Avancier Methods
Motivation Elements

Aims: Goals, Objectives and Requirements

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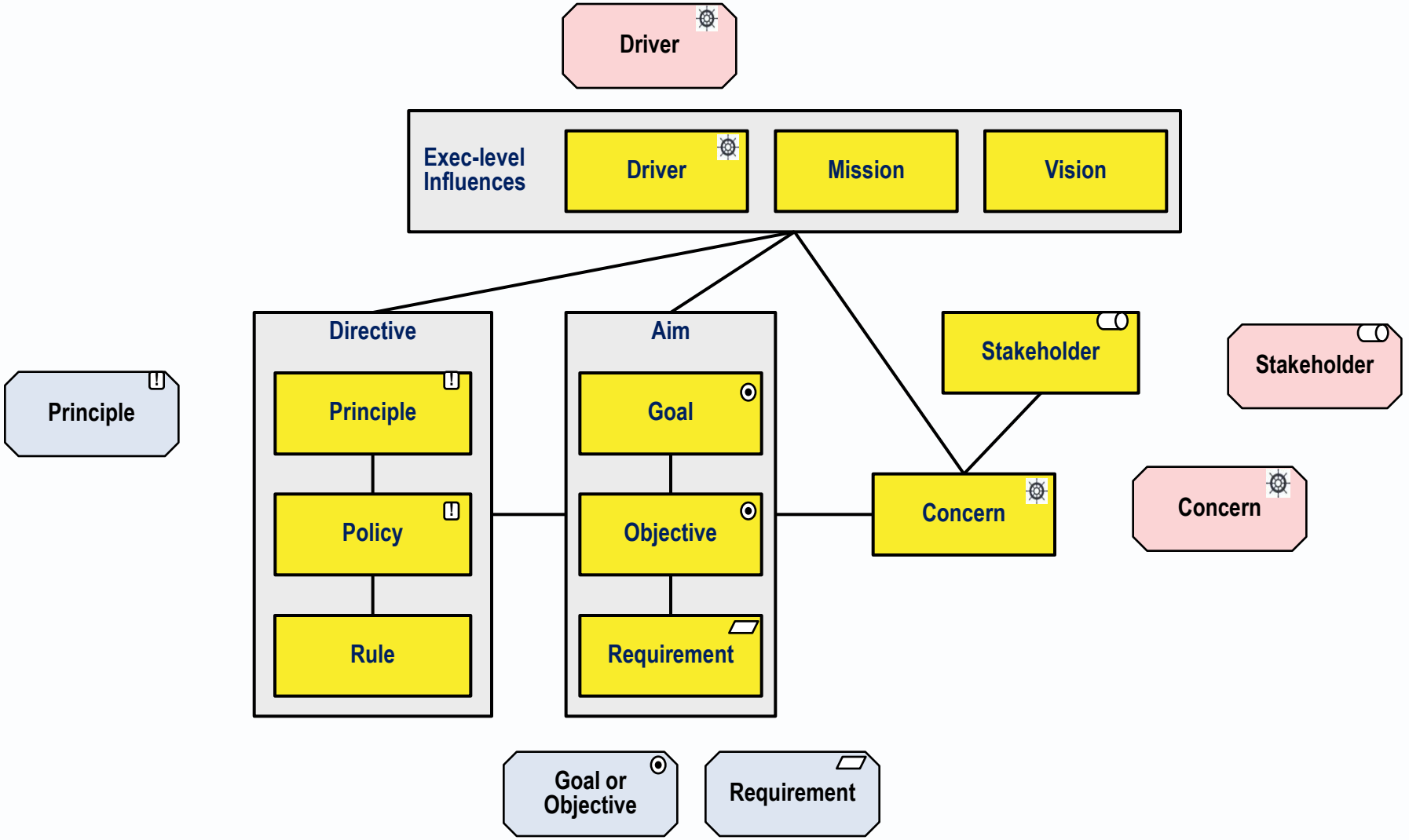
Motivation elements in AM



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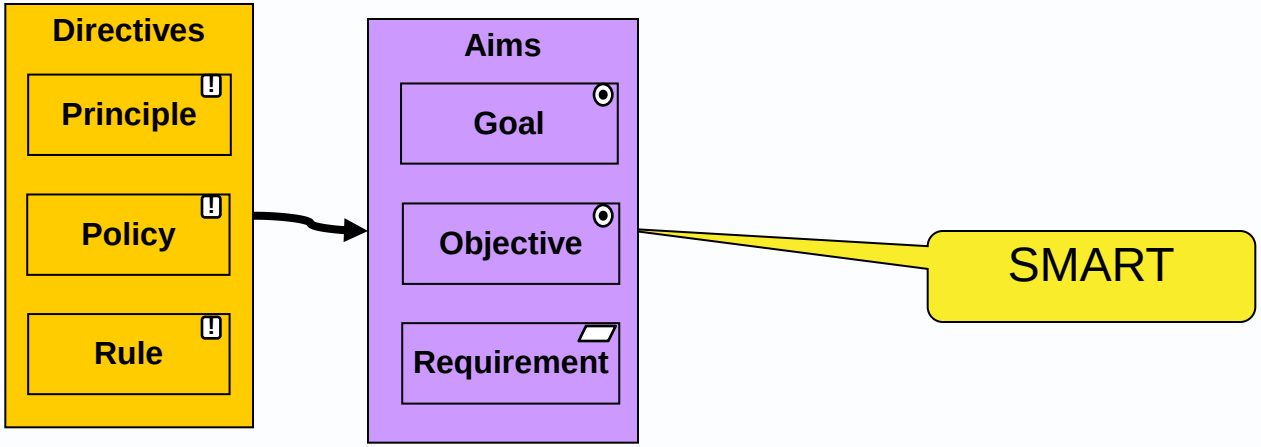
From directives to aims



- Principle – data security is paramount
- Goal – in the next year, we shall have no more than 2 top-level security incidents.

