# Granularity

## (Full version)

## What is the right level of granularity for architecture precursors?

This presentation maps

the ISEB Reference Model for Enterprise and Solution Architecture to

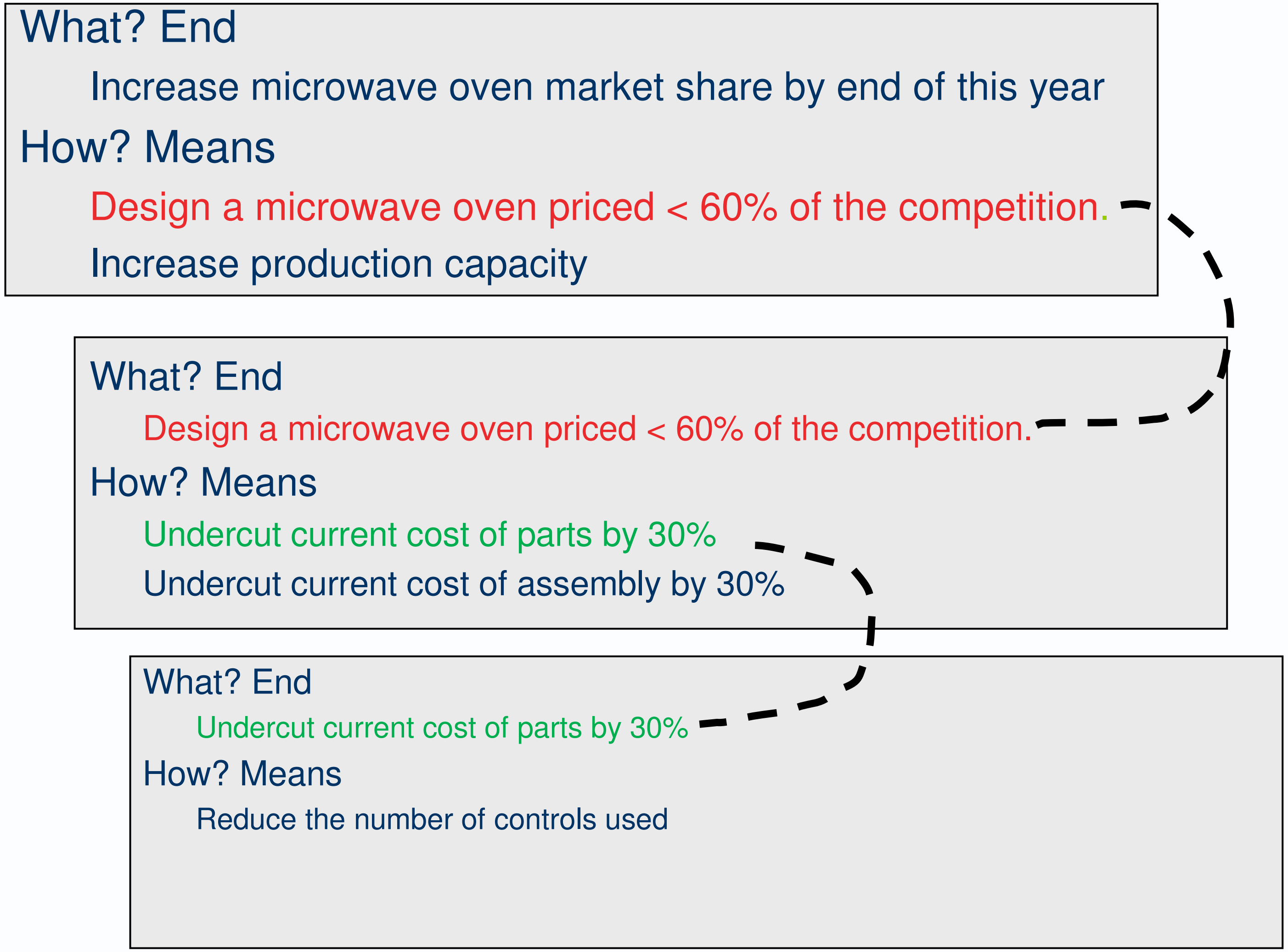
the Business Motivation Model (BMM) from the Object Management Group (OMG)

# Granularity in the structure of activity systems

- The presentation on Modularity showed
  - A coarse-grained Component* contains and executes finer-grained Processes
  - A coarse-grained Process is performed by the cooperation of finer-grained Components
- The granularity of Components is discussed elsewhere on this web site.
- This presentation focuses on the granularity of architecture precursors
  - GOAL and PROCESS
  - WHAT and HOW
  - END and MEANS

* Component here is a sub system of an activity system – be it human or computer.

# Goal decomposition



What? End

Increase microwave oven market share by end of this year

How? Means

Design a microwave oven priced < 60% of the competition.

Increase production capacity

What? End

Design a microwave oven priced < 60% of the competition.

