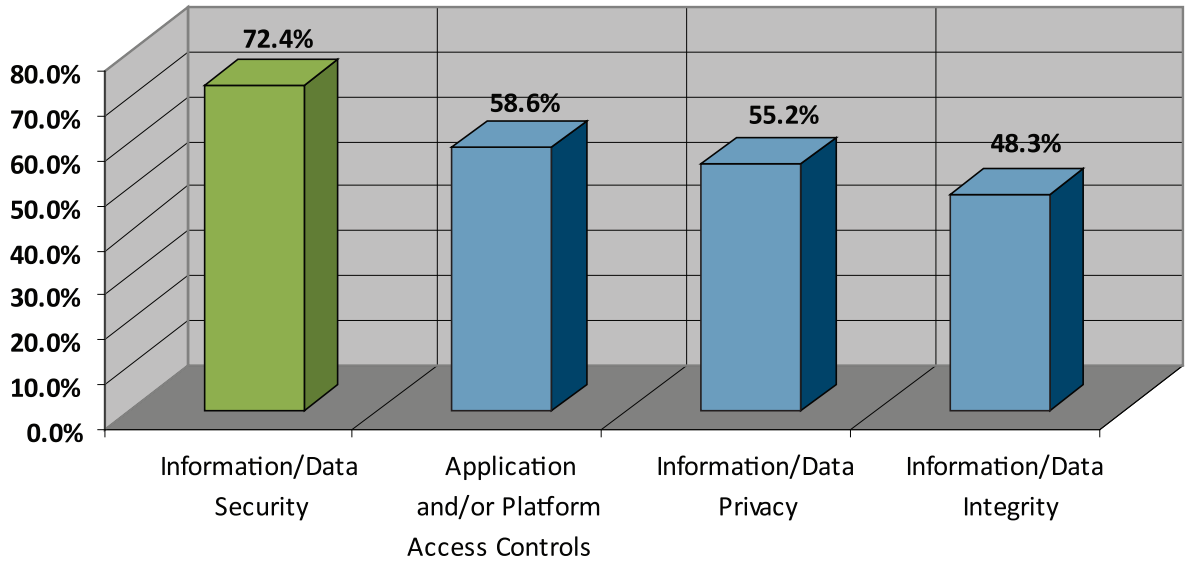
4.2 Please indicate which of the following "Enterprise Risk" concerns have driven the move to modernize legacy systems in your state. (*Please check all that apply*)

When states were asked to indicate which "Enterprise Risk" concerns have driven their move to modernize legacy systems, it was clear that **Inability to meet line-of-business needs**, **Inability to adequately meet constituent needs (public perception)**, and **Inability to adequately meet internal user needs** were by far the most significant concerns for states driving their move toward modernization of legacy IT systems; ***see table 6***.

Other responses:

- Lack of COBOL programmers
- Consolidation/integrated processing and reporting. Hardware end-of-life.
- Enterprise consolidation
- Duplication and redundancy

Figure 4. "Security" concerns that have driven states to modernize legacy systems; N=29



Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

Table 6. "Enterprise Risk" Drivers towards modernization of IT systems and applications; N=29.

"Enterprise Risk" Drivers towards modernization	Percentage
Inability to meet line-of-business needs	75.9%
Inability to adequately meet constituent needs (public perception)	72.4%
Inability to adequately meet internal user needs	69.0%
Compliance	55.2%
Inappropriate failover and Disaster Recovery mechanisms	51.7%
Financial controls	48.3%
Enterprise information security risk	44.8%
Extended system unavailability due to obsolete hardware and software	44.8%
Performance degradation or inabilities to handle required volume/load	41.4%
Unreliability (unpredictable, unacceptable downtime)	31.0%

Source: NASCIO's 2008 National Survey on Legacy Systems and Modernization in the States

Survey Section 5: Staffing

5.1 Please describe below to what degree staff support issues (either internal or outsourced) have influenced your ability, or is driving the need, to modernize "Legacy Systems" in your state.

States were asked to describe the degree to which staff support issues (either internal or outsourced) have influenced their ability, or is driving their need, to modernize "Legacy Systems." The overarching theme in this section centered greatly on a high percentage of "retirement eligible" staff that have the knowledge to run legacy systems, and that younger, new hires are not willing to learn the old legacy languages.