- Principle – buy rather than build.
- Goal – in the next year – at least 75% of our new application systems will be packages rather than bespoke.

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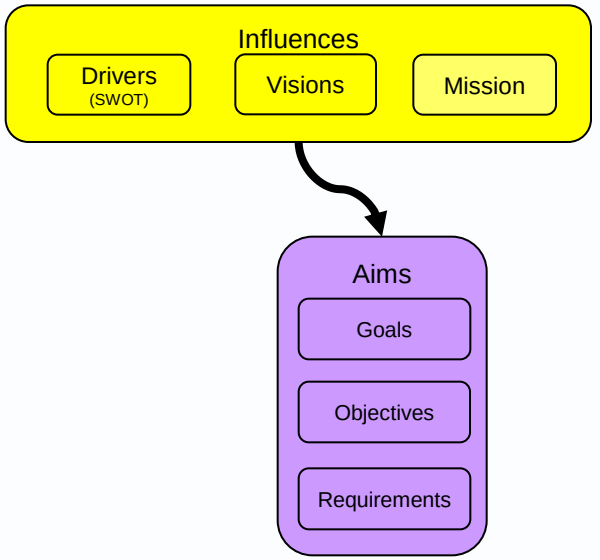
From drivers to aims

- Enterprise leaders respond to drivers by defining aims
  - e.g. define expansion goals to ward off competition.
- As they cascade downwards, broad and high level aims are hierarchically decomposed into narrower and more detailed aims.
  - A lower level aim can support more than one higher level aim – so it is not a strict hierarchy.



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A what/how (or end/means) cascade

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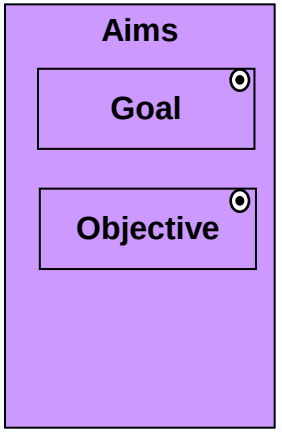
Big goals

- Increase customer base by 50% in the next 2 years
  - Offer services differentiated by target age group
  - Open 30 stores in neighbouring countries in the next 2 years.
    - Buy 2 to 6 companies in neighbouring countries.
      - Hire 2 industry analysts to find suitable companies and report back within 2 months to the board.

Little goals = objectives



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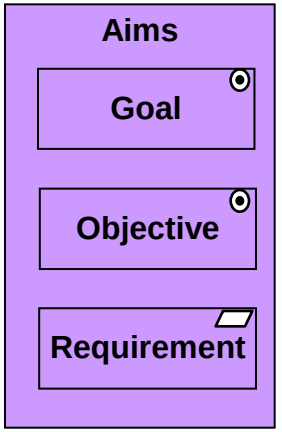
Aim hierarchies

- There is a loosely structured hierarchy of aims.
- The terms goal, objective and requirement can be used to differentiate levels within a given aim hierarchy.
- But there is no sharp or universally agreed distinction between aims at different levels.



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Aims: top level goals

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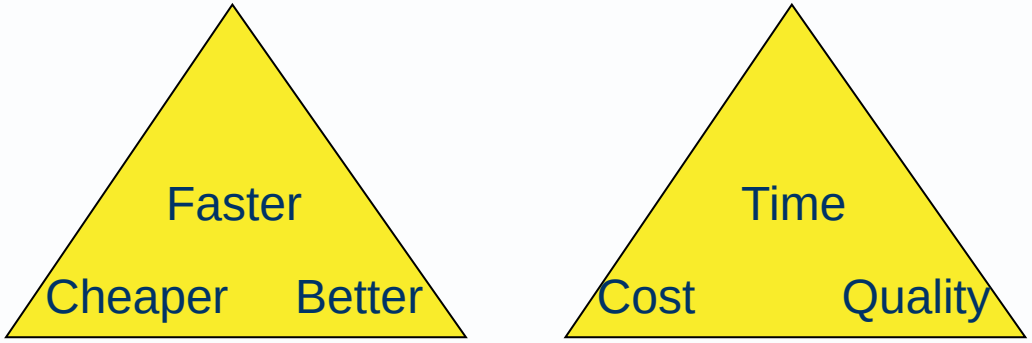
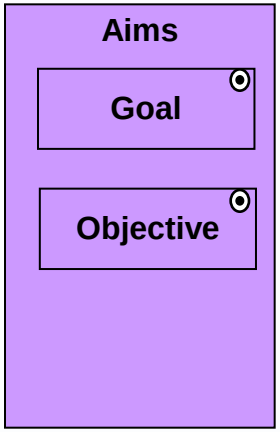
- The ‘iron triangle’ of project management





