

# AM extra

## EA framework history

(Including five things to know)

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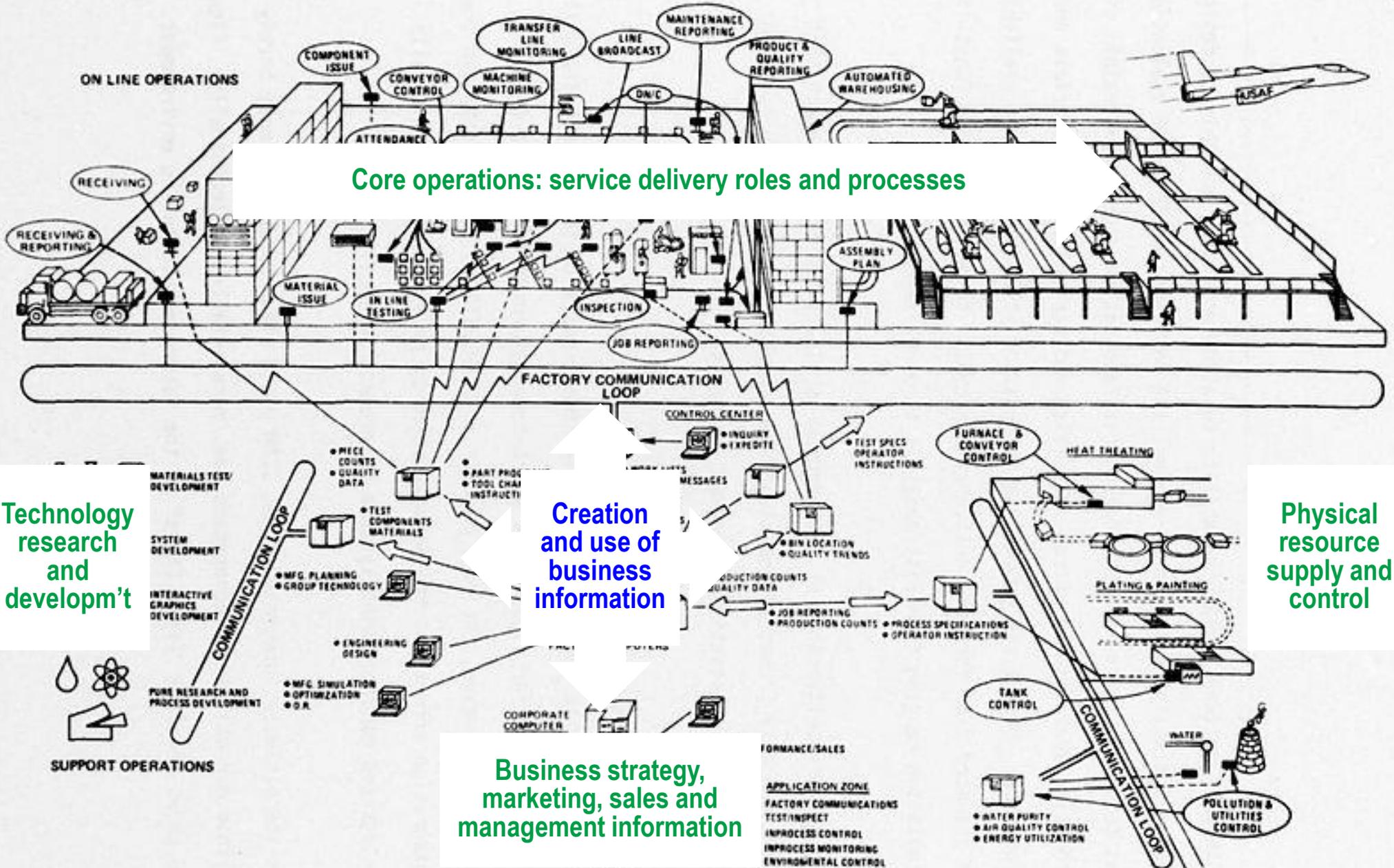
- ▶ Businesses roles and processes that can or do create and use business data have increasingly been digitised, have been supported or enabled by digital information and data sources.
  
- ▶ Solution architects have addressed business problems, requirements and opportunities recognised by business sponsors:
  - "Increase the speed and accuracy of our accounting system."
  - "Help sales and marketing by capturing and analysing information about customers' interests."
  - "Grow our market share by developing a new delivery channel facilitated by social media."
  
- ▶ Solution architects have done this within and without a strategic context

# Solution architecture around 1975

- ▶ The focus was on digital transformations that formalise business systems using computers.
- ▶ For many, there was no network - only an enterprise mainframe few business people ever saw.



# 1977: the importance of integrated information to business operations



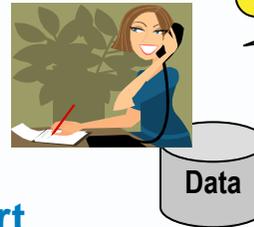
By Dennis E. Wisnosky - An overview of the Air Force program for Integrated Computer Aided Manufacturing (forerunner of IDEF). ICAM program prospectus. SME technical paper, Public Domain, <https://commons.wikimedia.org>

- ▶ a method for analyzing and designing an organisation's **information architecture**, goals being:
  1. understand the issues and opportunities with the current **applications and technical architecture**
  2. develop a future state and migration path for the **technology** that supports the enterprise
  3. provide business executives with a direction and decision making framework for **IT capital expenditures**
  4. provide **information system (IS)** with a blueprint for development

(After Wikipedia and Robinson College of Business, Georgia State University.)

# The process in BSP - for study and presentation of plan

- ▶ 1 Preparation
  - 1.1 Obtain authorization for the study
  - 1.2 Study preparation
  - 1.3 Study beginning
- ▶ 2 Analytical
  - 2.1 Define the **business strategy**
  - 2.2 Define the **business processes**
  - 2.3 Define the **data classes**
  - 2.4 Analyse current **information support**
  - 2.5 Discuss the analysis results with management
  - 2.6 Issue the analysis results
- ▶ 3 Final part
  - 3.1 Define the **information architecture**
  - 3.2 Establish priorities for **IS development**
  - 3.3 Verify the impact of study to **IS managing**
  - 3.4 Next procedure proposal
  - 3.5 Results presentation
  - 3.6 Next procedure (implementation)



