

Enterprise Architecture

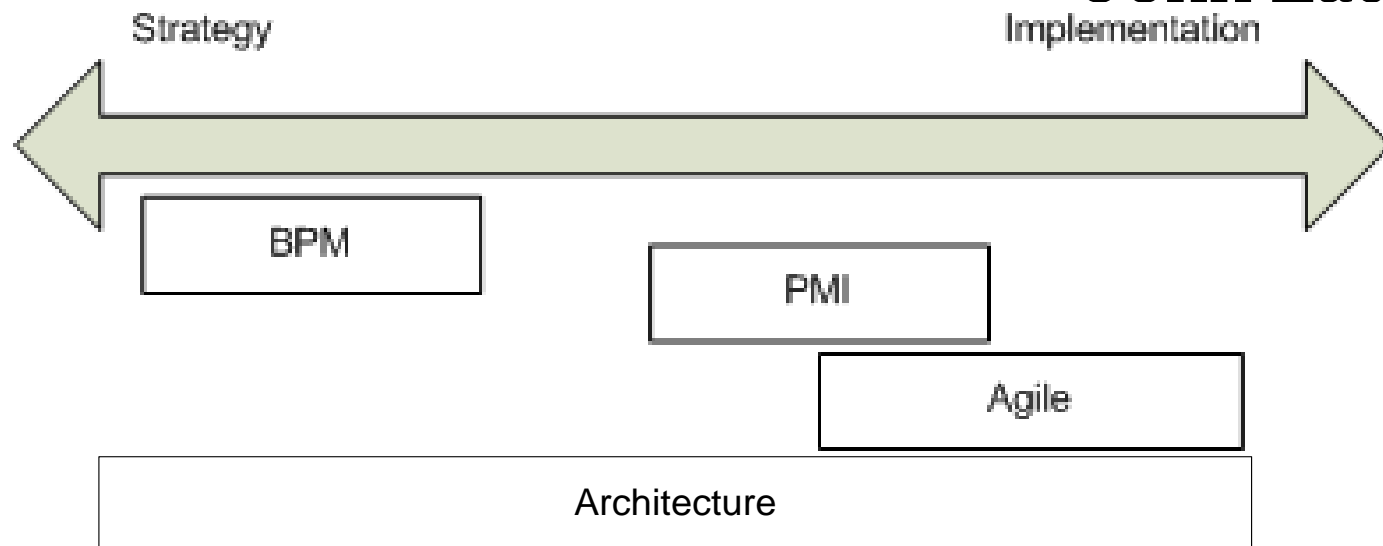
An Overview

About Me

- **G. Hussain Chinoy, Architect**
 - **In software industry for 18 years**
 - Developer, consultancy owner, architect
 - **Relevant Formal Training**
 - TOGAF 8 Certified, TOGAF 9 Trained
 - Agile Scrum Master
 - PM Cert from CSU
 - Software Engineering Cert from CU
 - **Huge nerd**

“During the 1980’s, I became convinced that architecture, whatever that was, was the thing that bridged strategy and its implementation.”

– John Zachman



Enterprise Architecture: an overview

- **What is EA?**
- **Why is EA useful?**
- **EA Frameworks**

EA: An Overview

- **What is EA?**
 - Intro
- Why EA?
- EA Frameworks

What is EA? Lots of Definitions

Holistic view of the enterprises IT resources rather than an application-by-application view

- Kaisler, et al. 2005

EA is a strategic information asset base - defines mission, information necessary to perform the mission, transitional processes for implementing new technologies; includes a baseline and target architecture and sequencing plan

- CIO Council 2001

EA provides explicit, common, and meaningful structural frame of reference that allows an understanding of what an enterprise does, when, where, how, and why it does it and what it uses to do it

- GAO 2003

The design of business and IT system alignment is the domain of EA; EA's seek to align enterprise processes and structure with supporting IT systems

- Wegmann et al. 2005

What is EA?

[EA is] a **planning framework** that describes how the technology assets of an organization connect and operate. It also describes what the organization needs from the technology. And finally, it describes the set of activities required to meet the organizational needs... it operates in a context of a process for setting priorities, making decisions, informing those decisions, and delivering results called - **IT Governance**.

- Linda Cureton, CIO NASA

“How to Rule the World of IT through Enterprise Architecture”

http://blogs.nasa.gov/cm/blog/NASA-CIO-Blog.blog/posts/post_1256697836332.html

What is EA?

You cannot cost justify architecture. Architecture is not an expense. Architecture does not displace any other costs. Architecture is an **asset**. You can save orders of magnitude more money and time, **but you have to invest in Architecture** to enable you to do something you otherwise are unable to do, namely: “Alignment,” “Integration,” “Change,” and “Mass Customization.”

Architecture is an Information-Age idea. “Cost Justification” was an Industrial Age idea.

- John Zachman 2001

What is EA?

- Identifies the main components of the organization, its information systems, the ways in which the components work together to achieve defined business objectives, and the way in which information systems support business processes of the organization
 - Components - staff, business processes, technology, information, financial and other resources
 - Processes, tools and structures necessary to implement an enterprise-wide coherent and consistent IT architecture for supporting the enterprise's business operations
- EA is the process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key principles and models that describe the enterprise's future state and enable its evolution - Gartner 2006
- EA - four types of architecture subsets (TOGAF 2003)
 - business architecture - strategy, governance, organization, key business processes
 - data/info architecture - structure of org's logical/physical data assets and data management resources
 - applications/systems architecture - blueprints for individual applications to be deployed, interactions and relationships to core business processes of the org
 - technology architecture - software infrastructure intended to support the deployment of mission-critical applications
- Architecture != technology



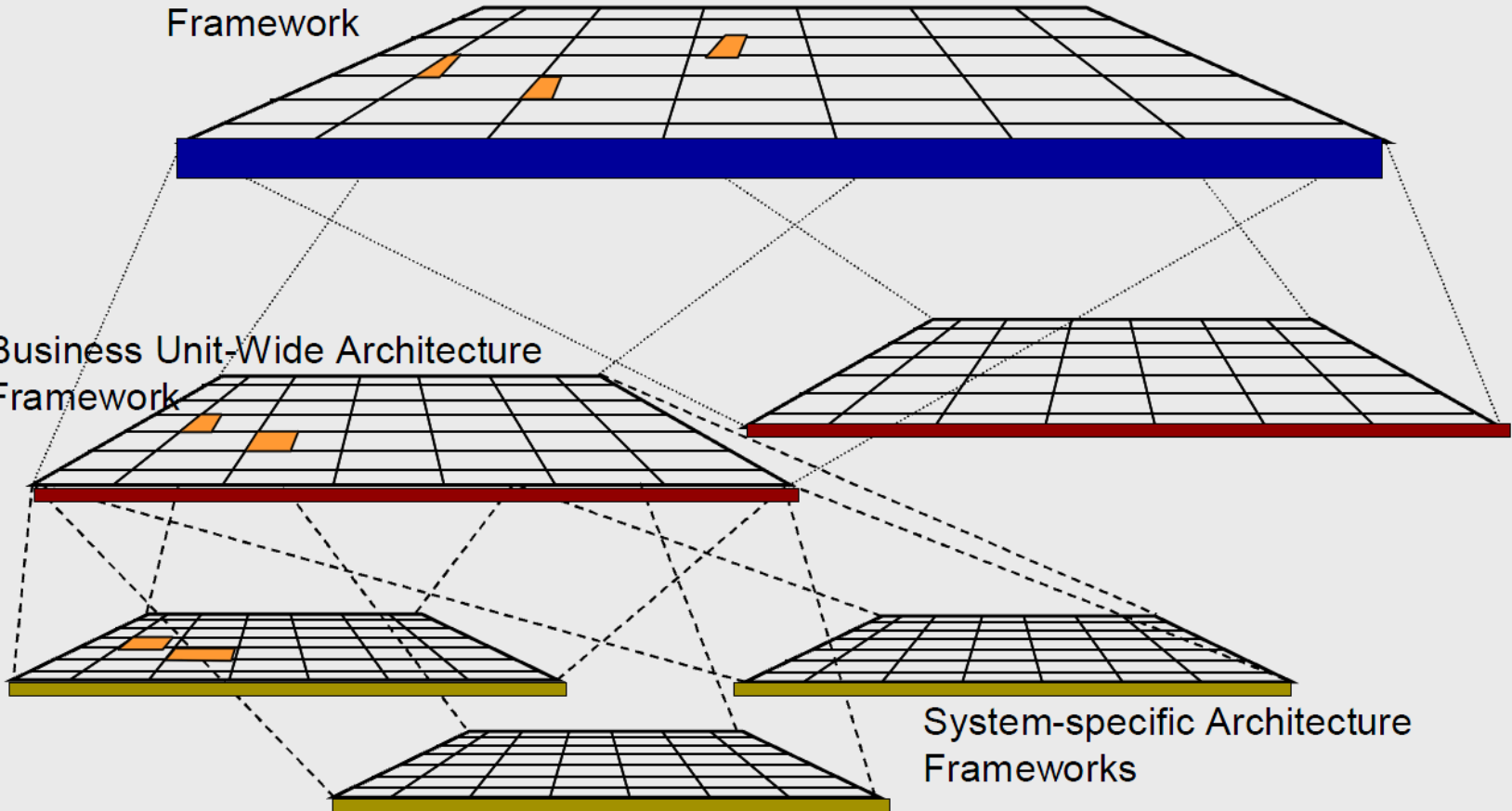
What is EA?