How? Means

Undercut current cost of parts by 30%

Undercut current cost of assembly by 30%

What? End

Undercut current cost of parts by 30%

How? Means

Reduce the number of controls used

# Every Process has an End

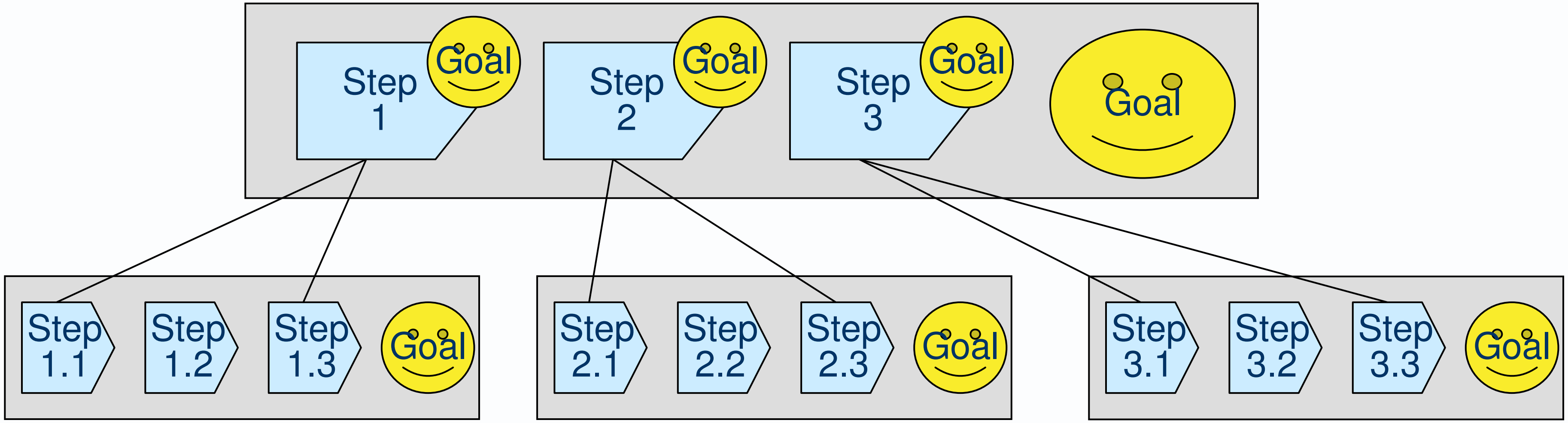
- Every Process ends in a result.*

- The result may be called variously
  - The Goal of the Process.
  - The Output of the Process
  - The Service delivered by the Process
    - (to one or more consumer Actors)

* FYI: in computer science, a process is a kind of procedure – a terminating procedure.
A procedure (calculate the value of pi) may never finish. A process – by definition - terminates.

# GOAL and PROCESS

- Designer: What is the right level of granularity for a process (or use case) specification?
- Guru: Match your process to a goal.
- Designer: But there is a process-goal hierarchy!
  - the *intermediate* goal in one process is
  - the *ultimate* goal of a lower level process



- You merely changed the question to: What is the right level of granularity for goal specification?

# Hmm…

- Every process has a goal
  - (at that level of composition)
- Perhaps every goal is the result of a process?
  - (at that level of composition).

# Aside on USE CASE (process) and REQUIREMENT (goal)

- A process has a goal
- A requirement is a kind of goal
- A use case is a specification of a process*
  - usually a human-computer dialogue.
- So a goal (requirement) may be identified with the process (use case) that delivers it

- But most of the requirements in a typical requirements catalogue are more fine-grained than a use case.
- A requirement may define
  - An output required at one step of a use case
  - A business rule executed during the process of a use case
  - A non-functional requirement (say response time)
  - Some other attribute of a use case.

* The essence of a use case is its main path and alternative paths: The rest is definition of the goal or service.

# *WHAT and HOW*

- Your manager may say something along these lines:
  - I'm not interested in the means, tell me about the end.
  - I'm not interested in the process, tell me about the goal.
  - I'm not interested in the how, tell me about the what.
- *This is OK when you and your manager are talking at one level of granularity – the granularity of your work*
- The trouble is…

# There is a cascade

- There is a cascade of goals, processes, components, etc.
- No statement is objectively and definitely a statement of
  - What or How
  - Strategy or Tactic
- Your view of which is which depends on what level of the cascade you are working at or thinking about.

# The what – how cascade in a management hierarchy

- Your boss tells you WHAT to do.
- You work out HOW to do it
  - (in ways not all visible to your manager).

- You tell us WHAT to do
  - (which is all part of the HOW to your manager).
- We work out HOW to do it
  - (in ways not all visible to you).

- We tell our own subordinates WHAT to do
  - (which is all part of the HOW to you).
- They work out HOW to do it