**Note business process-orientation.**

**No “technology”?**

**In 1980, the mainframe was taken for granted.**

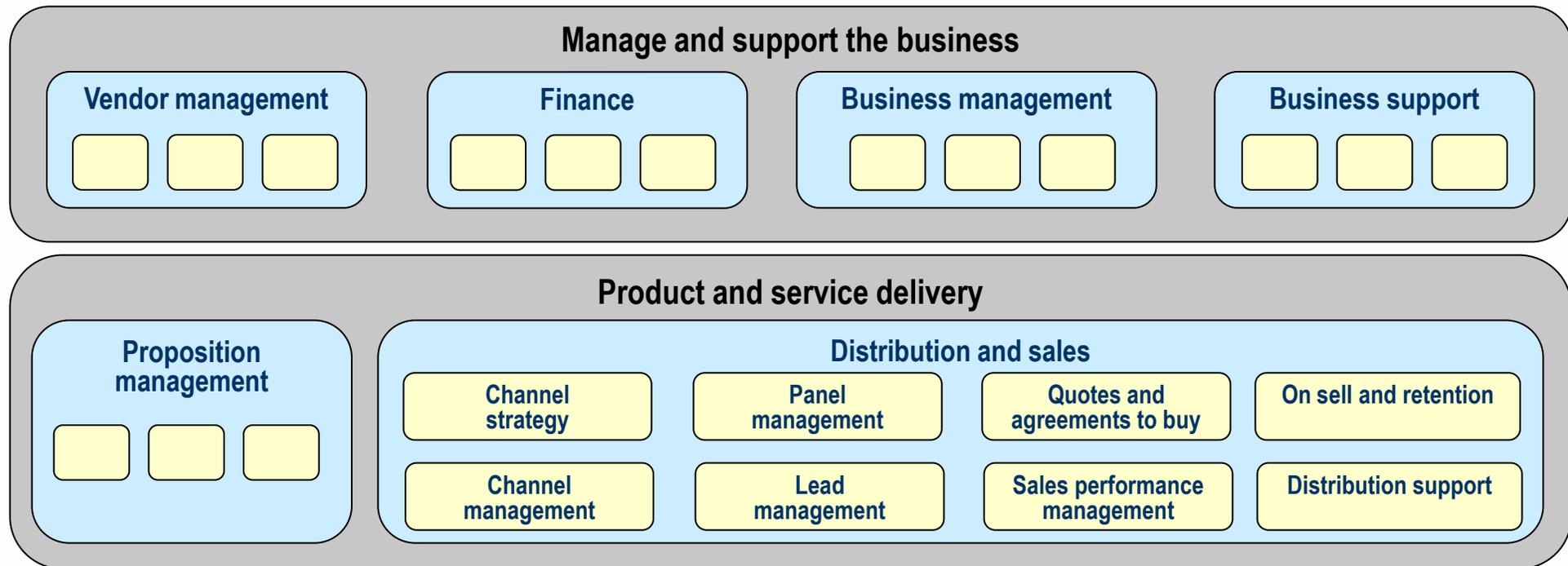
## 1982: John Zachman of IBM spoke of EA

- ▶ "Although many popular information systems planning methodologies, design approaches, and various tools and techniques
- ▶ do not preclude or are not inconsistent with **enterprise-level analysis**, few explicitly address or attempt to **define EAs.**"
- ▶ So EA came to mean taking a holistic enterprise-level, enterprise-wide view of the business roles and processes that use information systems

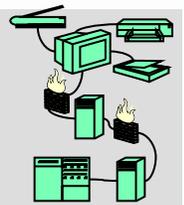
Useful in  
discrete solution  
architecture

# "Information Engineering" (IE) James Martin and others.

- ▶ We start by mapping out what the business does
- ▶ In a **business function hierarchy**
- ▶ Nowadays called a **business capability map**.



- ▶ **“Dispersion and Interconnection: Approaches to Distributed Systems Architecture”**
- ▶ divided enterprise-level architecture into four architecture domains
- ▶ **“Organization”**
  - ▶ The people and **[business]** structures that make it all work.”
- ▶ **“Data”**
  - ▶ The information assets of the organization [surely means the data processed by application software]”
- ▶ **“Application software”**
  - ▶ The code which processes data for the organization, including acquired as well as internally developed programs.”
- ▶ **“Infrastructure”**
  - ▶ The underlying technological platform which supports data and applications, including hardware, systems software, and communications networks.”



## Also four architecture “types”

### PRISM 1986

#### ▶ “Principles

- A statement of the organization's philosophy of information systems expressed in terms of objectives and goals in each domain area

#### ▶ “Standards

- Specific rules or guidelines for implementing the models

#### ▶ “Inventory

- A snapshot of the **current state** showing the architectural items in place today and their relationships

#### ▶ “Models

- Pictures of the **desired state**, with emphasis on what goes where, and how it is all connected”

### TOGAF today

#### ▶ Principles

#### ▶ Standards info. base

#### ▶ Baseline architecture

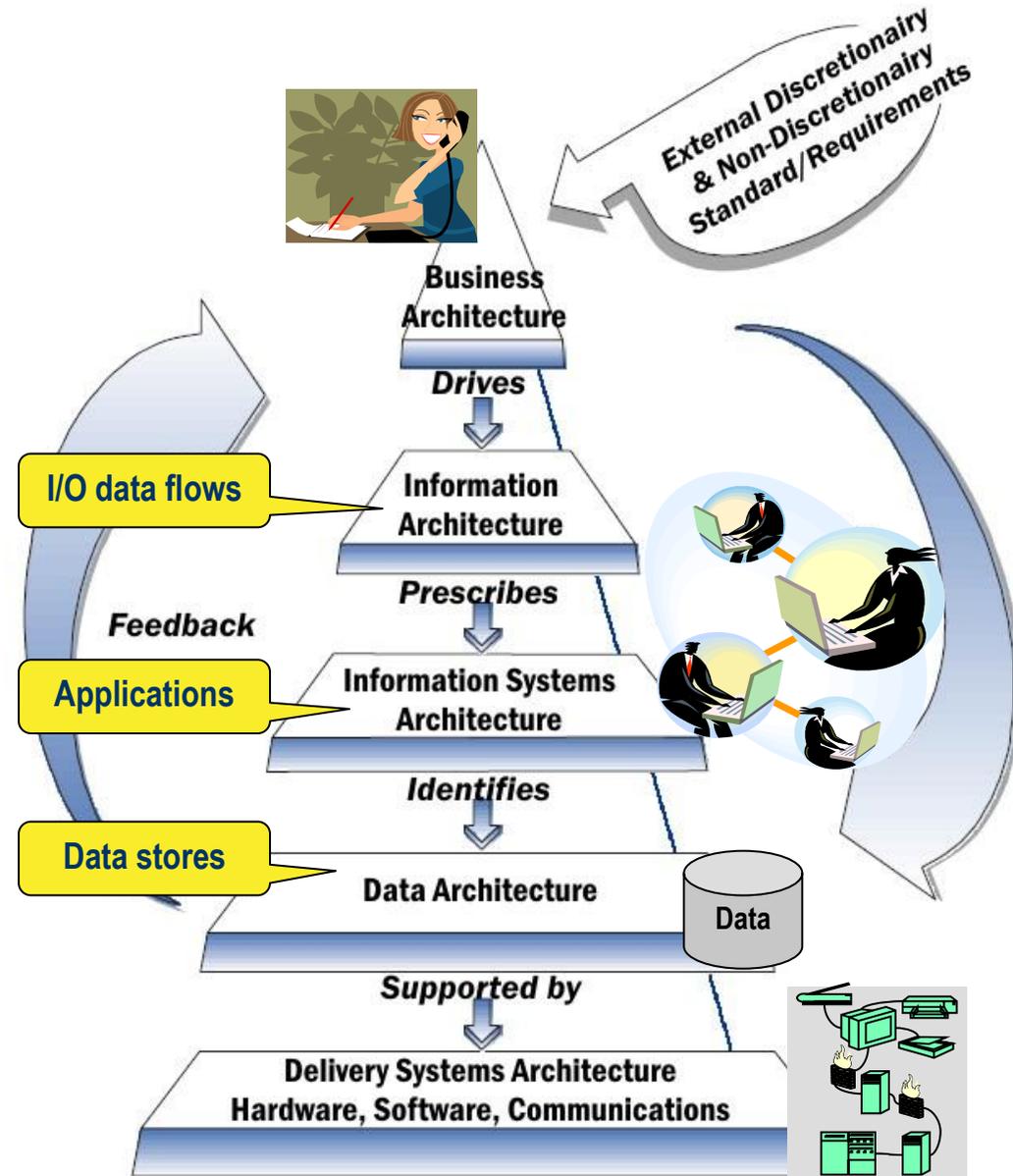
#### ▶ Target architecture

## 1987 reference to EA by John Zachman of IBM

- ▶ “The cost and the success of the business
- ▶ depending increasingly on its information systems
- ▶ require a disciplined approach to the management of those systems.”
  
