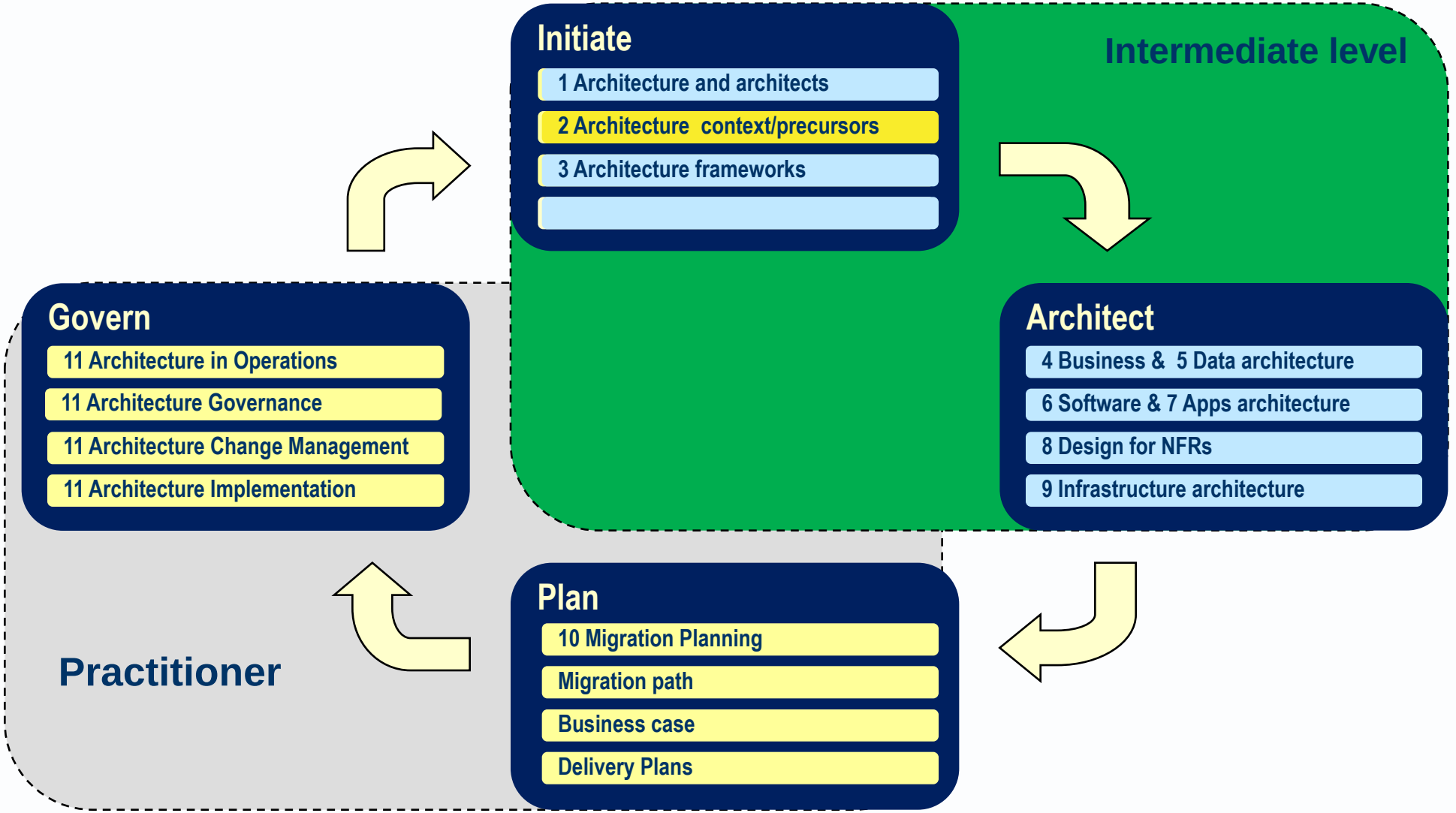
Avancier Reference Model

Architecture Context/Precursors (ESA 2)

2. Architecture context/precursors

Avancier



2.1: Foundation (rarely examined)

- **Architecture context**
  - The setting of and influences upon a system.
  - It includes what is known of the wider environment that architects should be aware of.
  - E.g. stakeholders, systems, concerns, influences and information.

The environment of the enterprise or system

Avancier

Environment

- [A view] that describes the operational context in which system operates.
- The focus is on external entities that system elements interact with.
- And on cross-boundary inputs and outputs, events or flows.

External entity

- [A component] outside the business, system or component of interest.
- It interacts with that business, system or component by requesting or supplying services.
- Naming external entities as logical *roles* makes a model more stable and flexible.
- Naming them as physical *actors* can make a model more immediately understandable.

2.2: Stakeholders and concerns

- **Stakeholder** [an actor or role] an individual, team, organization, or class thereof, having one or more concerns about or interests in a system, and/or power over the architecting of it.

  - Enterprise and solution architecture stakeholders include:
  - Owners: business and IT board members, customers.
  - Managers: programme/project/change managers.
  - Buyers: procurement/acquisition roles.
  - Suppliers: service and product providers.
  - Designers, Builders, Testers, other project team members:
  - Users: representatives and domain experts.
  - Operators and Maintainers, IT Services Management.

Stakeholder

- **Stakeholder catalogue**
  - [An artifact] that lists stakeholders and associated facts.
  - E.g. concerns, interest level, power level, and plans for communicating with stakeholders.
  - Purposes: To help architects communicate with stakeholders and so facilitate change.
  - To guide the development of specific architecture views.
- **Stakeholder management**
  - [A technique] for ensuring concerns of stakeholders are understood and addressed.
  - An aim being to ensure that stakeholders support changes that are envisaged.
  - A stakeholder's position in a power/interest grid helps to prioritise attention to their concerns and determine a suitable communication plan.

Plan communication with each stakeholder

Avancier

- Are you communicating as effectively as you should be with your stakeholders.?

The end product

Stakeholder	Concerns	Power (H,M,L)	Interest (H,M,L)	Communication plan
1 Customer	Goal, Deadline	High	High	Involve - Manage closely
2 Manager	Reputation, Profit	High	Low	Persuade – Satisfy - Monthly status report
3 End user	Usability	Low	High	Inform – Weekly newsletter JAD workshops
4 Sales person	Customer relationship	Low	Low	Monitor

Concern

- An interest of stakeholders.
  - (E.g. system usage, cost, continuity, safety, modularity and all kinds of requirements and standards).
- A basis for approaching particular situations, problems and opportunities.
- Concerns are generic (e.g. availability) whereas aims are specific (e.g. 24*7)
- Architects identify concerns to select artifacts for presentation to stakeholders, and to ensure their interests are addressed and requirements are identified.