- Business-focused, business-driven approach to architectures
- A process by which businesses can direct the development of the enterprise as a whole and, in particular, their IT portfolio.
- A set of principles that constrain the design space for developers and operations staff

Enterprise-Wide Architecture
Framework

Business Unit-Wide Architecture
Framework

System-specific Architecture
Frameworks





THAT IS
ARCHITECTURE

<http://www.youtube.com/watch?v=E55OcGB0L8o>

Principles

- Establish
- Communicate
- Apply

Architecture Principles

- **Business Principles**
 - Primacy of Principles
 - Maximize Benefit to the Enterprise
 - Information Management is Everybody's Business
 - Business Continuity
 - Common Use Applications
 - Service Orientation
 - Compliance with Law
- **Data Principles**
 - Data is an Asset
 - Data is Shared
 - Data is Accessible
 - Common Vocabulary and Definitions
- **Application Principles**
 - Technology Independence
 - Ease-of-Use
- **Technology Principles**
 - Requirements-Based Change
 - Responsive Change Management
 - Control Technical Diversity
 - Interoperability

Primacy of Principles

- These principles of information management apply to all organizations within the organizations
- *Rationale*
 - The only way we can provide a consistent and measureable level of quality information to decision-makers is if all organizations abide by these principles
- *Implications*
 - Without this principle, exclusions, favoritism, and inconsistency would rapidly undermine the management of information
 - Information management initiatives will not begin until they are examined for compliance with the principles
 - A conflict with a principle will be resolved by changing the framework of the initiative

Responsive Change Management

- Changes to the enterprise information environment are implemented in a timely manner
- *Rationale*
 - If people are to be expected to work within the enterprise information environment, that environment must be responsive to their needs
- *Implications*
 - We have to develop processes for managing and implementing change that do not create delays.
 - A user who feels a need for change will need to connect with a “business expert” to facilitate explanation and implementation of that need.
 - If we are going to make changes, we must keep the architectures updated.
 - Adopting this principle might require additional resources.
 - This will conflict with other principles (e.g., maximum enterprise-wide benefit, enterprise-wide applications, etc.).

Technology Independence

- Applications are independent of specific technology choices and therefore can operate on a variety of technology platforms.
- *Rationale*
 - Independence of applications from the underlying technology allows applications to be developed, upgraded, and operated in the most cost effective and timely way. Otherwise technology, which is subject to continual obsolescence and vendor dependence, becomes the driver rather than the user requirements themselves. Realizing that every decision made with respect to IT makes us dependent on that technology, the intent of this principle is to ensure that Application Software is not dependent on specific hardware and operating systems software.
- *Implications:*
 - This principle will require standards which support portability.
 - For Commercial Off-The-Shelf (COTS) and Government Off-The-Shelf (GOTS) applications, there may be limited current choices, as many of these applications are technology and platform dependent.
 - Subsystem interfaces will need to be developed to enable legacy applications to interoperate with applications and operating environments developed under the enterprise architecture.
 - Middleware should be used to decouple applications from specific software solutions.

EA: An Overview

- What is EA?
- **Why is EA Useful?**
 - Why (and how) is EA Useful?
 - Why EA?
 - EA Drivers
 - Business Rationale
- EA Frameworks



Why EA?

- Streamlining
- Visibility
- Accountability
- Mandate

Top 5 EA Drivers

- Business-IT Alignment
- Service-oriented architecture
- Reduce technology cost
- Reduce project or service redundancy
- Technical adaptability

Gartner, 2007, survey of 200 EA programs

Business Rationale

- Over the last 20 years, IT has become a dominant force in organizations
- Over the last 15 years, IT has grown in complexity, increasing the necessity for managing the complexity
- Over the last 10 years, IT ROI has been perceived as bringing less to the table than before
 - SOA / ESB
 - BPM - business process management
 - BAM - business activity monitoring
 - Agile
 - WWW

EA: An Overview

- What is EA?
- Why EA?
- **EA Frameworks**
 - Intro
 - Approaching
 - Draw from Existing Knowledge
 - Elements of an EA Framework
 - EA Framework History
 - EA Lineage
 - Frameworks and Users
 - Existing Frameworks
 - Zachman
 - The Open Group Architecture Framework (TOGAF)
 - Federal Enterprise Architecture (FEA)
 - Comparison
 - Mapping TOGAF & FEA
 - Assessing EA Maturity

EA Frameworks

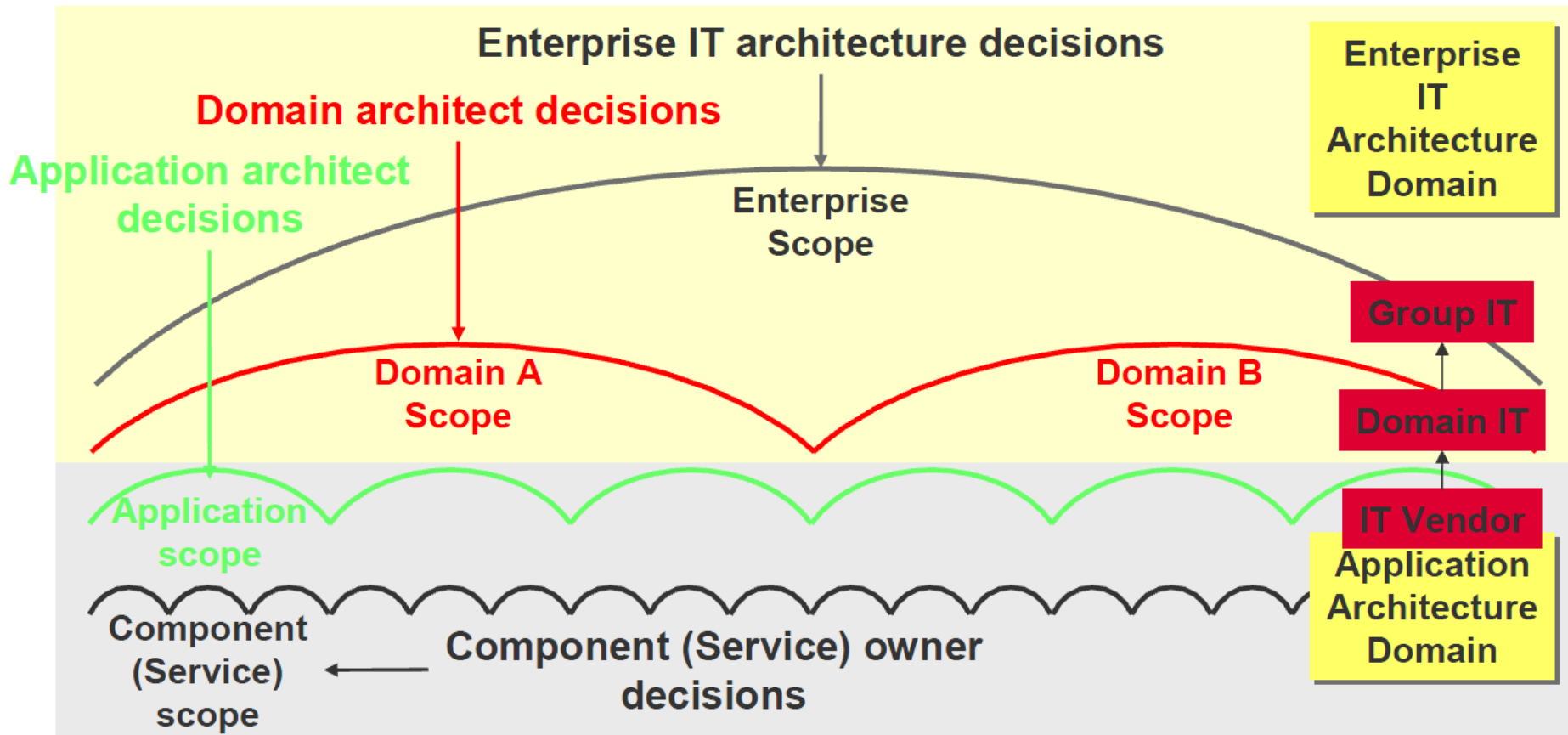
”An Enterprise Architecture framework is a **communication model for developing an Enterprise Architecture (EA)**. It is not an architecture per se.

Rather; it presents a set of models, principles, services, approaches, standards, design concepts, components, visualizations and configurations that guide the development of specific aspect architecture.”

- Jaap Schekkerman

How to Survive in the Jungle of Enterprise Architecture Frameworks
Trafford, 2006

"System of systems" architecture



Approaching EA Frameworks

- Frameworks are the most recognizable feature of the EA discipline, and there are many
- Cover many areas under the same banner
- From a commonality standpoint, the principles of the frameworks are most relevant
- Knowing the frameworks help to avoid reinventing the wheel
- Some frameworks are legal requirements, such as with the federal government

Draw from Existing Knowledge

- EA's should be custom tailored to the specific organization that you're in.
- This doesn't mean that you have to start from scratch.
 - There are organizational standards (agency, specific corp)
 - There are segment standards (LOB)
 - There are Sector standards (Public, Private)
 - There are Industry standard (Tech, Health, Fin)

Elements of an EA Framework

- Methodologies and Processes
- Governance
- Reference Architectures
- Structures and Matricies
- Samples
- Artifacts and Products
- Standards and Principles

EA Framework History

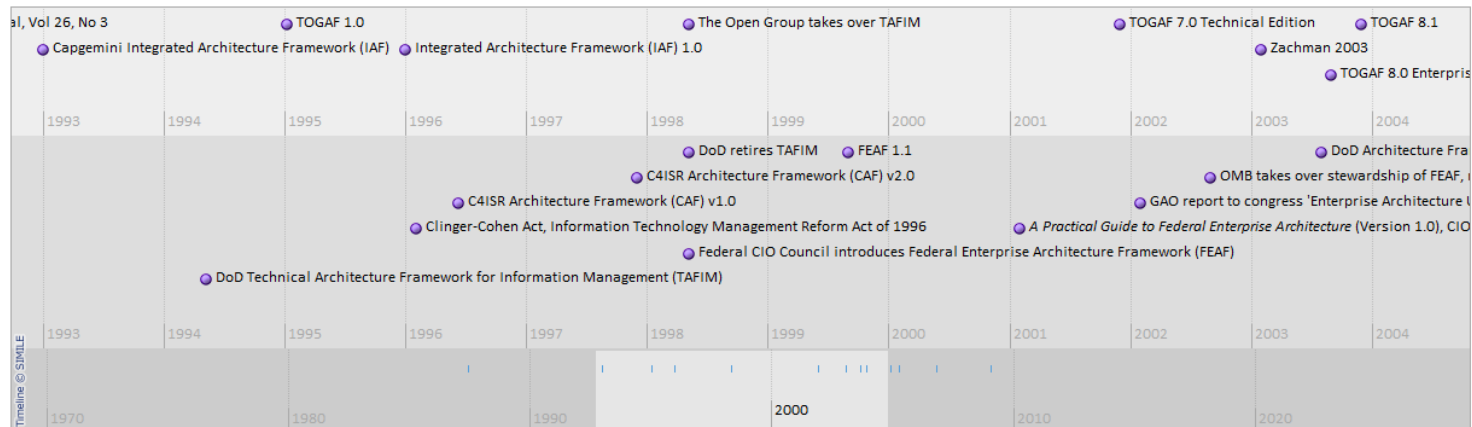
Timeline of Enterprise Architectures

About EA Timeline

Timeline of significant events in Enterprise Architecture history, including [Zachman](#), [FEA](#), [TOGAF](#), and [Gartner EA](#) frameworks/processes.