- ▶ “It is not hard to speculate about, if not realize, very large, very complex systems implementations,
- ▶ **extending in scope and complexity to encompass an entire enterprise.”**

# In 1989, The NIST Enterprise Architecture Model

- ▶ Promoted in U.S. federal gov.
- ▶ **Information** is **data** at the point of creation or use by an actor
- ▶ In practice, the terms are interchangeable.
- ▶ I/O data flows should be identified in IS/App Service Contracts



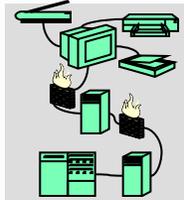
# In 1992, “Extending and formalising the information systems architecture framework” Sowa and Zachman

- ▶ “the overall information system and how it relates to the enterprise and its surrounding environment.”
- ▶ “a framework for information systems architecture (ISA) that has been widely adopted by systems analysts and database designers.”

	DATA <i>What</i>	FUNCTION <i>How</i>	NETWORK <i>Where</i>	PEOPLE <i>Who</i>	TIME <i>When</i>	MOTIVATION <i>Why</i>
Objective/Scope (contextual) <i>Role: Planner</i>	List of things important in the business	List of Business Processes	List of Business Locations	List of important Organizations	List of Events	List of Business Goal & Strategies
Enterprise Model (conceptual) <i>Role: Owner</i>	Conceptual Data/ Object Model	Business Process Model	Business Logistics System	Work Flow Model	Master Schedule	Business Plan
System Model (logical) <i>Role: Designer</i>	Logical Data Model	System Architecture Model	Distributed Systems Architecture	Human Interface Architecture	Processing Structure	Business Rule Model
Technology Model (physical) <i>Role: Builder</i>	Physical Data/Class Model	Technology Design Model	Technology Architecture	Presentation Architecture	Control Structure	Rule Design
Detailed Representation (out of context) <i>Role: Programmer</i>	Data Definition	Program	Network Architecture	Security Architecture	Timing Definition	Rule Speculation
Functioning Enterprise <i>Role: User</i>	Usable Data	Working Function	Usable Network	Functioning Organization	Implemented Schedule	Working Strategy

# In 1992, “EA Planning” by Stephen Spewak

- ▶ A data-centric architecture planning process
  - ▶ “defining architectures for the use of information in support of the business and the plan for implementing those architectures”.
- ▶ EAP is “the process of defining architectures for the use of information in support of the business and the plan for implementing those architectures”.
    - The **business** mission is the primary driver.
    - Then the **data** required to satisfy the mission,
    - Then the **applications** built to store and provide that data
    - Finally the **technology** to implement the applications.
  - ▶ **to improve data quality, access to data, adaptability to changing requirements, data interoperability and sharing, and cost containment.”**
  - ▶ After Wikipedia

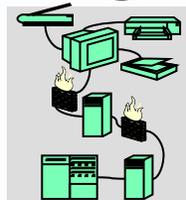
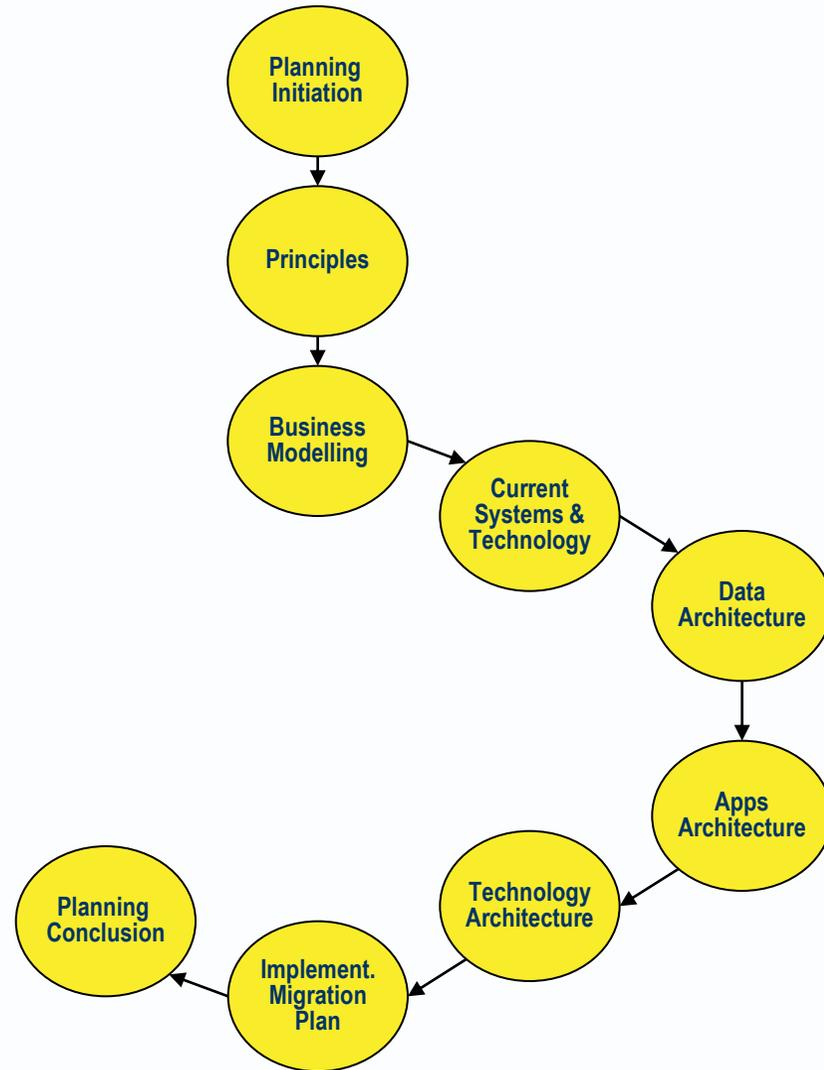


# The process in EAP (Spewak)

The first well-known process for EA

1. Planning Initiation
2. Principles
3. **Business** Modelling
4. Current Systems & Technology
5. **Data** Architecture
6. **Applications** Architecture
7. **Technology** Architecture
8. Implementation/Migration Plans
9. Planning Conclusion

Stopped short of implementation and change management.



## In 1996, The “IT Management Reform Act”

- ▶ This “Clinger Cohen Act”
- ▶ directed that a US federal government agency’s investment in IT must be mapped to identifiable business benefits.
- ▶ made each federal agency’s CIO responsible for **“developing, maintaining and facilitating the implementation of a sound and integrated IT architecture for the executive agency.”**
- ▶ Encouraged the development of EA frameworks and tools
- ▶ EA framework = **process framework + product/content framework**



# By 1997: Zachman had refocused his ISA framework as an EA framework.

- ▶ A Product/Content framework
- ▶ “A classification scheme for artefacts: plans, technical details, lists, charts and natural language statements.”