States concerns:

- Over 50 percent of our applications development staff is eligible for **retirement**. We have been trying to cross-train, backfill, etc. **(DE)**
- The eligibility for **retirement** of nearly 40 percent of our current IT workforce plays a significant role in our current planning efforts. We are still assessing the issues and options currently. We will be developing accelerated plans for addressing these issues commencing in FY '09. **(IA)**
- We are **losing many of our staff that built and operate our custom legacy systems**. We no longer have development staff capable of writing applications that are comparable to COTS applications. In general, our approach is to select a COTS product and customize as necessary to meet our business needs. It is sometimes a struggle to balance the need for customization with the effort required to keep those customizations current, particularly in conjunction with application version upgrades. **(KS)**
- Internal staff with institutional knowledge are critical to moving forward with any renovation strategy. Since these are the same resources maintaining the day-to-day operation, it's nearly impossible to have them also involved in new development. One strategy that has produced some result is to partner with a using agency to impose a moratorium or freeze on modifications and enhancements. This allows us to free-up experienced resources to help us architect replacement or new solutions. **(NJ)**
- **The average age of an IT employee in our state is 50**+. Since I have been with the state

we **have experienced considerable turnover** due to retirement and death. **(WV)**

- To date the availability of internal (in-house) personnel and the appropriateness of vendor staffing have not presented major problems for the larger agencies. However, internal staffing resources have been an issue for smaller agencies, and both are anticipated to emerge as pressing concerns in the near future for all agencies. **(NC)**
- The availability of mainframe system engineers and programmers is an ever-growing concern and issue. **(MS)**
- In house technical support expertise continues to be a huge issue for the state. As **'graying' staff** that have traditionally supported these legacy systems retire, we are forced to look more and more at outside vendors. **Technical graduates do not want to learn and support legacy systems**, and lower state salaries are always a concern. **(SC)**
- Good staff but "**graying**". We need to move on modernization now in order to leverage their knowledge to transition to new technologies. We are **currently recruiting younger staff** that do not have legacy system skills, nor any desire to acquire them. **(MA)**
- Approximately 40 percent of state IT staff will be eligible for **retirement** in next five years. Some systems are over 30 years old and there are very few that understand not only how they work but why they work the way they do. **Finding support for old legacy development languages** (e.g. COBOL-68) **has become more difficult**. **(MI)**
- Many New York critical applications were developed on the state's mainframe platforms and the ability to find both the technical support and programming skills to continue to support these platforms is extremely difficult. Skill sets coming out of college and into the state workforce do not focus on older technologies and we are forced to turn to the vendors for support. Institutional knowledge is also retiring with the **graying of the state's workforce**, so utilizing that knowledge base before it exits is a strong influence in the modernization effort. **(NY)**
- Pennsylvania has a number of legacy systems built using many different technologies, e.g., COBOL, PowerBuilder, assembler, and progress. It has become increasingly difficult to hire staff with these skills. Additionally as the skill sets become more difficult to find internally, they also become more expensive to acquire from outside sources. Inadequate resources and inadequately trained resources intensify the risk of failure of legacy systems which in many cases are mission critical. Therefore, staffing issues are a major contributing factor in the justification of and decision to replace legacy systems. **(PA)**
- Finding and keeping the right IT staff remains a challenge for both states and large companies. The problem is attracting qualified IT staff where we have a large number of legacy systems and the need to migrate them to newer technologies. The problem may not be about an overall shortage, but rather a **shortage of specific skill sets that are in high demand** and can't be found fast enough – not insufficient skills, but outdated skills. Because of these problems mentioned, Louisiana has had to resort to supplementing state staff with contract staff in order to meet the required skill sets needed. **(LA)**
- Our **legacy systems support staff** is approaching and/or **has reached retirement age**. In some cases, we are hiring them back as consultants after they have retired. It is very **difficult to recruit younger IT staff** that are willing to learn legacy computer languages. We have trained some of our legacy IT staff on newer technology to reduce the fear of their obsolescence after legacy migration. **(VA)**
- **We have to hire young and train**, while losing our senior staff to retirement. This actually pushes us to modernize. **(SD)**
- **Support staff for aging systems are getting close to retirement**, and about 40 percent of the IT staff will be eligible to retire in the next 5 years. Technical support and application development support for both the legacy hardware and applications are becoming difficult to find. **(OK)**
- Thirty-two percent of IT staff are currently eligible to retire. Of course this is the group with the most knowledge. **Newer staff are not interested in pursuing legacy technologies** and would prefer to work on a more modern system with marketable skills learned along the way. **(HI)**
- To a considerable degree, the **"graying" of IT staff** supporting legacy systems, and the general shortage of skilled personnel in this niche are driving the need to modernize our legacy systems. **(ME)**
- We have not modernized systems because of