References

- [Comparison of the Top Four Enterprise Architecture Methodologies](#) (pdf), Roger Sessions, Object Watch, 2007
- http://en.wikipedia.org/wiki/Enterprise_architecture
- [Other Architectures and Frameworks](#), TOGAF 8.1.1



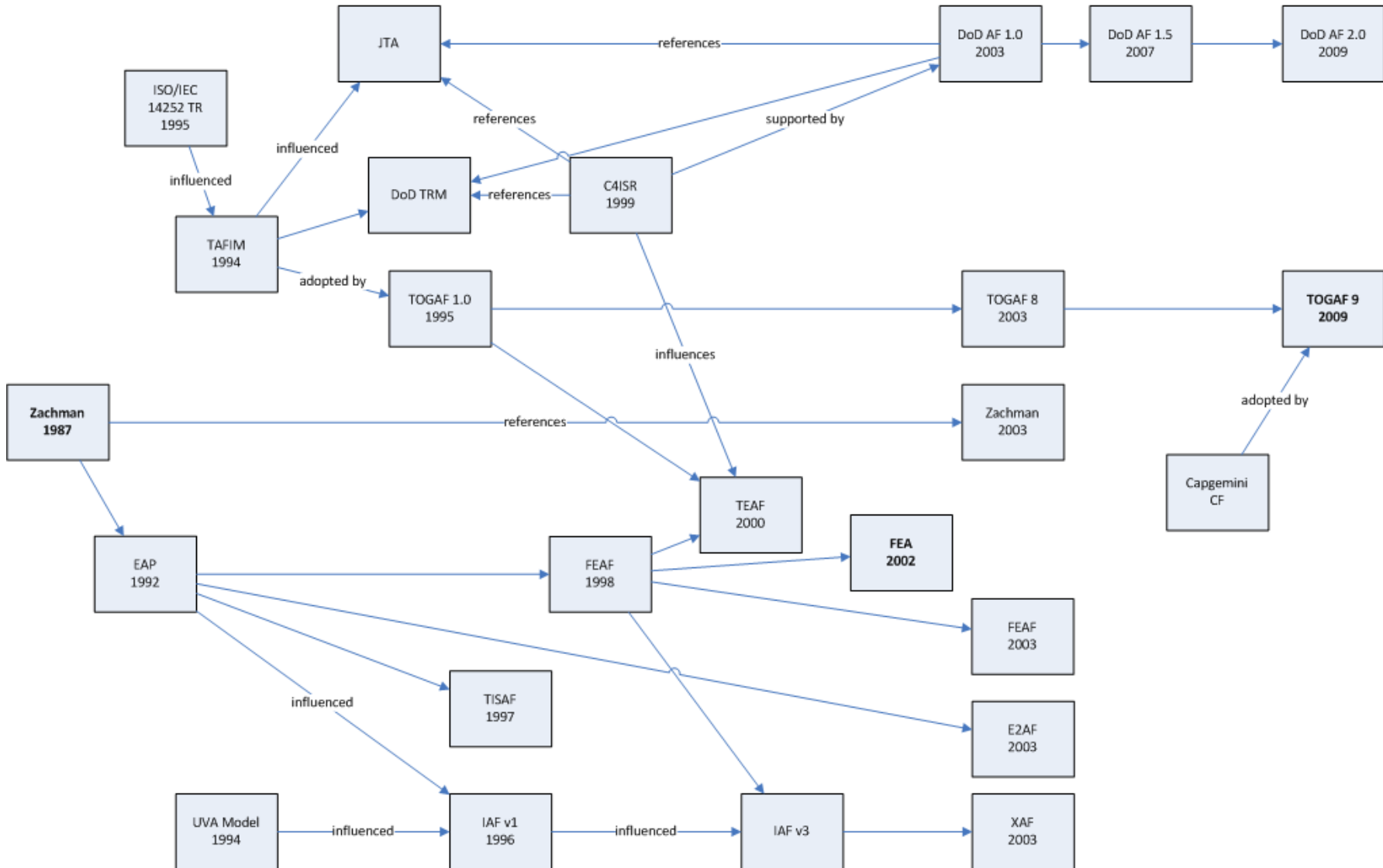
Event Details

Date	Event	Details
Jun 01 1987	'A framework for information systems architecture,' John Zachman article in IBM Systems Journal	First definition of enterprise architecture, pdf article
Jan 01 1993	Capgemini Integrated Architecture Framework (IAF)	
May 08 1994	DoD Technical Architecture Framework for Information Management (TAFIM)	
Jan 08 1995	TOGAF 1.0	With input from DISA, TOGAF 1.0 uses TAFIM as baseline; V2 TRM becomes TOGAF's TRM and is published as TOGAF 1.0
Jan 01 1996	Integrated Architecture Framework (IAF) 1.0	
Feb 01 1996	Clinger-Cohen Act, Information Technology Management Reform Act of 1996	"In February 1996, Congress enacted the Clinger-Cohen Act to reform and improve the way Federal agencies manage their information technology resources."

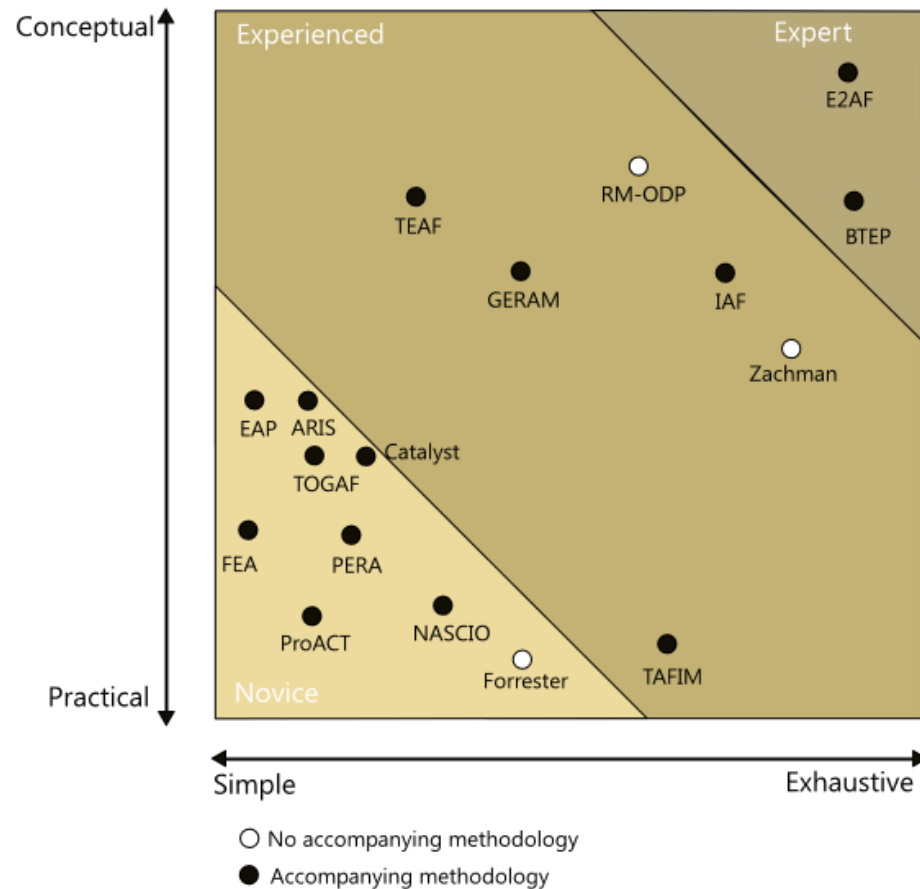
Enterprise Architecture Lineage

G. Hussain Chinoy

Adapted from Jaap Schekkerman, *How to Survive in the Jungle of Enterprise Architecture Frameworks*, 2004