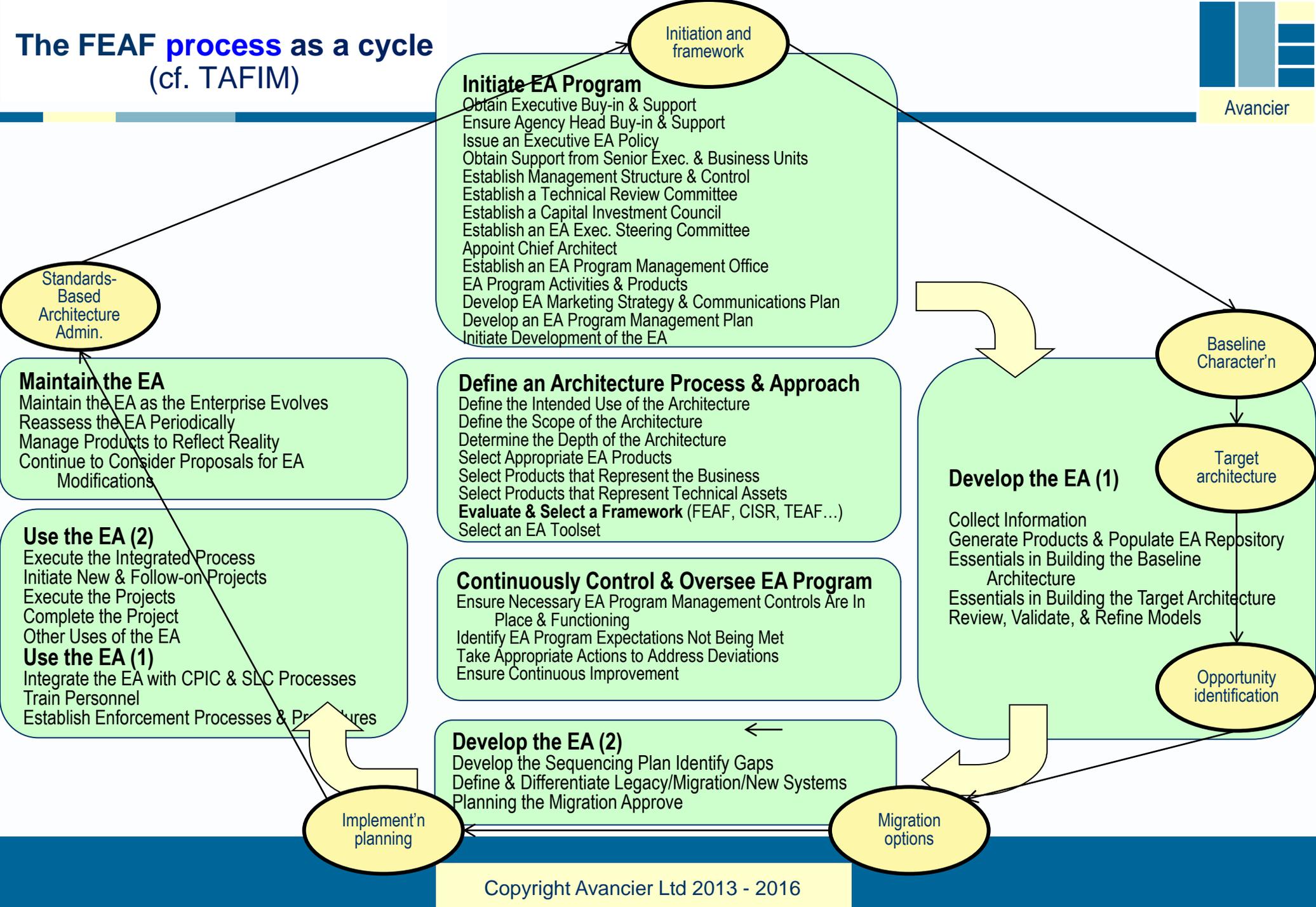
Question Stakeholder	What	How	Where	Who	When	Why
	Data	Processes	Network	Organisation	Events	Goals
Planner						
Owner						
Designer						
Builder						
Subcontractor						
Operations						

- ▶ Zachman has always said his framework is not a process

# In 1998, The Federal CIO Council began developing FEAF

- ▶ A process
- ▶ Reflecting priorities of the Clinger-Cohen Act
- ▶ The Federal Enterprise Architecture Framework
  1. Initiate EA program
  2. Define an Architecture Process & Approach
  3. Develop the EA
  4. Use the EA
  5. Maintain the EAContinuously Control & Oversee the EA Program
- ▶ “The architecture team generates a sequencing plan for the transition of systems, applications, and associated business practices predicated upon a detailed gap analysis [between baseline and target].”

# The FEAF process as a cycle (cf. TAFIM)



Initiation and framework

**Initiate EA Program**  
 Obtain Executive Buy-in & Support  
 Ensure Agency Head Buy-in & Support  
 Issue an Executive EA Policy  
 Obtain Support from Senior Exec. & Business Units  
 Establish Management Structure & Control  
 Establish a Technical Review Committee  
 Establish a Capital Investment Council  
 Establish an EA Exec. Steering Committee  
 Appoint Chief Architect  
 Establish an EA Program Management Office  
 EA Program Activities & Products  
 Develop EA Marketing Strategy & Communications Plan  
 Develop an EA Program Management Plan  
 Initiate Development of the EA

Standards-Based Architecture Admin.

**Maintain the EA**  
 Maintain the EA as the Enterprise Evolves  
 Reassess the EA Periodically  
 Manage Products to Reflect Reality  
 Continue to Consider Proposals for EA Modifications

**Define an Architecture Process & Approach**  
 Define the Intended Use of the Architecture  
 Define the Scope of the Architecture  
 Determine the Depth of the Architecture  
 Select Appropriate EA Products  
 Select Products that Represent the Business  
 Select Products that Represent Technical Assets  
**Evaluate & Select a Framework** (FEAF, CISR, TEAF...)  
 Select an EA Toolset

Baseline Character'n  
 Target architecture  
 Opportunity identification  
**Develop the EA (1)**  
 Collect Information  
 Generate Products & Populate EA Repository  
 Essentials in Building the Baseline Architecture  
 Essentials in Building the Target Architecture  
 Review, Validate, & Refine Models

**Use the EA (2)**  
 Execute the Integrated Process  
 Initiate New & Follow-on Projects  
 Execute the Projects  
 Complete the Project  
 Other Uses of the EA  
**Use the EA (1)**  
 Integrate the EA with CPIC & SLC Processes  
 Train Personnel  
 Establish Enforcement Processes & Procedures

**Continuously Control & Oversee EA Program**  
 Ensure Necessary EA Program Management Controls Are In Place & Functioning  
 Identify EA Program Expectations Not Being Met  
 Take Appropriate Actions to Address Deviations  
 Ensure Continuous Improvement

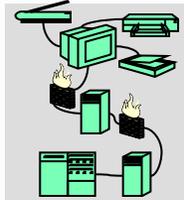
Migration options

**Develop the EA (2)**  
 Develop the Sequencing Plan Identify Gaps  
 Define & Differentiate Legacy/Migration/New Systems  
 Planning the Migration Approve

Implement'n planning

## 2001: FEAf: the US Chief CIO council

- ▶ “A practical guide to Federal Enterprise Architecture”, starts
- ▶ “An enterprise architecture (EA) establishes
- ▶ the **Agency-wide roadmap** to achieve
- ▶ an Agency’s mission through
- ▶ optimal performance of its core business processes within an
- ▶ efficient information technology (IT) environment.”