Request for architecture work

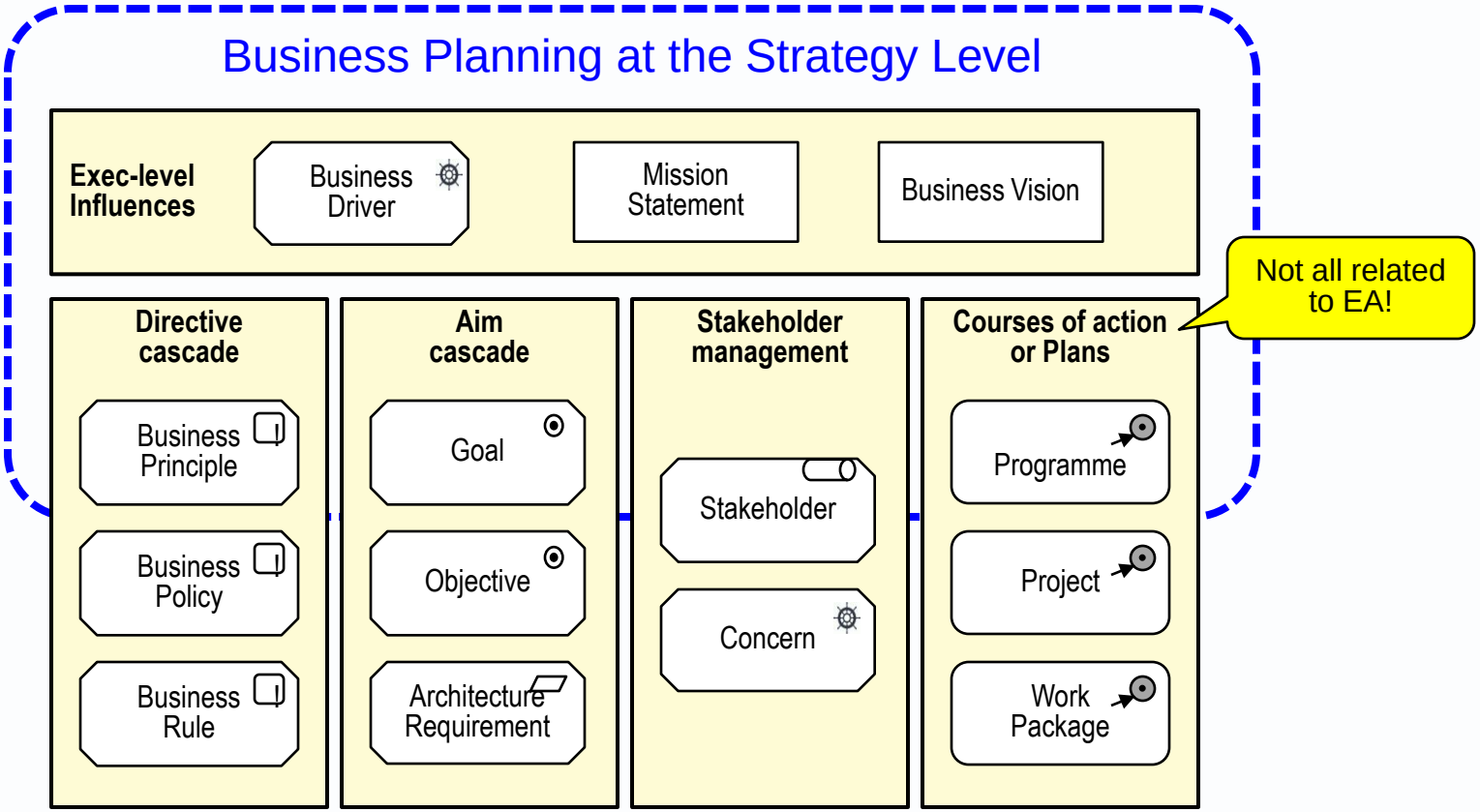
- **Sponsor**
  - [A stakeholder] who is willing to apportion money or other resources to some work.

- **Request for architecture work**
  - [A document] a request from a sponsor for an architect to architect one or more systems.
  - The first architecture deliverable to be recorded in an architecting process.

2.3: Requirements and constraints

We make sense of this messy space as follows

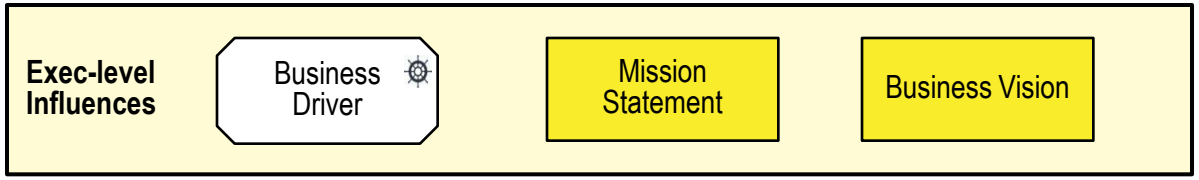
Imposing a structure on the mess of precursors



Mission v. Vision

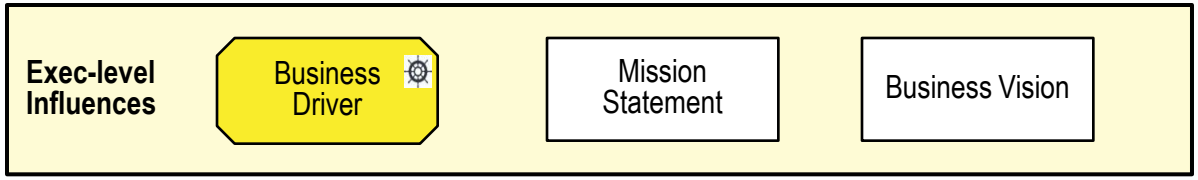
- **Mission**
  - what an enterprise, business or organisation is about;
  - its reasons for being;
  - the essential products and services it offers customers.

- **Vision**
  - what an organisation wants to be or become



Driver

- An influence, recognised by managers, that shapes the directives and aims of a business.



PESTLE
Political
Economic
Social
Technological
Legal
Environment

5-forces analysis
Buyers
Suppliers
Competitors
New entrants
Substitute products

SWOT
Strengths (internal)
Weaknesses (internal)
Opportunities (external)
Threats (external)

