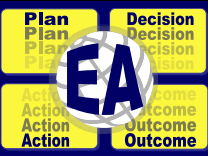




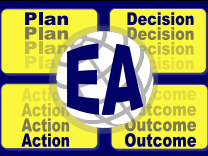
**Enterprise
Architecture:
Enabling
Enterprise
Strategic
Performance**

**Dr. W. Stan Boddie
Professor Con Kenney
Professor Matt Newman
April 11, 2011**



Vision

- **Enterprise architecture (EA) and strategic enterprise performance**
- **Chief Enterprise Architect Criteria Definition Activity**
- **Analytic Hierarchy Process (AHP)**
- **Summary**



The Enterprise

“an enterprise is any collection of organizations that has a common set of goals and/or a single bottom line. An enterprise, by that definition, can encompass a Military Department, DoD as a whole, a division within an organization, an organization in a single location, or a chain of geographically distant organizations linked by a common management or purpose.” (DoD, 2009)



United States Office of Management and Budget (OMB) EA Definition

- An EA describes the current and future state of the agency, and lays out a plan for transitioning from the current state to the desired future state. An EA is a management practice for aligning resources to improve business performance and help agencies better execute their core missions.

(OMB, 2007)

EA Benefits and Outcomes



Planning

**Decision-
Making**

**Business
Process
Execution
Optimization**

**Enterprise
Performance
Effectiveness
and Efficiency**





DoD Performance Improvement Opportunities

GAO

United States Government Accountability Office
Report to Congressional Addressees

March 2011

Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue



GAO-11-318SP

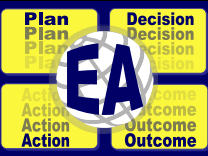




DoD Performance Improvement Area Examples

- **Realigning DOD's Military Medical Command Structures and Consolidating Common Functions Could Increase Efficiency and Reduce Costs Framework Approach & Overview**
- **Opportunities Exist for Consolidation and Increased Efficiencies to Maximize Response to Warfighter Urgent Needs**
- **Opportunities Exist to Avoid Unnecessary Redundancies and Improve the Coordination of Counter-Improvised Explosive Device Efforts**
- **Opportunities Exist to Avoid Unnecessary Redundancies and Maximize the Efficient Use of Intelligence, Surveillance, and Reconnaissance Capabilities**

GAO, 2011



DoD Performance Improvement Area Examples

- **A Departmentwide Acquisition Strategy Could Reduce DOD's Risk of Costly Duplication in Purchasing Tactical Wheeled Vehicles**
- **Improved Joint Oversight of DOD's Prepositioning Programs May Reduce Unnecessary Duplication**
- **DOD Business Systems Modernization: Opportunities Exist for Optimizing Business Operations and Systems**

GAO, 2011

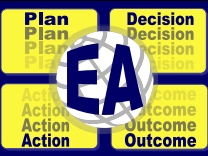


Enterprise Architecture as Strategic Performance Enabler

➤ Enterprise Architectures: Key Mechanisms for Identifying Potential Overlap and Duplication

- An enterprise architecture is a modernization blueprint that is used by organizations to describe their current state and a desired future state and to leverage information technology (IT) to transform business and mission operations.
- The development, implementation, and maintenance of architectures are widely recognized as hallmarks of successful public and private organizations

GAO, 2011



Enterprise Architecture Value

**If managed effectively,
enterprise architectures
can be a useful change
management and
organizational
transformation tool.**

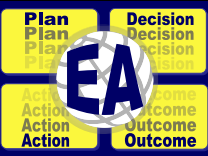
GAO, 2011





Architects' Competency Framework





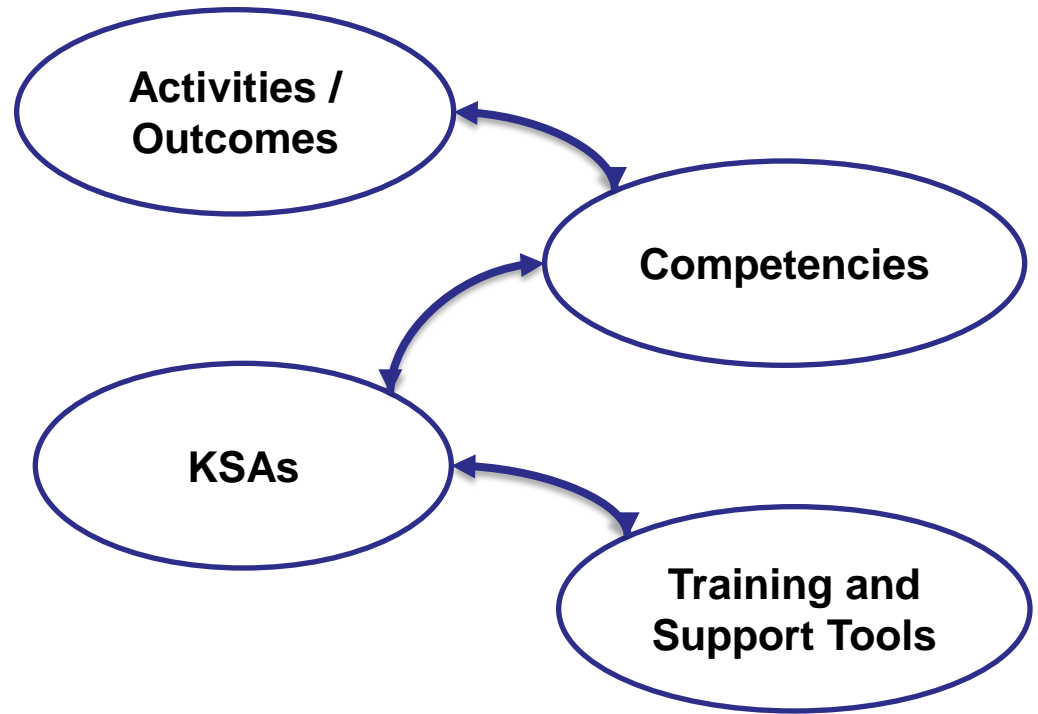
- **Background and Goals**
- **Framework Approach & Overview**
- **Recent Accomplishments**
- **Stakeholder Roles**
- **Framework Uses and Benefits**
- **Framework Structure**
- **Framework Content**
- **Career Paths**
- **Examples of Generic Job Descriptions**
- **Next Steps**
- **Looking Beyond DoD**