## 2003: Zachman listed 10 key points for EA, including

- ▶ **“If it gets so complex that you can’t remember everything all at the same time, you have to write it down (Architecture).**
- ▶ Then, if you want to change it (whatever it is), you start with what you wrote down (Architecture), the baseline for managing change.
  
- ▶ **... The broader you define the analytical target, the better leverage you are going to get on integration, reusability, interoperability, etc...**
- ▶ If you draw the boundary more narrowly than your jurisdictional control, you will disintegrate your Enterprise, that is, you will build a “legacy.”
  
- ▶ If you are not observing the engineering design principles..., you are not going to realize the engineering design objectives of alignment, integration, reusability, interoperability, flexibility, reduced time-to-market, etc., etc.
- ▶ ... you are never going to appreciably reduce time-to-market until you have something in inventory before you get the order.
- ▶ **If you are not building (and storing, managing and changing) primitive models, you are not doing Architecture. You are doing implementations.”**

## In 2006, "EA as Strategy" by Ross, Weill and Robertson

- ▶ "companies excel because they've [decided] which processes they must execute well, and have implemented the IT systems to digitise those processes."
- ▶ Work by MIT's Center for Information System Research) led authors to encourage enterprise architects to engage business managers using an "operating model" to explore how far a business seeks integration and/or standardisation of core processes.

<b>"Operating model"</b> <b>Integration and/or standardisation of core business processes</b>		
<b>High integration</b>	<b>Integrated</b>	<b>Coordinated</b>
<b>Low integration</b>	<b>Diversified</b>	<b>Replicated</b>
	<b>Low standardisation</b>	<b>High standardisation</b>

# The process in “Enterprise Architecture as Strategy”

For

- ▶ “C-level executives determined to get IT right”
- ▶ delivering “a road map for the CIO and IT organisation to follow”.
- ▶ "improving strategy execution and lowering IT costs" and
- ▶ "creating a foundation for business execution”

The process

1. Analyse your foundation for execution
2. Define your Operating Model
3. Design your Enterprise Architecture
4. Set Priorities
5. Design and implement an IT Engagement Model
6. Exploit your foundation\* for execution for growth

\* Foundation = “an IT infrastructure and digitised processes that implement your company's core capabilities.”

- ▶ EA emerged in the 1980s
  - to address the diseconomies of silo solutions
  - by taking the cross-organisational and strategic perspective necessary to coordinate, standardise and unify business roles and processes across the enterprise.
  
- ▶ TOGAF started in the 1990s
  - initially an IT platform rationalisation framework
  - joined mainstream EA in the 2000s, when the "Enterprise Edition" was published
  - is often used by solution architects - within or without an EA context.

- ▶ promotes and encourages EA
- ▶ The core is **the process**, ADM, for “transforming the enterprise from baseline to target architecture.”

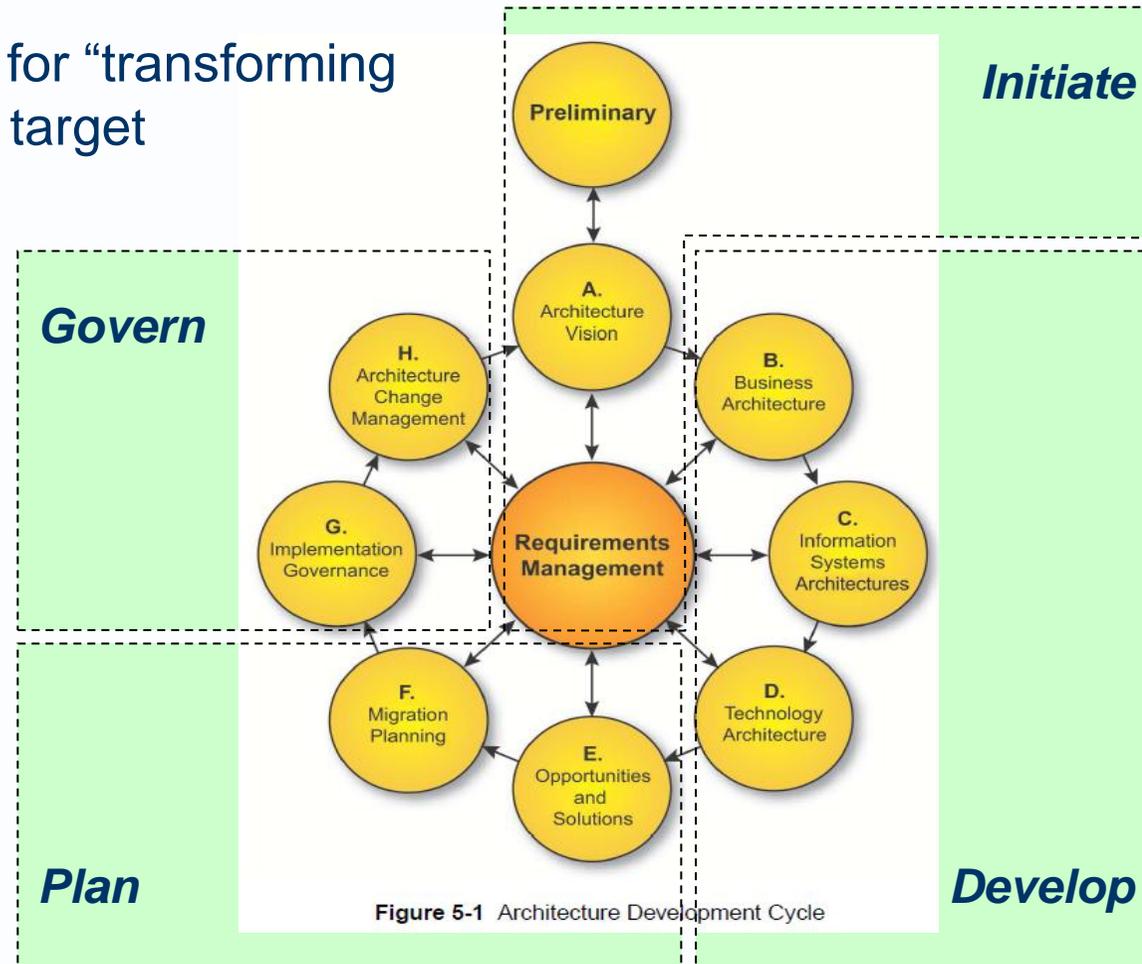
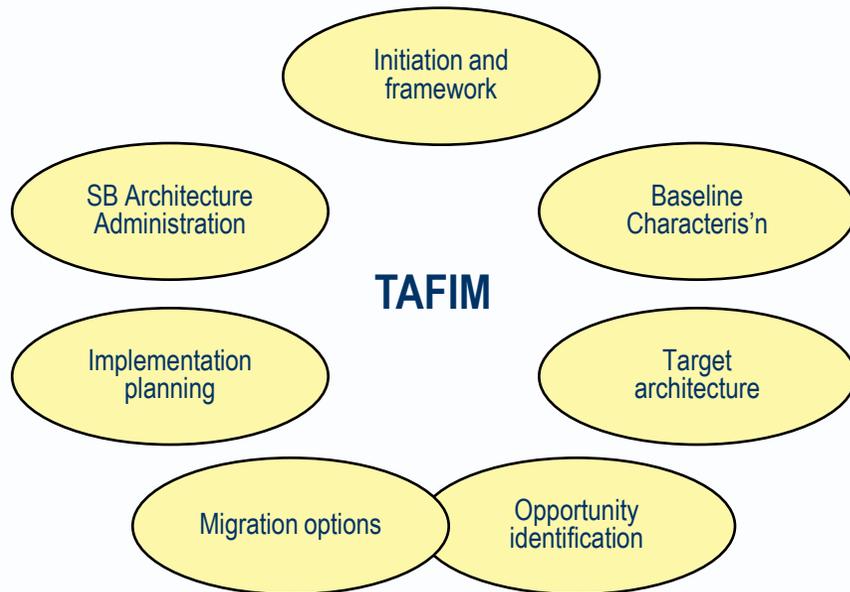
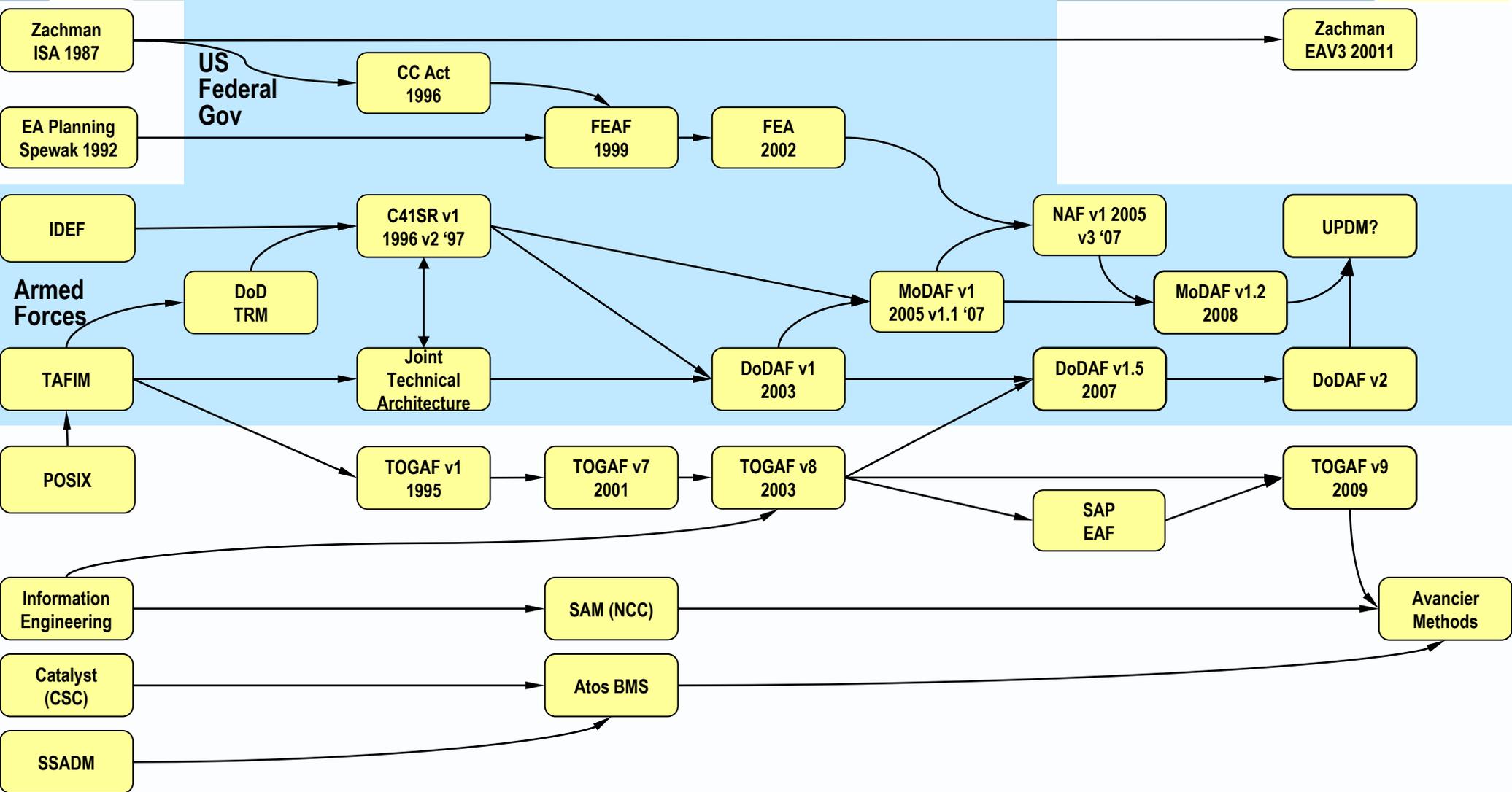