Frameworks

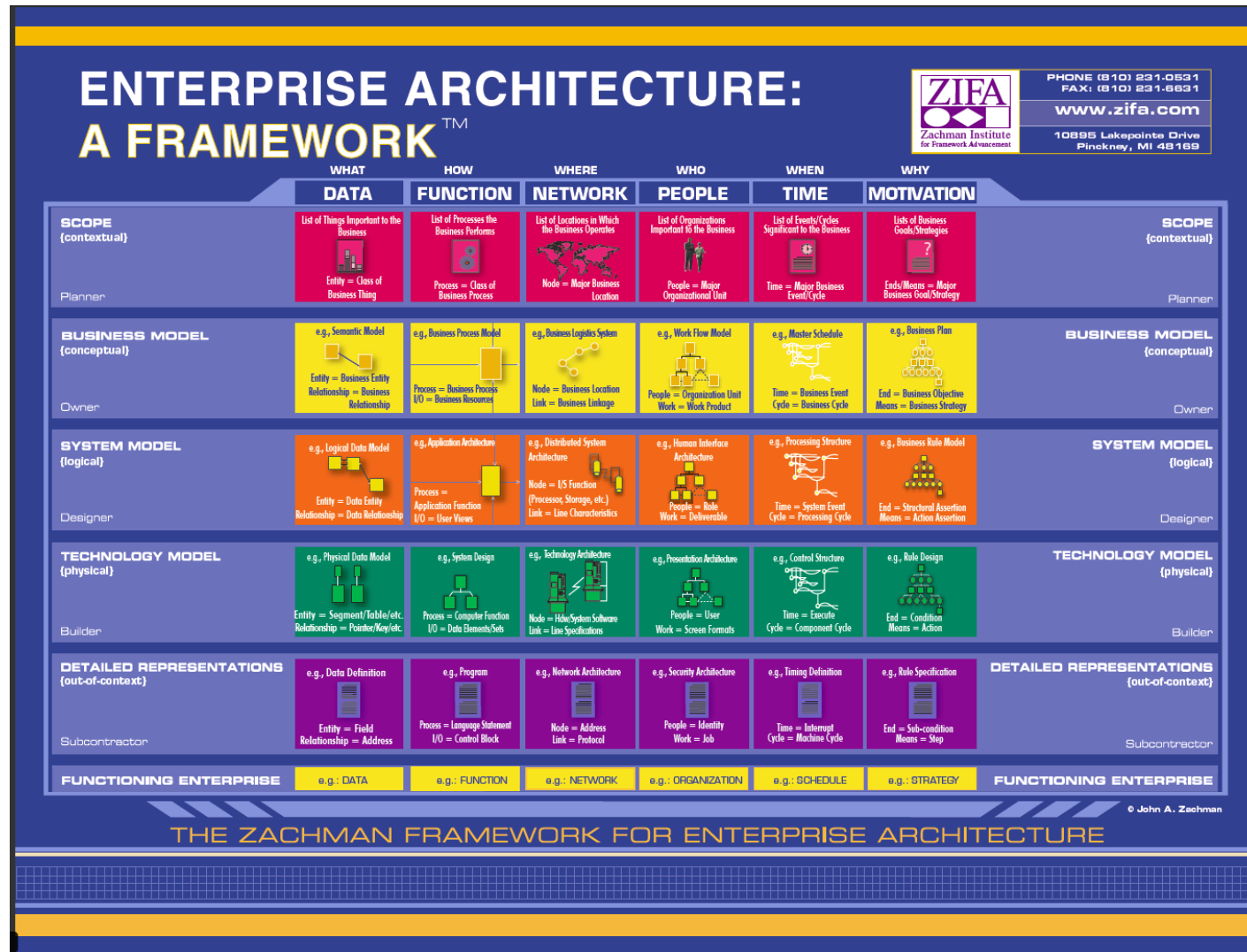


Existing EA Frameworks

- **Zachman Framework**
- **The Open Group Architecture Framework (TOGAF)**
- **Federal Enterprise Architecture (FEA)**

Zachman Framework

<http://zifa.com/framework.html>



Zachman Abstractions & Perspectives

- Planner
- User
- Designer
- Developer
- Contractor
- System

	Structure (What)	Activities (How)	Locations (Where)	People (Who)	Time (When)	Motivation (Why)
Objectives/ Scope (Planner's View)	Most significant business concepts	Mission	International view of where organization operates	Human resource philosophies and strategies	Annual planning	Enterprise vision
Enterprise Model (Business Owner's View)	Business language used	Strategies and high-level business processes	Offices and relationships between them	Positions and relationships between positions	Business events	Goals, objectives, business policies
Model of Fundamental Concepts (Architect's View)	Specific entities and relationships between them	Business functions and tactics	Roles played in each location and relationships between roles	Actual and potential interactions between people	System events	Detailed business rules
Technology Model (Designer's View)	System representation of entities and relationships	Program functions/ operations	Hardware, network, middleware	User interface design	System triggers	Business rule design
Detailed Representation (Builder's View)	Implementation strategy for entities and relationships	Implementation design of functions/ operations	Protocols, hardware components, deployed software items	Implementation of user interface	Implementation of system triggers	Implementation of business rules
Functioning System	Classes, components, tables, ...	Deployed functions/ operations	Deployed hardware, middleware, and software	Deployed user interface (including documentation)	Deployed systems	Deployed software

↑
Computation Independent Models

↑
Platform Independent Models (PIMs)

↓
Platform Specific Models (PSMs)

Zachman

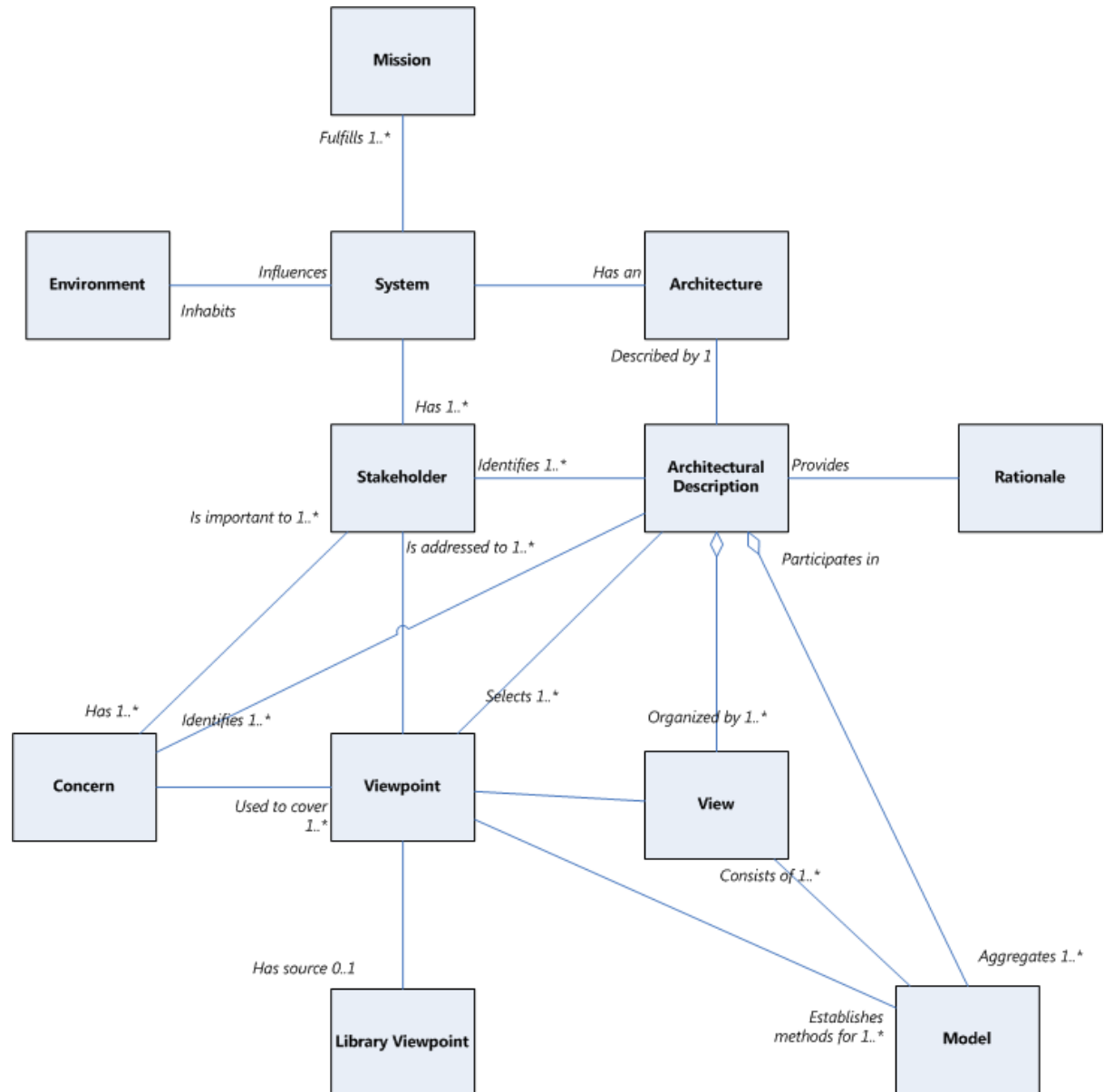
Pro

- First, and unique for a long time
- Well known
- Exhaustive
- Accommodates different viewpoints

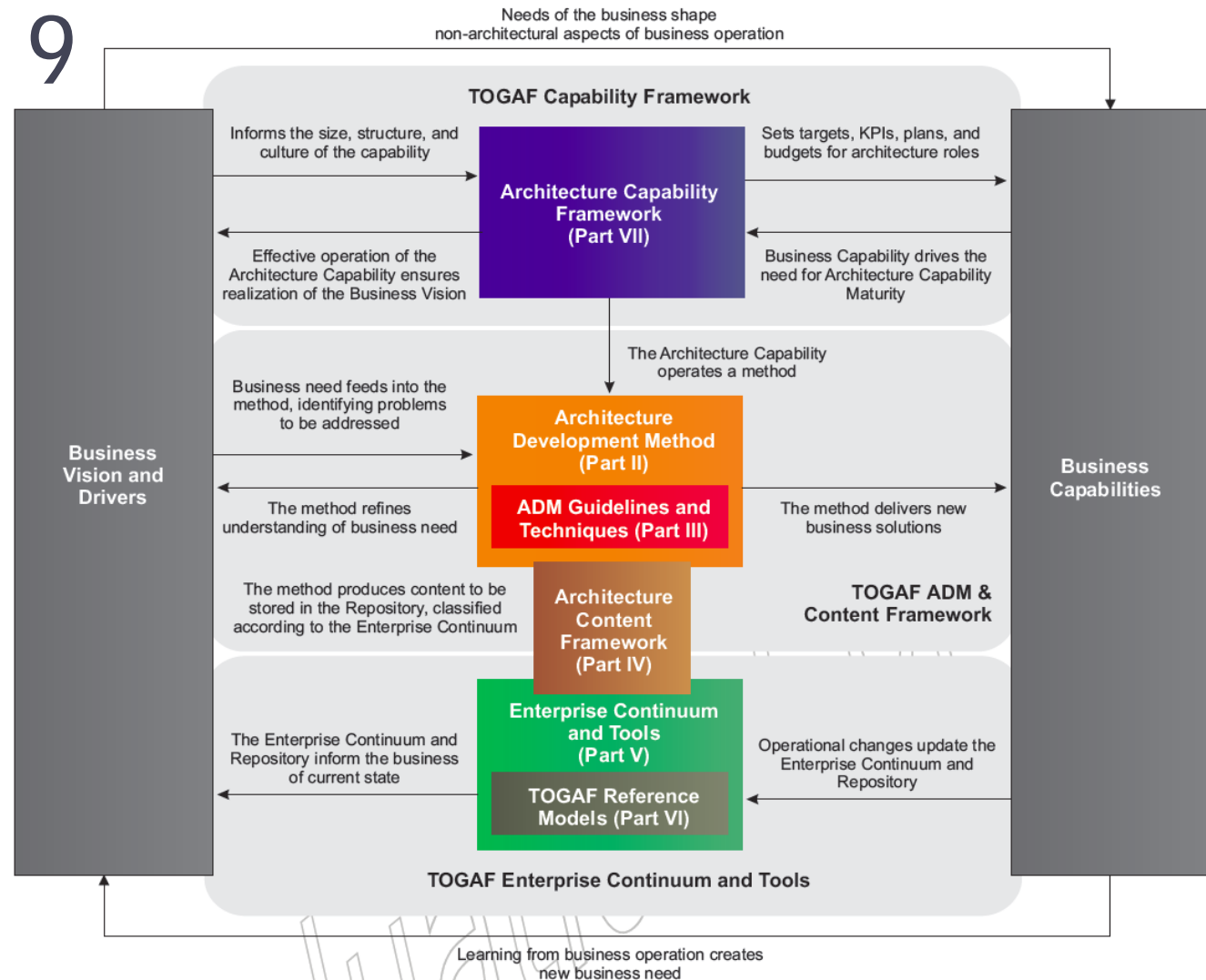
Con

- Taxonomy only
- No models
- Separates technology from the business
- Not immediately operational – must be adapted and tailored