- Faster: Deliver sooner or faster
- Cheaper: Reduce cost
- Better: Improve quality

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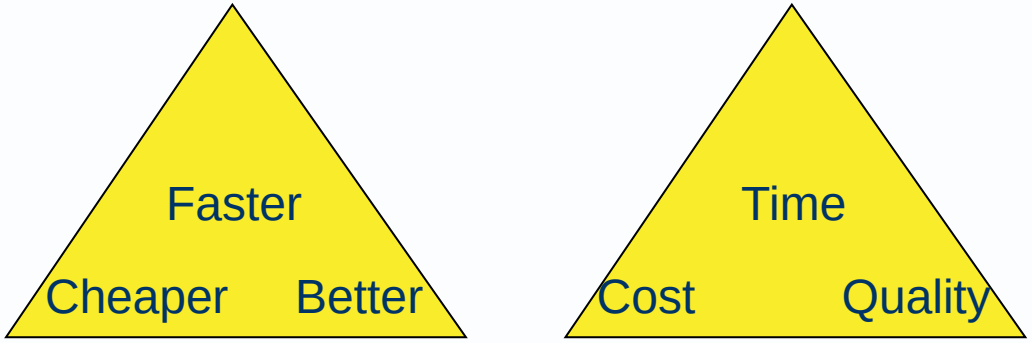
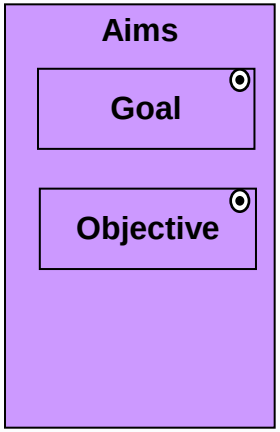
A useful completeness check

- Have we covered the three angles?





- Faster
  - Shorter cycle time for changes and improvements
  - How quickly can we eliminate old systems.
- Cheaper: Share resource pool
- Better: Fewer incidents

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A structured terminology for aims
helps people talk about aims at different levels of abstraction

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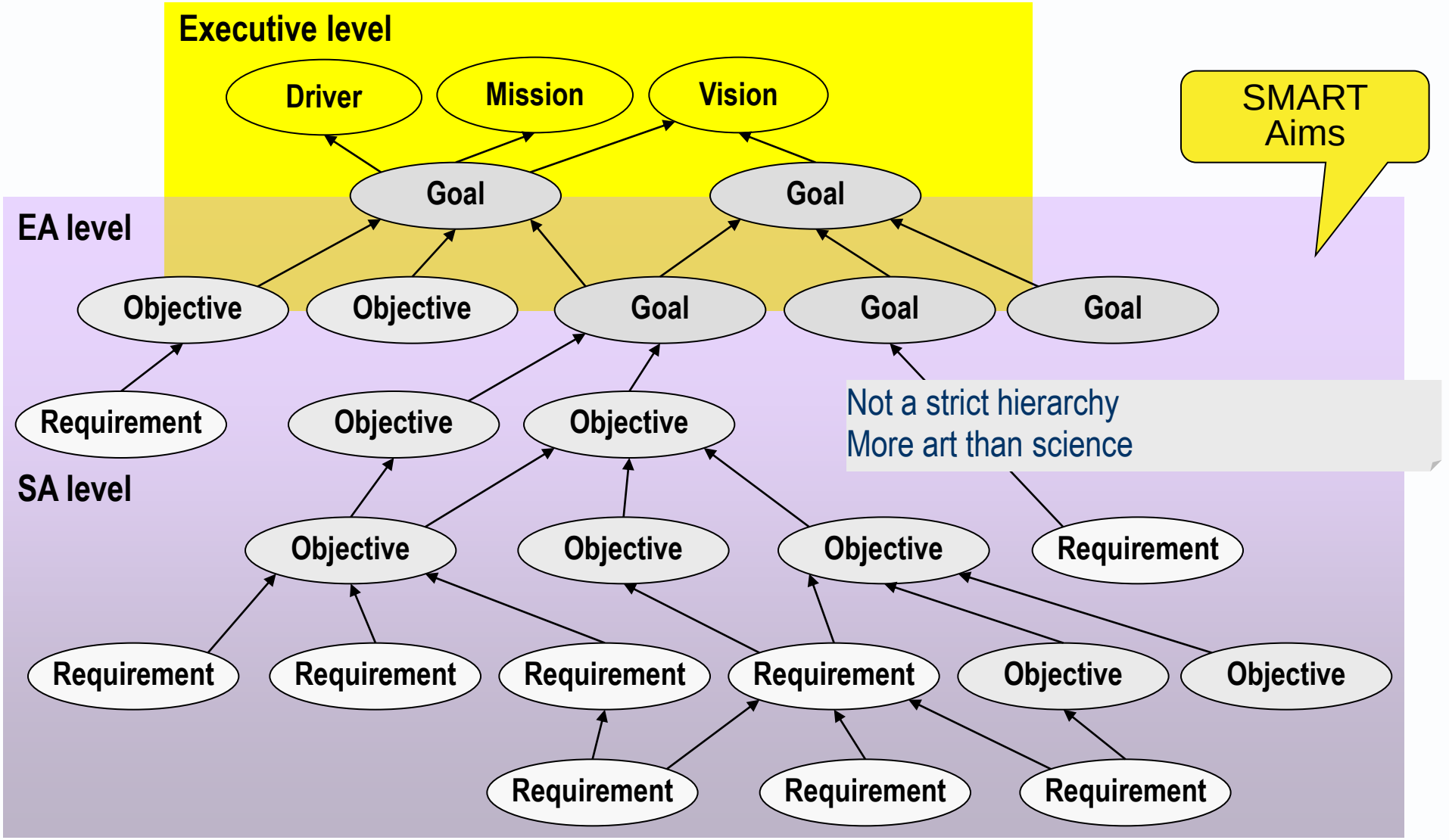