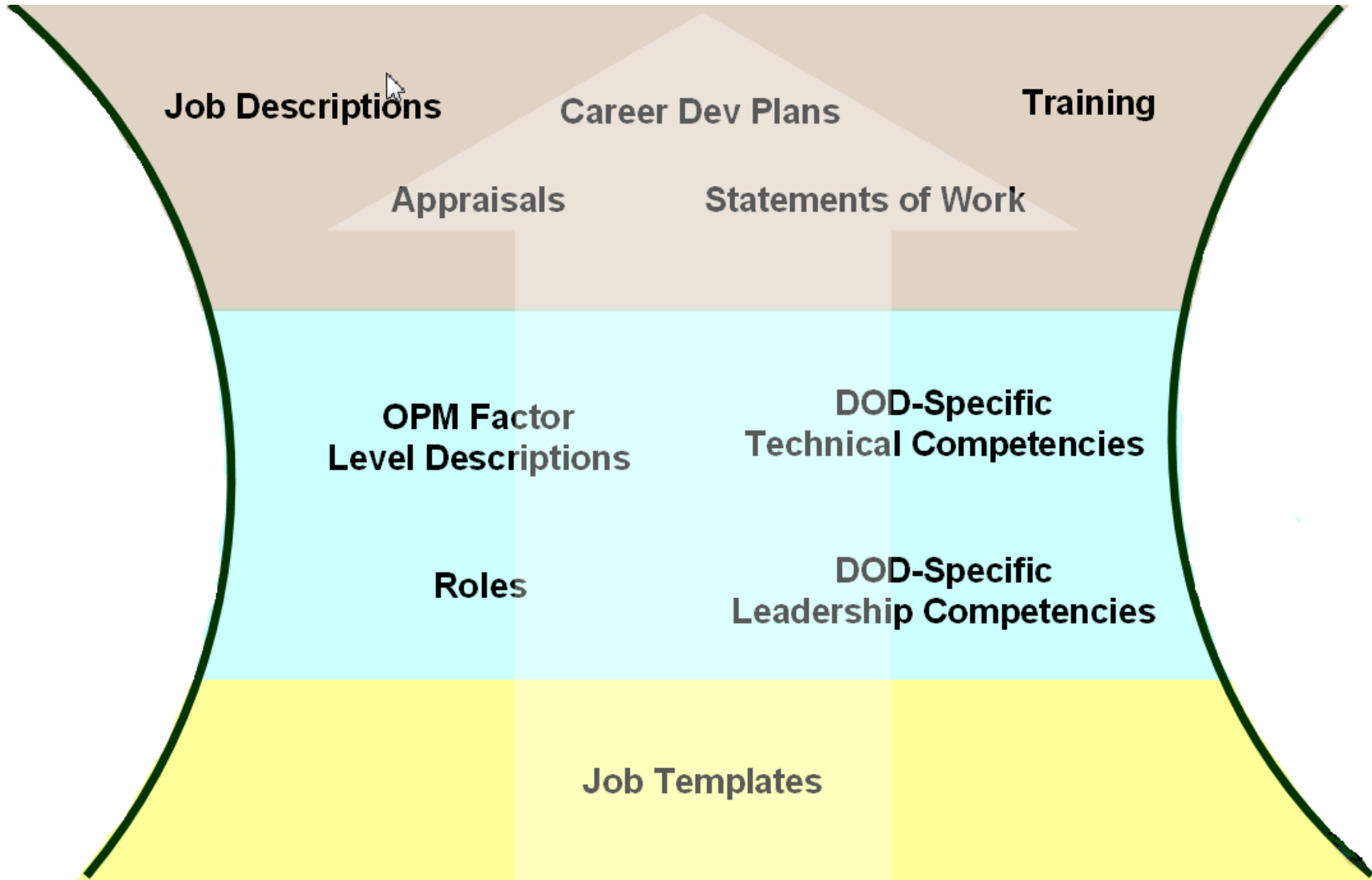
- **DoD asked the IAC EA SIG for help in developing an Architects' Competency Framework in October 2009**
- **A workgroup with participants from DoD, industry, and academia has been engaged in this task**
 - Establish approach
 - Develop framework
 - Propose and refine competencies
 - Employ the framework
- **Workgroup Goals**
 - Complete DoD competency standards development
 - Leverage framework for civilian agency use
 - Broadly promote and evolve the framework standards



- Map framework concepts with established OPM job category descriptions
- Test and refine the mappings with the help of EA practitioners and the academic community
- Identify and associate training and tools



DOD EA Competency Framework Overview



- ✓ **Conducted research and established approach**
- ✓ **Validated approach**
- ✓ **Performed DoD outreach and communication**
- ✓ **Developed the framework**
- ✓ **Tested the framework**
 - Framework validation
 - Competency development
 - Framework use
 - Job template development
- ✓ **Initiated civilian agency outreach**
- ✓ **Engaged the OMB Chief Architect, Scott Bernard, and presented to the Federal Chief Architect's Forum**



- **Employee** – someone who is performing or considering an EA job
- **Supervisor** – someone who supervises an EA practitioner
- **Hiring Manager/HR Specialist** – someone responsible for filling a position for an EA job
- **Program Manager** – someone writing a statement of work for an acquisition that includes EA activities
- **Education/Training Provider** – someone who creates and delivers offerings to help an employee acquire KSAs that support his or her professional objectives

- **Career planning** – reduces time and effort for employee by organizing information about EA-related activities, jobs, job families, training, and experience
- **Appraisal** – reduces time and effort for supervisor and employee by clarifying expectations
- **Hiring** – reduces time and effort for hiring manager and HR specialist in specifying KSAs for new job descriptions
- **Contracting** – reduces time and effort for program manager in specifying EA activities and KSAs for new acquisitions
- **Educating and training** – reduces time and effort to develop a instructional program for architects



