

NATIONAL ASSOCIATION OF STATE CHIEF INFORMATION OFFICERS



Enterprise Architecture Maturity Model





NASCIO Enterprise Architecture
Maturity Model

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For more information about the validation effort, please see <https://www.nascio.org/publications/index.cfm> where a report on the validation effort can be ordered and downloaded.



EA MATURITY MODEL

Introduction

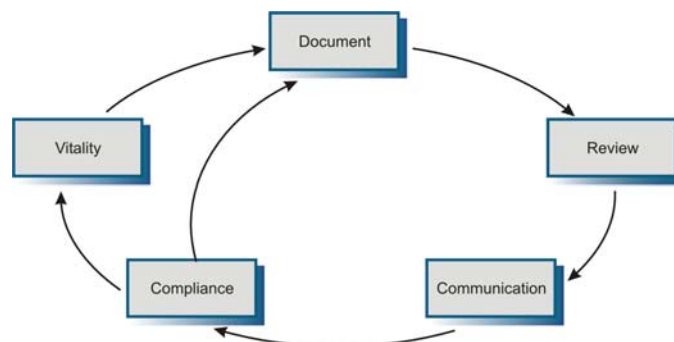
Adaptive enterprise architecture consists of characteristics necessary to support the information technology infrastructure of an organization. The infrastructure exists to support the business operation of the organization. An adaptive, dynamic enterprise architecture enables the enterprise to change and manage the complexities inherent in large government enterprise.

The NASCIO Enterprise Architecture Maturity Model provides a path for architecture and procedural improvements within an organization. As the architecture matures, predictability, process controls and effectiveness also increase. For definitions of terms used in this document please refer to the lexicon found in Appendix A of the *NASCIO Adaptive Enterprise Architecture Tool-Kit*.

Development of the Enterprise Architecture Framework is critical because it provides the rules and definition necessary for the integration of information and services at the design level across agency boundaries. The framework combines business and environment processes and representations to allow planning and development of a blueprint. The Enterprise Architecture Blueprint is the collection of the actual standards and specifications that define what the Business and IT Portfolios are and how they may be built. The Blueprint contains the details that are essential for allowing data to flow from agency to agency, just as water flows through the pipes and electricity flows through the wiring of a well planned home.

Development of the Enterprise Architecture is an ongoing process and cannot be delivered overnight. An organization must patiently work to nurture and improve upon its Enterprise Architecture Program until architectural processes and standards become second nature and the Architecture Framework and the Architecture Blueprint become self-renewing.

Whatever the current stage of the organization's enterprise architecture program, each activity undertaken also has its own lifecycle. Without continuous monitoring of the driving business and technology factors, any Enterprise Architecture Blueprint can soon become obsolete. Just as individual product and compliance components contained in the Blueprint need to go through the cyclic process of Documentation, Review, Compliance, Communication, and Vitality, the high-level Enterprise Architecture Framework and procedures must be reviewed and updated to properly reflect environmental changes.



Three high-level components to the Enterprise Architecture Framework were defined in the Enterprise Architecture Development Tool-Kit V2.0. Together they provide the rules and form factors to create the blueprint for the integration of information and services. Each component contains a number of elements which must be factored individually, addressed on its own merit, and may be at a different maturity level at any given point in time. The high level components are:

- Architecture Governance includes the leadership, organizational structures, direction, and processes needed to ensure Information Technology (IT) enables the enterprise's mission, goals, objectives and strategies in a planned manner.

The purpose of architecture governance is to direct or guide architecture initiatives, ensure that organizational performance aligns with the strategic intent of the business, ensure IT resources are used responsibly and Technology Architecture-related risks are managed appropriately.

- Business Architecture identifies and describes environmental drivers, and defines the mission, guiding principles, goals, objectives and strategies of the business. This strategic intent is executed through enabling capabilities that include information technology. Enterprise Architecture ensures appropriate traceability from business architecture to the other allied architectures.
- Technology Architecture provides the processes and templates to document products and compliance criteria used within the organization. The Technology Architecture includes the portions of the Enterprise Architecture Framework that will set direction for technology and migration of existing IT services. Enterprise Architecture ensures that technical solutions meet the business needs of the organization.