## And in a software project

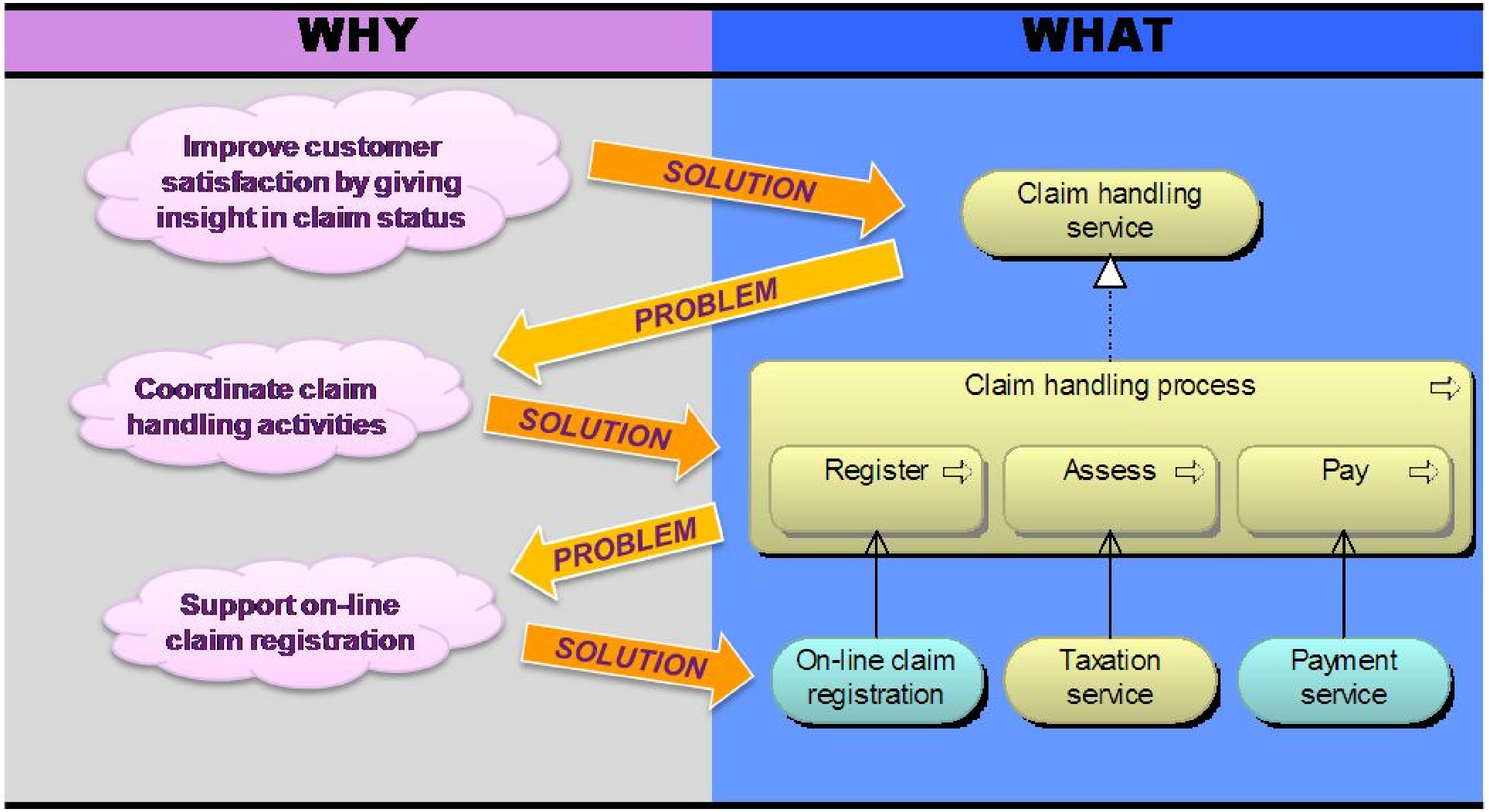
- The bottom of the management hierarchy is a programmer.
- Have we finally reach the HOW?
- The computer program?
- No
- The programmer tells the machine WHAT to do
  - by writing executable instructions.
- And the machine works out HOW to execute the instructions
  - (in ways invisible to the programmer).

# In any management hierarchy

- One manager’s *how*,
  - is a subordinate’s *what*
- One managers *tactic*
  - is a subordinate’s *strategy.*
- A step in one manager’s *means*
  - is a subordinate’s *end*
- As defined at one level, a *solution*
  - Is a problem statement for those at the next level down

# The ‘fundamental interrogatives’ are not used consistently

- “What v. How” might be expressed as “Why v. What”
- As in this graphic from an ArchiMate presentation


WHY
WHAT
Improve customer satisfaction by giving insight in claim status
SOLUTION
Claim handling service
PROBLEM
Coordinate claim handling activities
SOLUTION
Claim handling process
Register
Assess
Pay
PROBLEM
Support on-line claim registration
SOLUTION
On-line claim registration
Taxation service
Payment service

# You might say

- You might say
  - my boss does not tell me *what* to do
- You probably mean
  - he does not tell you *how* to do it?
- Hmm… how tricky that what/how distinction is!*

- You might say more clearly
  - my boss does not tell me the *means,* only the *ends*
- OK, that works at your level of granularity
- But your *ends* are only stepping stones
- In the *means* to the *higher end* of your boss's boss.

* To confuse things further: your boss might tell you what to achieve, what to do or how to do it.

