System Engineering

- **Systems engineering and software engineering overlap in a number of areas -- including problem definition, requirements analysis, design, project management, metrics etc.**

- **In s/w engineering the focus is to develop software based solutions.**

- **In systems engineering, our objective is problem solving, and the solution may or may not require software solutions.**

- **Systems engineering is far more multidisciplinary and integrative than s/w engineering.**

System Specification

- **A system specification is the FOUNDATION for**
  - **Hardware Engineering**
  - **Software Engineering**
  - **Database Engineering**

Computer-Based Systems

- **Computer-Based Systems**
  - **A set or arrangement of elements that are organized to accomplish some pre-defined goal by processing information**
- **System Elements**
  - **Software**
    - **programs/data structures/related documentation**
  - **Hardware**
    - **electronic / electromechanical**

- **People**
  - **user/operator**
- **Database**
  - **a large, organized collection of info**
- **Documentation**
- **Procedures**
  - **steps that define the specific use of each system element**

System Engineering

- **System engineering relates to the need to model some complex (technologically complex) system.**

- **We need to thoroughly understand the components of the system and their relationships and translate the user's needs for these components into a useful system model.**

System Engineering

- **In system engineering, we divide a world view, which is the umbrella under which is generally either a business or product into specific domains of interest under this higher topic.**

- **These domains have elements which make them up, which we can further describe in detail.**

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- **Note that each domain constitutes a view we are examining and attempting to understand fully.**

- **The general techniques of system engineering employ a "divide and conquer" approach to separate the concerns of a system into its components, and a decomposition to examine and understand each component.**

System Engineering

- **It encompasses**
  - **information engineering e.g information system software to assist marketing department**
  - **product engineering e.g. control software to support a robot**
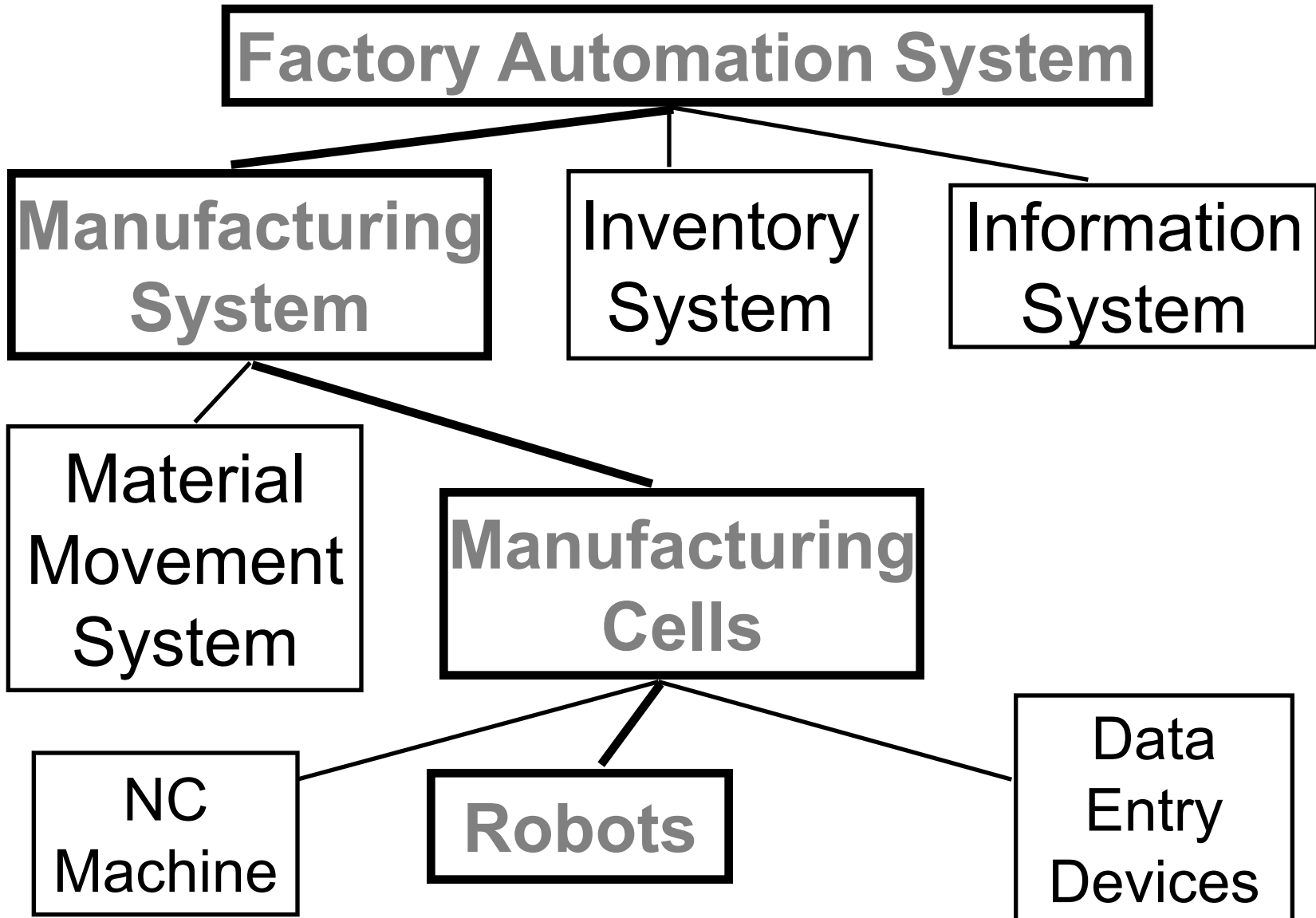
- **The production line system has many domains -- of personnel, tools, parts, manufacturing, assembling, packaging, delivery etc.**