Some of the individual components that must be considered at the Enterprise level, as well as in the various Architecture disciplines include components of the following:

- *Architecture Planning* ensures the program is managed to assure the goals for implementation are realistic and achievable and the program is kept within scope.
- *Architecture Framework* consists of the processes, templates and forms used by those documenting the operations and standards of the organization.
- *Architecture Blueprint* refers to the completed documents that are prepared using the Architecture Framework processes, templates and forms. The Blueprint refers to the documented products and standards, together with their detail, classifications, impact statements, and migration strategies.
- *Communication* is the element that ensures standards and processes are established and readily available to team members for reference and use. As an organization changes and programs evolve the continued communication ensures the EA program remains vital and operates optimally.
- *Compliance* must be reviewed periodically to be sure the business and IT programs and services are operating effectively.
- *Integration* addresses the ability of the various entities (internal or external to the organization) to coordinate their efforts to the greatest benefit of the organization. This is a key factor, as great efficiencies are gained by identifying similar functions or operations, both inside and outside of an organization.
- *Involvement* must be part of an EA Program. Without the support of managers and employees who are expected to utilize and follow the defined process, the program is sure to fail.

The goal of NASCIO's Adaptive Enterprise Architecture Development Program is to create a set of tools to assist state and local government in the development of an enterprise architecture that facilitates information sharing among all functions and across all levels of state and local government.

The original NASCIO Enterprise Architecture Development toolset, as published in 2001 consisted of an adaptive Enterprise Architecture Primer, which included the business case for architecture, guidance for architecture development, and samples from state and local government. It also consisted of a Governance Recommendations Report that provided the basic elements necessary for the Governance structure to support an adaptive enterprise architecture program.

After a three-state validation process and workshops, which gathered comments from CIOs and IT architects from 22 states, NASCIO published its Adaptive Enterprise Architecture Tool-Kit – Version 2.0. This publication covers the topics of Architecture Governance and Technology Architecture in greater detail, including the addition of roles and responsibilities for Governance, process models and detailed description of the architecture development lifecycle processes, detailed templates and additional samples.

As NASCIO continues to work with representatives from the various states, the focus is the constant improvement of the information provided in the Tool-Kit as well as the provisioning of additional tools and programs for assisting state and local governments in their architecture development efforts.

An essential part of enterprise architecture development is for the organizations to assess their current situation, and then set goals for the future. Identifying the maturity of EA Architecture program components formally allows the organization to benchmark the status of current programs and begin the process of improving their effectiveness, or kick off a new program.

NASCIO has developed an Enterprise Architecture Maturity Model state and local governments can use as a tool to objectively review the status of their Enterprise Architecture program, assess the current maturity and provide direction to attain the next level. As an organization's architecture matures, the benefits to the entire enterprise increase.



Background

Over the past several years many organizations have developed capability maturity models designed to support process improvement in various areas such as:

- Software development
- Systems engineering
- Integrated product and process development
- Security

The Capability Maturity Model developed by Software Engineering Institute (SEI), which describes the evolution of software development processes, has been used by most of the organizations as the basis for maturity models in these various areas.

The NASCIO Maturity Model for Enterprise Architecture is based on the same concept.

The intent of this model is to supply a tool that can be used to benchmark the effectiveness of an Enterprise Architecture program. It also illustrates the natural progression of benefits that a supported and managed architecture program will contribute to an organization as it matures.

The following advice comes from the State of Kansas concerning the development of Enterprise Architecture:

“Regardless of the architectural development level with which an organization starts, certain criteria should be considered in order for the end-product to be useful and accepted within the organization:

- Architectural principles must be derived from agency goals, objectives and written requirements.
- An architecture plan should guide individual agency information systems and technology infrastructure decisions.
- Senior Managers, legislators, technical project architects, designers, developers, etc. must understand architecture plans.
- The architecture should be developed within the enterprise-wide context of IT and technology benefits.
- The architecture should enable flexibility and nimbleness in reacting to new changes in IT, systems and data access.