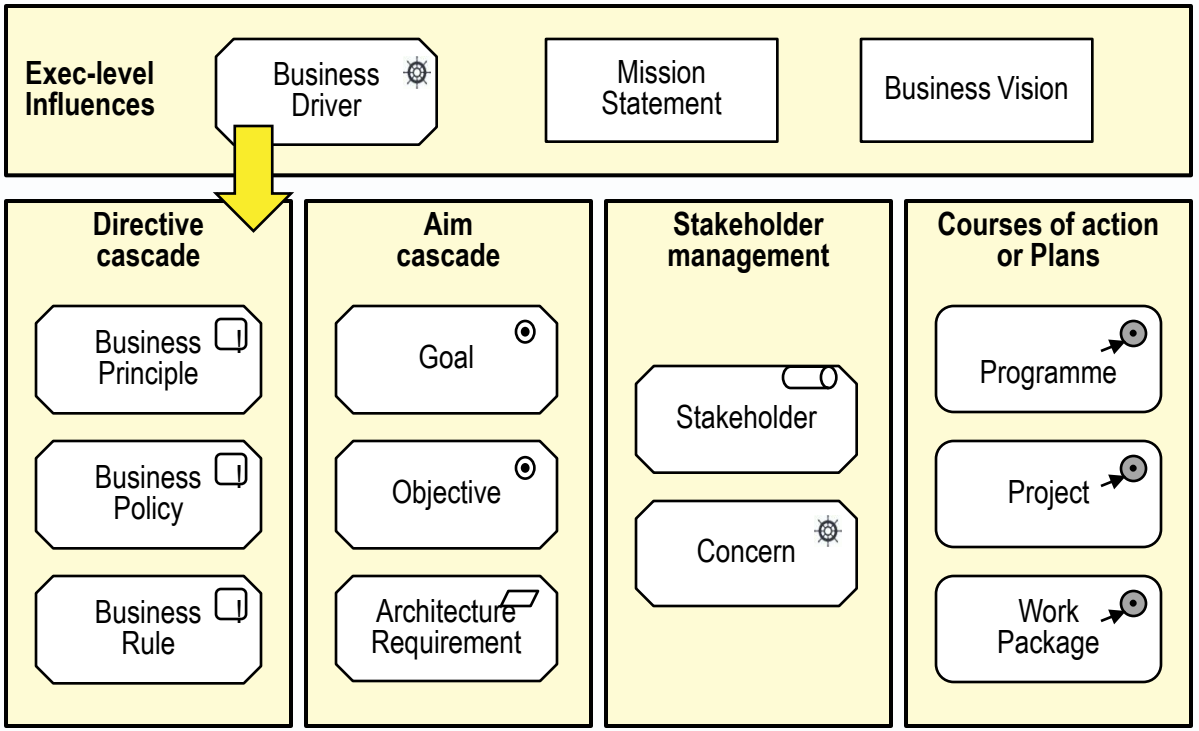
Driver examples

- changes in **customer behaviour or interest**
- the threat of **increased competition** from a new entrant to the market.
- **high turnover** of staff, with negative reports in leaving interviews.
- increased media attention to **embarrassing** “loss” of citizen data.

- Drivers stimulate enterprise leaders to define aims and directives for activity.

From drivers to directives

- Driver = high turnover of staff, with negative reports in leaving interviews.
  - Principle = “We value our people.”
- Driver = increased media attention to embarrassing “loss” of citizen data.
  - Principle = “Data security is paramount”.



Directives: Principle conflicts

Avancier

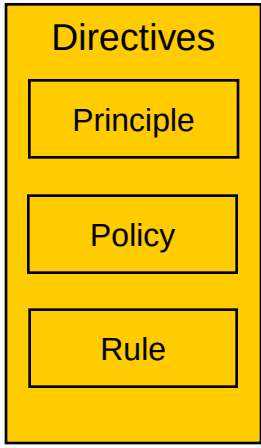
- The practitioner manual has a menu of c80 principles.
- Some are contradictory

- You may select contradictory principles provided you include in them guidance on how to choose one over another – e.g.
  - what kind of data must be secure
  - what kind of data must be accessible.

Directive hierarchy

Avancier

- **Directive** an influence or guideline, enduring and seldom amended, that steers or constrains behaviour or choices.
- Directives may be arranged in a hierarchical structure



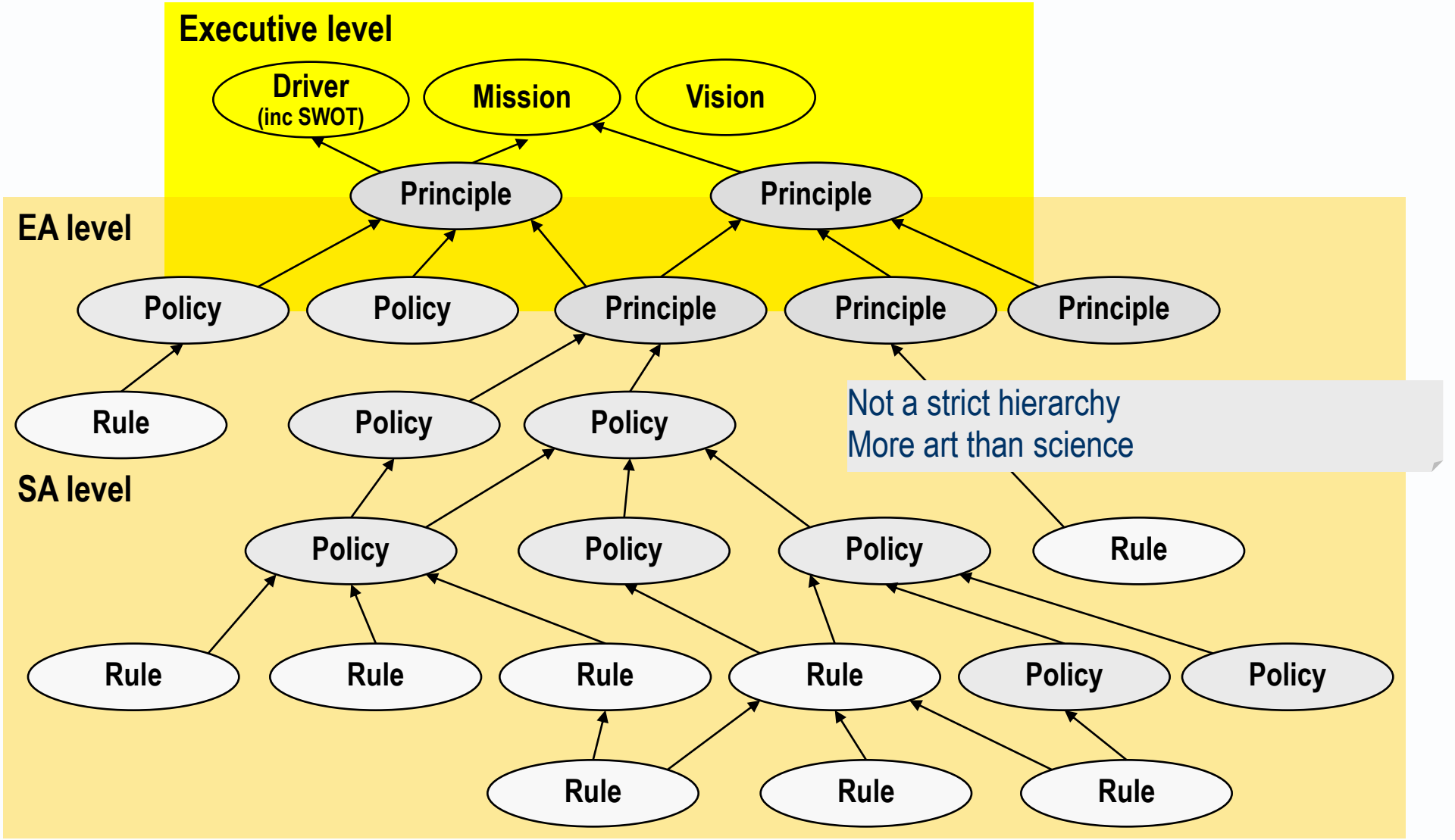
- **Principle** [a directive] that is strategic and not-directly-actionable.
- E.g. Waste should be minimised.
- Data security is paramount.

- **Policy** [a directive] that supports a principle.
- E.g. The public have minimal access to business data.
- USB ports are disabled.
- Messages at security level 3 are encrypted.

- **Business Rule** [a directive] that implements a policy in data processing.
- E.g. Access Level = Low if User Type = Public.