staff support issues. **(NE)**

- Workforce demographics and bureaucratic hiring practices make it difficult to hire employees with current skills. **(MN)**
- The **"graying" of our IT workforce** is definitely a driver. **(MT)**
- California is facing the daunting task of replacing an **aging workforce**. Succession planning and the modernization of our systems and infrastructure serve as means to leverage the emerging workforce while meeting the needs of business. **(CA)**
- Staff support has actually hindered our move away from legacy systems due to a lack of available skill sets in our area. **(Guam)**
- Oregon polled several large agencies on this and other questions throughout the survey. **One large agency indicated**: Many of the legacy systems are written in COBOL and run on a mainframe. The staff who maintain these systems are, in many cases, close to retirement and persons to replace their skill levels are difficult to find. There are also a limited number of staff maintaining these systems. Since it is unlikely we can increase the number of staff, it is necessary to find ways to make our maintenance processes more efficient. **Another mid-sized agency indicated**: The current siloed, one-off architecture of legacy applications require assignment of dedicated, specialized staff for support, maintenance and enhancements. We can no longer afford the inefficiencies of a fragmented environment and modernization toward a common enterprise architecture will reduce the agency's maintenance footprint. **Another large agency indicated**: The agency is undergoing a replacement project to modernize our legacy systems for HR, Finance and Procurement and replace them with an off the shelf **ERP integrated system**. One driver for this effort is the concern that the ability of the agency to support the current system(s) for the foreseeable future is quickly coming to an end. **(OR)**

<u>On the positive side, several states indicated no significant issues with staff:</u>

- The state of Indiana is not influenced by staffing concerns. **(IN)**
- Initially it was feared that this would pose a problem but it has not materialized. There has been adequate support available in the vendor community when needed. **(ND)**
- Inability to find knowledgeable staff to support legacy applications has been some consideration, but it has not been a major factor. **(KY)**
- Texas recognizes the need to focus our limited staff resources/skill sets on achieving our agencies' specific missions. Therefore, we are consolidating/outsourcing the operation of our data centers. This will, in turn, increase the ability of our state agencies to innovate and modernize. **(TX)**

Survey Section 6: CIO Perspectives

6.1 If your state has used, is using, or is currently considering legacy system modernization practices or processes that have not been addressed in this survey, or you consider an improvement or innovation to legacy system modernization practices, please describe the process or methodology below.

States were asked to describe legacy system modernization practices or processes not addressed in previous sections of this survey, or that they consider an improvement or innovation to legacy system modernization practices already discussed. Below are responses from eight states that provided input:

- **New Jersey** provided an Assessment Process and Renovation Matrix, <www.nascio.org/publications/documents/LegacySystem Assessment 2_NJ_0708.pdf>, "*Legacy System Assessment Status*," July 2008.

- The Commonwealth of **Kentucky** commented that, "Often identifying the funding mechanism is an important aspect of initial planning of any legacy system modernization. Capturing the true cost of an existing legacy system is very important before the system modernization initiative can be discussed. This information allows the stakeholders to better understand the ROI of such system modernization."

- The state of **North Carolina** provided the following information: Our applications portfolio management (APM) software tool has been invaluable in the management of their legacy applications by assisting statewide and agency staff to:
  (1) Maintain a comprehensive and accurate inventory of applications;
  (2) Analyze each application and the portfolio as a whole to determine the current status ('as is' state) from value, performance, cost, and risk perspectives; and
  (3) Develop coherent and realistic plans for managing each application over its useful life and transitioning each and the portfolio of applications to the desired ('to be') state considering future (desired) business, information, and technical architectures.