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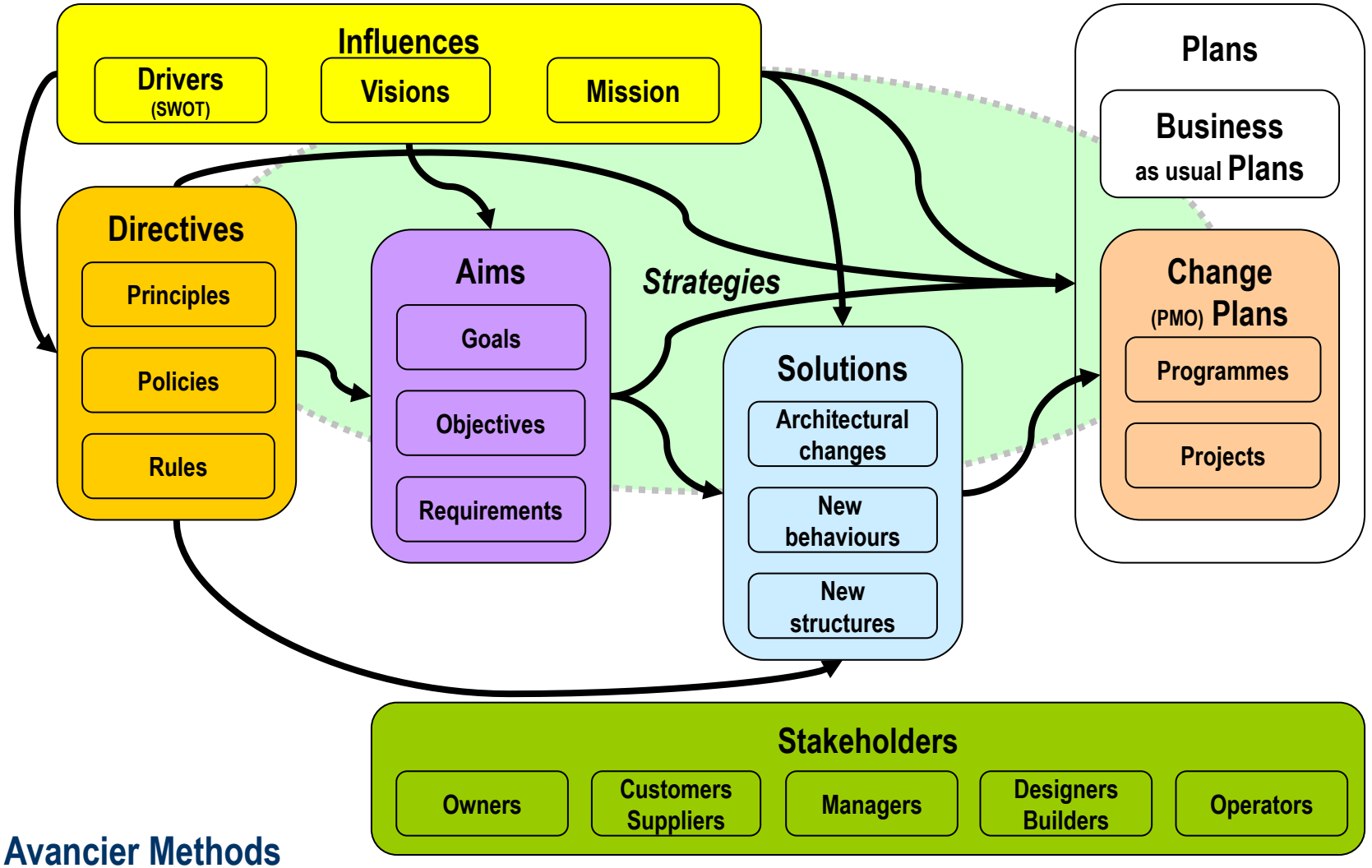
A mind map of the architecture context



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Explicit requirements

- Needs people tell you about
- [a requirement type] that classifies requirements declared by stakeholders.

