

# A Model for Consumer Product Development from a Systems Perspective

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# The Problem

- INCOSE seeks to extend the role of systems engineering outside defence and aerospace
  - We believe we have a sound approach to engineering work that can benefit all sectors
  - But not everyone sees things this way
  - SE is not yet seen as the natural method for commercial engineering

# Simplistic Description of SE

- A top-down method to investigate, propose, develop and deliver solutions to needs involving technology
- A key point is ‘top-down’
  - The activity is to investigate the issue surrounding the need
  - Then to propose an apposite solution
  - The effect of constraints is added AFTER the goal is well characterised

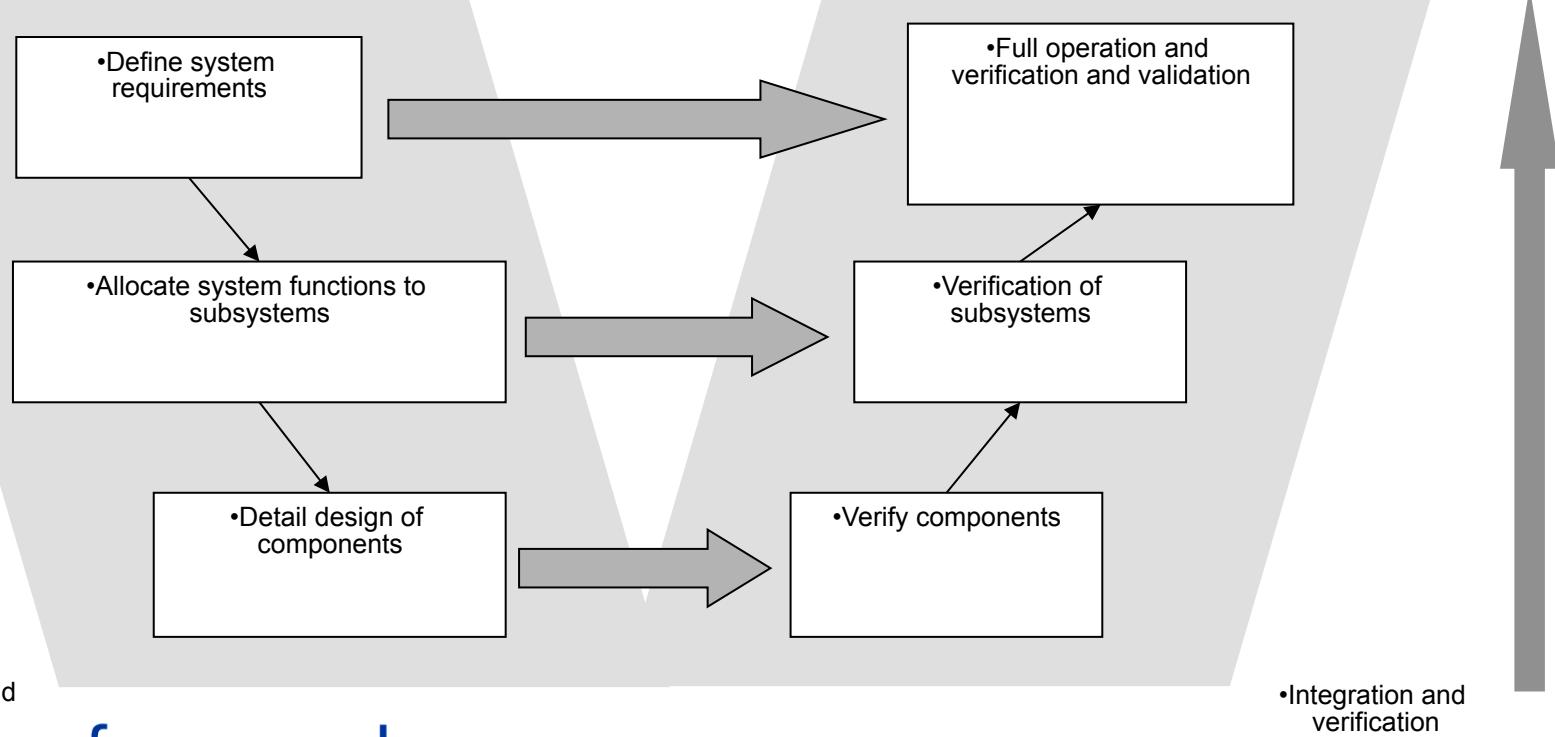
# Commercial Response

- The simplistic description of SE seems to perfectly fit the commercial enterprise need
- Commercial enterprises need a method to:
  - Identify needs worth addressing
  - Clarifying the need in terms enabling proposal of a solution matching the enterprise capability
  - Clarifying the need in terms enabling a market attractive product to be developed
  - Doing the engineering to get the product right

# Traditional SE Setting

## ■ Simple Vee model of SE

•Testing



# Vee model of SE

- This model describes the project lifecycle from need identification to delivery
  - Vee model can be expanded to elaborate detail of any part of the process
- Much discussion takes the starting point of SE as requirements analysis
  - But good needs analysis is critically important
  - How do you decide what project is worth developing?