## *END and MEANS*

- In BMM (to follow)
  - Means = Course of Action
  - End = Desired Outcome

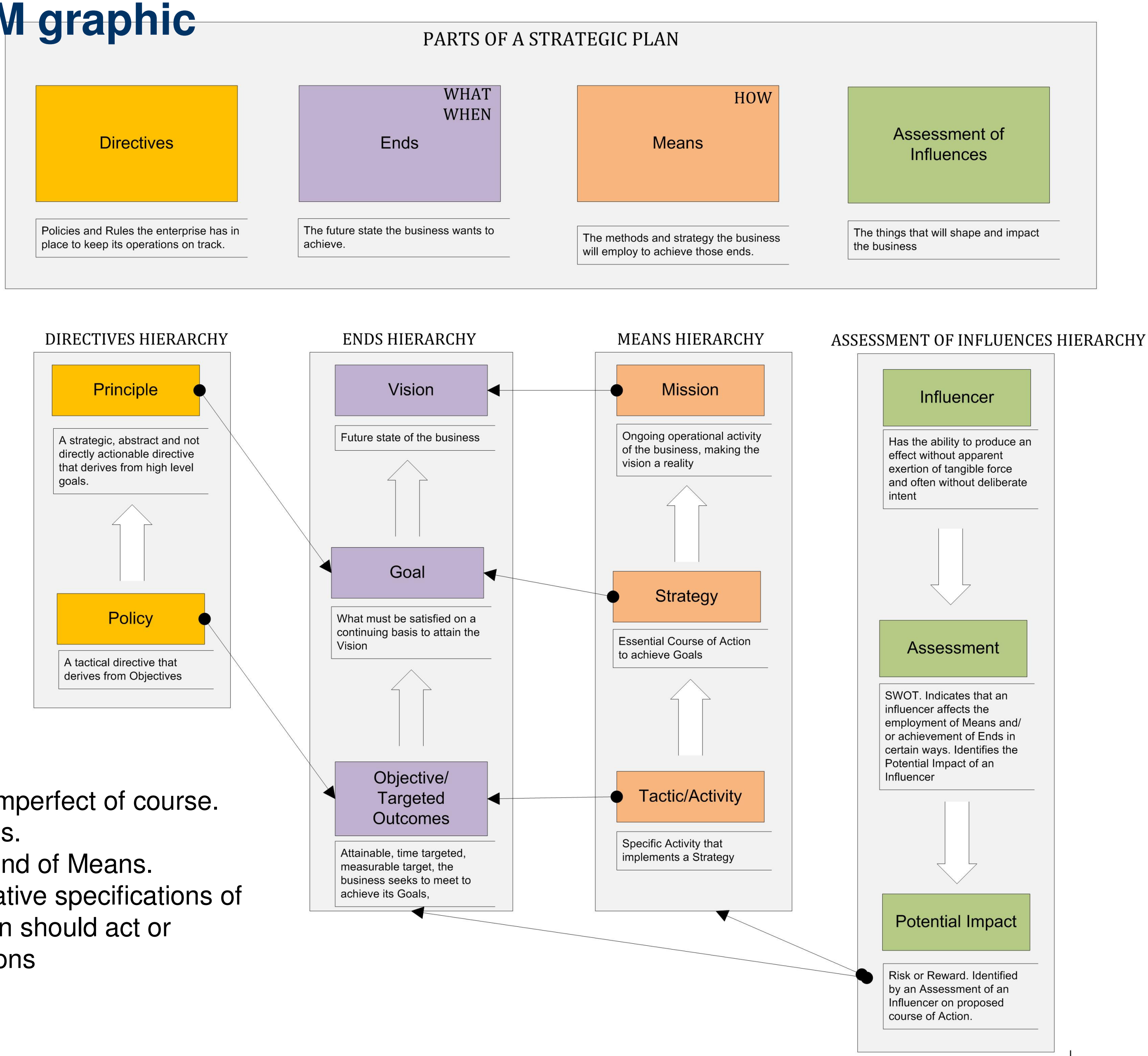
- The distinction could be made thus:
  - Means = Process = Behaviour
  - End = Goal = Effect = A passive Structure, or a Quality of it
    - E.g. The goal “better-than-average customer satisfaction” is a number on a customer satisfaction survey management information report.

# Which industry standards might address granularity?

- TOGAF (explored in other places on our web site)
  - Is not strong on levels of granularity
- The BMM taxonomy – introduced herein
  - Suggests three levels of goal and process granularity
- The taxonomy in the ISEB reference model
  - Addresses levels of granularity in a comparable way

| | Strategic Planning Method | Modelling Language |
|---|---|---|
| The Open Group | TOGAF's ADM | ArchiMate |
| The Object Management Group | Business Motivation Model (BMM) | Unified Modelling Language (UML) |

# The BMM graphic


PARTS OF A STRATEGIC PLAN
Directives
Policies and Rules the enterprise has in place to keep its operations on track.
WHAT
WHEN
Ends
The future state the business wants to achieve.
HOW
Means
The methods and strategy the business will employ to achieve those ends.
Assessment of Influences
The things that will shape and impact the business
DIRECTIVES HIERARCHY
Principle
A strategic, abstract and not directly actionable directive that derives from high level goals.
Policy
A tactical directive that derives from Objectives
ENDS HIERARCHY
Vision
Future state of the business
Goal
What must be satisfied on a continuing basis to attain the Vision
Objective/ Targeted Outcomes
Attainable, time targeted, measurable target, the business seeks to meet to achieve its Goals,
MEANS HIERARCHY
Mission
Ongoing operational activity of the business, making the vision a reality
Strategy
Essential Course of Action to achieve Goals
Tactic/Activity
Specific Activity that implements a Strategy
ASSESSMENT OF INFLUENCES HIERARCHY
Influencer
Has the ability to produce an effect without apparent exertion of tangible force and often without deliberate intent
Assessment
SWOT. Indicates that an influencer affects the employment of Means and/ or achievement of Ends in certain ways. Identifies the Potential Impact of an Influencer
Potential Impact
Risk or Reward. Identified by an Assessment of an Influencer on proposed course of Action.