  Our approach for doing these things is **explained in question 2.8**.

  Similar to most IT management disciplines, APM is 20 percent tool and 80 percent people, methodologies, and processes. The intents are to optimize value/benefits and minimize costs and risks of individual applications over their useful lives while transitioning the state's application portfolio to a more business receptive, technically controllable, financially viable, and risk suitable environment. The APM discipline reflects the facts that each application is a valued asset deserving time, energy, and resources for reviewing it and determining its future in the organization, and each asset has an appropriate plan (at least over the next 5-years) for managing it over its lifecycle.

- **Louisiana** stated that they are in the process of reviewing legacy systems for modernization or replacement, and it is the state's desire to review integration and consolidation options, with the goal to reduce stove-piped applications.

- The Commonwealth of **Virginia** indicated that they are seriously evaluating Software as a Service (SaaS) that promises to provide quicker implementation solutions without the large capital investment.

- The State of **Hawaii** stated that they will utilize outsourcing to mitigate their legacy problems.

- **Montana** said they are following the model that some federal agencies have deployed; the Methodology for Business Transformation or (*__MBT__). It operates within the enterprise architecture and provides a methodology for re-engineering our business processes. *For example, reference *U.S. Department of the Interior, Office of the Chief Information Officer (OCIO)* Webpage on **MBT Toolkit: Guidance and Templates**, <www.doi.gov/ocio/architecture/mbt/guidance.htm>.

- **Oregon** polled several large agencies on this and other questions throughout the survey.

One mid-sized agency indicated that: Outsourcing lines-of-business is a consideration but one that is

seldom a real option because state agency lines-of-business are usually mandated. However, our agency is currently redefining methods for joint delivery of related services to job seekers and employers with workforce partners. The redefinition could result in reduction or elimination of a current line-of-business.

Another large agency indicated that: The agency is pushing for a statewide Enterprise Architecture program to enable the agency's ERP Enterprise Program. In a perfect world, the state would have already have completed an Enterprise Architecture. Showing:

- The State's Business Architecture,
- The Information and Data Architecture,
- The supporting Applications Architecture, and
- The underlying Technology Architecture.

On the one hand, Enterprise Architecture equips us with a Sustainable Business Architecture for best-in-class decision making:

- With Alignment of EA-to-business needs,
- A repeatable EA framework, and
- Architecture that is visible across all state agencies.

On the other hand, Enterprise Resource Planning can define the **as-is** and **to-be** states for systems supporting Human Resources, Finance and Procurement; the central services of our organizations.

Survey Section 7: Additional Resources

7.1 Please provide any links to models, studies, empowering legislation or other resources that could be of benefit to state CIOs in planning for legacy system modernization initiatives.

States were asked to provide links to models, studies, empowering legislation or other resources that could be of benefit to state CIOs in planning for legacy system modernization initiatives. Below are responses from five states that provided input:

- The Commonwealth of **Kentucky**: A system modernization prompted by a legislative mandate is a very effective vehicle for a legacy system modernization initiative. The Commonwealth had an initiative to modernize its legacy vehicle information system that is more than 40 years old. The need to modernize was recognized by everyone and that prompted legislation which created the funding vehicle for this initiative, available at: <www.lrc.state.ky.us/record/06RS/HB537/bill.doc>

- **North Carolina** included the following three resources:
  (1) The URL for the state CIO's statewide IT Plan is: <www.its.state.nc.us>. Look under "Hot Topics" in the right column.
  (2) The URL for the state CIO's Legacy Applications Report is: <www.scio.state.nc.us>. Look under "Hot Topics" in the right column.
  (3) The URL for the applications portfolio management (APM) initiative is: <www.scio.state.nc.us/PortfolioManagementInitiative.asp> Applications Portfolio Management is in the center of the page. A chart of NC's four-step process can be found by clicking on Applications Portfolio Management, then clicking on APM Process Diagram.