In general, architecture should:

- Sell its vision to government leaders and IT management.
- Help align the use of technology with the strategic goals and objectives.
- Facilitate the communication of plans within a decentralized IT community.
- Help manage the increasing complexity of IT technologies.
- Facilitate “bridging” new and emerging IT to legacy architecture.
- Provide guidance in adapting the architecture that packaged solutions bring to the architectural vision.
- Be complete and consistent and provide guidance to application developers, IT managers, and end-users that need to plan, budget, implement and use information technology.

- Provide for easy access (less paper/fewer binders); be web enabled, easy to view, traverse and query.
- Provide a means to analyze how processes, tools, technology and people should interact to produce IT solutions that achieve both individual and combined goals.”

Architecture is an iterative process. It is important that the pieces are broken down into workable modules where the individual pieces can be reviewed and all understand where they fit and how they interact within the organization. This is not a project with an end-date. A vital successful program must be an on-going process. How often the individual and overall modules are reviewed and updated is the decision of each individual organization.

The standard set within the *NASCIO Enterprise Architecture Development Tool-Kit* recommends the framework be reviewed any time business strategies or IT strategies make a noticeable shift. Enterprise Architectural Framework reviews should occur every one to two years at a minimum. Some individual modules may need to be reviewed as often as every six months.

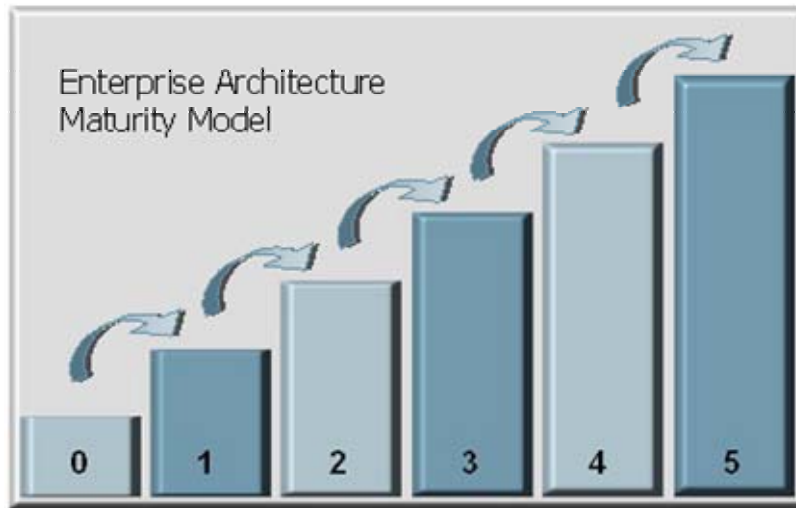
Some of the benefits that can be expected as an Enterprise Architecture progresses in its maturity are:

- Reduced software and data redundancy
- Enhanced enterprise information sharing
- Reduced information systems complexity
- Better alignment of business strategy and system development
- Greater reliability at implementations & updates
- Reduced dependency on key resources
- Improved accuracy in scheduling software development / implementation
- More accurate forecasting of development and support costs
- More efficient deployment of technology solutions
- Greater ability to set realistic goals
- Improved alignment of IT solutions with business strategy
- Increased traceability



Maturity Model for Enterprise Architecture

While the task of implementing and maintaining a comprehensive enterprise architecture program may seem daunting at times, the results speak for themselves. This Enterprise Architecture Maturity Model, depicted below, and the following section reflect the phases an organization will see as their architecture program matures.



The model follows the path of an organization as their enterprise architecture program matures, and sets benchmarks to measure the performance and path that is a natural progression in the development of enterprise architecture. The NASCIO Tool-Kit provides guidance for the development process.