The classification is imperfect of course.
Principles serve Goals.
So Directives are a kind of Means.
Directives are declarative specifications of "how” the organisation should act or choose between options

## Business Motivation Model (BMM)

- BMM is centered on two parallel hierarchies

| Ends | Means |
|---|---|
| Vision | Mission |
| Goals | Strategy |
| Objectives | Tactics |

- The challenge in practice is that there is
  - A cascade of Ends (or goals)
    - At what level of granularity does a goal become an objective?
      - (Even the highest level goals can be made SMART)
  - A cascade of Means (or processes)
    - At what level does a strategy become a tactic?
  - And worse…

# Worse: there is cascade of Ends and Means!

- Ends and means are themselves arranged hierarchically
- Because goal and process are in 1-to-1 correspondence
- And if you name the process after the goal *, then - at that level of discussion - the distinction between them disappears

* Naming conventions is another issue we can't address here

# Consider the end-means cascade of a soccer player

- His end/goal is to be respected.
  - His means/process is to score goals.
- His end/goal is to score goals.
  - His means/process is to practice hard and get selected.
- His end/goal is to practice hard and get selected.
  - His means/process is to turn up for training every day.
- His end/goal is to turn up for training every day.
  - His means/process is to place an order with a taxi firm
    - (in case he is too hung over to wake up and drive his Ferrari).
- Etc.

# You might put something of that into BMM speak

- Ends: to be selected for the team and
  - outfielder: score goals
  - goalkeeper: prevent goals
- Means:
  - play football
- Context:
  - training, league and cup matches, international matches
- Behaviour
  - Outfielder: kick the ball accurately, sprint faster, tackle harder etc.
  - Goalkeeper: catch the ball, punch the ball, block the ball etc

- You can make up various definitions of this kind at every level of the footballer’s ends/means cascade

# Consider the end-means cascade of Roger Federer

- His end is to win the tournament
  - A step in his means is to win the next match
- His end is to win the next match
  - A step in his means is to win the next set
- His end is to win the next set
  - A step in his means is to win the next game
- His end is to win the next game
  - A step in his means is to win the point
- His end is to win the next point
  - A step in his means is to hit the next ball where he aims
- His end is to hit the next ball where he aims
  - A step in his means is to practice beforehand

# You might put something of that into BMM speak

- End:
  - get a successful result
- Means:
  - play tennis
- Context:
  - Practice, Point, Game, Set, Match, Tournament. (when)
- Behaviour:
  - Hit the ball into play such that the opponent cannot reply likewise
- Business Rules:
  - Game = 4 points or two more than opponent if each have 3 points;
  - Set = 6 games or two ahead of opponent, etc.

- But your choice of Roger's end is at an arbitrary level.

# Why does Roger want a successful result?

- This is only a means to one or more higher end:
  - earn lots of money
  - earn at least enough money to put off getting a proper job
  - earn the respect of the others
  - earn self-respect
  - acquire fame and all the trapping of it.

- And playing tennis well is only one option Federer has
  - (you know Maslov's hierarchy of needs?)

# The granularity of the planning in BMM?

- BMM can be used
  - at different levels of the management hierarchy
  - in a nested fashion at different levels
- The language of the BMM can only make sense when you and co-workers have fixed the level of granularity to which you are applying it.
- That level is fixed by the level of the declared Vision
- Which could be
  - the vision of a CEO
  - the vision that is a technical architect's Solution Outline
    - At a level the CEO regards as a tactic.

# How do industry standards meet the granularity challenge?

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- Hierarchical decomposition
  - of goals, processes, components…
- bedevils discussion of architecture and management

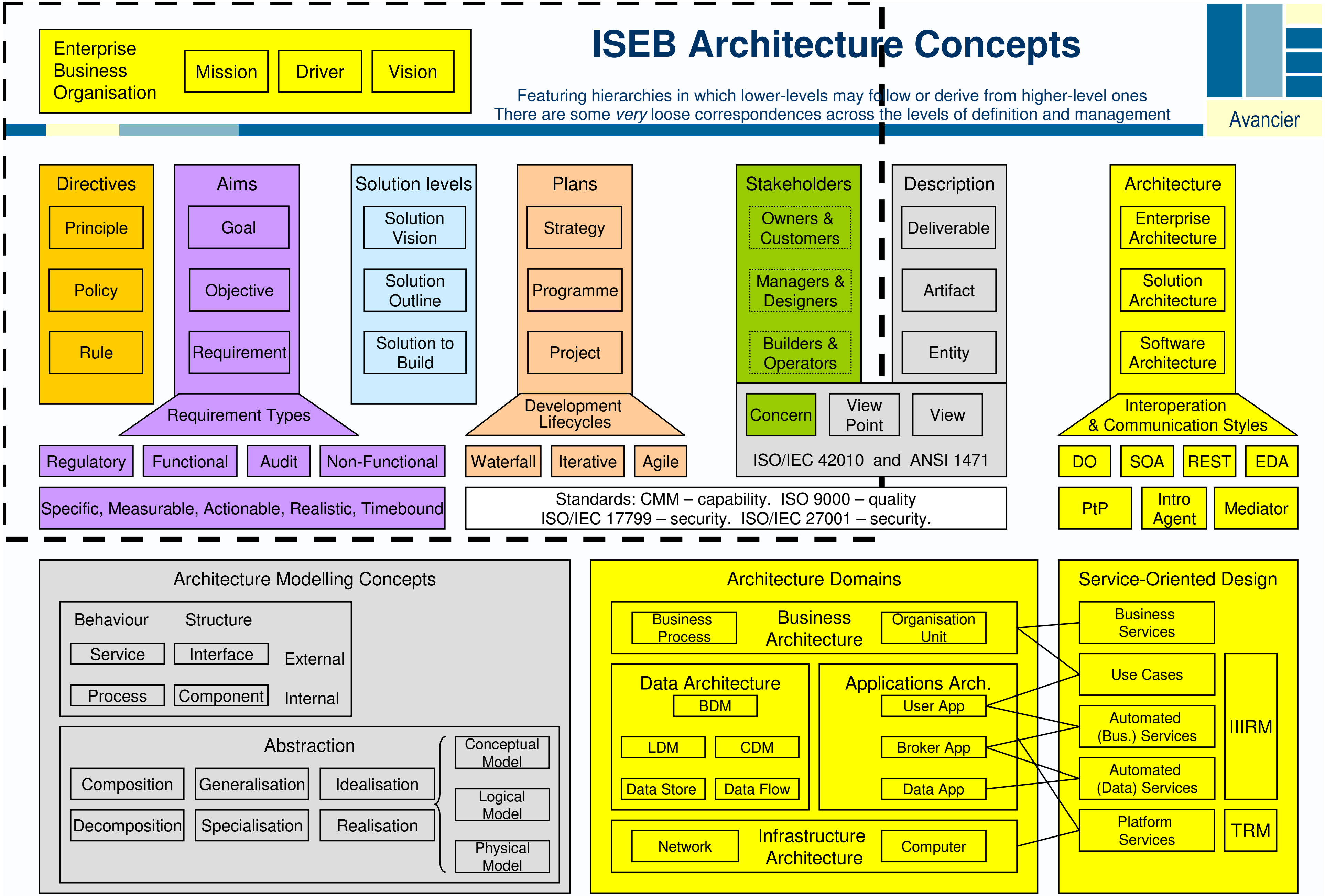
- You can EITHER
  - Use the same limited vocabulary every level of composition.
  - Talk about big and little ones, long and short ones.
- OR
  - Use a vocabulary that pins different terms to different levels of a hierarchical composition structure.