Framework Structure

Entry Level

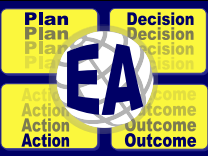


Mid-Level



Chief Architect

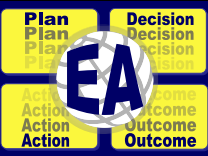
| Group | Competency Name | Level 1 Activity | Level 2 Activity | Level 3 Activity | Level 4 Activity | Level 5 Activity |
|---------------|---------------------|---|--|--|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Interpersonal | Communicating | Communicates clearly | Provides information to customers | Provides guidance on complex technology issues | Provides expert technical guidance | Advises other experts to communicate value/use of architecture and help expand the role and influence of the architecture community |
| Technology | Managing Technology | Ensures appropriate use of resources under personal control | Recommends procedure changes | Tests systems | Ensures IT integration | Delivers systems that meet business requirements and optimize the existing architecture |
| Technology | Designing Solutions | Designs modules | Coordinates with others to resolve design issues | Partitions requirements into meaningful subsets and maps subsets to existing and new solution components | Reviews the solution architectures of others, providing constructive feedback on design, partitioning, mapping, and tradeoff issues | Establishes and manages standards for reviewing solutions architectures to meet business needs and promote enterprise solutions |



Framework Structure

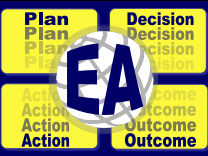


| Group | Competency Name | Level 4 Source | Level 4 Activity | Level 4 KSAs |
|---------------|---------------------|----------------|---|---|
| Interpersonal | Communicating | 1-8 | Provides expert technical guidance | Mastery of advanced architecture principles, interrelationships of multiple technical specialties, technology architecture, new applications, emerging technologies and their applications to business processes, security concepts, project management practices, oral, written, and visual communication techniques |
| Technology | Managing Technology | 1-8 | Ensures IT integration | Mastery of advanced architecture principles, interrelationships of multiple technical specialties, technology architecture, new applications, emerging technologies and their applications to business processes, security concepts, project management practices, oral, written, and visual communication techniques |
| Technology | Designing Solutions | S1-4 | Reviews the solution architectures of others, providing constructive feedback on design, partitioning, mapping, and tradeoff issues | Reads architecture models fluently, elicits and expresses design rationales clearly, capable of tough but sympathetic feedback |



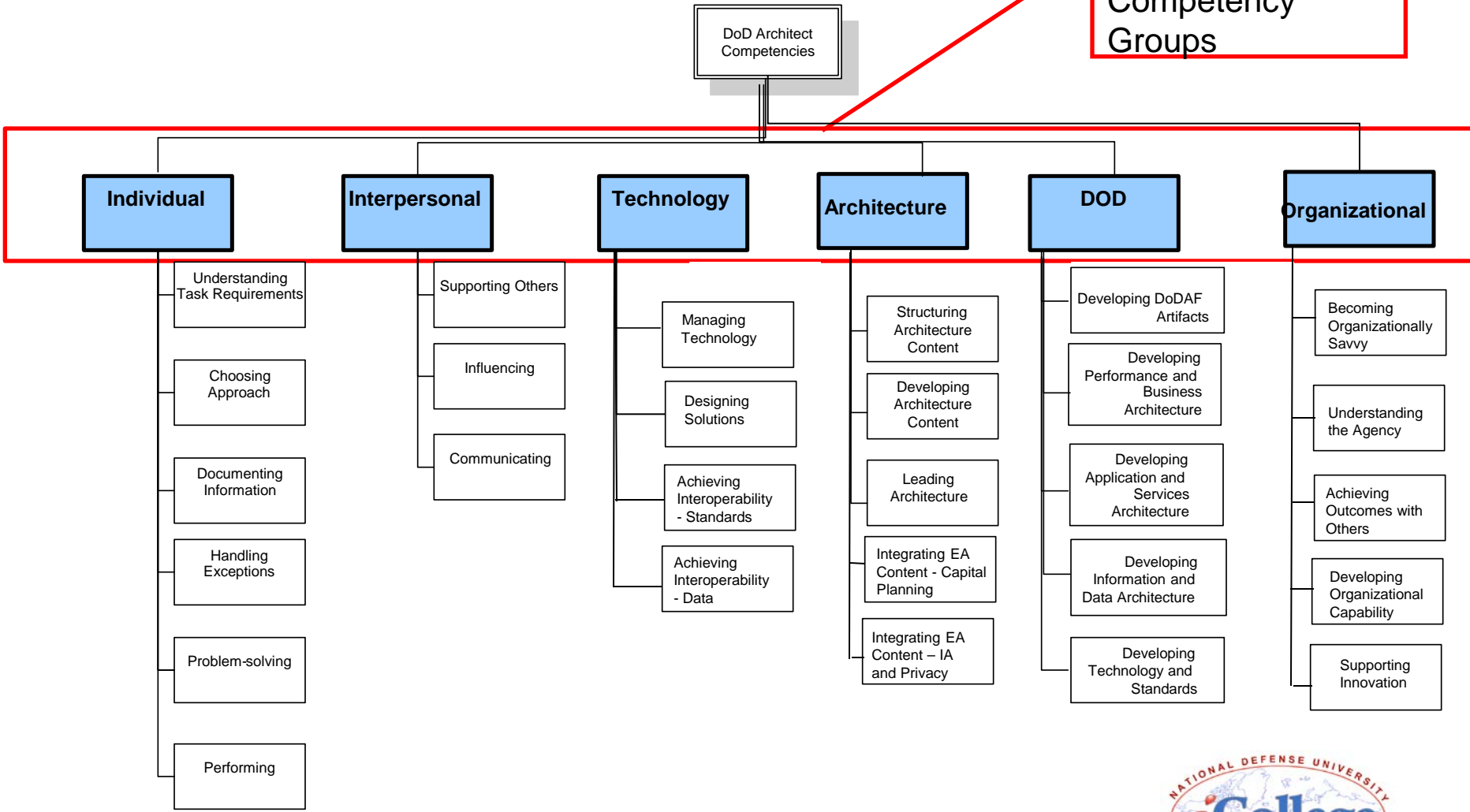
- **6 Competency Groups**
- **Individual**
- **Interpersonal**
- **Technology**
- **Architecture**
- **DoD**
- **Organizational**