In the following sections, each of the levels of NASCIO's Enterprise Architecture Maturity Model is defined. Each level contains statements that are indicative of an EA Program at that level. These statements have been organized into the following Enterprise Architecture categories:

- *Administration* – Governance Roles & Responsibilities
- *Planning* – EA program road map and implementation plan
- *Framework* – processes and templates used for Enterprise Architecture
- *Blueprint* – collection of the actual standards and specifications
- *Communication* – education and distribution of EA and Blueprint detail
- *Compliance* – adherence to published standards, processes and other EA elements, and the processes to document and track variances from those standards
- *Integration* – touch-points of management processes to the EA
- *Involvement* – support of the EA Program throughout the organization

EA LEVEL 0 - NO PROGRAM

There is not a documented architectural framework in place at this level of maturity. While solutions are developed and implemented, this is done with no recognized standards or base practices. The organization is completely reliant on the knowledge of independent contributors.

What to expect of an organization at this level

Administration

- No Architecture Governance is in place

Planning

- No plans for developing Enterprise Architecture are in place

Framework

- Architecture processes and templates are not documented

Blueprint

- IT technology standards are not documented

Communication

- Senior Management and agencies are not aware of what enterprise architecture is or the benefits

Compliance

- No compliance process exists within the organization.

Integration

- No program in place for integration across the enterprise

Involvement

- There is no program in place for Enterprise Architecture awareness
- Several independent groups or individuals typically work to solve a single issue

EA LEVEL 1 - INFORMAL PROGRAM

The base architecture framework and standards have been defined and are typically performed informally. There is general consensus that these steps should be performed, however they may not be tracked and followed. Organizations with an Enterprise Architecture framework at this level are still dependant on the knowledge of individual contributors.

What to expect of an organization at this level

Administration

- The need for committees to define the standards and processes has been identified

Planning

- Need for Enterprise Architecture has been identified
- EA activities are informal and unstructured

Framework

- Processes are ad hoc and informal, processes followed may not be consistent
- There is no unified architecture process across technologies and lines of business

Blueprint

- Documentation of business drivers, technology standards, etc. are informal and inconsistent

Communication

- The need to create greater awareness about EA has been identified
- Little communication exists about the EA process or possible process improvements

Compliance

- The need for compliance to standards has been identified
- Compliance is informal and unstructured
- Compliance cannot be measured effectively, because processes and procedures are not consistent across areas and/or projects

Integration

- The need to document common functions that integrate with an EA Program has been identified
- Projects and purchases are typically done in isolation, resulting in costly purchases and redundant development and training requirements

Involvement

- The organization has identified a need to make staff throughout the enterprise aware of the benefits and concepts of Enterprise Architecture

- EA awareness efforts are informal and inconsistent
- Some groups are unsupportive of the efforts and may cause unrest in the organization

EA LEVEL 2 - REPEATABLE PROGRAM

The base architecture and standards have been identified and are being tracked and verified. At this point in the program processes are repeatable and reusable templates are starting to be developed. The need for product and compliance components to conform to the standards and requirements has been agreed upon, and metrics are used to track process area performance.

What to expect of an organization at this level

Administration

- A need for Architecture Governance has been identified
- EA Program has begun to develop clear roles and responsibilities
- Governance committees are starting to form

Planning

- The organization has begun to develop a vision for Enterprise Architecture
- Organization has begun to identify EA tasks, and resource requirements.
- Organization has decided on a methodology and begun to develop a plan for their EA Program

Framework

- The basic EA Program is documented
- Processes are planned and tracked
- The organization is beginning to reuse methods for capturing critical EA information

Blueprint

- Business Drivers, and strategic information have been identified
- The need for an EA repository for storage and dissemination of the captured EA information has been identified

Communication

- The need for Enterprise Architecture is being communicated to Senior Management
- EA awareness activities are beginning to emerge or be developed

Compliance

- The organization has begun to develop a compliance process to ensure that projects and enhancements are consistent with EA standards

Integration

- The need for integration to the EA Program Framework (Architecture Lifecycle Processes) has been identified

- The various touch-points between the Management Processes and the EA Program Framework have been mapped (however, no details exist as to how the integration will work)

Involvement

- The organization has begun to develop plans for EA educational sessions and materials to increase the awareness and understanding of the EA concepts and processes
- EA concepts are beginning to be introduced and more consistently discussed in normal day-to-day meetings

EA LEVEL 3 - WELL-DEFINED PROGRAM

The enterprise architecture framework is well defined; using approved standard and/or customized versions of the templates. Processes are documented across the organization. Performance metrics are being tracked and monitored in relationship to other general practices and process areas.