- The Commonwealth of **Virginia** offered their experience with an Act passed in 2002: The Public-Private Education and Infrastructure Act of 2002 (PPEA) was designed to bring private sector expertise to bear on public projects, saving time and money. It has allowed private entities to "acquire, design, construct, improve, renovate, expand, equip, maintain or operate qualifying projects" and encourages innovative approaches to financing construction and renovation. Available at: <www.dgs.virginia.gov/PPEA/tabid/62/Default.aspx>

- **Oklahoma** referenced past legislation: The state passed legislation in 2000 to replace the state's central accounting system. This was the authorization to implement the ERP system.

- As in *Section 6, **Montana** referenced the U.S. Department of the Interior, Office of the Chief Information Officer, and additional Federal resources from the Federal Chief Information Officers (CIO) Council Website:

  *Methodology for Business Transformation Toolkit: Guidance and Templates <www.doi.gov/ocio/architecture/mbt/guidance.htm>

  *U.S. Department of the Interior, Office of the Chief Information Officer <www.doi.gov/ocio>

  Documents Webpage <www.cio.gov/index.cfm?function=documents>

  CIOC Architecture & Infrastructure Committee <www.cio.gov/index.cfm?function=eastatement>

Appendix I – Complete Responses for Question 2.6.

2.6 Please rank on a scale of 1-5, the following concerns around "Legacy Systems" relative to issues you are facing in your state.

Legend:

Overall rating based on the scale from 1 to 5

- Not challenging 1
- 2
- 3
- 4
- Extremely challenging 5

Application Development tools – limited expertise ('dead' languages)

	Percent	Count	Answers
	3.4%	1/29	Least critical 1
	10.3%	3/29	2
	24.1%	7/29	3
	48.3%	14/29	4
	13.8%	4/29	Most critical 5

Documentation – non-existent or out of date

	Percent	Count	Answers
	6.9%	2/29	Least critical 1
	17.2%	5/29	2
	58.6%	17/29	3
	10.3%	3/29	4
	6.9%	2/29	Most critical 5

Extensibility, Adaptability, Agility – inability to enhance or revise

	Percent	Count	Answers
	3.4%	1/29	Least critical 1
	0.0%	0/29	2
	17.2%	5/29	3
	51.7%	15/29	4
	27.6%	8/29	Most critical 5

Hardware – no longer available, limited or no support

	Percent	Count	Answers
	27.6%	8/29	Least critical 1
	20.7%	6/29	2
	24.1%	7/29	3
	27.6%	8/29	4
	0.0%	0/29	Most critical 5

Hardware Maintenance – limited or unavailable

	Percent	Count	Answers
	27.6%	8/29	Least critical 1
	17.2%	5/29	2
	24.1%	7/29	3
	31.0%	9/29	4
	0.0%	0/29	Most critical 5

Recoverability – uncertain how or where to recover

	Percent	Count	Answers
	17.2%	5/29	Least critical 1
	24.1%	7/29	2
	17.2%	5/29	3
	24.1%	7/29	4
	17.2%	5/29	Most critical 5

Security – ability to enhance, revise to meet changing security guidelines (e.g. passwords)

	Percent	Count	Answers
	10.3%	3/29	Least critical 1
	17.2%	5/29	2
	37.9%	11/29	3
	10.3%	3/29	4
	24.1%	7/29	Most critical 5

Software – no longer available, limited or no support

	Percent	Count	Answers
	6.9%	2/29	Least critical 1
	6.9%	2/29	2
	37.9%	11/29	3
	34.5%	10/29	4
	13.8%	4/29	Most critical 5

Software Maintenance/Upgrades – limited or unavailable

	Percent	Count	Answers
	6.9%	2/29	Least critical 1
	6.9%	2/29	2
	27.6%	8/29	3
	58.6%	17/29	4
	0.0%	0/29	Most critical 5

Technical Support – unavailable or difficult to obtain

	Percent	Count	Answers
	6.9%	2/29	Least critical 1
	10.3%	3/29	2
	37.9%	11/29	3
	34.5%	10/29	4
	10.3%	3/29	Most critical 5

Appendix II – Response Definitions for Question 2.7.

Question 2.7 Please indicate the most common method(s) your state is utilizing for the modernization of legacy systems?

Applications wrapping: A technique that enables a closed, non-open application to be part of another application and enables information that was resident in non-accessible applications to be used outside of this application.