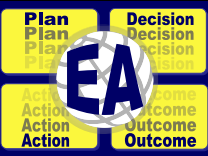




Framework Content – Overview of Competencies

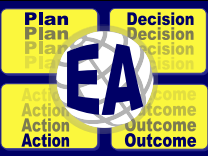
The 6 Competency Groups



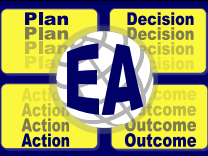


- **Individual: competencies, activities, and KSAs required for a person to complete tasks successfully working on his or her own.**
 - **Understanding Task Requirements**
 - **Choosing Approach**
 - **Documenting Information**
 - **Handling Exceptions**
 - **Problem-solving**
 - **Performing**





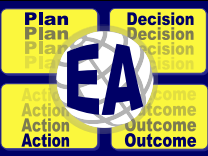
- **Interpersonal : competencies, activities, and KSAs required for a person to complete tasks successfully working with others.**
 - **Supporting Others**
 - **Influencing**
 - **Communicating**



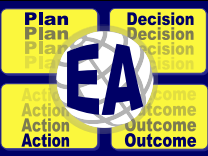
- **Technology: competencies, activities, and KSAs required for a person to complete tasks widely carried out by technology organizations.**
 - **Managing Technology**
 - **Designing Solutions**
 - **Achieving Interoperability – Standards**
 - **Achieving Interoperability - Data**

- **Architecture: competencies, activities, and KSAs required for a person to complete solutions and enterprise architecture tasks.**
 - **Structuring Architecture Content**
 - **Developing Architecture Content**
 - **Leading Architecture**
 - **Integrating EA Content - Capital Planning**
 - **Integrating EA Content - Information Assurance and Privacy**

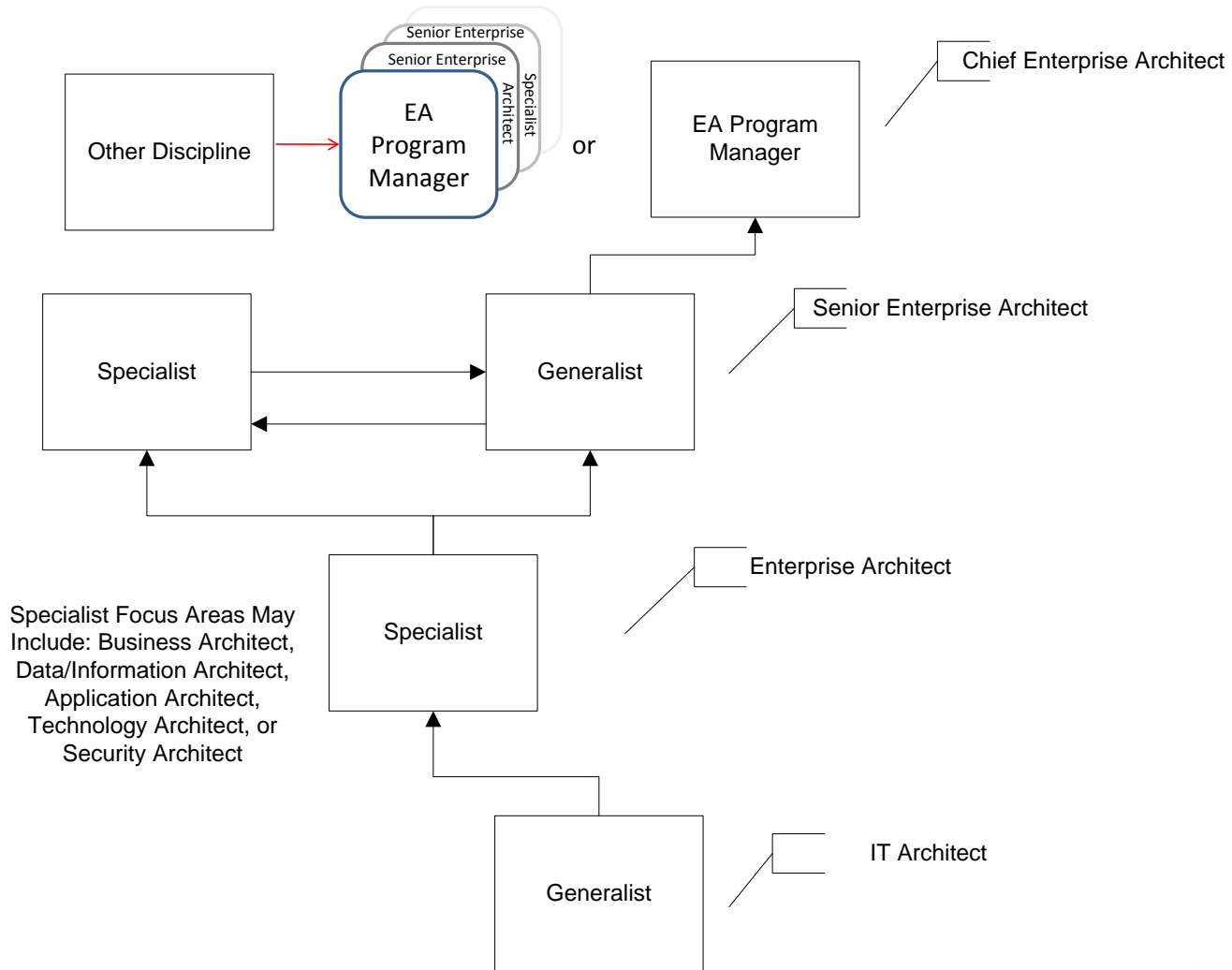
- **DoD: competencies, activities, and KSAs required for a person to complete solutions and enterprise architecture tasks within DoD.**
 - **Developing DODAF Artifacts**
 - **Developing Performance and Business Architecture**
 - **Developing Application and Services Architecture**
 - **Developing Information and Data Architecture**
 - **Developing Technology and Standards Architecture**

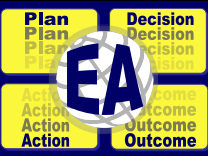


- **Organizational: competencies, activities, and KSAs required for a person to gain, display, and act on deep understanding of his or her organization.**
 - **Becoming Organizationally Savvy**
 - **Understanding the Agency**
 - **Achieving Outcomes with Others**
 - **Developing Organizational Capability**
 - **Supporting Innovation**