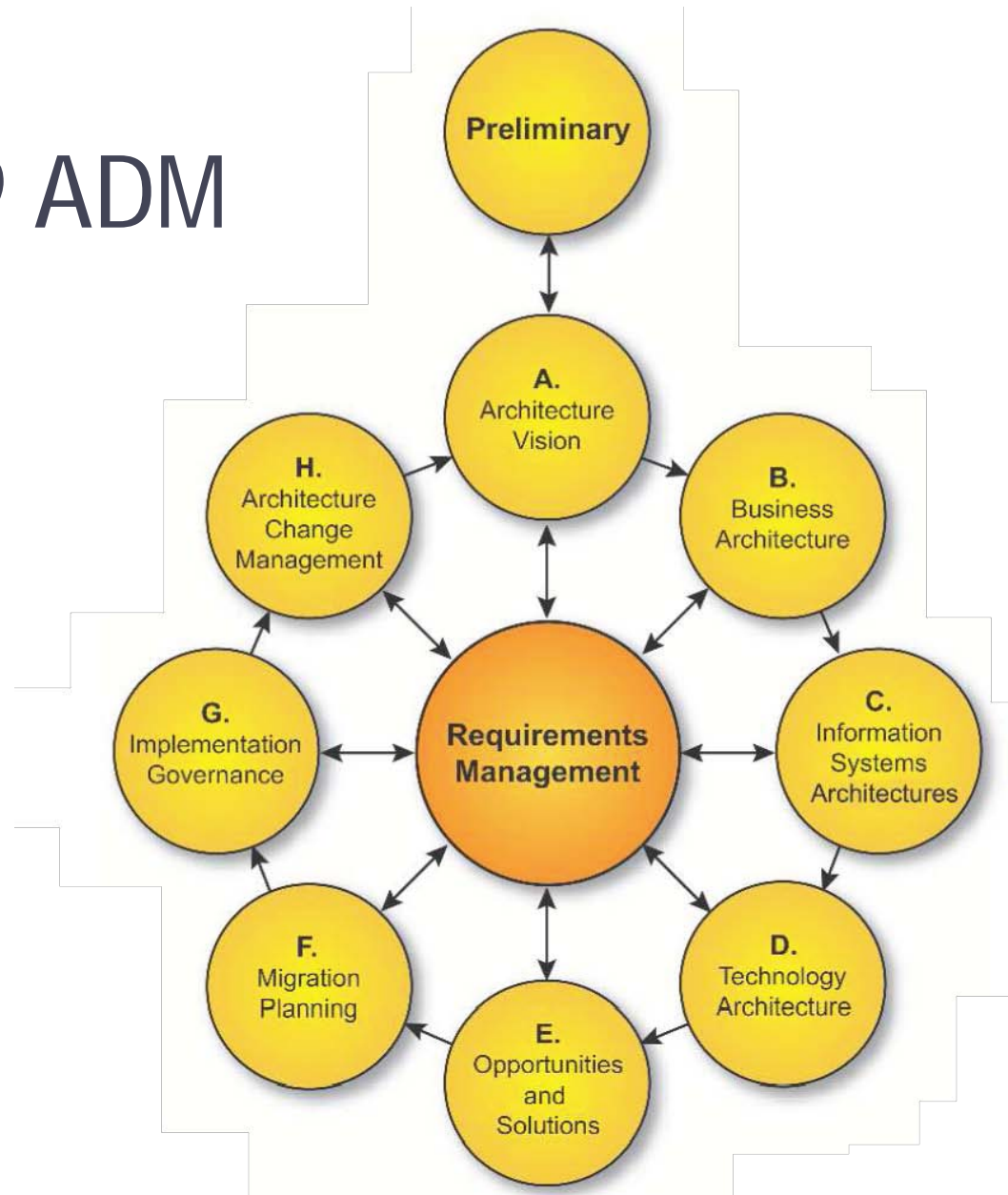
TOGAF 9 Definitions

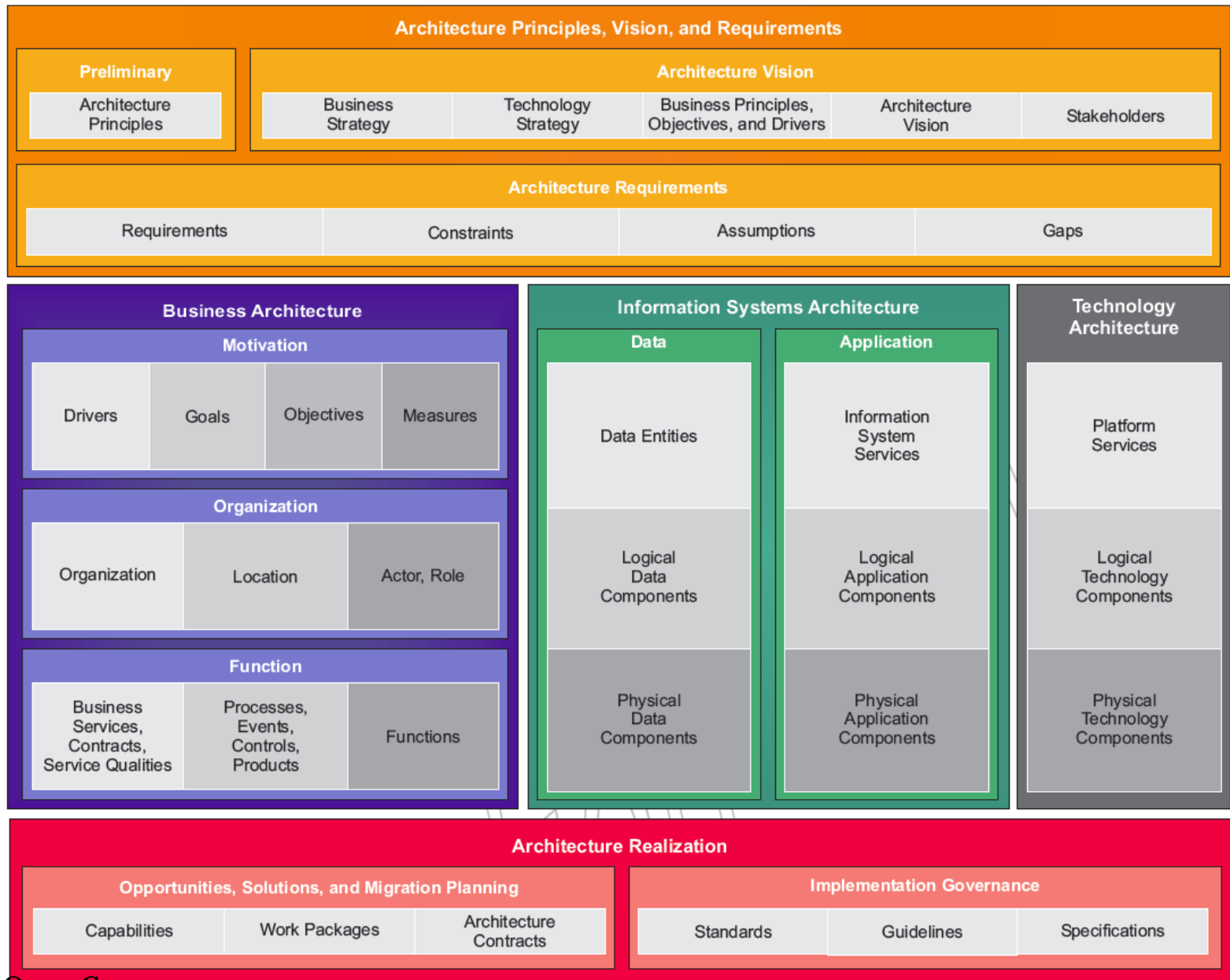


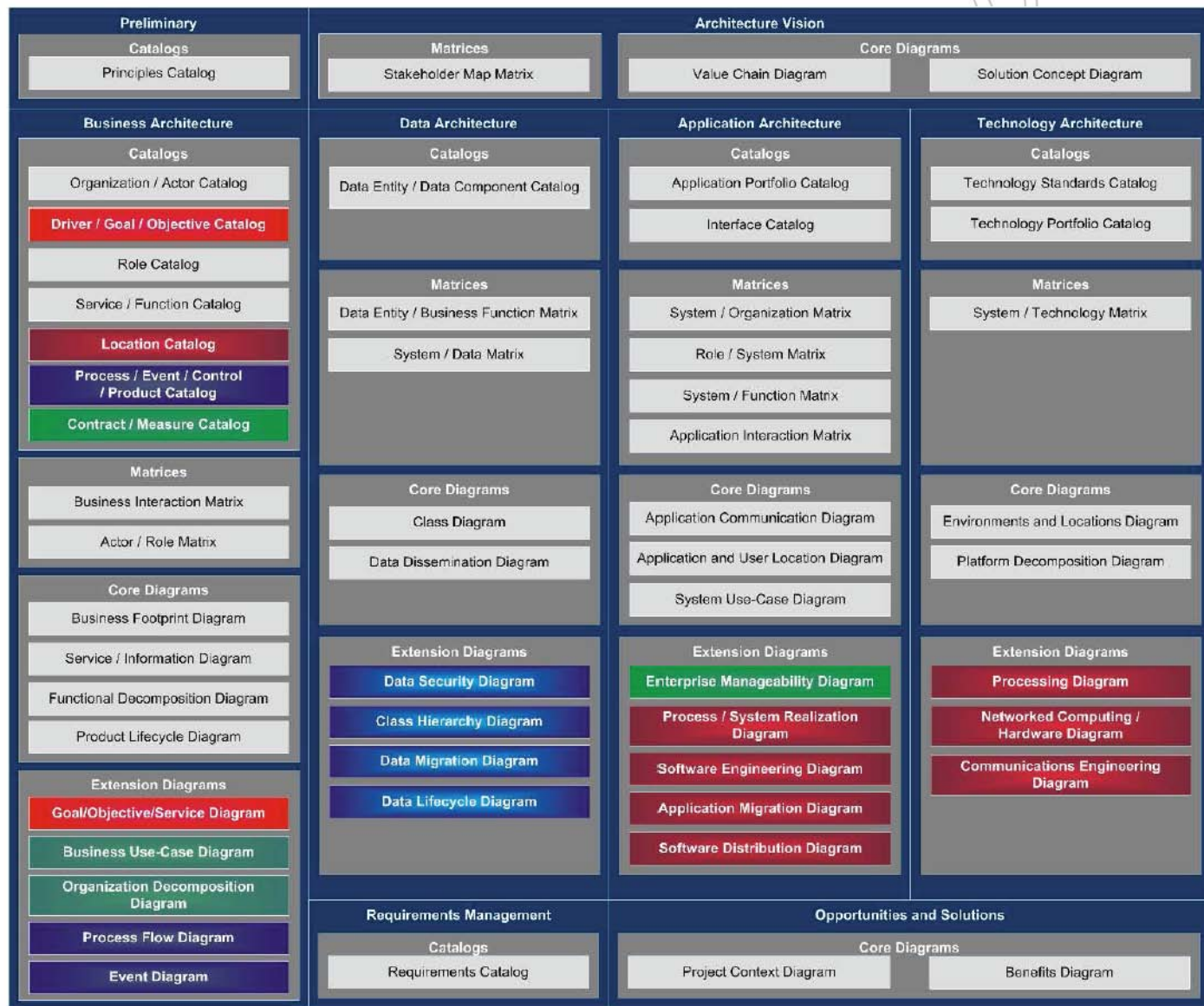
TOGAF 9



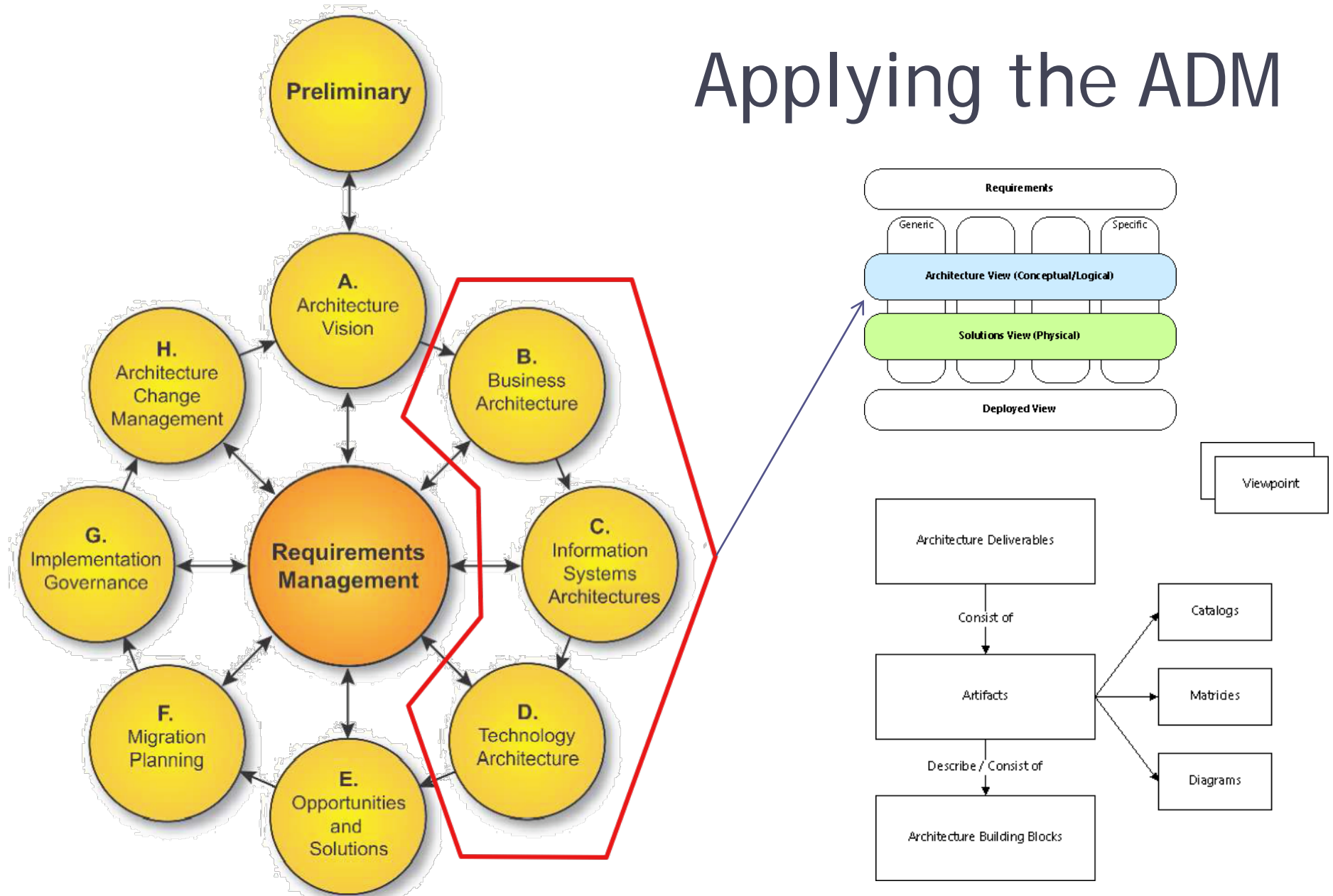
TOGAF 9 ADM



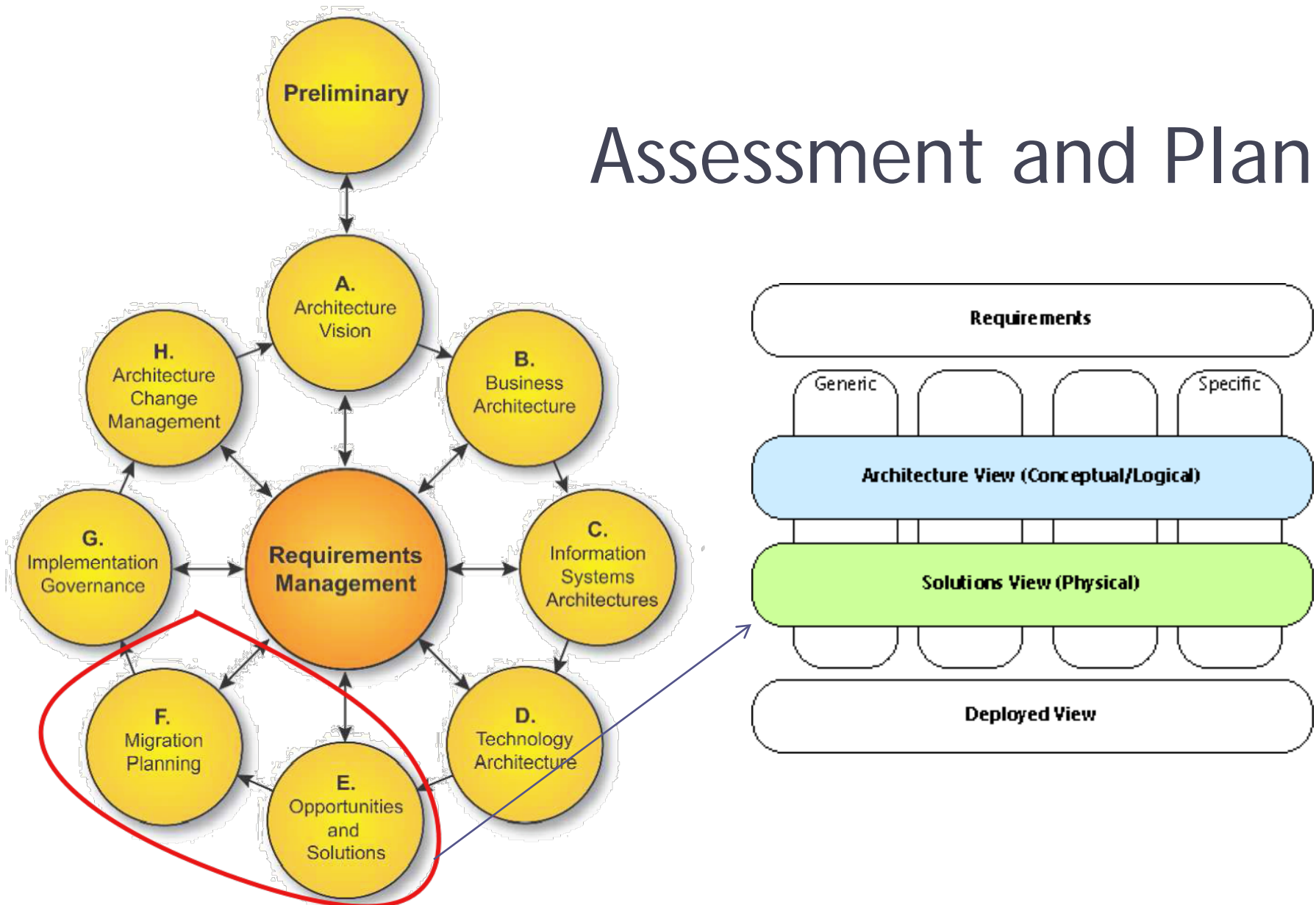




Applying the ADM

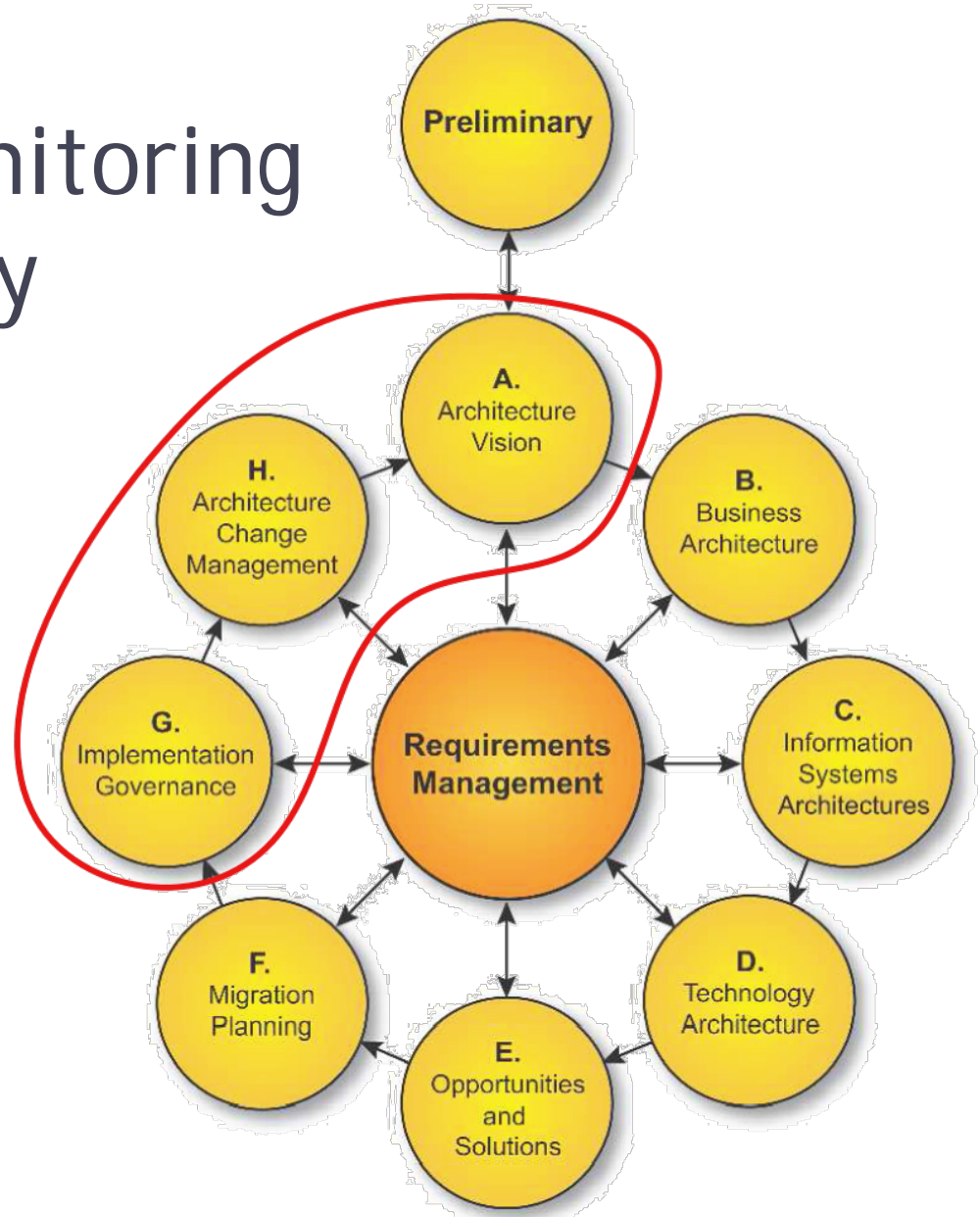


Assessment and Plan