# Requirements

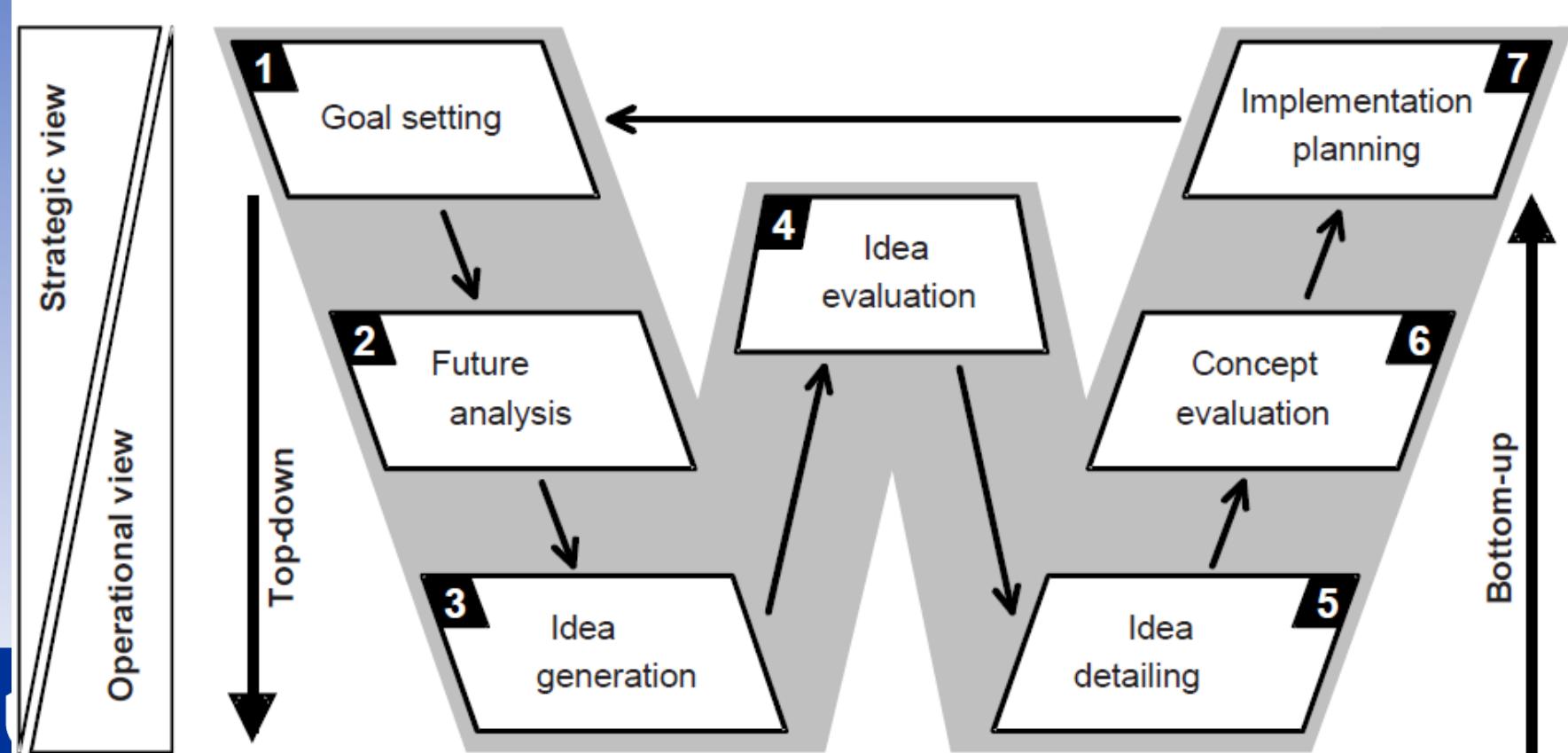
- These are a way to describe the intended product
- Well suited to a contractual boundary between supplier and producer
  - A mechanism is needed to determine if the product is the right one
  - A method to explore whether a product is desirable in the market is needed for commercial development