EA Career Paths



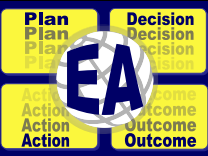


Competencies for Senior Business Architect

| | | | | | |
|-----------------------|----------------------------|-------------|--|---|----------|
| Individual | Handling Exceptions | 2 - 3 | Exercises judgment to resolve common problems | Employee performs assignments that have clear precedents | 2 |
| Individual | Problem-solving | 1 - 7 | Analyzes and recommends resolution of complex issues | Architecture concepts, principles, methods, and practices, mission and programs of customer organizations, infrastructure, performance management, systems testing, security principles and methods, requirement analysis principles and methods, COTS products, Internet technologies, technology industry trends, acquisition management policies and procedures, cost-benefit analysis principles and methods, analytical methods and practices, project management principles and methods, oral, written, and visual communication techniques | 1 |
| Individual | Performing | 1 - 7 | Carries out complex assignments | Architecture concepts, principles, methods, and practices, mission and programs of customer organizations, infrastructure, performance management, systems testing, security principles and methods, requirement analysis principles and methods, COTS products, Internet technologies, technology industry trends, acquisition management policies and procedures, cost-benefit analysis principles and methods, analytical methods and practices, project management principles and methods, oral, written, and visual communication techniques | 2 |
| Inter-personal | Supporting Others | 1 - 7 | Recommends adoption of enhanced approaches | Architecture concepts, principles, methods, and practices, mission and programs of customer organizations, infrastructure, performance management, systems testing, security principles and methods, requirement analysis principles and methods, COTS products, Internet technologies, technology industry trends, acquisition management policies and procedures, cost-benefit analysis principles and methods, analytical methods and practices, project management principles and methods, oral, written, and visual communication techniques | 2 |



- Develop and refine job templates Underway
- Continue testing Architects' Competency Framework with representative employees, supervisors, hiring managers, program managers, and educators Q3FY11
- Obtain management approval to roll out EA Competency Framework for use Q3FY11
- Work with Scott Bernard of OMB to get feedback from the federal chief architects Q3FY11

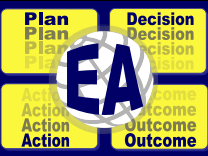


- **Engaging civilian agencies**
 - Department of Homeland Security
 - Department of Health and Human Services
 - Department of Interior
- **Connecting with the broader practitioner community**
 - Collaboration with OMB and the Chief Architect's Forum
 - Continued EA SIG engagement
 - Federation of EA Professional Organizations (FEAPO)
- **Supporting and stimulating research**
 - Penn State



Discussion

- **Individual: competencies, activities, and KSAs required for a person to complete tasks successfully working on his or her own.**
 - **Understanding Task Requirements – takes steps to understand the expectations of others for assigned tasks and to verify understanding of those expectations by obtaining explicit feedback**
 - **Choosing Approach – reflects on task requirements, selects appropriate techniques for addressing those requirements, and plans activities necessary to complete the task**
 - **Documenting Information – collects data from people and other sources using a variety of techniques and creates value-added products, managing those products throughout their lifecycles**
 - **Handling Exceptions – responds effectively to unexpected barriers and complexities in completing tasks**
 - **Problem-solving – identifies, frames, scopes, and addresses analytical, interpersonal, and organizational challenges**
 - **Performing – completes tasks and verifies explicitly that task expectations have been met**



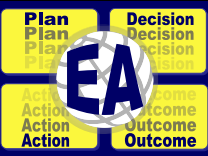
- **Interpersonal : competencies, activities, and KSAs required for a person to complete tasks successfully working with others.**
 - **Supporting Others – helps colleagues accomplish their tasks and acts as good organizational citizen**
 - **Influencing – earns the trust and respect of colleagues that enables greater impact on organizational decisions and actions**
 - **Communicating – finds ways to connect with other people to achieve understanding and agreement**

- **Technology: competencies, activities, and KSAs required for a person to complete tasks widely carried out by technology organizations.**
 - **Managing Technology – employs information technology processes, applications, and infrastructure to deliver and manage integrated solutions that meet requirements**
 - **Designing Solutions – helps create efficient, compliant, and effective information technology processes, applications, and infrastructure**
 - **Achieving Interoperability – Standards – defines, complies with, and enables compliance with enterprise-wide rules for information technology processes and products**
 - **Achieving Interoperability - Data – defines, complies with, and enables compliance with enterprise-wide rules for representation of information in many forms as well as interfaces and metadata**

- **Architecture: competencies, activities, and KSAs required for a person to complete solutions and enterprise architecture tasks.**
 - **Structuring Architecture Content – defines conventions, rules, and model types for presenting architecture information to meet the needs of agency stakeholders**
 - **Developing Architecture Content – creates and maintains different architecture information products for various agency stakeholders and decision processes**
 - **Leading Architecture – brings about architecture-informed decisions and outcomes in support of agency goals and architecture program plans**
 - **Integrating EA Content - Capital Planning – works closely with agency capital planning staff to provide relevant, useful architecture information for planning and budgeting decisions and reporting throughout the solution lifecycle**
 - **Integrating EA Content - Information Assurance and Privacy – works closely with agency IA and privacy staff to provide relevant, useful architecture information for risk assessment and management throughout the solution lifecycle**

- **DoD: competencies, activities, and KSAs required for a person to complete solutions and enterprise architecture tasks within DoD.**
 - **Developing DoDAF Artifacts – applies knowledge of DoDAF viewpoints and techniques to produce information products that help achieve architecture-informed decisions and outcomes**
 - **Developing Performance and Business Architecture – develops deep expertise in analyzing and measuring agency performance outcomes and in describing the business processes that deliver those outcomes**
 - **Developing Application and Services Architecture - develops deep expertise in capturing and presenting useful information about agency information technology applications and shared services**
 - **Developing Information and Data Architecture - develops deep expertise in capturing and presenting useful information about agency information products, data structures, interfaces, and metadata**
 - **Developing Technology and Standards Architecture - develops deep expertise in capturing and presenting useful information about agency information technology infrastructure and rules for acceptable technology protocols, processes, and products**