Execution, Monitoring New EA Activity

- SDLC
- PM



TOGAF

PRO

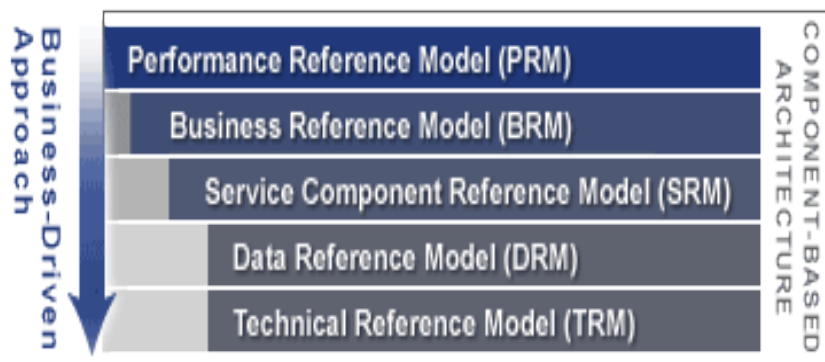
- Well known, widely used
- Strong process
- Public, free
- Includes common accepted EA viewpoints
- Technology architecture focus

CON

- Too much technology focus
- Too large for smaller projects

Federal Enterprise Architecture

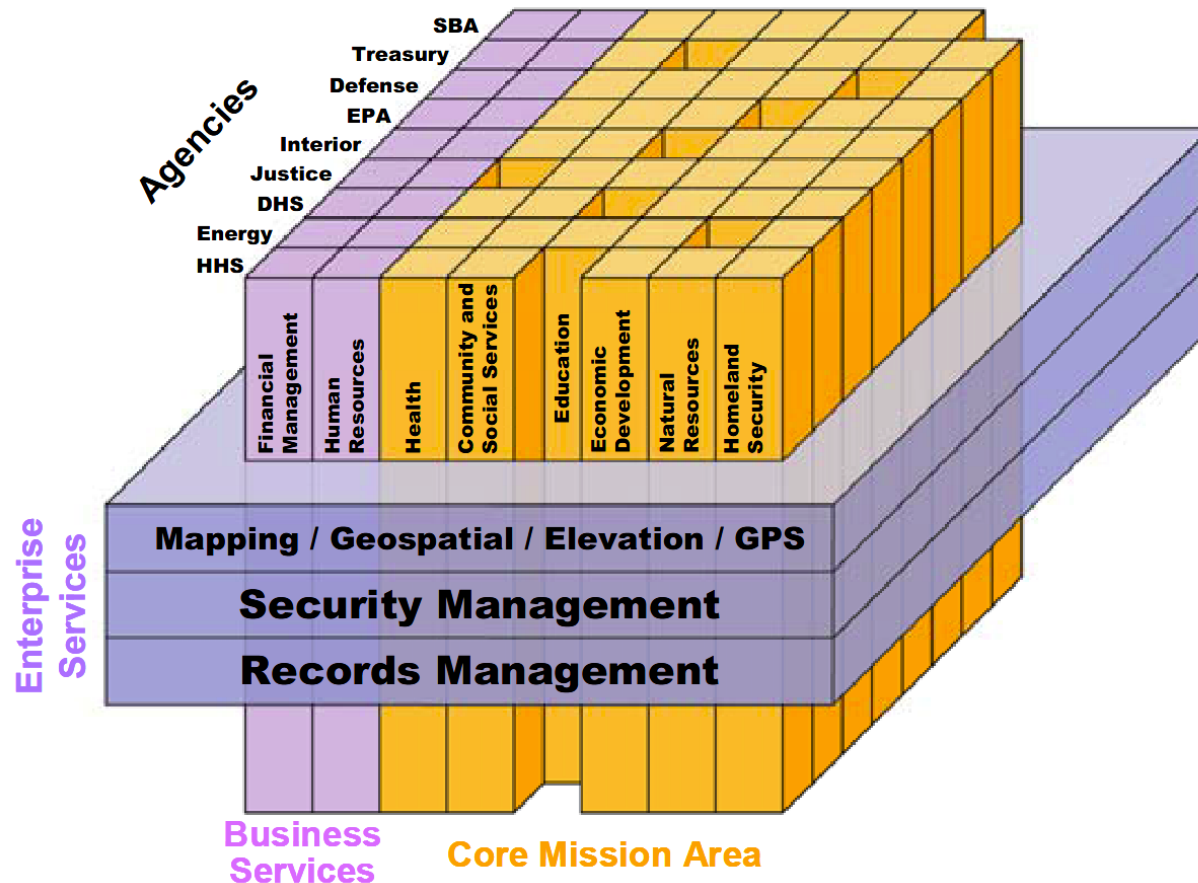
- “a business and performance-based framework to support cross-agency collaboration, transformation, and government wide improvement”



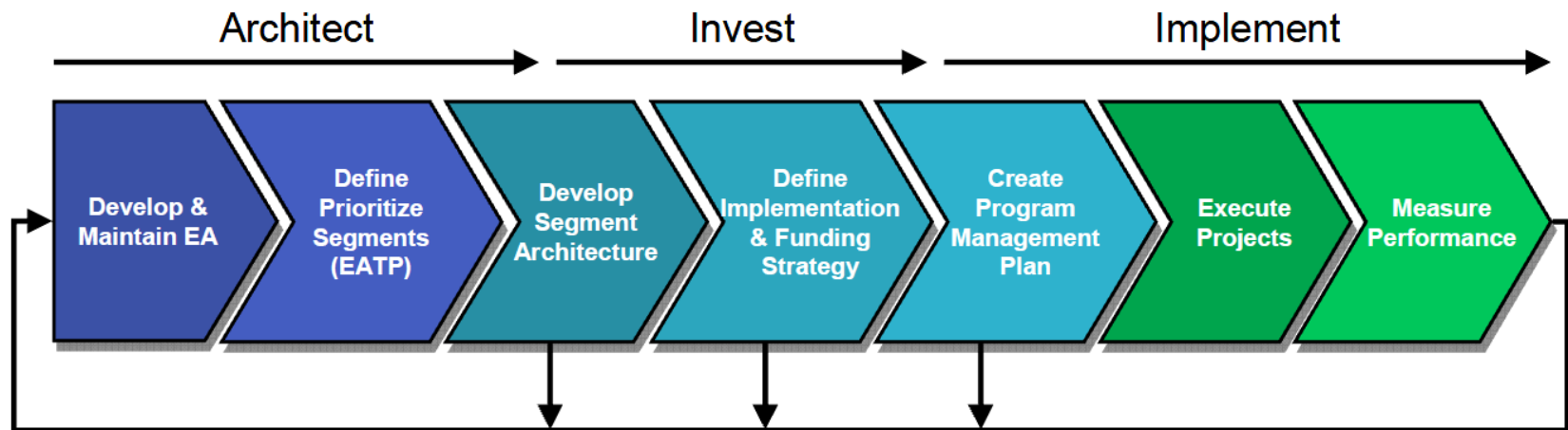
FEA Drivers

- CPIC: Capital Planning and Investment Control
- PART: Program Assessment Rating Tool
- eGov initiative
- President's Management Agenda