- **Each of these has unique elements to be addressed -- personnel may include: training of personnel, work hours, availability, payrolling etc.**

System Engineering Hierarchy

- **System Engineering Hierarchy**
  - **World View [WV]**
    - **entire business/product domain**
  - **Domain View [Di]**
  - **Element View [Ej]**
  - **Detailed View [DVk]**
    - **technical components**
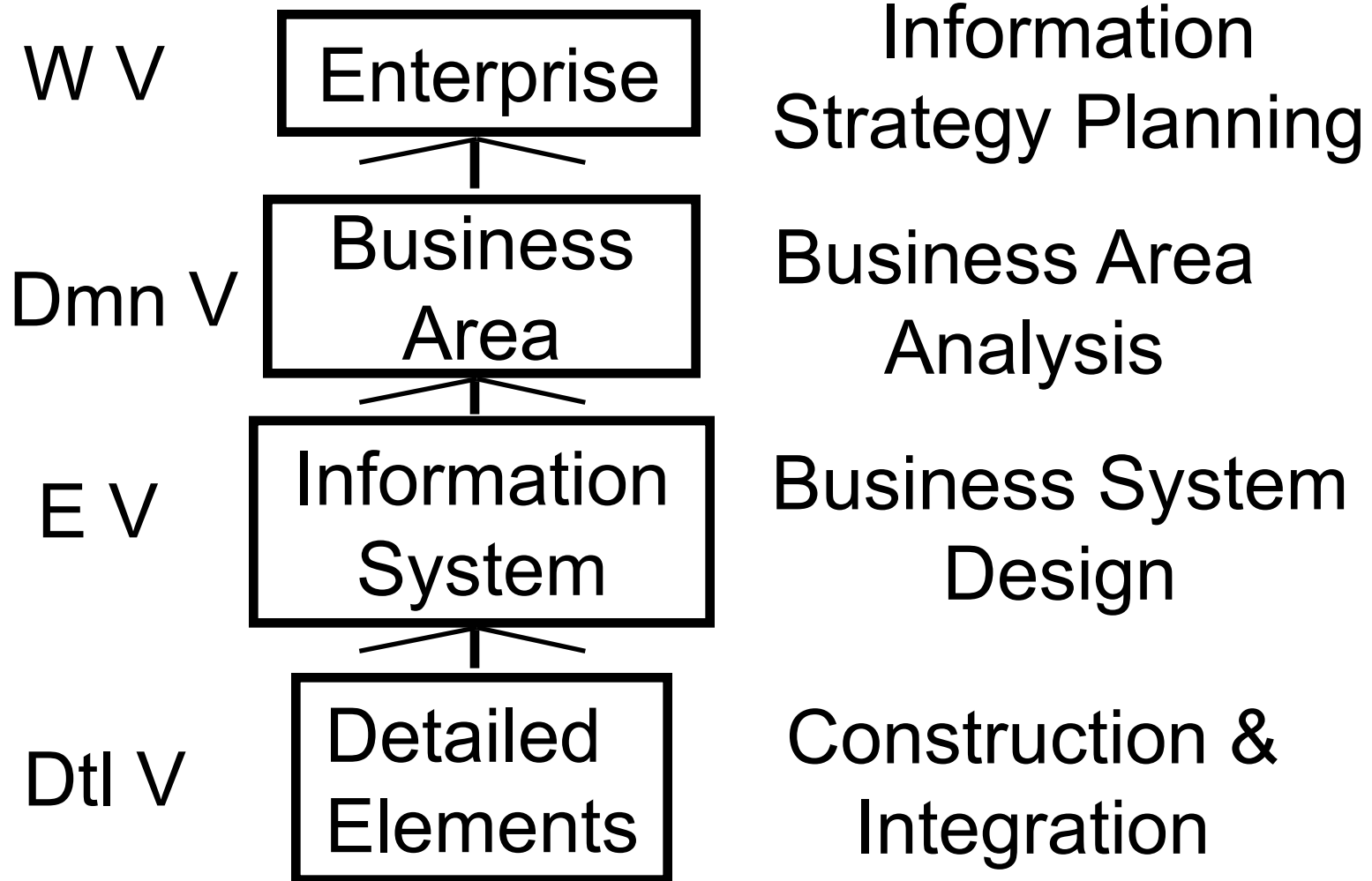
System Engineering Hierarchy