- **Organizational: competencies, activities, and KSAs required for a person to gain, display, and act on deep understanding of his or her organization.**
 - **Becoming Organizationally Savvy – learns actively about the agency and enables learning by others in the service of agency goals**
 - **Understanding the Agency – strives continuously to make sense more deeply of the agency environment, stakeholders, mission, goals, strategies, structure, culture, processes, information and information technology and use this knowledge to shape actions**
 - **Achieving Outcomes with Others – establishes, develops, and maintains relationships with other parties that lead to agency-valued outcomes that no one party could have accomplished**
 - **Developing Organizational Capability – invests in agency competencies, processes, and people that increase the agency’s delivery of public value**
 - **Supporting Innovation – finds ways to help new ideas and practices flourish as well as the people who create them**



Competency List

| |
|--|
| Understanding Task Requirements |
| Choosing Approach |
| Documenting Information |
| Handling Exceptions |
| Problem-solving |
| Performing |
| Supporting Others |
| Influencing |
| Communicating |
| Managing Technology |
| Designing Solutions |
| Achieving Interoperability - Standards |
| Achieving Interoperability - Data |
| Structuring Architecture Content |
| Developing Architecture Content |
| Leading Architecture |
| Integrating EA Content - Capital Planning |
| Integrating EA Content - Information Assurance and Privacy |
| Developing DODAF Artifacts |
| Developing Performance and Business Architecture |
| Developing Application and Services Architecture |
| Developing Information and Data Architecture |
| Developing Technology and Standards Architecture |
| Becoming Organizationally Savvy |
| Understanding the Agency |
| Achieving Outcomes with Others |
| Developing Organizational Capability |
| Supporting Innovation |





Multi-Criteria Decision Making

Analytic Hierarchy Process (AHP)

*“Most of us lack the ability-and the desire-to make sophisticated cost-benefit calculations. Instead of insisting on finding the best possible decision, we will often accept one that seems good enough. And we often let emotion affect our judgment. Yet despite all these limitations, when our imperfect judgments are **aggregated in the right way**, our collective intelligence is often excellent.”* The Wisdom of Crowds, James Surowiecki – pg xiv.

- **Analytic Decision Making Challenges**
- **Introduction to the Analytic Hierarchy Process (AHP)**
- **AHP Applications in Enterprise Architecture Development and Management**
- **Workshop Team Assignment**

➤ Two Types of MCDM:

- multiple criteria discrete alternative problems (finite set of alternatives)
- multiple criteria optimization problems (infinite set of alternatives)

➤ Over 20 MCDM Techniques

➤ Predominate Techniques*:

- **Analytic Hierarchy Process (AHP) & Fuzzy AHP**
 - **Analytic Network Process (ANP) & Fuzzy ANP (recent circa 2005)**
- Pros and Cons
- Kepner-Tregoe (K-T) Decision Analysis
- Multi-Attribute Utility Theory (MAUT)
- Cost -Benefit Analysis
- Custom tailored tools

* Source – *Guidebook to Decision-Making*, 2001



Diverse Applications of AHP

- Conflict Resolution
- Contingency Planning
- Portfolio Selection
- Energy Allocation
- Technology Selections
- Terrorism Assessment
- HR Performance Evaluation
- Facility Location Selection
- Supporting other techniques such as the Balanced Score Card & SWOT
- Etc.....

History

- **Founder**
 - Thomas Saaty
- **Issue - assigning value to qualitative concepts and subjective decisions in complex environments**



The old adage that one cannot compare apples to oranges is false. Thomas Saaty

- **Primary use of AHP is the resolution of choice problems in multi-criteria environments**

- **Weighted criteria alternatives or product selection**
 - Arguing over the weighted criteria when the selection is contested
 - Establishing weights and criteria for complex problems
 - Does not account for criteria interaction (*i.e.*, complementarities)
 - What is the right scale (*what is the just noticeable difference between 7 & 8 on a 10 pt scale?*)
- **Cost/Benefit Analysis (CBA) and Return on Investment (ROI)**
 - Quantifying intangibles (*i.e.*, noneconomic factors) for strategic alternatives (micro-economic techniques not macro-economics)
 - Leads to less-riskier alternatives or rejecting higher risk projects
- **Achieving Consensus or a Decision**
 - With polarized view points
 - With “large” (> 20) participants/populations
- **Defensibility of Decision**
 - Nominal group techniques - reproducibility/consistency
 - Testable
 - Believable