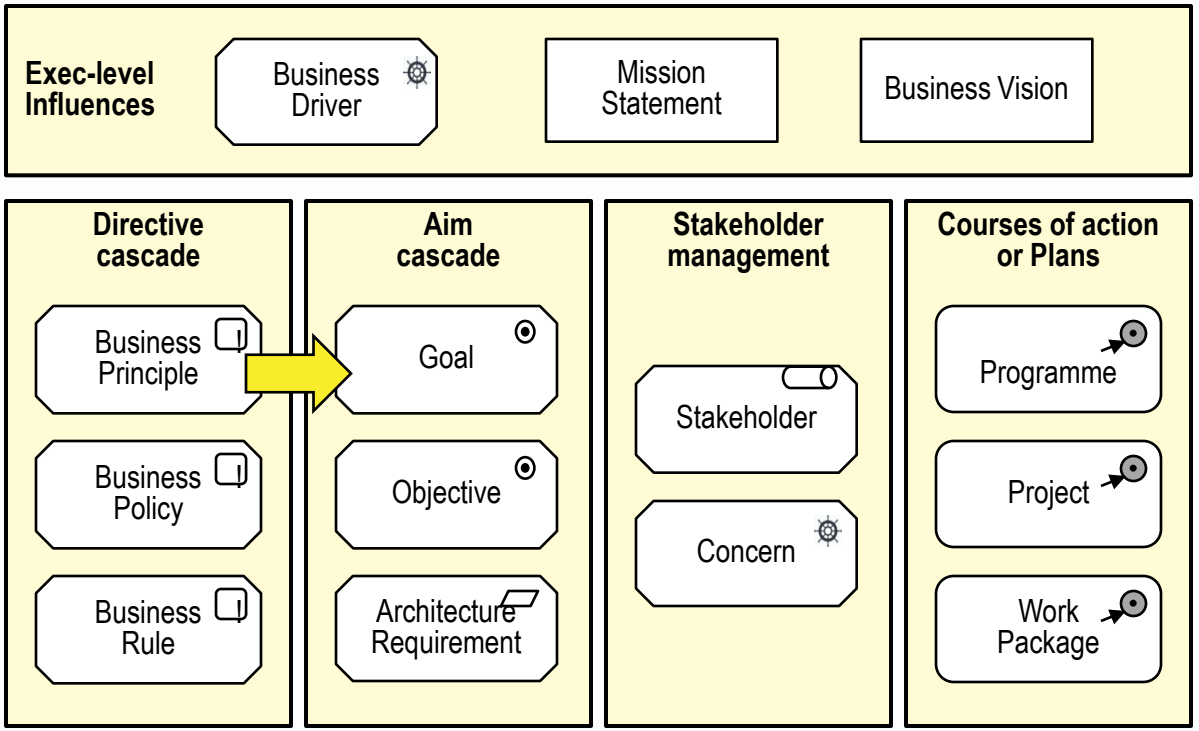
A structured terminology for directives
helps people talk about directives at different levels of abstraction

Avancier



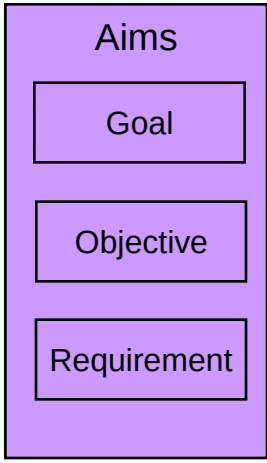
From directives to aims

- Principle - security is paramount
  - Goal – in the next year, 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.



Aim hierarchy

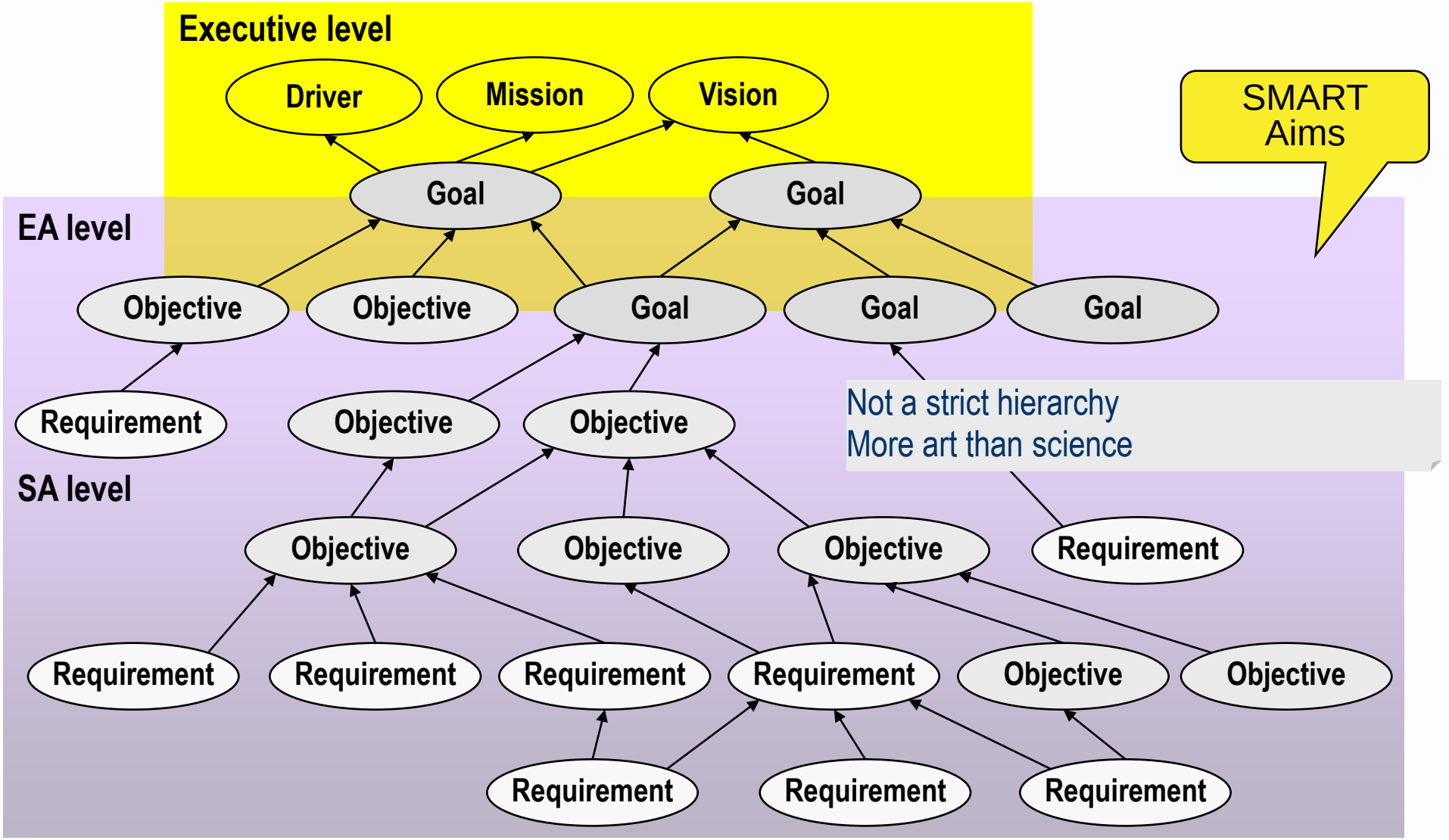
- **Aim** [an influence] a desired result or outcome declared or recognised by business managers, or a requirement for a particular endeavour or system. It should be SMART (Specific, Measurable, Actionable, Realistic and Time-bound.). Aims may be arranged in a hierarchical structure.



  - **Goal** [an aim] that is strategic. It may be quantified using Key Goal Indicators.
  - It may be decomposed into lower level goals or objectives.
  - **Objective** [an aim] that is more tactical than a goal. It may support one or more higher-level goals. It should be quantified using Key Performance Indicators. It may be decomposed into lower level objectives or seen as a high-level requirement.
  - **Requirement** [an aim] a statement of need with which compliance can be demonstrated in a specific solution or project.
  - It should have acceptance tests and an acceptance authority.
  - It may be captured in a requirements catalogue or in the text of a service contract or use case.
  - It should be traceable to higher level concerns, aims, directives or strategies.