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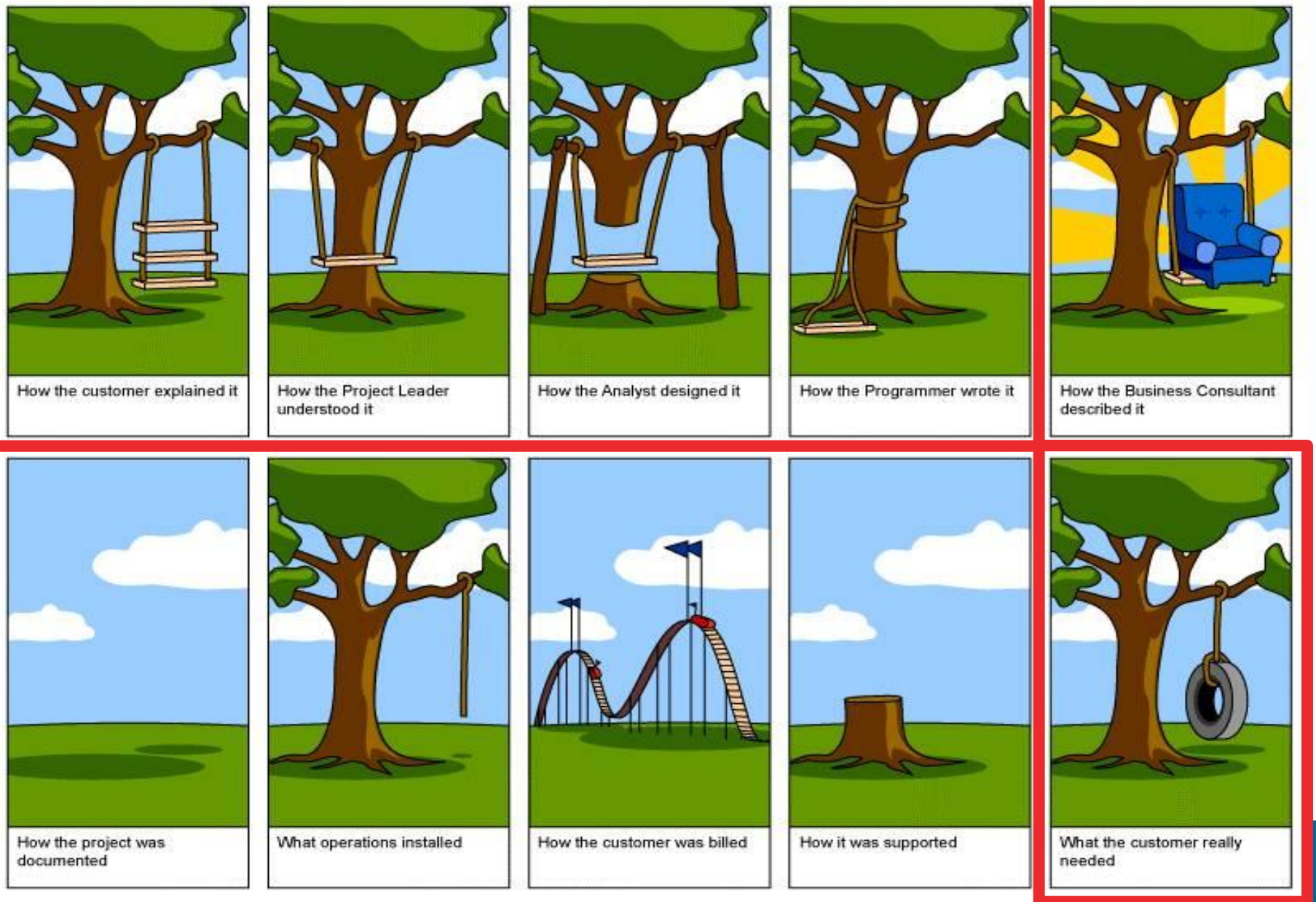
Which is your favourite? http://www.songdawg.com/archives/Tree%20Swing%20requirements.php



Architecture-level requirement – close to business/IT objectives

- Business requirements
  - The look-to-book ratio will be increased from 0.5% to 1%
  - The average time from Order to Delivery will be halved
- Data requirements
  - All enterprise database schemas will conform to the customer and product data types defined in the enterprise canonical data model
  - The CRM system will be “the single source of truth” for all customer names; and all other systems will updated within 48 hours of any change
  - The Billing system will be “the single source of truth” for all customer addresses; and all other databases bar the CRM database will updated within 48 hours of any change
  - All data classified at security level 3 will be encrypted in databases
- Apps requirements
  - The time sheet system will ensure compliance with the European working time directive
  - All employees will use our new SAP time-sheet recording system
- Technology requirements
  - 75% of applications will use our single-sign on system
  - 90% of employee lap tops will have no client apps other than a browser
  - BYOD….

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Requirements: PARRISSS

Non-functional requirement	A requirement about the ability of a system to perform its functions (whatever they are) effectively and efficiently. Usually quantitatively measurable.
Performance	Subdivides into two measures, often in opposition: •Throughput: number of services executed in a time period. •Response or cycle time (aka latency): time taken from request to response.
Availability	The amount or percentage of time that the services of a system are ready for use, excluding planned down time.
Recoverability	The ability of a system to be restored to live operations after a failure.
Reliability	The mean time between failures. Usually applied to the technologies in the Infrastructure, ignoring the more likely risk of application failure.
Integrity	See Data integrity and Data flow integrity.
Scalability	The ability of a system to grow to accommodate increased work loads.
Security	The ability of a system to prevent unauthorized access to its contents.
Serviceability	The ability of operations team to monitor and manage a system in operation.