What to expect of an organization at this level

Administration

- Architecture Governance committees are defined, and have defined roles and responsibilities
- Authority of the governance committees is aligned to work together smoothly

Planning

- EA Program plans are well-defined, including governance roles & responsibilities, a structured framework and timeline for developing the EA, and financial & staffing resource requirements
- EA activities are carried out according to the defined plan

Framework

- The lifecycle architecture processes have been defined and documented
- Generic architecture processes are being customized for uses by agencies, departments, etc.
- Process models have been prepared
- Templates are used to ensure the capturing of information is consistent

Blueprint

- Classification of existing technology standards is consistent
- Documentation of business drivers, and strategic information is consistent

Communication

- The architecture is well defined and communicated
- Training is provided for Senior management and agencies regarding architecture and its benefits
- Training is provided for members of the EA committees

Compliance

- A formal EA compliance process is well-defined and is an integral part of the EA lifecycle processes

- The EA Compliance process is followed consistently throughout the enterprise
- A Business Case is required for variance from the EA standards

Integration

- EA Program is integrated with strategic planning and budgeting processes
- Touch-points of management processes to the EA are well-defined

Involvement

- The organization begins to operate as a team, using the defined architecture program and standards
- Senior Management participate in various EA committees
- Business and technical staff participate in EA committees

EA LEVEL 4 - MANAGED PROGRAM

At this point performance metrics are collected, analyzed and acted upon. The metrics are used to predict performance and provide better understanding of the processes and capabilities.

What to expect of an organization at this level

Administration

- Governance roles and responsibilities are reviewed and updated to incorporate changes to the EA Framework

Planning

- EA plans are reviewed and changes are incorporated to improve the EA Program
- The organization captures metrics to measure the progress against the established EA plans
- Goals are being set for the future of the EA Program Plan

Framework

- The organization captures metrics to measure the effectiveness of the EA processes and templates
- Corrective action plans are put in place when deficiencies in templates and/or procedures are identified
- Meetings are held regularly to review modifications to the EA Framework

Blueprint

- Documentation of business drivers and strategic information has become a standard practice
- Documentation and classification of products and compliances has become a standard practice
- The organization captures metrics from the Compliance process to identify the need for updates to Blueprint information and/or classifications

Communication

- A formal Communication process is in place and being followed

- The communication process is reviewed and changes are incorporated to improve the communication of architecture activity and detail.
- EA awareness training is incorporated into new employee orientation
- The organization captures metrics to measure the effectiveness of the EA Communication process

Compliance

- Compliance to the EA standards has become common practice throughout the enterprise
- Quality metrics associated with the business cases are captured
- The compliance process is reviewed and updated when deficiencies or enhancements to the process are identified

Integration

- Enterprise Architecture is used to guide development and acquisition
- The organization captures metrics to measure the savings in resources, including time and money
- Costs and benefits, including benefits across agency boundaries, are considered in identifying projects
- Integration procedures are reviewed and the process is updated when problems or new functionality is identified

Involvement

- Personnel throughout the organization have a good understanding of the architecture principals and participate in the EA processes as members of committees or as their projects, etc. have touch points with the architecture
- The organization captures metrics to measure the awareness, participation, acceptance and satisfaction with the EA Program

EA LEVEL 5 - CONTINUOUSLY IMPROVING VITAL PROGRAM

The processes are mature; targets have been set for effectiveness and efficiency based on business and technical goals. There are ongoing refinements and improvements based on the understanding of the impact changes have to these processes.