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

Avancier

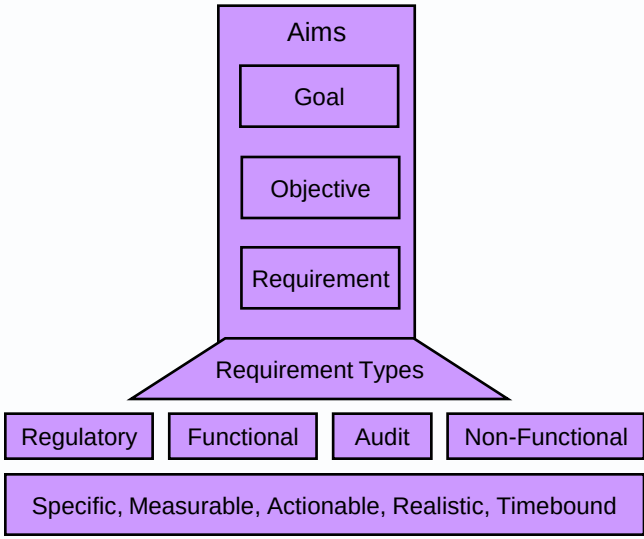


Requirements and constraints

Avancier

Requirements catalogue

- [A document] that lists requirement instances and their properties. E.g.
  - Reference number
  - Description
  - Source
  - Owner,
  - Priority
  - Requirement type.

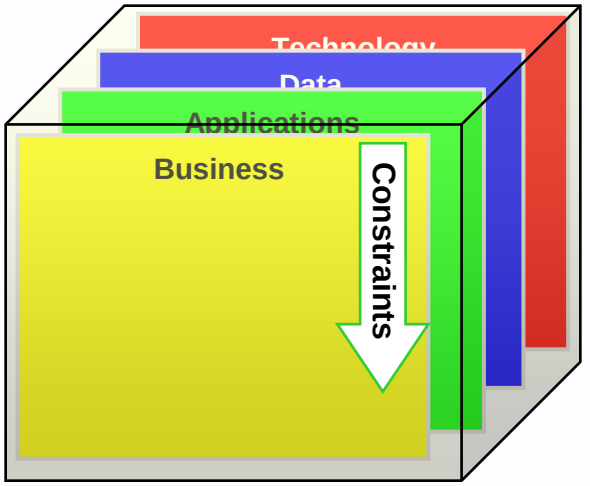


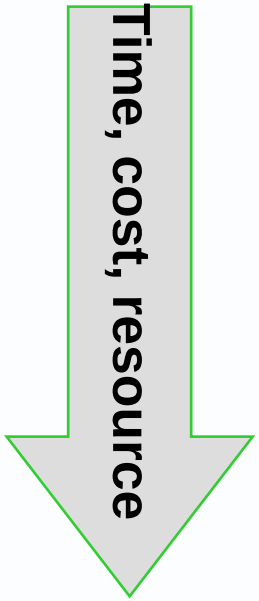
Constraint

- A factor that limits how far an organization can pursue an approach and/or meet a goal.
- Common constraints include time, cost, resources and regulations.

Constraint (on work)

- A factor that limits how far an organization can pursue an approach and/or meet a goal.
- Common constraints include time, cost, resources and regulations.





You can only do what you have time, money and resources to do

2.4: Requirement types

Architecture requirement

- A high-level requirement related to how business goals/objectives can be met.
- Often, a change to a value stream, business scenario, or user experience.
- Or the provision of management information.

Functional requirement

- [A requirement type] related to services offered by a system.
- It may refer to inputs and outputs, processes and business rules.

NFR: Non-functional requirement

- [A requirement type] that quantifies how well, effectively or efficiently a system should deliver services. (See section 8.)

Explicit v implicit requirements

- **Explicit requirement** [a requirement type] that classifies requirements that are declared by stakeholders.

- **Implicit requirement** [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 below.

  - **Audit requirement** [a requirement type] how an auditor can find the when/where/how/who of activities performed and data recorded, and replay events.
  - Audit requirements have implications for data records and retention.

Regulatory requirements

Avancier

- **Regulatory requirement** [a requirement type] including legislation and regulations that direct or constrain architecture work.
  - **IT accountability and procurement:** Regulation that makes public sector, IT directors and CIOs accountable for justifying investment in IT and for fair procurement from suppliers. E.g. Information Technology Management Reform act (ITMRA) of 1996, Division E, P.L. 104-106. This “Clinger Cohen Act” was the stimulus for many early enterprise architecture initiatives.
  - **Data protection:** E.g. GDPR.
  - **Data freedom:** E.g. Freedom of Information Act 2000.
  - **Disability and accessibility:** E.g. UK Equality act. US Americans with Disability act. W3C Web Content Accessibility Guidelines.
  - **Shareholder protection and audit:** E.g. US Sarbanes-Oxley act 2002. Basel I/II/III.
  - **Health and Safety.**
  - **Intellectual property rights:**

Clinger Cohen Act

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

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

Avancier

- 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

Clinger Cohen Act

- 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”.

Information Technology Management Reform act of 1996

Avancier

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**

Standards

- [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

- **Enterprise Standards Information Base** [an artefact] a catalogue of standards that is recommended or used across the enterprise.
- The aim is to ensure your enterprise does not rely on the haphazard knowledge that individual architects have of which standards are relevant
- See www.opengroup.org – search "SIB"

Standards bodies

- 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).
- Open Applications Group Standards (OAGIS).
- **Organisation for Advancement of Structured Information Standards (OASIS).**
- **The Object Management Group (OMG). UML and BPMN**
- **The Open Group. TOGAF and ArchiMate**
- US National Institute of Standards and technology (NIST).
- Software Engineering Institute (SEI).
- Internet Engineering Taskforce (IETF)

Industry standards in the reference model

Avancier

- These standards appear (incidentally) in reference model entries:

Number	Topic	Title / subject matter
ISO/IEC 42010	**Architecture Description**	Recommended Practice for **Architecture Description** of Software-Intensive Systems.
ISO/IEC 17799	**Security**	Information technology: Code of practice for information **security** management (OLD – superseded by 27001)
ISO/IEC 24762:2008	**Security**	Information technology — **Security** techniques — Guidelines for information.
ISO/IEC 27001	**Security**	Information technology — **Security** techniques — Information
CMM-I	**Quality**	Capability maturity model – integrated (process **quality** standard)
ISO 9001	**Quality**	A standard in the ISO 9000 family for **quality** management systems.
ISO/IEC 20000	**ITSM**	An international standard for **ITSM** (based on the earlier British Standard, BS 15000).

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.

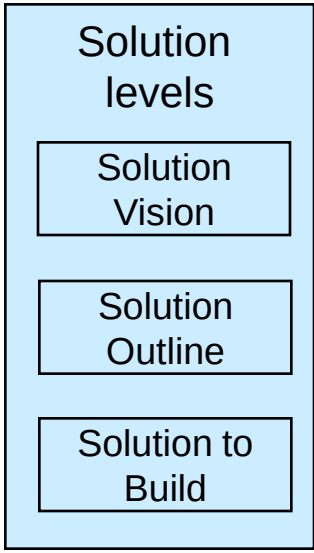
Emerging	E
Standard	S
Contain	C
Retire	R
Unsupported	U
Archived	A

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																

2.5: Scoping deliverables and artifacts

Avancier

- **Solution architecture description** [an architecture description] describing a system or other solution to problems and requirements. Its elements may be mapped to directives, aims and plans. It is usually defined at several levels of abstraction.