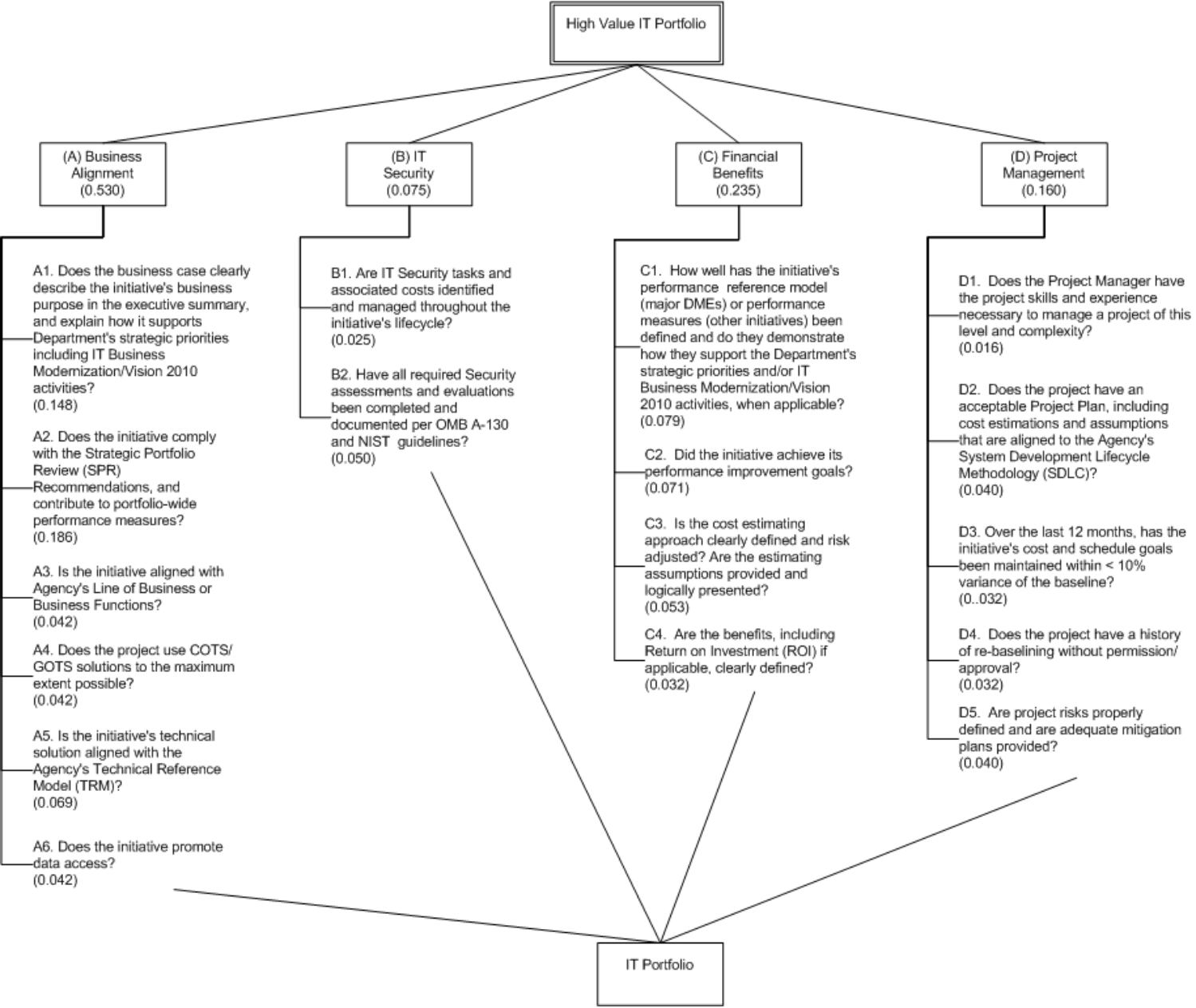
Federal Agency IT Portfolio Hierarchy & Priorities

Level 1:
Goal

Level 2:
Criteria

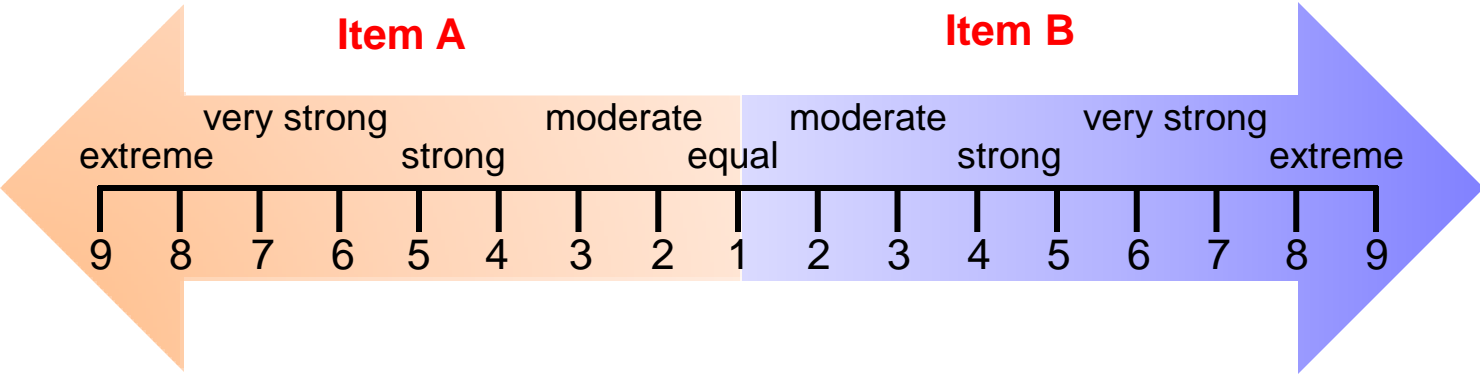
Level 3:
Subcriteria

Level 4:
Composite
IT Portfolio



Priority Scale

Default: A is <something more> than B



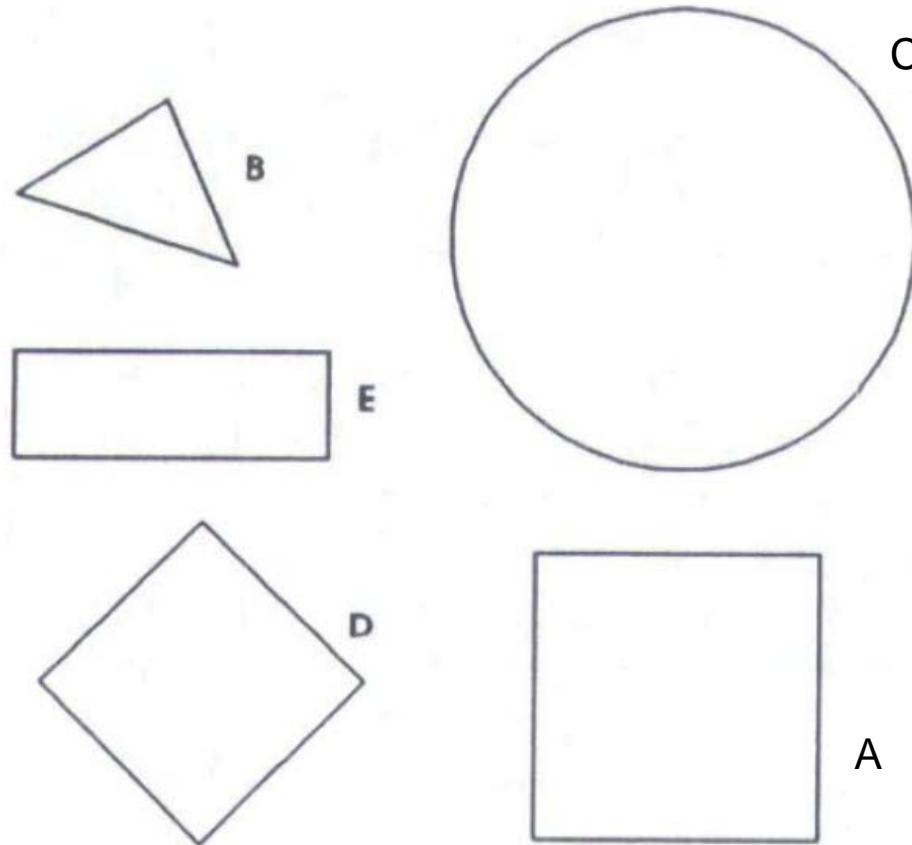
Press "Invert" to change to B is <something more> than A