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Requirements: UMPIIE

Usability	The ability of actors to use a system.
Maintainability	The ability of maintenance teams to revise or enhance a system.
Portability	The ability to move a component from one platform to another, or convert it to run on another platform. In practice, it can be difficult to set or estimate this quality metric realistically.
Interoperability	The ability for subsystems to exchange data at the technical level using shared protocols and networks.
Integratability	The ability of interoperable subsystems to understand each other, which requires either common data types or brokers to translate between data types.
Extensibility	A synonym of [related to] maintainability [cf. Open-Closed principle]

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Implicit requirements

- Needs people don’t tell you about
- [a requirement type] that must be addressed, even if never mentioned by stakeholders.
- Under any “best endeavours” obligation, the architect must be aware of the possibly implicit requirements such as
  - Regulations
  - Standards

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Regulations

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Requirement

The IT management reform (Clinger-Cohen) act of 1996

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- A USA federal government regulation
  - A response to the mess IT was in by the early 1990s
  - Clinger and Cohen heard testimony from John Zachman among others
- Defines roles and responsibilities of
  - IT director
  - CIO
- Makes CIOs responsible for
  - “developing, maintaining and facilitating the implementation of a sound and integrated IT architecture for the executive agency”.

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Requirement

Information Technology Management Reform act of 1996

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CCA section	Distillation of the message
SEC. 5112. CAPITAL PLANNING AND INVESTMENT CONTROL	**Improve business processes through using data better and reducing data entry effort; make a business case for work to be done; study best practices for information resources management and train people in them**
(2) DIRECTION FOR EXECUTIVE AGENCY ACTION	Map IT work to the business mission, and keep data secure
(3) GUIDANCE FOR MULTIAGENCY INVESTMENTS	Share data processing projects and resources to accomplish shared missions
(4) PERIODIC REVIEWS	Map IT work to the business mission and business process improvement
(a) DESIGN OF PROCESS	Identify and manage IT risks
(b) The CIO … shall be responsible for—	Map IT work to the business mission and business process improvement
(c) DUTIES AND QUALIFICATIONS	Maintain the skills and capabilities to manage information resources
SEC. 35. MODULAR CONTRACTING FOR IT.	Plan for incremental development, and assure interoperability through following standards
(c) PROCESS REQUIREMENTS	IT work must start with requirements and end with measurable improvement
SEC. 5126. ACCOUNTABILITY.	Ensure money is spent wisely, and we can justify money spent.
SEC. 5402. IDENTIFICATION OF EXCESS AND SURPLUS COMPUTER EQUIPMENT.	**Maintain a comprehensive IT architecture repository**

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The essence of the act – which shaped EA frameworks

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- We have and apply standards for acquiring and managing IT – a methodology based on best practices - to ensure money is spent wisely, and we can justify money spent.
- IT = automated data processing resources, including applications, databases, technologies and everything needed for IS development and IT operations.
- **Architect roles and skills**
  - We maintain the skills and capabilities to manage information resources.
  - IT architecture is an integrated framework for evolving/maintaining/acquiring IT to achieve strategic and information resources management goals.
- **Architecture requirements and other inputs**
  - The business and IS/IT goals come first
  - IT work must map to the business mission
  - IT work must start with user requirements and end with measurable improvement
- **Business architecture**
  - The work must map to business process improvement
  - We improve business processes by informing actors and reducing data entry effort
- **Data, Applications and technology architecture**
  - We study best practices for information resources management and train people in them
  - We assure interoperability through following standards
  - We keep data secure
  - We maintain a comprehensive IT architecture repository
- **Plans**
  - We plan for incremental development of IT and offer modular contracts
  - We identify and manage IT risks
  - We share data processing projects and resources to accomplish shared missions
  - We make a business case for IT work to be done

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Reflected in a Senior Enterprise Architect role in 2012

- responsible for:

- a) The definition and ongoing **management of the IT Architecture** for the firm through the creation of **an architecture blueprint**.

- b) Ensuring that the **infrastructure, applications and systems**
  - **adhere to the IT architecture plan**, as defined by the EA team,
  - deliver **against the stated IT strategy and overall business strategy.**

- c) Ensuring all projects and activities requiring an IT capability
  - meet the ongoing demands of the business in terms of functionality
  - adhere to published IT standards and best practice

- The senior enterprise architect will take architectural responsibility for the successful delivery of the “Unity” programme of work in its current phase and in future phases.

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Office and Management and Budget (OMB) circular Q-130

- Refines the definition of EA

- Requires that EA describes
  - current architecture,
  - target architecture and
  - transition processes

The basis of TOGAF's process (ADM)

- includes
  - a TRM
  - a Standards Profile

Hence the TRM in TOGAF

Hence the SIB in TOGAF
www.opengroup.org – search "SIB"

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Regulatory requirements example

- “The Olympics website is speech-enabled using a free software download.
- You can install the software on your computer and have the content of this site read aloud to you.”