- The ISEB and BMM have both chosen the latter option
- The next two slides compare their hierarchical taxonomies

# ISEB Architecture Concepts

Featuring hierarchies in which lower-levels may follow or derive from higher-level ones
There are some *very* loose correspondences across the levels of definition and management

Avancier



Enterprise Business Organisation
Mission
Driver
Vision

Directives
Principle
Policy
Rule

Aims
Goal
Objective
Requirement

Requirement Types
Regulatory
Functional
Audit
Non-Functional

Specific, Measurable, Actionable, Realistic, Timebound

Solution levels
Solution Vision
Solution Outline
Solution to Build

Plans
Strategy
Programme
Project

Development Lifecycles
Waterfall
Iterative
Agile

Standards: CMM – capability. ISO 9000 – quality
ISO/IEC 17799 – security. ISO/IEC 27001 – security.

Stakeholders
Owners & Customers
Managers & Designers
Builders & Operators

Description
Deliverable
Artifact
Entity

Concern
View Point
View
ISO/IEC 42010 and ANSI 1471

Architecture
Enterprise Architecture
Solution Architecture
Software Architecture

Interoperation & Communication Styles
DO
SOA
REST
EDA
PtP
Intro Agent
Mediator

Architecture Modelling Concepts

Behaviour
Structure
Service
Interface
External
Process
Component
Internal

Abstraction
Composition
Generalisation
Idealisation
Decomposition
Specialisation
Realisation
Conceptual Model
Logical Model
Physical Model

Architecture Domains

Business Process
Business Architecture
Organisation Unit

Data Architecture
BDM
LDM
CDM
Data Store
Data Flow

Applications Arch.
User App
Broker App
Data App

Network
Infrastructure Architecture
Computer

Service-Oriented Design
Business Services
Use Cases
Automated (Bus.) Services
Automated (Data) Services
Platform Services
IIIRM
TRM

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# ISEB "Architecture Precursors"