- **Relations**
  - **WV = {D1, D2, D3, ..., Dn}**
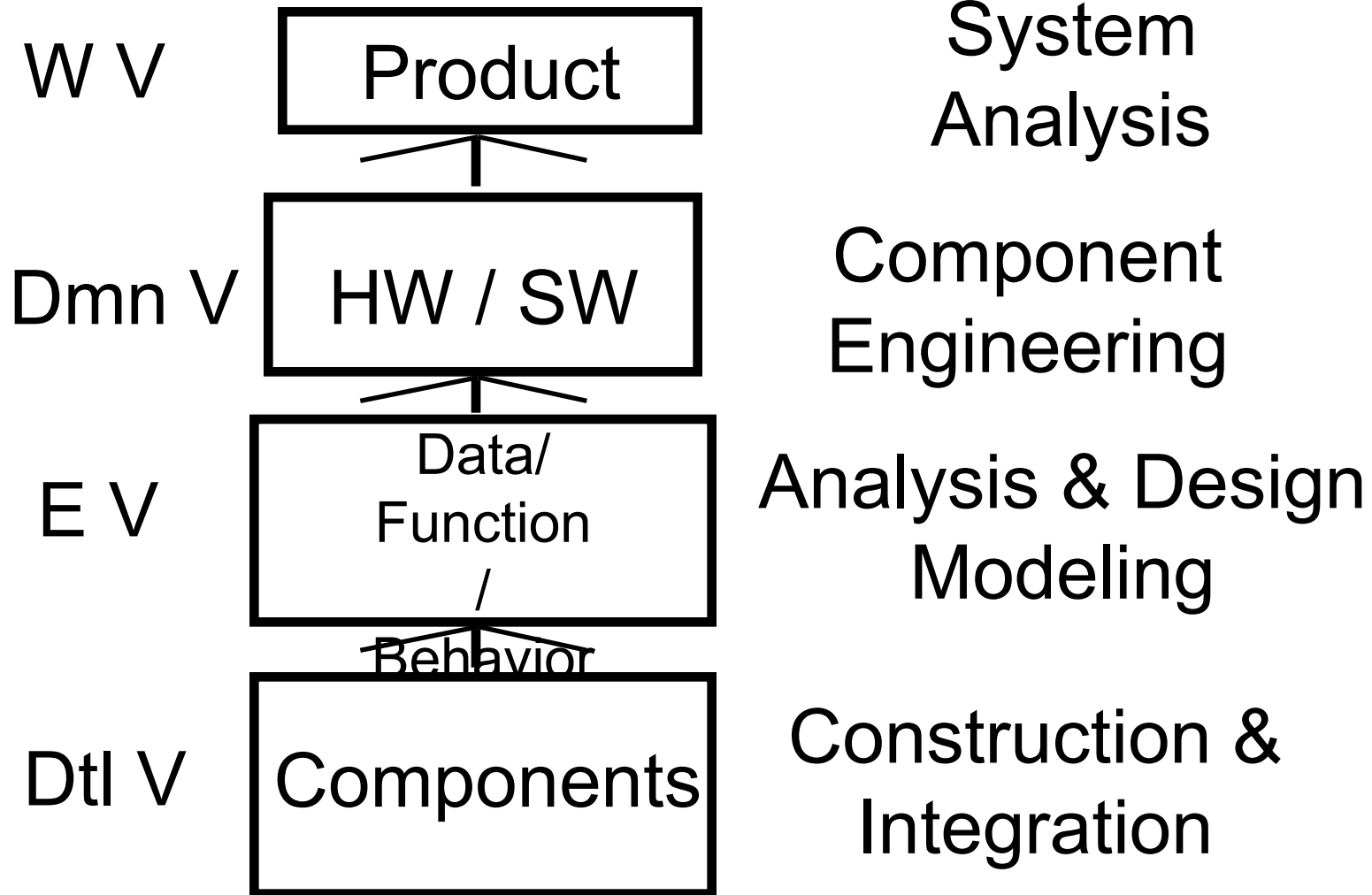 - **Di = {E1, E2, E3, ..., Em}**
  - **Ej = {C1, C2, C3, …,Ck}**

Information Engineering

- **Goal of IE**
  - **Define architectures that will enable a business to use information effectively**
  - **create an overall plan to implement the architecture**

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W V	Enterprise	Information Strategy Planning
Dmn V	Business Area	Business Area Analysis
E V	Information System	Business System Design
Dtl V	Detailed Elements	Construction & Integration

Product Engineering

- **Goal of PE**
  - **Translate customer's desire for a set of defined capabilities into a working product**

W V	**Product**	System Analysis
Dmn V	**HW / SW**	Component Engineering
E V	Data/ Function / Behavior	Analysis & Design Modeling
Dtl V	**Components**	Construction & Integration

System Specification

- **The FOUNDATION for**
  - **Hardware Engineering**
  - **Software Engineering**
  - **Database Engineering**
  - **Human Engineering**