- For the software to work on your PC it will need the following:
  - Operating system: Windows XP, Windows Vista, Windows 7
  - Processor: Pentium 350MHz; recommended Pentium III 800MHz for Windows XP and Vista
  - Memory: minimum 256MB RAM; recommended at least 512MB for Windows XP and Vista
  - Disk space: 20MB free disk space
  - Other: sound card; speakers or headphones
  - Web browser: Internet Explorer 6, 7 or 8; Firefox 3.5
  - Microsoft Word 2002, 2003
  - PDF reading: Adobe Reader 9
- For the software to work on your Mac it will need the following:
  - Operating System X 10.3.9 or later
  - 256 Mb RAM (512 Mb is preferable)
  - Compatibility with Power PC or Intel processor

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Regulatory requirement references

- UK's data protection act: http://www.opsi.gov.uk/ACTS/acts1998/19980029.htm
- Freedom of Information act 2000: http://www.opsi.gov.uk/ACTS/acts2000/20000036.htm
- UK Disability Discrimination act: http://www.opsi.gov.uk/acts/acts1995/1995050.htm.
- W3C Web Content Accessibility Guidelines: http://www.w3.org/TR/WAI-WEBCONTENT/
- US Americans with Disability act.
- US Sarbanes-Oxley act of 2002.
- Basel II.
- IP (International and national laws protect people and enterprises from theft of intellectual property)

- Also
  - Solvency 2
  - PCI
  - FSA
  - VISA
  - Patriots Act

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Avancier Methods
Context Elements

Standards

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Standard

- [a concern] a widely-accepted definition of a structure, process or rules, intended to increase uniformity and interoperability between distinct systems and processes.

"The nice thing about standards is that you have so many to choose from."

Andrew S. Tanenbaum in *Computer Networks 2003*

"Yes, our product conforms to the standard. More precisely, it conforms to an *extended subset* of the standard."

Product vendor

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Standards bodies

- An enterprise with a mission to set standards and assess compliance to them. E.g.
  - American National Standards Institute (ANSI).
  - British Computer Society (BCS).
  - Information Systems Examination Board (ISEB).
  - Institute of Electrical and Electronic Engineers (IEEE).
  - Information Systems Audit and Control Association (ISACA)
  - International Standards Organisation (ISO).
  - Office of Government Commerce (OGC).
  - Organisation for Advancement of Structured Information Standards (OASIS).
  - **Open Applications Group Standards (OAGIS).**
  - **The Object Management Group (OMG).** **UML**
  - **The Open Group.** **TOGAF and ArchiMate**
  - US National Institute of Standards and technology (NIST).
  - Software Engineering Institute (SEI).
  - Internet Engineering Taskforce (IETF)

- What “open” means is debatable.
- Arguably, standards are what is adopted rather than what is published by a standards body

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What is the difference between a technology and a standard?

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- A technology portfolio catalogue lists technologies used in an enterprise's system estate.

- A standards catalogue lists standards to which technologies are expected to conform.
- Any catalogued technology may conform to zero, one or more standards.

- However, the concept of technology is vague.
- At the EA-level, it probably means technology **type** rather than technology instance.

- Your technology portfolio could include "FTP server from vendor X".

- However, the concept of standard is also vague.
- FTP is a standard.
- An FTP server from vendor X is a technology.

- Your local standards catalogue could include "FTP server from vendor X".

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Standards

- Does your enterprise have its own SIB?
- Do all solution architects know what standards to follow?

- Do you recognise any of these standards?

  - ISO/IEC 42010
  - ISO/IEC 17799
  - ISO/IEC 24762:2008
  - ISO/IEC 27001
  - CMM-I
  - ISO 9001
  - ISO/IEC 20000

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Other standards

- Open standards (e.g. W3C).
- Government standards (e.g. e-GIF)
- Payment card industry, data security standards (PCI DSS)
- A technical strategy that mandates (say) choice of database or mid-range servers.

Emerging	E
Standard	S
Contain	C
Retire	R
Unsupported	U
Archived	A

Tech Category	TAF Product	2010				2011				2012				2013			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
"Application Servers"	"Application Servers"																
	RedHat x.y		S														
	Tomcat		S														
	WebLogic App Server 10.x	S															
	WebLogic App Server 9.x	S							C								R
	WebLogic App Server 8.x	C						R									
"Web Servers"	"Web Servers"																
	Apache 1.x		S														
	Apache 2.0	S				C											
	Apache 2.2x		S														
Portals	Portals																
	Accordant Media Management System																

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Architecture Trade-off Analysis Method

And Pugh Matrix

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A normal approach to requirements

- Define a system in terms of architecturally significant scenarios
  - A required use case or service is essentially a service-process-response scenario.
- Define the qualities required of each scenario
  - Performance
  - Availability
  - Recoverability
  - Integrity
  - Security
  - Scalability
  - Conformance to legislation
  - Conformance to enterprise standards
  - Etc
- ATAM inverts the process

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Architecture Trade Analysis Method (ATAM)

- A process in which a consultant leads analysis of target system options and the trade offs between them.

- Published and promoted by the Software Engineering Institute of Carnegie Mellon University.

- Four phases
  1. Presentation
  2. Investigation and Analysis
  3. Testing
  4. Reporting

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ATAM Phase 1: Presentation

- 1.**Present the ATAM.**
- The evaluation leader describes the evaluation method to the assembled participants, tries to set their expectations, and answers questions they may have.

- 2.**Present business drivers.**
- A project spokesperson describes what business goals are motivating the development effort and hence what will be the primary architectural drivers. E.g.
  - high availability
  - time to market
  - high security

- 3.**Present architecture**
- The architect will describe the architecture, focussing on how it addresses the business drivers.