# Commercial Development

- Commercial developers develop products because they BELIEVE that if they create a product there will be a market
  - Fundamentally different business risk to tradition SE sectors
    - Commercial developers dream of the idea of the product and then must determine what product would suit the market sector for which they aspire
    - There is no ‘lead customer’ to help define the product

# W-model of Innovation

- Brandenburg's (2002) model of innovation



# W-model Phases

- Goal setting – develop understanding of the current state of the enterprise and its environment
  - Determine the strategic intention
- Future analysis – review expectations of the future which can reveal opportunities (or potential problem areas)
  - This looks at diverse dimensions – political, technical, social, ecological etc.

# W-model Phases

- Idea generation – future analysis identifies either problems needing solutions or solutions needing problems and provides the complementing solution or problem
  - Seek solutions not limited by current enterprise capability
- Idea evaluation – review possibilities for their quality as products and their fit with enterprise strategy and state

# W-model Phases

- Idea detailing – expand the expression of the ideas
  - This is much more expensive, so it is only done for ideas which pass the evaluation phase
- Concept evaluation – detailed review to determine technical feasibility
  - Use modeling or prototyping
  - Review the market to predict likely profitability

# W-model Phases

- Implementation planning – integrate the results of earlier phases to evaluate how the proposed innovation can be fully realised
- Note – the W-model is intended to be recursive – should not be treated as a waterfall

# Comparison of W- & V-Models

- V-model provides a guide through the whole development project lifecycle
  - Indicates activities and milestones
  - 1<sup>st</sup> step – define requirements – where do they come from?
- W-model is focused on the front-end
  - How to decide what projects to do
  - How to develop the knowledge leading to requirements

# Comparison of W- & V-Models

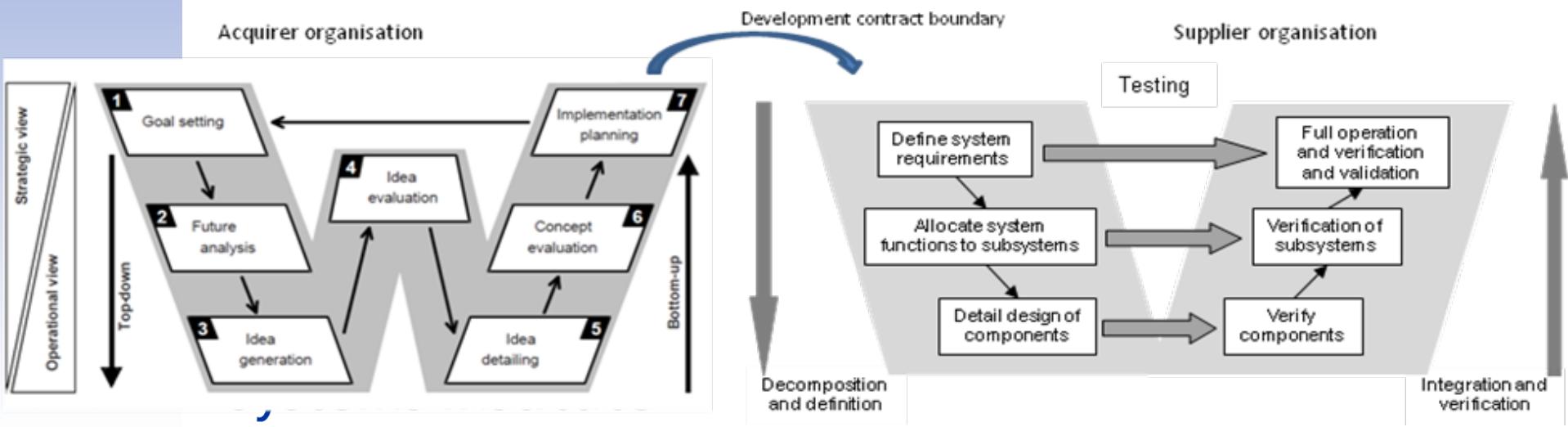
- V-model emphasises matters of interest to a producing organisation
- W-model deals with the specific needs of the acquiring organisation
- Commercial organisations are simultaneously producer and acquirer
  - With a view to finding a market for their products/services

# Comparison of W- & V-Models

- W-model provides a way to deal with the issue of the front-end where the purpose and scope of systems proposed for development is explored