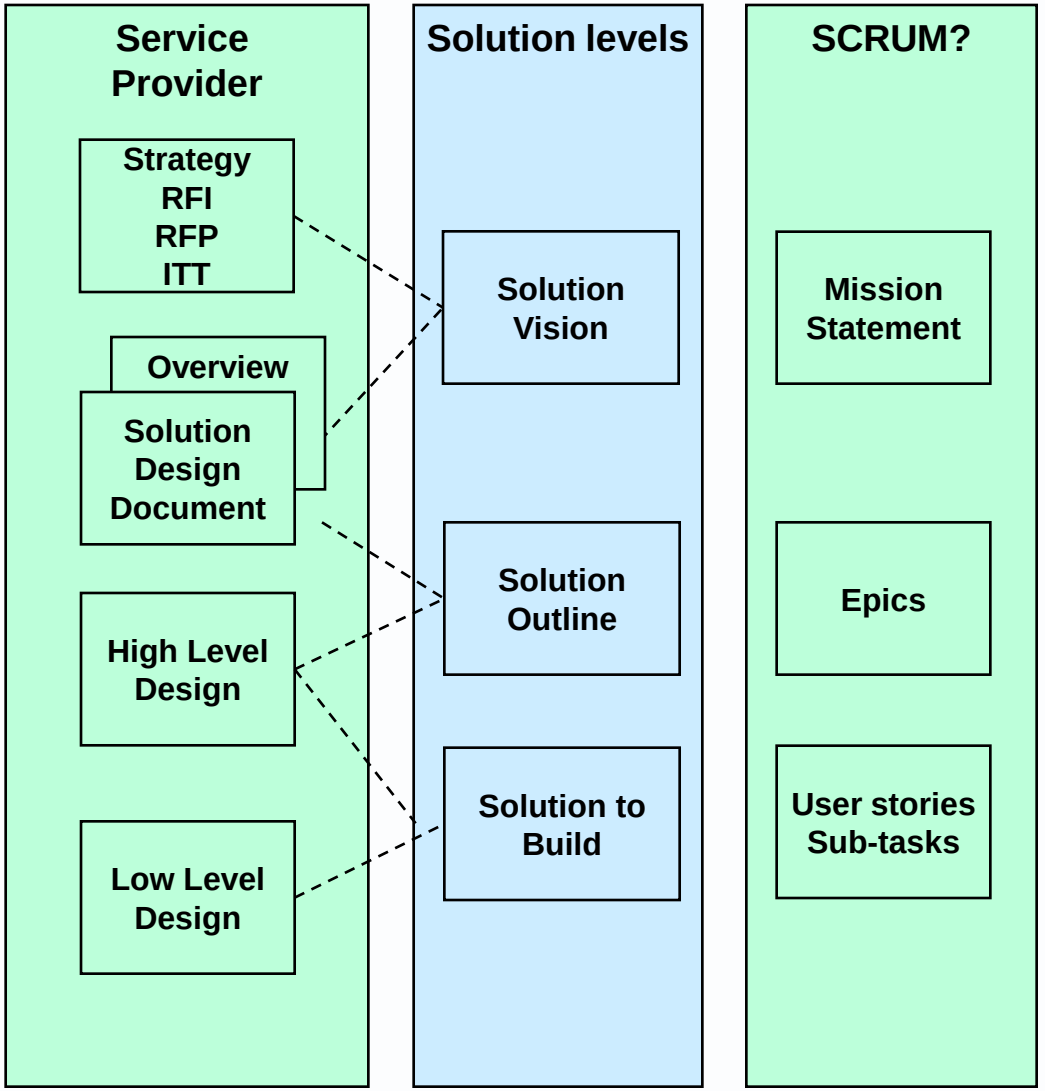


- **Solution concept/vision** [an architecture description] that briefly describes of a target, just enough to enable options to be compared (including any initial idea of costs and risks) and solution outline work to proceed. It may be a response to a business problem or an elaboration of how to reach a business vision.

- **Solution outline** [an architecture description] that describes the high-level design of a target system, produced after a first pass architecture description, enough to enable an acceptably accurate estimate of cost, benefits and risks, and projects to be planned.

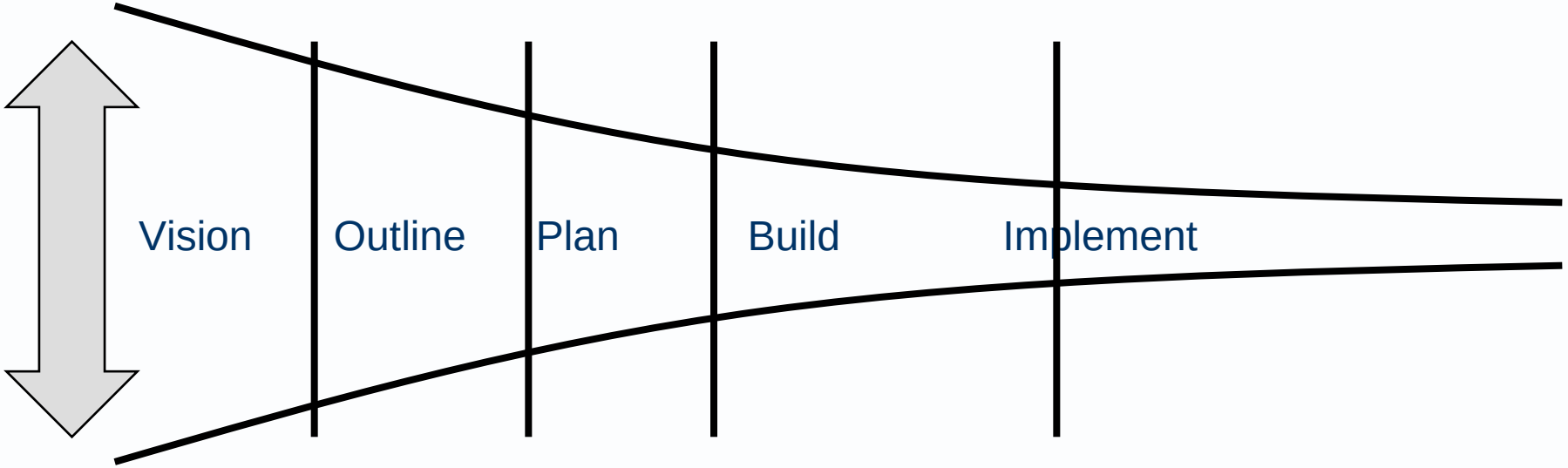
- **Solution to be built** [an architecture description] that describes a project-ready architecture, or detailed design, that is complete enough for the project to be scheduled and resourced, and the building team to start work.

Other views



How far *should* an architecture description be refined?