Figure 5-1 Architecture Development Cycle

# Some EA framework history



# Conclusions and remarks

What has remained the same and what has changed?

# The history through which EA emerged

## 20<sup>th</sup> century sources

- ▶ Business Systems Planning , IBM
- ▶ PRISM paper
- ▶ The Zachman Framework
- ▶ EA Model, NIST
- ▶ EA Planning, Spewak
- ▶ IT Management Reform Act (Clinger Cohen Act)

## ▶ Other sources

- Hierarchical, Input, Process, Output (HIPO)
- Structured Analysis and Design Technique (SADT)
- Integrated Computer Aided Manufacturing (ICAM)
- Integration Definition Language (IDEF)

## 21<sup>st</sup> century sources

- ▶ Federal EA Framework, Federal CIO council
- ▶ Enterprise edition of TOGAF, The Open Group
- ▶ Integrated Architecture Framework (IAF), Cap Gemini
- ▶ “EA as Strategy”, Ross, Weill and Robertson
- ▶ Avancier Methods, Avancier Ltd
- ▶ E&SA reference model, The British Computer Society

# What has remained stable since the 1980s?

- ▶ For 50 years, businesses have been:
  - Introducing “emerging technologies.”
  - Managing “transformative/disruptive changes” to business operations
  - Making “digital transformations” of roles and processes
  
- ▶ In TOGAF today you see things established in the 1980s.
  - The importance of *integrated information* to business operations
  - The need for strategic alignment of IT with business needs
  - Four architecture domains
    - Business, data, apps and technology
  - Four architecture “types”
    - Principles, standards, baseline and target architectures
  - A cyclical development process
    - after TAFIM and FEAF

- ▶ Optimise business systems and increase agility at the enterprise level
  - Treat the enterprise as a system
  - Take a strategic and cross-organisational view
  - Tidy up the mess of duplicated and overlapping systems
  - Standardise and integrate
  - Improve business data quality, relevance and use.

- ▶ Minimise business risks and maximise opportunities
  - Join up business, IS and IT
  - Monitor information system & technology evolution
  - Produce road maps where needed

- ▶ Help understanding and change impact analysis
  - Maintain abstract descriptions of business functions, roles and processes and the resources they use

“Operating model”		
Integrated	Coordinated	Unified
	Diversified	Replicated
		Standardised

“the EA is permanent and manages the EA artefacts delivered by projects.” TOGAF

# What has changed since 1980?

- ▶ A more pervasive, invasive and complex IS and IT estate.
- ▶ Wide area networks
  - employees carry devices and
  - customers connect from remote locations.
  - worries about availability and security of business data
- ▶ Commoditisation of apps and infrastructure
- ▶ Movement of infrastructure and apps into a “Cloud”
- ▶ The latest “emerging technologies”
  - Internet of Things, Big Data and Analytics
- ▶ Recognition that strategy and agility must be balanced

### Five things to know about enterprise and solution architects

1. Solution architects address roles and processes which (because they do or can create and use business data) can be digitised, can be supported or enabled by digital information and data sources.
2. Solution architects address business problems, requirements and opportunities recognised by business sponsors - within or without a strategic context.
3. EA emerged in the 1980s to address the diseconomies of silo solutions by taking the cross-organisational and strategic perspective necessary to coordinate, standardise and unify business roles and processes across the enterprise.
4. Enterprise and solution architects heed business goals, strategies and management structures - and may influence them – but they are not business strategists or organisation designers.
5. TOGAF started in the 1990s as an IT platform rationalisation framework. TOGAF joined mainstream EA in the 2000s, when the "Enterprise Edition" was published, but is often used by solution architects - within or without an EA context.