Automated migration: Where an application is automatically transformed (with little or no human effort) to another language and/or database; also referred to as language conversion.

Data conversion: The conversion of one form of computer data to another – the changing of bits from being in one format to a different one, usually for the purpose of application interoperability or for the capability of using new features.

Extension: Technology platforms and software that allow you to extend the life of your existing systems. Might include extending systems to Web-based applications and new presentation layers.

Re-hosting/Re-platforming: Where an application is moved from one platform to another intact to preserve business logic but move to a lower cost platform. For example, a Unisys COBOL based system is moved away from Unisys hardware to Linux with a relational database, with minimal changes to the application.

Re-engineer with Commercial-off-the-Shelf (COTS) software: Legacy custom code to COTS. Where a proprietary application is moved to a packaged application (e.g. a mainframe HR system is replaced by an off-the-shelf packaged application from a vendor).

Renovation/Re-architecting: Where an application's key business logic or workflow is extracted and forward engineered to a new native application (e.g. COBOL to Java). This results in a brand new application that makes use of existing legacy assets.

Service Oriented Architecture (SOA) integration: Covers both application and data integration where clients expose current legacy applications and data as reusable services. This can be as broad a using a SOA philosophy across an entire enterprise or as granular as one legacy application exposing a few services to be reused by one or two applications. (Vendor Lookup)

Utilize Enterprise Application Integration (EAI) to encapsulate and link legacy applications: The process of linking such applications within a single organization together in order to simplify and automate business processes to the greatest extent possible, while at the same time avoiding having to make sweeping changes to the existing applications or data structures.

Virtualization/Emulation: *Virtualization* involves taking a physical processor and partitioning it into multiple contexts - all of which take turns running directly on the processor itself. Virtualization is faster than emulation - but requires that you have the correct physical processor to work. *Emulation* on the other hand involves providing the functionality of your target processor completely in software. The main advantage of emulation is that you can emulate a processor on any other type of processor. The main disadvantage is that it tends to be slow.

Appendix III – Complete Responses for Question 2.7.

2.7 Please indicate the most common method(s) your state is utilizing for the modernization of "Legacy Systems." (*Please check all that apply*)

Applications wrapping

Timing

Percent	Count	Answers
31.8%	7/22	Used in Past
50.0%	11/22	Currently Using
18.2%	3/22	Plan to Use in Future

Experience

Percent	Count	Answers
70.0%	14/20	Used/Using Successfully
30.0%	5/20	Used Unsuccessfully

Comments

- ADabas, Cobol financial system extracted data to a financial data mart
- Oregon agencies have used this method in the past and also plan to use it in the future

Automated migration

Timing

Percent	Count	Answers
20.0%	3/15	Used in Past
53.3%	7/15	Currently Using
26.7%	4/15	Plan to Use in Future

Experience

Percent	Count	Answers
81.8%	8/11	Used/Using Successfully
18.2%	2/11	Used Unsuccessfully

Comments

- Systems were too complicated for the tool

Data conversion

Timing

Percent	Count	Answers
22.7%	5/22	Used in Past
68.2%	15/22	Currently Using
9.1%	2/22	Plan to Use in Future

Experience

Percent	Count	Answers
100.0%	19/19	Used/Using Successfully
0.0%	0/19	Used Unsuccessfully

Comments

- We have used and are currently using data conversion for legacy system modernization; also have "Used in the past"
- Retirement Systems
- Oregon agencies have used this method in the past and also plan to use it in the future.

Extension

Timing

Percent	Count	Answers
23.8%	5/21	Used in Past
66.7%	14/21	Currently Using
9.5%	2/21	Plan to Use in Future

Experience

Percent	Count	Answers
100.0%	17/17	Used/Using Successfully
0.0%	0/17	Used Unsuccessfully

Comments

- We've had mixed results, some positive, some didn't make it into production
- In Process
- Web interfaces for tax system (difficult to maintain)
- Oregon agencies have used this method in the past and also plan to use it in the future

Re-hosting/Re-platforming

Timing

Percent	Count	Answers
16.0%	4/25	Used in Past
64.0%	16/25	Currently Using
20.0%	5/25	Plan to Use in Future