What to expect of an organization at this level

Administration

- Governance committees proactively review their activities and institute changes to improve their processes
- The organization works with other states to share ideas for improvements to their EA Administration.

Planning

- Action plans are proactively implemented to increase the effectiveness of the EA Program based on captured metrics.
- Organization works with other states to share ideas with focus on improvements to the planning process for the future EA Program.

Framework

- The lifecycle processes are being followed and have become second-nature to the organization
- Captured metrics are used to identify inefficiencies in EA processes and templates prior to notification of issues
- Organization works with other states to share ideas for improvements to EA processes and templates.

Blueprint

- Captured business and technology information is reviewed in conjunction with the monitoring of new technology and business trends to proactively identify technology that will improve business
- The organization works with other states to share information regarding business and technology trends

Communication

- Metrics are used to proactively identify opportunities for improved communication avenues
- The organization works with other states to share ideas for improvements to the communications processes

Compliance

- Information gathered during the compliance process is used to proactively identify updates to the EA standards and/or framework
- Architecture metrics are used to drive continuous process improvements in the Business Cases
- The organization works with other states to share ideas for improvements to the compliance process

Integration

- The Enterprise Architecture process drives continual reinvention throughout the enterprise
- Business influences Technology and Technology influences Business
- Captured metrics are used to proactively identify improvements to the EA framework or blueprint information and/or integration processes.
- Organization works with other states to share ideas for improved integration, including procurement and project management practices

Involvement

- Agencies and departments work together as contributors to the architecture and its processes
- The organization uses the captured metrics to proactively create action plans for improvement in the EA marketing and educational programs
- The organization works with other states to share ideas for creating an atmosphere for active involvement and participation in EA Program and activities across the enterprise

The EA Maturity Model and the EA Assessment survey, together make up the EA Readiness/Maturity Assessment tool. The survey will help an organization assess their current Enterprise Architecture situation. When used with this model and the *Enterprise Architecture Development Tool-Kit*, a roadmap can be put in place to move the organization toward the goal of architecture vitality.



Summary

Long term benefits in mature and maturing organizations

There are many steps along the way and an organization may find that not all of the areas fit neatly within the lines. Maturity within the architecture framework will vary across the business architecture processes, technology architecture, as well as the architecture blueprint. This is an ever-evolving process in the life of all organizations that leads to an efficient, effective responsive development and support organization.

The NASCIO Tool-Kit is a development guide, illustrating basic Enterprise Architecture methodology. It contains templates to be used in the Architecture process and samples of real cases, which were compiled from the input of several state and county representatives.

It is through the enterprise architecture frameworks and framework elements that the NASCIO Tool-Kit provides state and local governments the means to apply adaptive enterprise architecture, which aids in a structured and consistent delivery of services and information.

The architecture blueprint is not a document that you produce once, store on the shelf and reference on occasion. It is a plan and a methodology; it must be both or it has no value. Just as with city plans and building codes, it is constantly being renewed and updated to meet the demands on the organization. There will be good decisions and bad decisions on the way, but having the information surrounding the decisions captured allows for better analysis for future decisions.

We encourage you to use all the tools developed under NASCIO's guidance. Enterprise Architecture is a key success factor to an organizations ability to plan and react to the many mandates and challenges presented to international, federal, state, and municipal officials involved in information resource management.



Reference Material

NASCIO Enterprise Architecture Development Tool-Kit, v2.0

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http://www.nascio.org/pressReleases/02_tool-kit02.cfm

NASCIO

167 W. Main Street, Suite 600

Lexington, Kentucky 40507-1324

Ph# 859.231.1971

Fax# 859.231.1928

Email: nascio@amrinc.net

Website: www.nascio.org

A Systems Engineering Capability Maturity Model, Version 1.1;

November 1995 / SEI-95-MM-003

<http://www.sei.cmu.edu/about/website/indexes/siteIndex/siteIndexTRnum.html>

A Framework for Assessing and Improving Enterprise Architecture Management (Version 1.1);

November 1995 / GAO-03-584G

<http://www.gao.gov/new.items/d03584g.pdf>