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ATAM Phase 2: Investigation and Analysis

- 4.**Identify architectural approaches.**
  - Architectural approaches are identified by the architect.

- 5.**Generate quality attribute utility tree.**
  - Qualities (NFRs) are elicited, specified down to the level of scenarios, annotated with stimuli and responses, and prioritized.

- 6.**Analyze architectural approaches.**
  - The architectural approaches that address high-priority factors identified in Step 5 are analyzed: risks, sensitivity points, and tradeoff points are identified.

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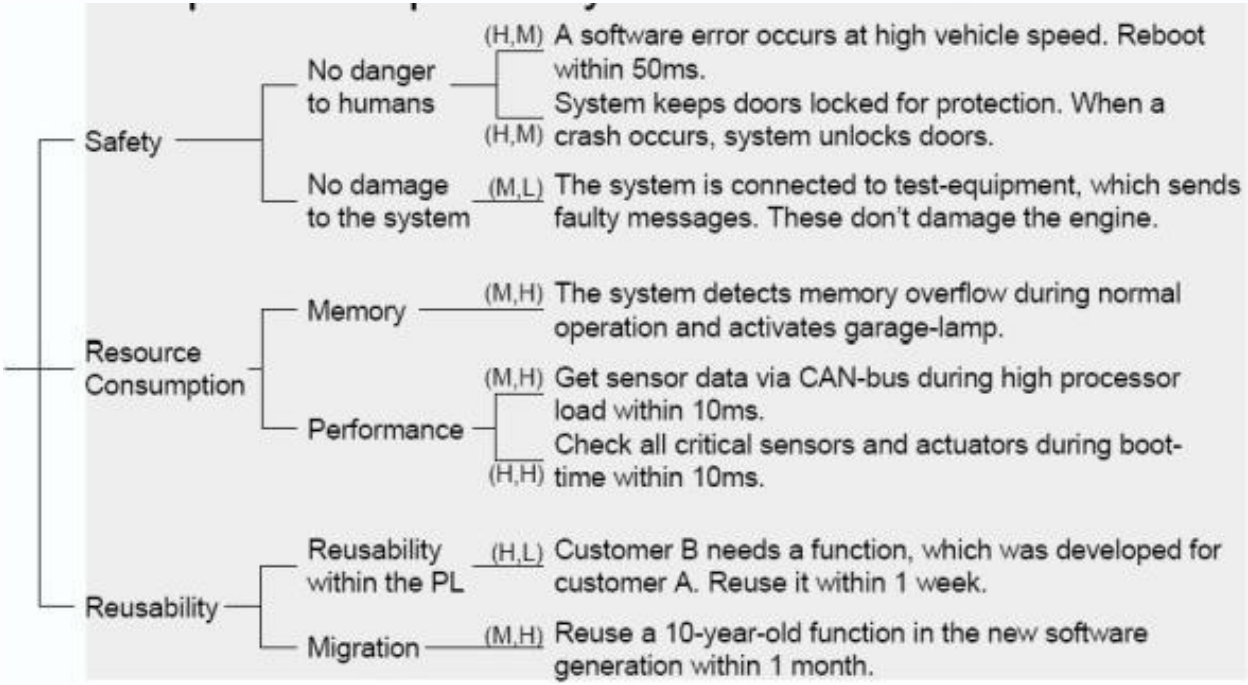
Generate quality attribute utility tree

- Select generic and important quality attributes as high-level nodes
  - E.g. performance, modifiability, security and availability.
- Refine nodes to more specific categories
- Write scenarios at the leaves of the tree
  - Stimulus
  - Context
  - Response
- Prioritize scenarios
- Present the quality attribute goals in detail



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ATAM Phase 3: Testing

- 7.**Brainstorm and prioritize scenarios**
  - A larger set of scenarios is elicited from the entire group of stakeholders.
  - This set of scenarios is prioritized via a voting process involving the entire stakeholder group.

- 8.**Analyze architectural approaches**
  - This step reiterates the activities of Step 6, but using the highly ranked scenarios from Step 7.
  - Those scenarios are considered to be test cases to confirm the analysis performed thus far.
  - This analysis may uncover additional architectural approaches, risks, sensitivity points, and tradeoff points, which are then documented.

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ATAM Phase 4: Present Results

- Based upon the information collected in the ATAM
  - approaches
  - scenarios
  - attribute-specific questions
  - the utility tree
  - risks
  - non-risks
  - sensitivity points
  - tradeoffs

- The ATAM team presents the findings to the assembled stakeholders.

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The Pugh Matrix (after Six Sigma)

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- A tool you can use to compare solutions against requirements

Requirement		**Option 1**	**Option 2**
Requirement 1			
Requirement 2			
Requirement 3			
Requirement 4			
Requirement 5			

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The Pugh Matrix (after Six Sigma)

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1 List criteria that the options must meet	*2 Attach a weight to each criteria (say 1/3/5/7/9)*	*3 List the options and rate how well (say 1/3/5/7/9) each option meets each Requirement.*	
Requirement	**Weight**	**Option 1**	**Option 2**
Response time	5	3	3
Throughput	5	3	5
Security	3	5	1
Cost	3	1	1
Supplier stability	1	3	7
4 For each option, multiply the weights by the ratings	**Total**	**51**	**53**

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