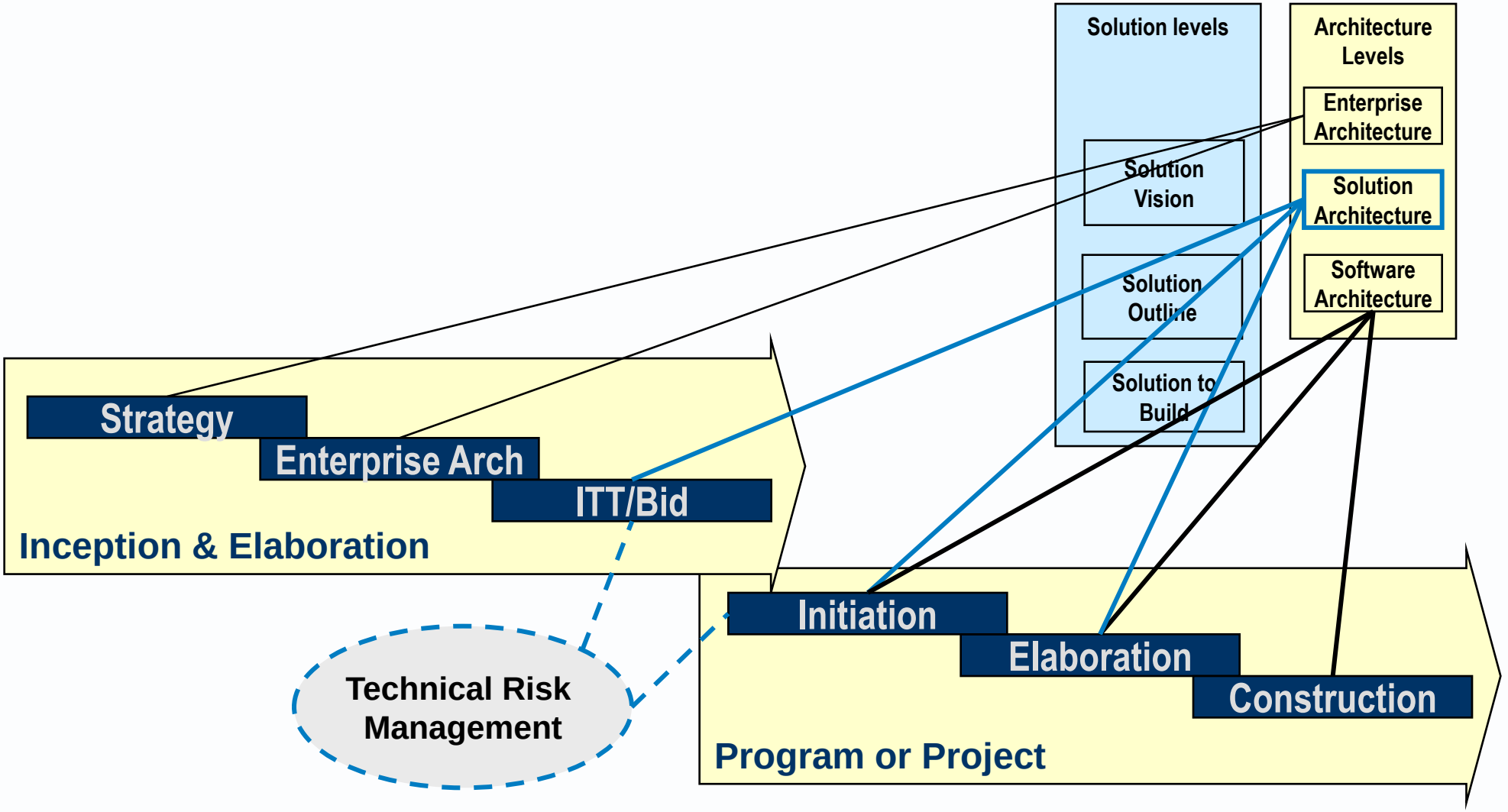
- Until the cone of uncertainty has narrowed sufficiently that
  - stakeholders understand the benefits, costs and risks
  - a decision to invest in the next stage can be made.



- Focus early on costs and risks associated with NFRs.
- Analysts complete functional requirements incrementally

Iterative elaboration of a solution architecture

Avancier



Scope view: a dimension of scope

Avancier

Requirements-oriented

What are stakeholders' aims?
Requirements catalogue

What do users want?
Services

What does it do?
Processes

	Behaviour	Structure
External	Service	Interface
Internal	Process	Component

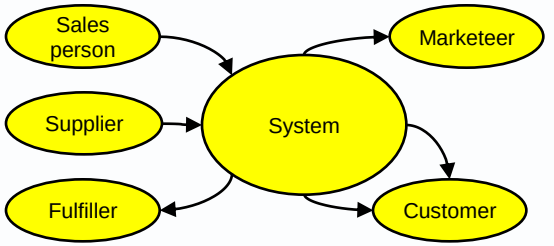
What does it consume and produce?
Context diagram
Interface definition

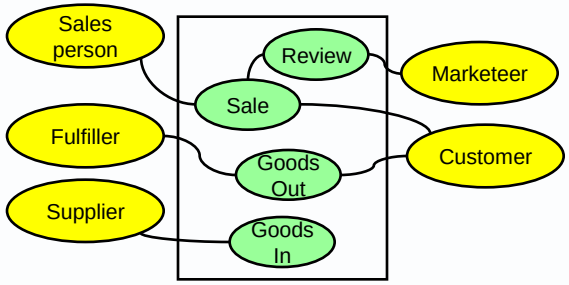
What is it made of?
Components
Data Structures

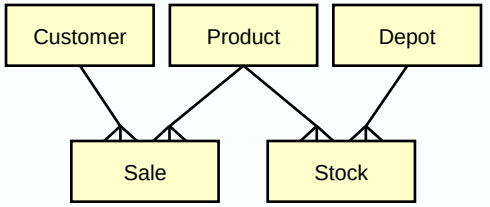
Design-oriented

Overview (breadth of enterprise or system)

- [A view] that defines the breadth of a system from one or other perspective.
- **Aim view:** goal/objective decomposition or requirement catalogue.
- **External view:** a service portfolio or interface definition.
- **Structural view:** a context diagram, or decomposition thereof.
- **Behavioural view:** a value chain, process map or use case diagram.
- **Data view:** a conceptual, domain or business data model.