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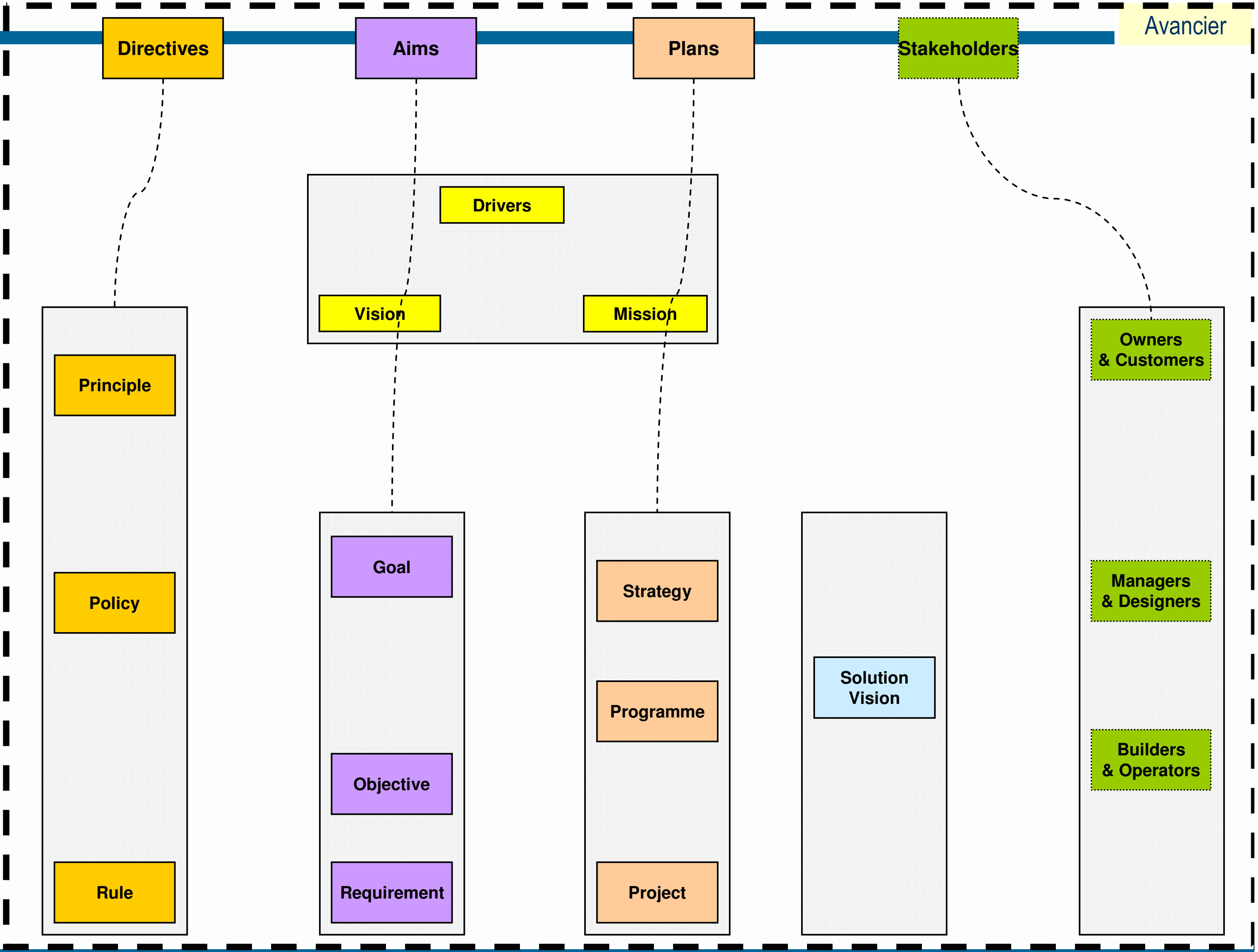
Ready for mapping to BMM



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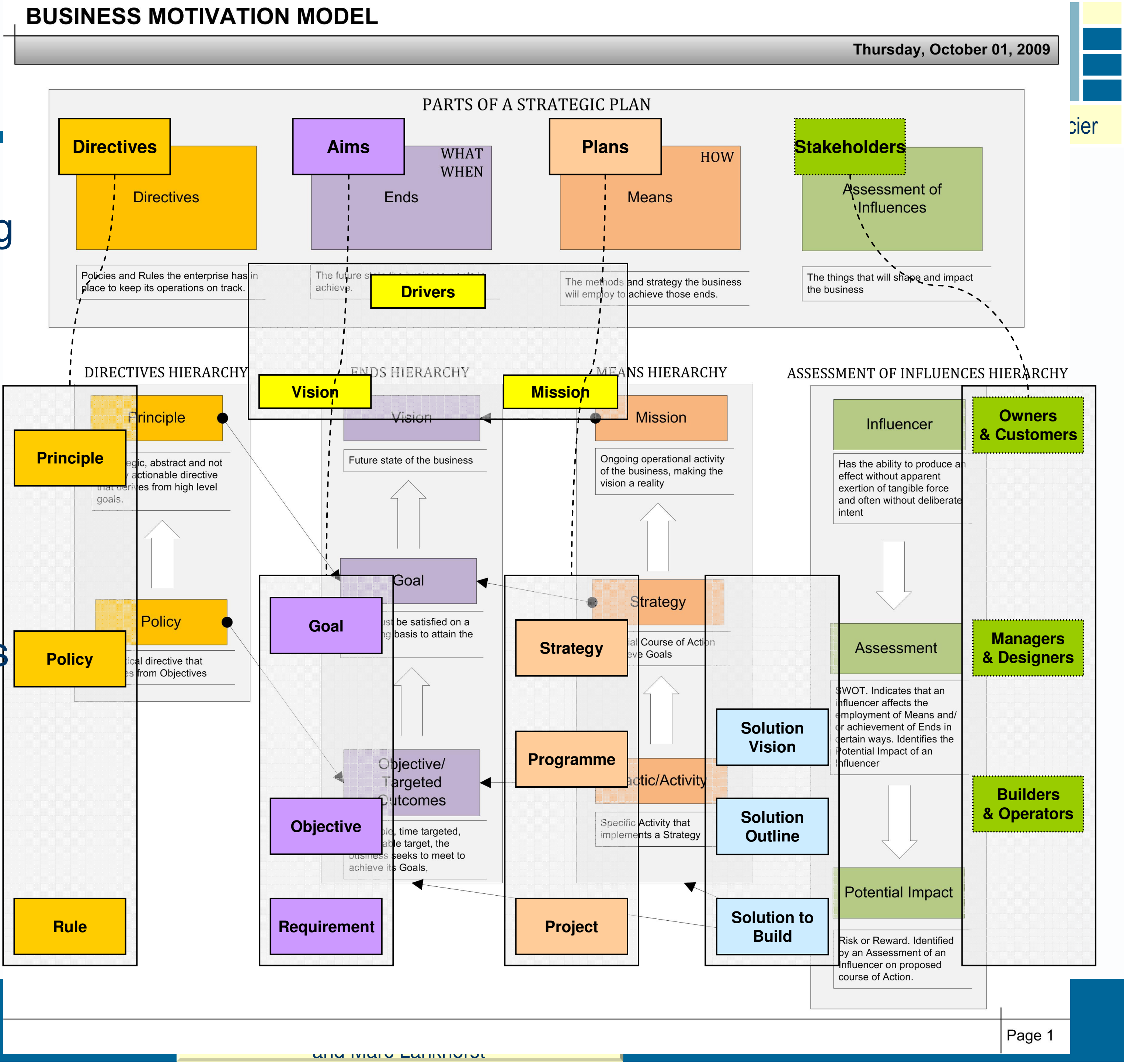
# Roughly mapping ISEB to BMM

We're not sure the BMM works for us.