Experience

Percent	Count	Answers
89.5%	17/19	Used/Using Successfully
10.5%	2/19	Used Unsuccessfully

Comments

- We haven't had much luck moving legacy apps to different platforms
- In Process
- Information Warehouse to *Netezza platform: *<http://en.wikipedia.org/wiki/Data_warehouse_appliance>
- Have done this in the past
- Failed ERP implementation
- Oregon agencies also plan to use this method in the future

Re-engineer or replace with a Commercial-of-the-Shelf (COTS) software

Timing

Percent	Count	Answers
10.7%	3/28	Used in Past
71.4%	20/28	Currently Using
17.9%	5/28	Plan to Use in Future

Experience

Percent	Count	Answers
91.3%	21/23	Used/Using Successfully
8.7%	2/23	Used Unsuccessfully

Comments

- This is our most common approach
- HR system using PeopleSoft
- Mixed experience
- Some unsuccessful attempts due to dynamic state needs (will use in future)
- Have and are using COTS
- DOT is acquiring Oracle Financials and if it works for them may become statewide

Renovation/Re-architecting

Timing

Percent	Count	Answers
16.0%	4/25	Used in Past
56.0%	14/25	Currently Using
28.0%	7/25	Plan to Use in Future

Experience

Percent	Count	Answers
87.5%	14/16	Used/Using Successfully
12.5%	2/16	Used Unsuccessfully

Comments

- Mixed results
- This method is regularly used (all three blocks should be checked) which often requires a change to our business practices
- Oregon agencies have used this method in the past and also plan to use it in the future

Service Oriented Architecture (SOA) integration

Timing

Percent	Count	Answers
3.8%	1/26	Used in Past
42.3%	11/26	Currently Using
53.8%	14/26	Plan to Use in Future

Experience

Percent	Count	Answers
84.6%	11/13	Used/Using Successfully
15.4%	2/13	Used Unsuccessfully

Comments

- Have not used extensively, though this is a common direction
- Human Services, Employment and Training, Public Safety
- Have used since 2004
- Exchanging data and services amongst law enforcement jurisdictions

Utilize Enterprise Application Integration (EAI) to encapsulate and link legacy applications

Timing

Percent	Count	Answers
10.5%	2/19	Used in Past
47.4%	9/19	Currently Using
42.1%	8/19	Plan to Use in Future

Experience

Percent	Count	Answers
90.9%	10/11	Used/Using Successfully
9.1%	1/11	Used Unsuccessfully

Comments

- Intermediate solutions while planning for more extensive application replacement
- Customized MQ Series for data transfers across applications
- There are some current SOA initiatives with several planned for the near future. (should also be checked use in future)
- Have used since 2001
- Oregon agencies have used this method in the past and also plan to use it in the future

Virtualization/Emulation

Timing

Percent	Count	Answers
4.3%	1/23	Used in Past
78.3%	18/23	Currently Using
17.4%	4/23	Plan to Use in Future

Experience

Percent	Count	Answers
94.1%	16/17	Used/Using Successfully
5.9%	2/17	Used Unsuccessfully

Comments

- There have been some failed modernization efforts using this method
- Migrating heterogeneous mix of servers, OS etc. to VMware on HP or IBM blades.
- Oregon agencies also plan to use this method in the future

Other, please specify

Timing

Percent	Count	Answers
25.0%	1/4	Used in Past
50.0%	2/4	Currently Using
25.0%	1/4	Plan to Use in Future

Experience

Percent	Count	Answers
100.0%	2/2	Used/Using Successfully
0.0%	0/2	Used Unsuccessfully

Comments

- Bridge systems
- Replacing old COTS package with new one (usually from different vendor)
- Replace legacy systems with new SOA-architected solutions

Appendix IV – Complete Responses for Question 2.9.

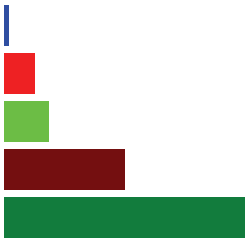
2.9 Please indicate obstacles or challenges your state has experienced with the modernization of "Legacy Systems," and rank on a scale of 1-5.