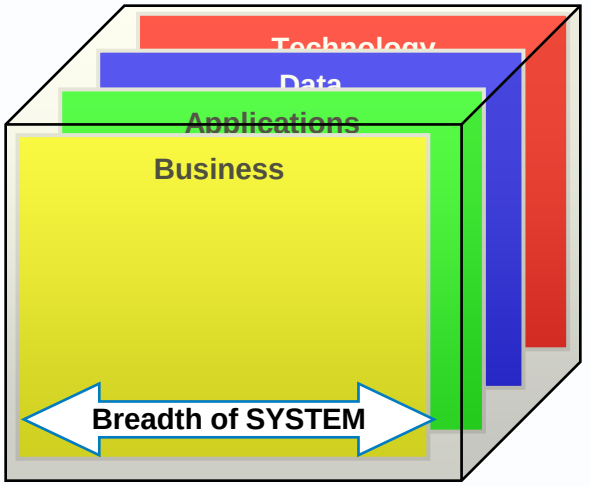




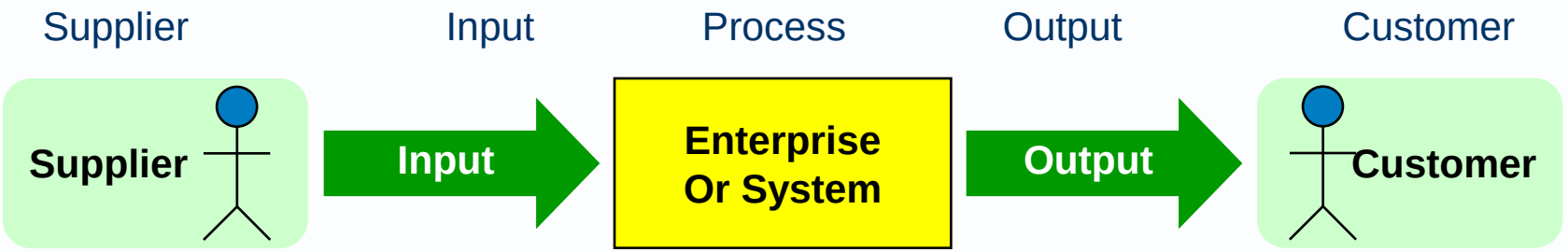


Context diagram

- [an artefact] that shows a system's scope in terms of
  - inputs consumed ,
  - outputs produced, and
  - the external entities (actors and/or roles) that send inputs and receive outputs.
- The system is shown as a 'black box'.



Cf."SIPOC" in Six Sigma



Solution concept diagram

- [An artifact] that shows an informal sketch or overview of a proposed solution.
- It likely refers to aims and constraints on work to be done.
- It likely indicate features and resources the solution will need.
- Purposes: to engage stakeholders with how an envisioned solution will work and meet goals.

2.6 Other contextual terms

- **Contract**
- A declaration of the functional and non-functional parameters for one or more interactions between two parties where one is a client/requester and the other is a server/provider.

  - *A service contact* declares the parameters any client uses to request one service.
  - The service requester, performer and consumer may be three different parties.

  - *A collaboration agreement* covers all services one client can request from one server.
  - It may be built by selection and aggregation of service contracts.
  - It may list only the exit conditions or results of services.
  - It may do no more than name some services results.

Measure

- A measure of a system/component or service/process.
- A quantity set as a target goal or requirement, or measured/reported in system operation.
- The measure type is typically a non-functional quality, requirement or attribute.
- E.g. cost, size, duration, throughput or confidentiality.
- A measure instance is a target or actual level of a measure.

Business case (before architecture)

Avancier

- [a document] that justifies work to build or change systems.

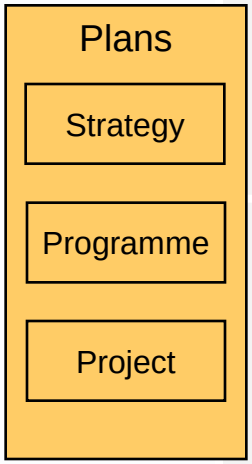
- It will be outlined at the start and updated as need be.
- It will be reviewed and refined several times while architecture work is done.
- It may be decomposed into business cases for specific options or projects.
- It should be completed when the full architecture and its implications are known.

- See the Migration Planning section for more on business cases.

PMO plans

- Addressed in last two sections of the reference model

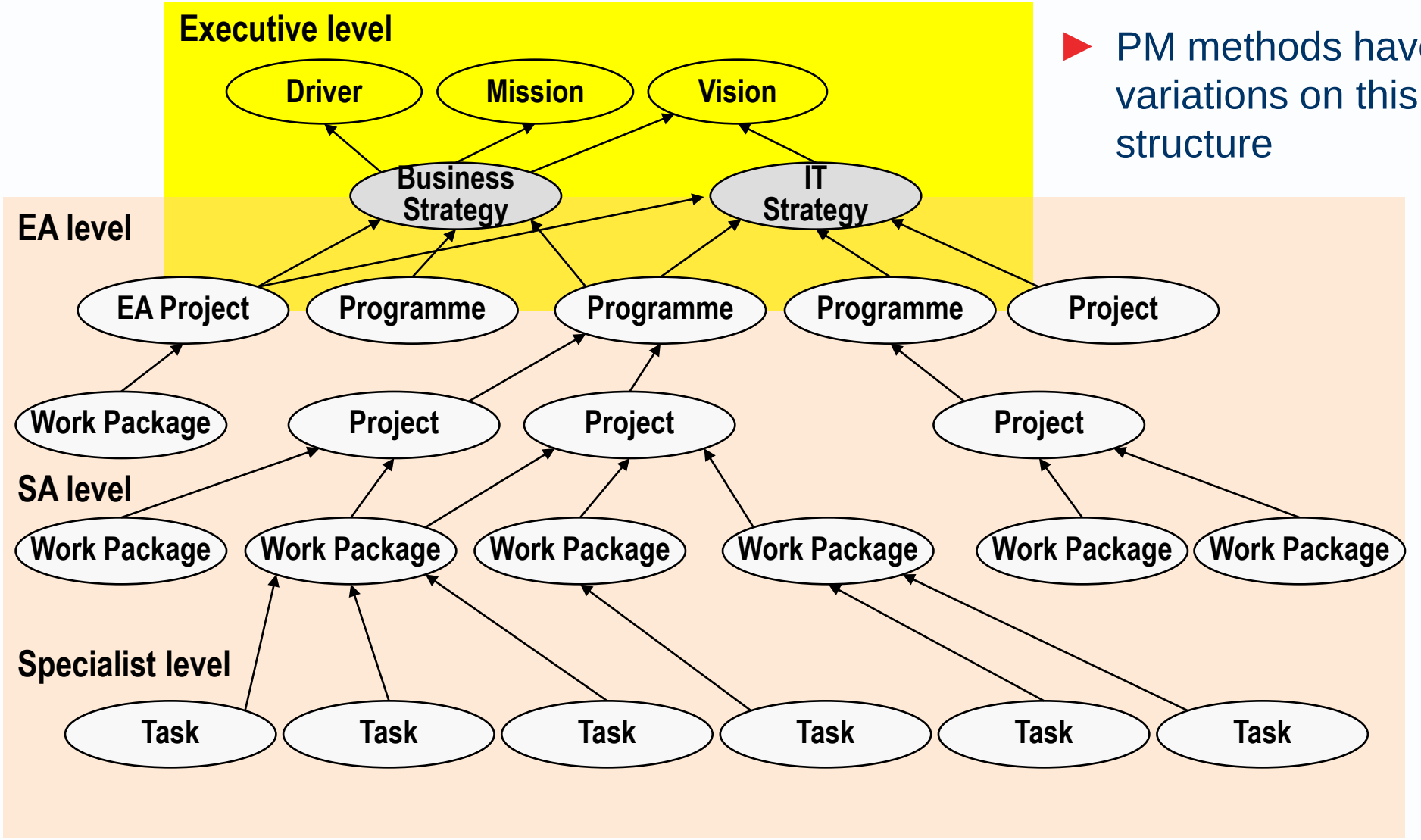
Avancier



Plan hierarchy	Plans are often arranged in a hierarchy, increasing in number and in detail from strategic to tactical.
Strategy	"A plan to channel efforts towards achieving a goal". Business Motivation Model. A relatively high-level and/or long-term plan to reach a new state and so achieve some relatively high-level and/or long-term goals.
Programme plan	A plan for a programme of projects. In the context of architecture, the plan via which the enterprise architecture is developed and implemented.
Project plan	A plan for a project to develop and/or implement a solution. In the context of architecture, the plan via which a relatively self-contained solution architecture is developed and/or implemented.

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

Avancier



- PM methods have variations on this structure