FEA Segments and Services



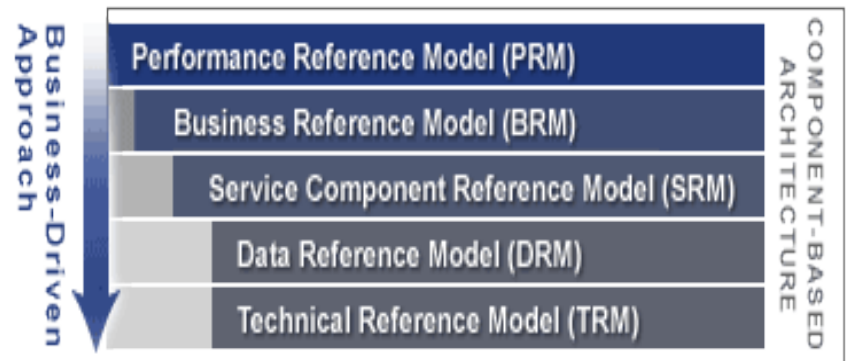
FEA & PM



FEA Practice Guidance – Segment Architecture, OMB, 2006

FEA

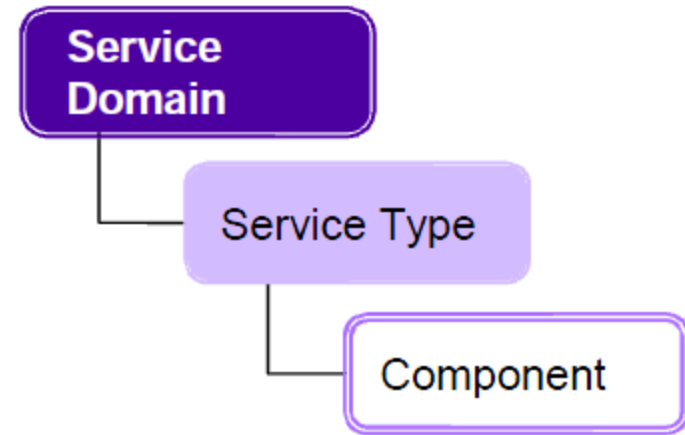
Reference Models



- Performance Reference Model (PRM)
 - common set of general performance outputs and measures to achieve business goals and objectives
- BRM
 - describes business operations including defining services provided to state and local governments
- SRM
 - identifies and classifies IT service (i.e., application) components that support federal agencies and **promotes component reuse across agencies and to support the discovery of government-wide business and application service components** in IT investments and assets.
 - The SRM is structured across horizontal and vertical service domains that, **independent of the business functions**, can provide a leverage-able foundation to support the reuse of applications, application capabilities, components, and business services
- DRM
 - describes at an aggregate level, data types that support program and business lines of operations, and relationships among these types
- TRM
 - describes how technology supports the delivery of service components, including relevant standards for implementing the technology

Service Component Reference Model

- Customer Services
- Process Automation Services
- Business Management Service
- Digital Asset Services
- Business Management Services
- Digital Asset Services
- Business Analytical Services
- Back Office Services
- Support Services



SRM: Back Office Services



FEA

PRO

- Simple and straightforward to understand
- Comes with reference models
- Developed for the government

CON

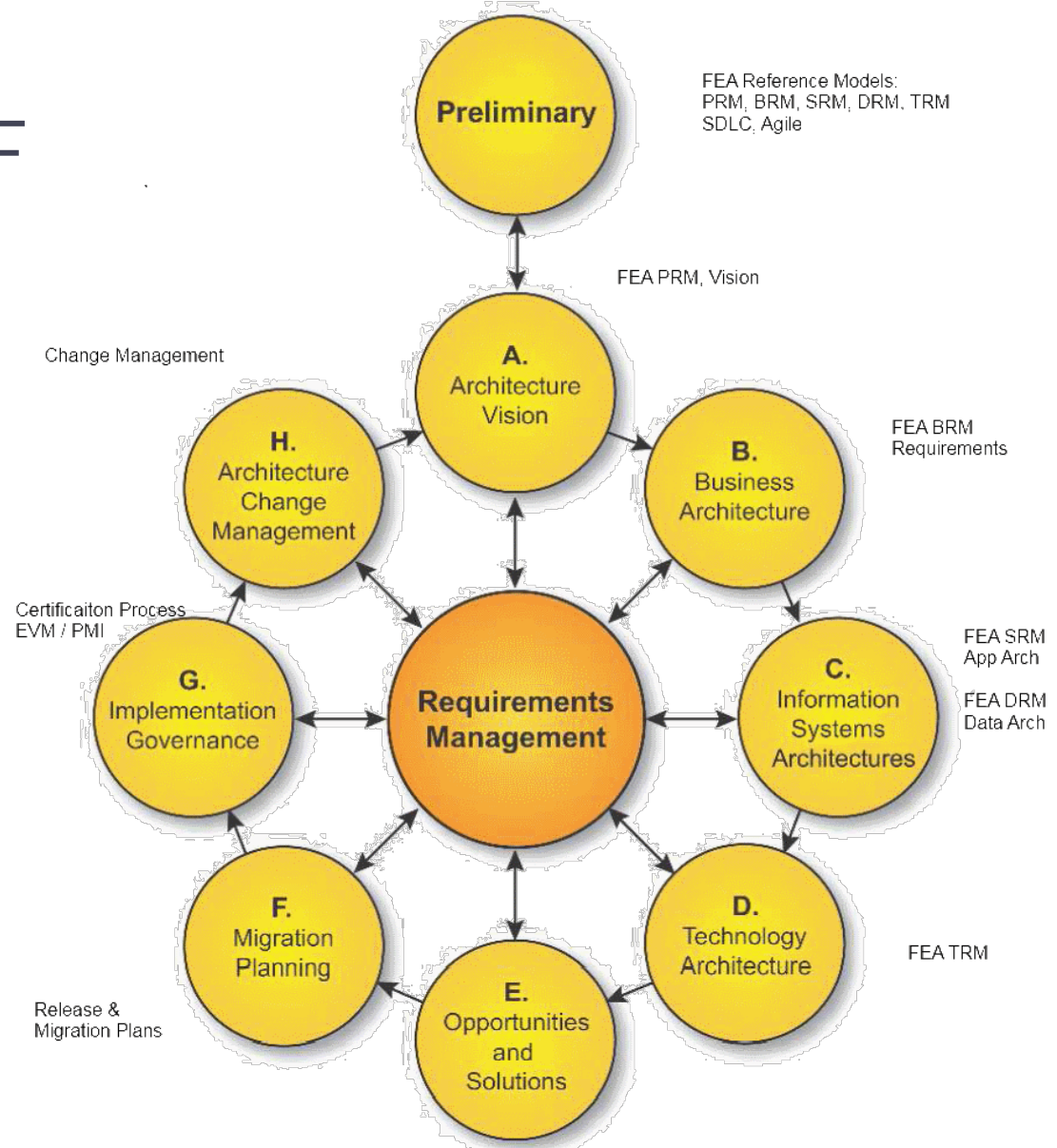
- Too simple, missing an abstraction model
- Dated, networking & technology not considered
- Processes are for large government organizations
- Separates technology from business functions that they enable

EA Overall Comparison

Criteria	Zachman	TOGAF	FEA
Taxonomic Completeness	4	2	2
Process Completeness	1	4	3
Reference Model Guidance	1	3	1
Practice Guidance	1	2	4
Maturity Model	1	1	2
Business Focus	1	2	4
Governance Guidance	1	2	3
Partitioning Guidance	1	2	3
Prescriptive Catalog	1	2	2
Vendor Neutrality	2	4	1
Information Availability	2	4	1
Time to Value	1	3	4

Source: Roger Sessions, Object Watch

FEA & TOGAF Mapping



Assessing EA Maturity

Level	Name	Description
1	Initial	Creating EA awareness
2	Repeatable	Building the EA management foundation
3	Defined	Developing the EA by applying a consistent process
4	Managed	Completing the EA
5	Optimized	Leveraging the EA to improve business benefit

- Enterprise Architecture Assessment Framework (Federal Enterprise Architecture Program Management Office, US FEAPMO),
- The Enterprise Architecture Maturity Model, EAMM (National Association of State Chief Information Officers , NASCIO)
- The Extended Enterprise Architecture Maturity Model, E2AMM (Institute for Enterprise Architecture Developments, IFEAD).
- A Framework for Assessing and Improving Enterprise Architecture Management, EAMFF (US General Accounting Office, GAO)
- The COSM (Component Oriented Software Manufacturing) Maturity Model (Herzum Software).
- IT Architecture Capability Maturity Model, ACMM (US Department of Commerce, Doc)
- Capability Maturity Models Integration, CMMI (The Software Engineering Institute, SEI)

Resources

- **TOGAF:** <http://www.togaf.com/>
 - <http://www.opengroup.org/architecture/>
- **FEA:** <http://www.whitehouse.gov/omb/e-gov/fea/>
 - **Practical Guidance:**
<http://www.whitehouse.gov/omb/asset.aspx?AssetId=471>
 - **Consolidated Reference Model 2.3**
<http://www.whitehouse.gov/omb/asset.aspx?AssetId=470>
- **Zachman:** <http://www.zifa.com/framework.html>