Legend:
Overall rating based on the scale from 1 to 5
Not challenging 1
2
3
4
Extremely challenging 5

Data migration

Percent	Count	Answers
0.0%	0/28	Not challenging 1
10.7%	3/28	2
53.6%	15/28	3
14.3%	4/28	4
21.4%	6/28	Extremely challenging 5

Funding

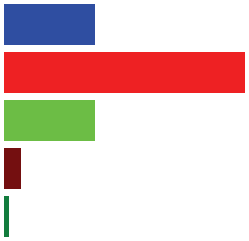


Percent	Count	Answers
0.0%	0/29	Not challenging 1
6.9%	2/29	2
10.3%	3/29	3
27.6%	8/29	4
55.2%	16/29	Extremely challenging 5

Lack of documentation

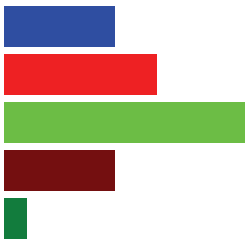
Percent	Count	Answers
10.3%	3/29	Not challenging 1
31.0%	9/29	2
20.7%	6/29	3
31.0%	9/29	4
6.9%	2/29	Extremely challenging 5

Lack of source code



Percent	Count	Answers
20.7%	6/29	Not challenging 1
55.2%	16/29	2
20.7%	6/29	3
3.4%	1/29	4
0.0%	0/29	Extremely challenging 5

Out-side vendor support



Percent	Count	Answers
17.2%	5/29	Not challenging 1
24.1%	7/29	2
37.9%	11/29	3
17.2%	5/29	4
3.4%	1/29	Extremely challenging 5

Resistance (or lack of internal support) from internal end users

Percent	Count	Answers
6.9%	2/29	Not challenging 1
27.6%	8/29	2
41.4%	12/29	3
13.8%	4/29	4
10.3%	3/29	Extremely challenging 5

Risk of failure versus tolerance or appetite for failure

Percent	Count	Answers
3.4%	1/29	Not challenging 1
20.7%	6/29	2
44.8%	13/29	3
17.2%	5/29	4
13.8%	4/29	Extremely challenging 5

Staff support (including both state and contracted staff)

Percent	Count	Answers
3.4%	1/29	Not challenging 1
27.6%	8/29	2
34.5%	10/29	3
34.5%	10/29	4
0.0%	0/29	Extremely challenging 5

System availability during transition period

Percent	Count	Answers
13.8%	4/29	Not challenging 1
34.5%	10/29	2
37.9%	11/29	3
10.3%	3/29	4
3.4%	1/29	Extremely challenging 5

Endnotes

[1] For more information on the graying of state's IT workforce, refer to NASCIO's survey report, *State IT Workforce: Here Today, Gone Tomorrow?*, <www.nascio.org/publications> © Copyright NASCIO, all rights reserved, www.NASCIO.org.

[2] For more information on funding for state IT, refer to NASCIO's survey report, *Innovative Funding for State IT: Models, Trends & Perspectives*, <www.nascio.org/publications> © Copyright NASCIO, all rights reserved, www.NASCIO.org.

[3] For more information on the graying of state's IT workforce, refer to NASCIO's survey report, *State IT Workforce: Here Today, Gone Tomorrow?*, <www.nascio.org/publications> © Copyright NASCIO, all rights reserved, www.NASCIO.org.

[4] For more information on funding for state IT, refer to NASCIO's survey report, *Innovative Funding for State IT: Models, Trends & Perspectives*, <www.nascio.org/publications> © Copyright NASCIO, all rights reserved, www.NASCIO.org.

[5] For more information on funding for state IT, refer to NASCIO's survey report, *Innovative Funding for State IT: Models, Trends & Perspectives*, <www.nascio.org/publications> © Copyright NASCIO, all rights reserved, www.NASCIO.org.

[6] For updated information on the fiscal condition of the states and projections for 2009 in the coming year, please reference, ***The Fiscal Survey of the States***, <www.nasbo.org/Publications/PDFs/Fall2008FiscalSurvey.pdf>, Copyright December 2008 by the National Governors Association (NGA) <www.nga.org>, and the National Association of State Budget Officers (NASBO) <www.nasbo.org>. All rights reserved.