"Hand-Mind Coordination Test" →





➤ **Determine the relative area for three figures: A, B & C (only)**

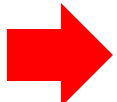


Source: How to Make a Decision: The Analytic Hierarchy Process, Saaty, T. *Interfaces*, pg 42

➤ **Compare results to know surface area**

EA Lifecycle Process*

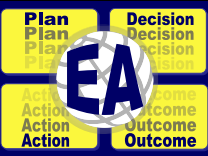


- 
- Selecting staff based on desired competency criteria
 - Selecting EA tools, methodologies, techniques, technologies etc.
 - Selecting Scope or focus of EA project
 - Determining Processes, Capabilities, Data Entities etc
 - Selecting alternative target states
 - IT Portfolio selection
 - Etc...



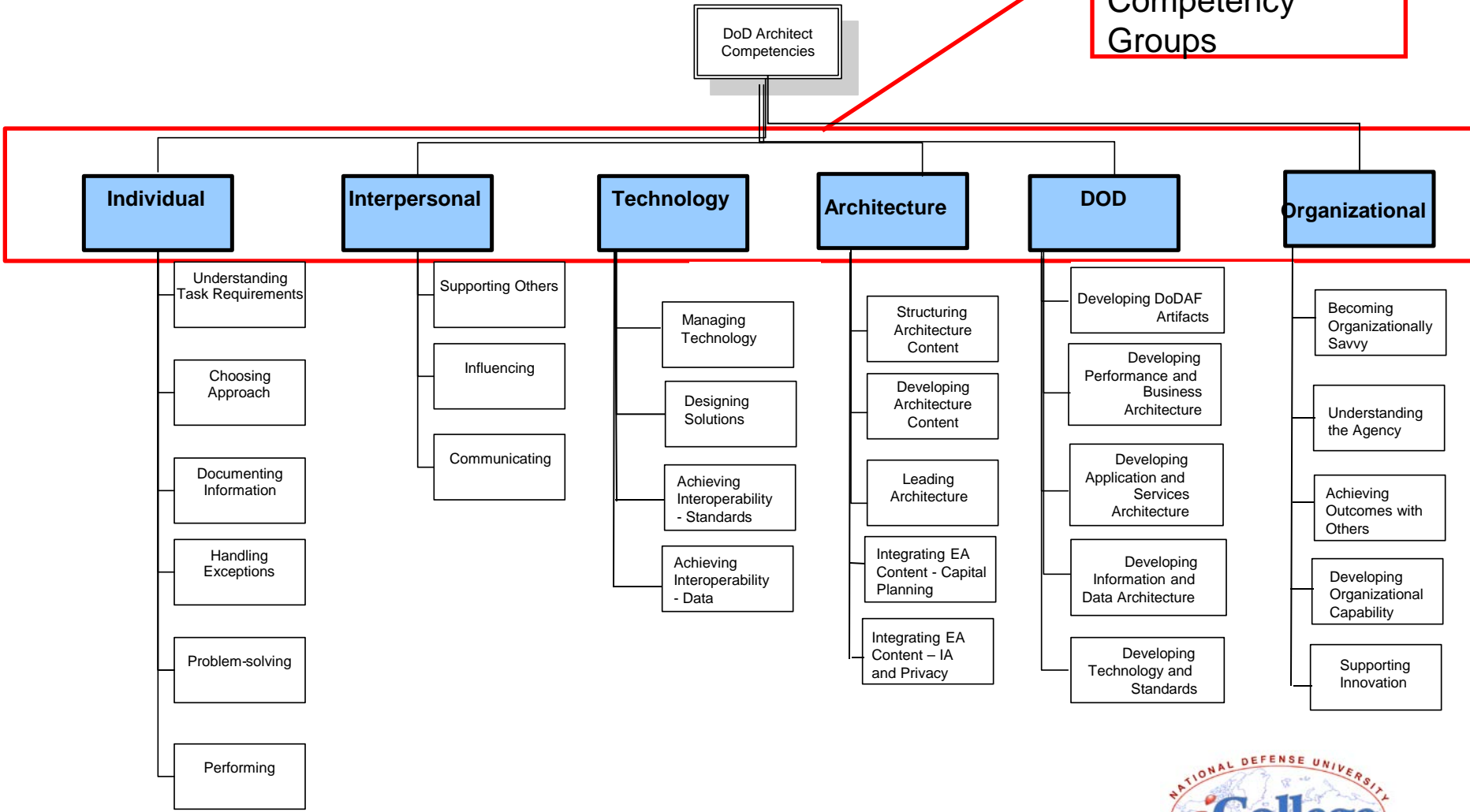
Exercise: To prioritize the Chief Architect Competencies

- **Your organization is a DoD entity that has been underperforming for some time. There have been three political appointees in as many years. The organization is experience significant infighting with programs implementing local solutions, resulting in ineffective and inefficient processes and stove-piped outdated legacy systems. DoD senior leadership is expecting improved performance under the organization’s newly appointed leader. Also, GAO and OMB have strongly criticized the organization for its underperformance and have stated this in part due to a lack of an EA Program to identify and guide improvements as well as a lack of a Chief Architect to support the senior leadership.**
- **Your team has been tasked to select the Chief Architect for your agency. You have been provided a set of architect competencies. Your fist step in developing the job description is to prioritize the competencies. Due to the organizational climate, the architect selection must be transparent and resistant to political pressures. Based on your prior experience you have proposed to use the Analytic Hierarchy Process.**



Framework Content – Overview of Competencies

The 6 Competency Groups





Questions, Observations, Comments