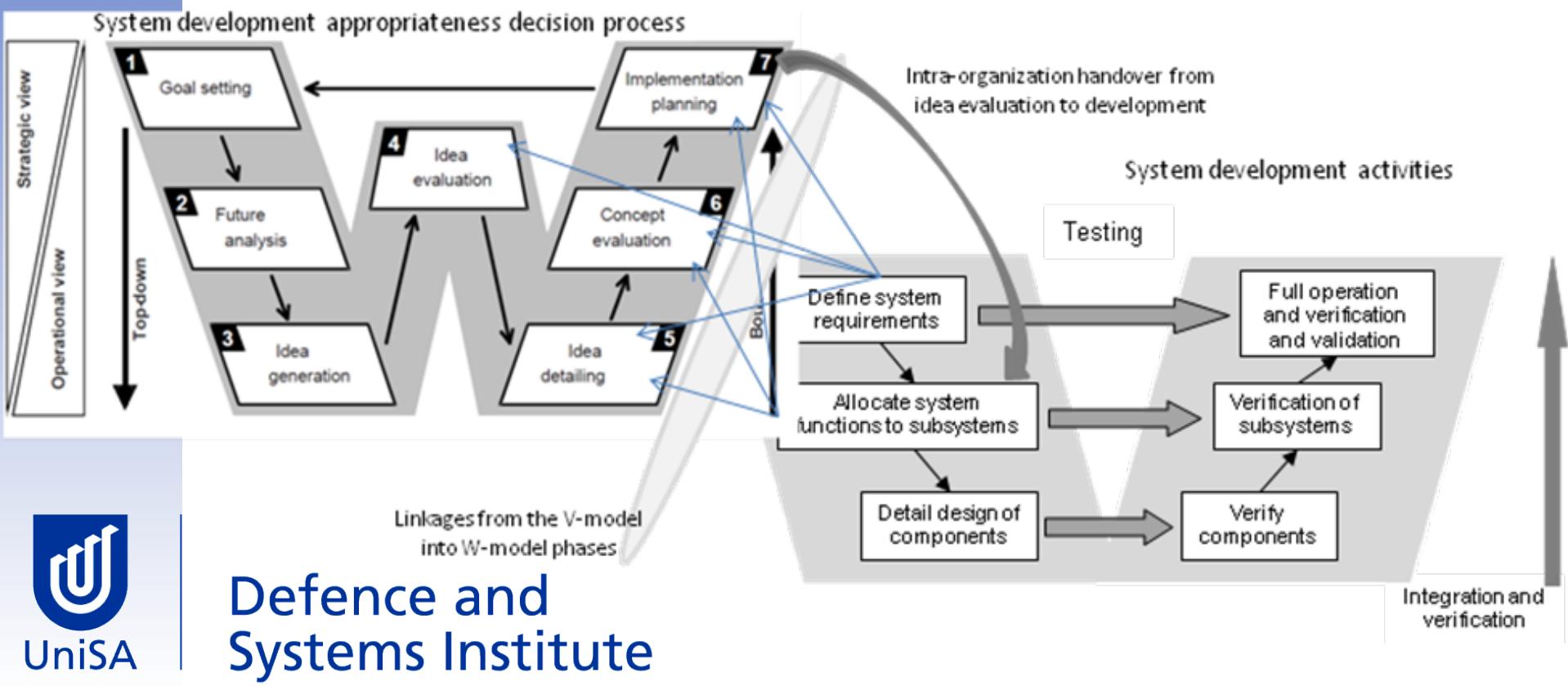
# Separate Organizations

- Acquirer explores the situation and scopes the project – W-model provides a method
- Supplier receives the project and delivers an instantiation



# Same Organization

- W- and V-models guide stages in the work
- Opportunities for creative feedback



# Creative Feedback

- Within a single organization there is not a contractual boundary that adds cost risks to blending project phases
  - “Bid low and make money from variations”
- The later phases of the W-model may be used to perform requirements definition or early stages of design
  - This blends the stages of work
  - Enables decision makers to work with more concrete descriptions of intended products

# Concrete Descriptions

- Requirements are a specialized representation of the systems they describe
  - Challenging to picture the whole of the system
  - Commercial success often depends on subtle distinctions of products
    - Which might be overlooked in the heavy functional emphasis of requirements
  - Decisions about commercial feasibility or likely market success depend on clear visualization of the product that will result

# Conclusion

- W-model is a useful augmentation of V-model to describe how the front-end can be done
- Commercial system development changes the context of SE by placing all project phases within one organisation
  - Allows easier front-end exploration than where there is a contractual boundary

# Questions