Don't rely on these correspondences fitting your situation



BUSINESS MOTIVATION MODEL

Thursday, October 01, 2009

PARTS OF A STRATEGIC PLAN

Directives

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Policies and Rules the enterprise has in place to keep its operations on track.

Aims

WHAT
WHEN

Ends

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Drivers

Plans

HOW

Means

The methods and strategy the business will employ to achieve those ends.

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Assessment of Influences

The things that will shape and impact the business

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Potential Impact

Risk or Reward. Identified by an Assessment of an Influencer on proposed course of Action.

Owners & Customers

Managers & Designers

Builders & Operators

and Marc Lankhorst

# The need to integrate architecture into management methods

- The BMM does not include architectural specification of the proposed solution – the proposed system(s) *
- The business capture and planning processes of some management consultancies and systems integrators also neglect this important content in proposals to win business.
- This goes some way to explain the frequency of sale-to-delivery mismatches!
- The ISEB reference model for architectural specification was constructed with a mind to
  - The need to link management and architecture methods
  - All the granularity questions raised in this presentation

* Aside from principles – which are vacuous compared with the system specification we need

# The need for context sensitivity

- There is no universally objective level of granularity
  - at which you can say - this is the level at which we will all use the term vision, goal, objective, ends, means, strategy, tactic…
- There is only your context
  - in which you and your co-workers agree to use the terms.
- The trouble is
  - Every context is nested within a wider context.
  - You will have to talk to people who use the same terms at a different level of granularity than you and your co-workers.

# The need to understand the granularity of components and process specification

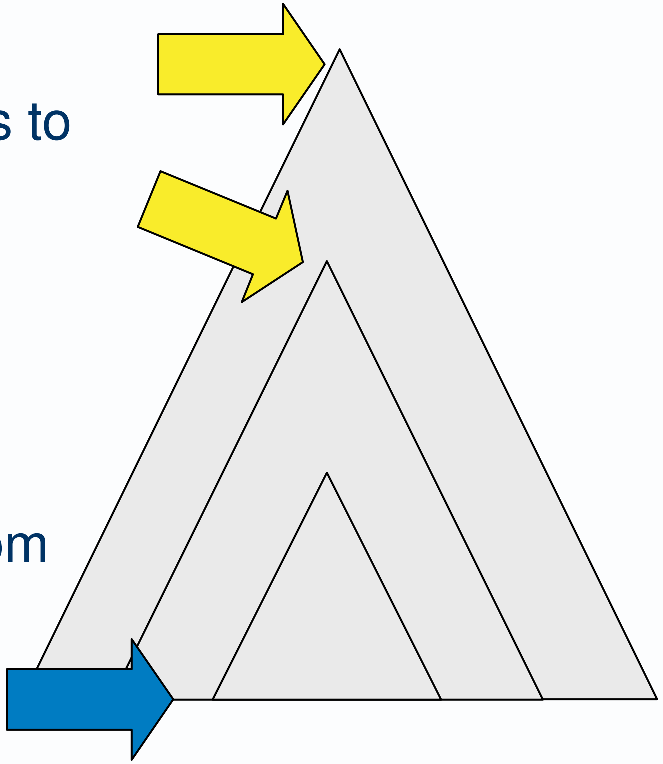
- The “right granularity” depends on the
  - Breadth of enterprise or system described
  - Detail needed by stakeholder reviewers
  - Detail needed by consumer designers
  - Risks and threats that need to be understood or removed
  - Accuracy required of estimates *

- It is constrained by
  - the money, people and tools available to outline the architecture.

- * To estimate system completion time and cost,
  - you must have an idea of how far you are from the bottom level

# The need for more concrete advice on granularity

- People start from different tops
- So no generic methodology can fix its terms to levels of granularity from the top down
- There are rules of thumb for middle-level granularity in our training courses
- We might universally agree where the bottom is.
  - In software - the data item and executable instruction.
  - In a human activity system - the procedure step needing no further explanation
- But we'll have to pursue that idea another day!



This presentation is for those interested in aligning different architecture frameworks

## 1 of 6 related presentations in the Library at http://avancier.co.uk

Avancier

- **Logicality**
  - Process threads you will find in various architecture frameworks
- **Modularity**
  - Foundation concepts and strands in the modelling of human and computer activity systems
- **Granularity**
  - The challenge of multi-level goals, plans and specifications
- **Architecture meta meta concepts**
  - A 4 cell schema for modelling systems, which helps you understand meta models
- **Functionality**
  - Functions, Organisation Units and Processes in human activity systems
- **Architecture meta models**
  - Comparing the meta models of industry standard architecture frameworks