- ▶ This not about separating "architecture" from "design".
- ▶ It is about separating aims and roles.
  
- ▶ Distinguishing
  - the cross organisational and strategic aims of an EA (at the application, technology and project portfolios level) from
  - the aims of a SA in shaping, steering and coordinating a particular solution delivery.
  
- ▶ Recognising that EA road maps differ from SA road maps
  - and that they tend to cut across each other.

# Four domains and three levels of architecture work

▶ Without the middle level, the top and bottom become disconnected

Domain Level	Business	Data/Information	Applications	Infrastructure technology
<b>Enterprise architecture</b>	Business roles & processes, standardisation, integration and road maps	Business data standardisation, integration and road maps	Business application portfolio standardisation, integration and road maps	Platform technology portfolio standardisation, integration and road maps
<b>Solution architecture</b>	Outline design of required processes	Outline design of solution data architecture	Outline design of solution application(s) architecture	Outline design of platform technology solution
<b>Detailed design</b>	Detailed design of processes & use cases	Detailed design of data stores and flows	Detailed design of software architecture	Detailed design of IT production environment

# How can we help?

Training to British Computer Society professional certificates in Enterprise and Solution Architecture (ESA)

- ▶ “The ESA course covers the key **length and breadth of solution and enterprise architecture concepts** from foundation to advanced.
- ▶ It elaborates progressively, making it easier to comprehend architecture frameworks and methods.
- ▶ **It suits both novices** wanting progress their career **and experienced professionals** wanting to strengthen their skills and apply their knowledge across the architecture domains.”
  
- ▶ “The training was very helpful, with lots of experience discussed and mapping the concepts with the real-time use cases.
- ▶ It was nice to meet Graham and have an opportunity to learn from him.
- ▶ Looking forward for the practitioner training next month.”

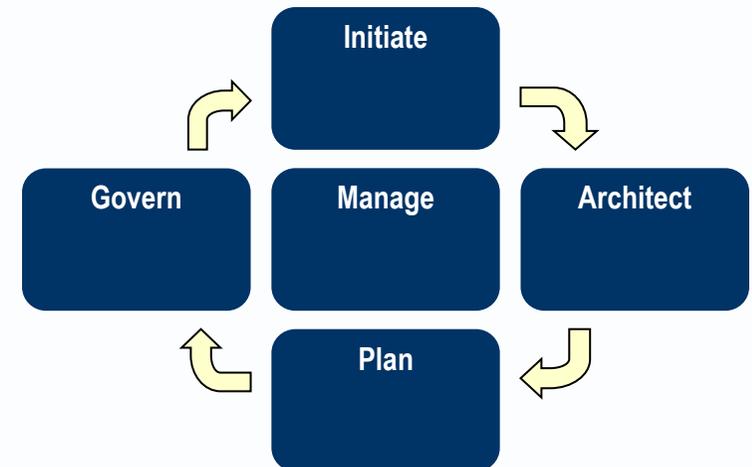
# ESA course variations

- ▶ The 3 day **ESA** course includes no examinations - finishes 4 pm on the last day.
- ▶ The 4 day **IC-ESA** course finishes with the BCS Intermediate level exam - finishes 4 pm on the last day.
- ▶ The 5 day Combined **IPC-ESA** course finishes with the BCS Practitioner level exam.
- ▶ If you want to attend the **PC-ESA** course alone, then look at our weekend PCESA dates

<b>IPCESA</b>	<b>ICESA</b>	<b>ESA</b>	<b>Monday</b>	<b>ARCHITECTURE &amp; ARCHITECTS</b> Architects and systems Components and layers Architecture terms and concepts Enterprise & solution architect roles	<b>CONTEXT &amp; MOTIVATION</b> Principles Scoping Stakeholders and concerns Goals and requirements,	<b>FRAMEWORKS &amp; METHODOLOGY</b> Architecture processes Architecture products Architecture reference models
			<b>Tuesday</b>	<b>BUSINESS DOMAIN</b> Human activity systems Functions/Capabilities Processes/Scenarios	<b>DATA DOMAIN</b> Data at rest - in stores Data in motion - in flows Data quality and interoperability	<b>SOFTWARE DOMAIN</b> Modularity and decoupling Design patterns Interoperation & comm. styles
			<b>Wednesday</b>	<b>APPLICATIONS DOMAIN</b> Application services Applications architecture Integration tools and patterns	<b>DESIGN FOR QUALITIES</b> Performance, availability, recoverability, integrity, security, etc.	<b>INFRASTRUCTURE TECHNOLOGY</b> Cloud computing Network concepts Solution technology definition
			<b>Thursday</b>	<b>Intermediate exam preparation</b>	<b>Intermediate examination</b>	<b>Practitioner exam preparation</b>
			<b>Friday</b>	<b>MIGRATION PLANNING</b> Migration path Business case The agile mindset	<b>IMPLEMENTATION &amp; GOVERNANCE</b> Waterfall / Iterative / Agile delivery Change management Governance	<b>Practitioner examination</b>

# ESA training is supported by Avancier Methods (AM)

- ▶ ESA training focuses on knowledge and skills relevant to architect roles.
- ▶ It introduces the broad sweep of architecture terms and concepts, outlines architecture frameworks and includes practical exercises.
- ▶ It is supported by AM, a methodology that grew out of answering questions asked on TOGAF and related courses
- ▶ It provides insights and guidance we haven't seen in other architecture frameworks.



TOGAF's ADM is a management framework that promotes the role of architects

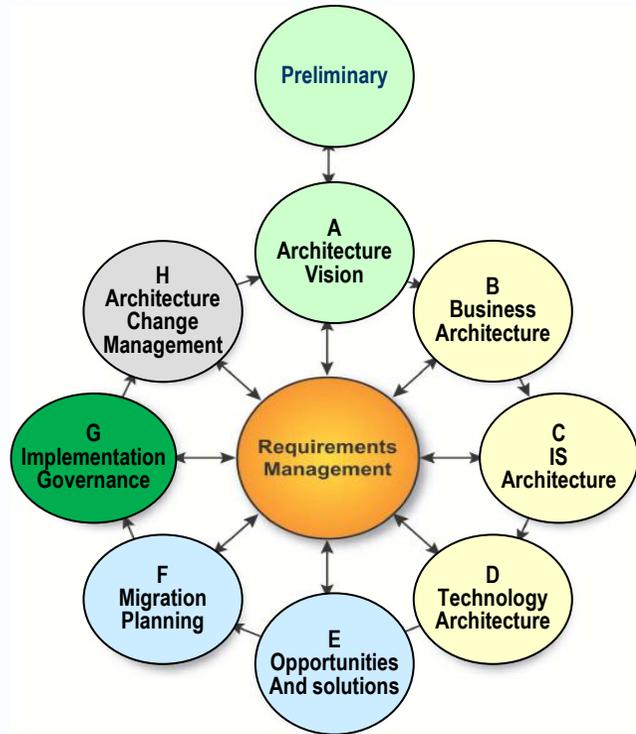
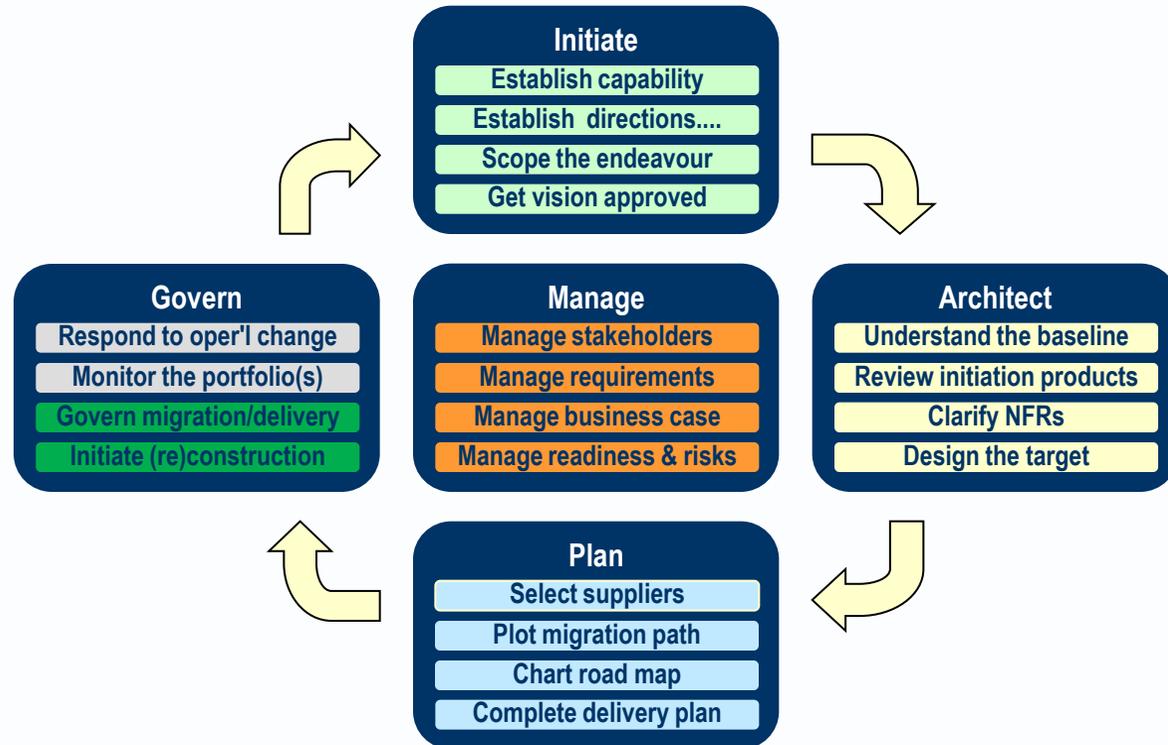
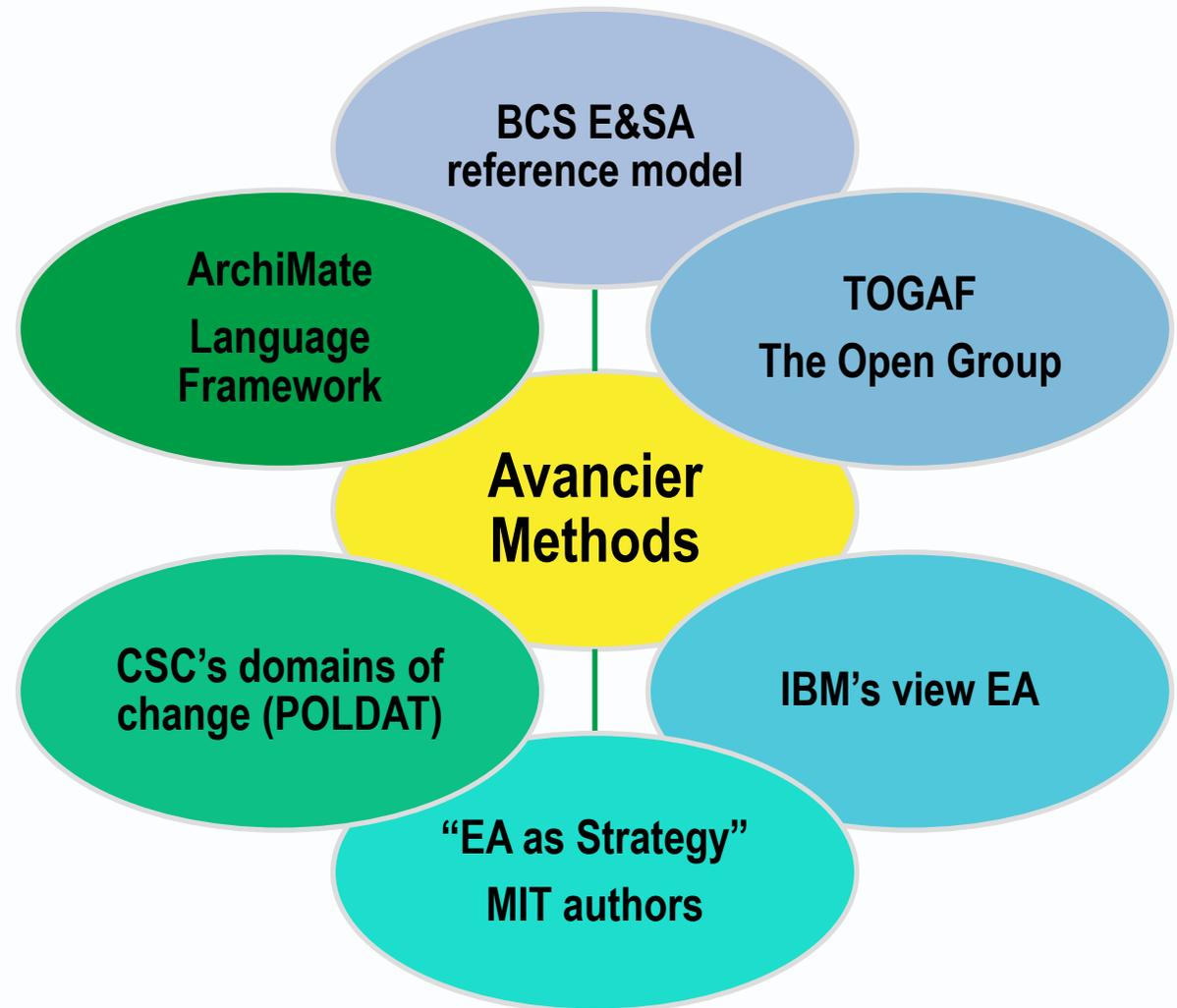


Figure 5-1 Architecture Development Cycle

AM gives architects more concrete guidance on architecting itself



- ▶ **Avancier Methods** are useful with all architecture frameworks that share similar ends and means
- ▶ <http://avancier.website>



# Would deeper education in architecture concepts help you?

- ▶ ESA training (3, 4, 5 and 6 day course variations)
  - more general, broader and deeper than Zachman and TOGAF
  - leads to exams for British Computer Society professional certificates.

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In the USA, EA Principals supply ESA training developed by Avancier, and are accredited to run associated professional certification examinations.

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