

The MathWorks Global Product Development Conference

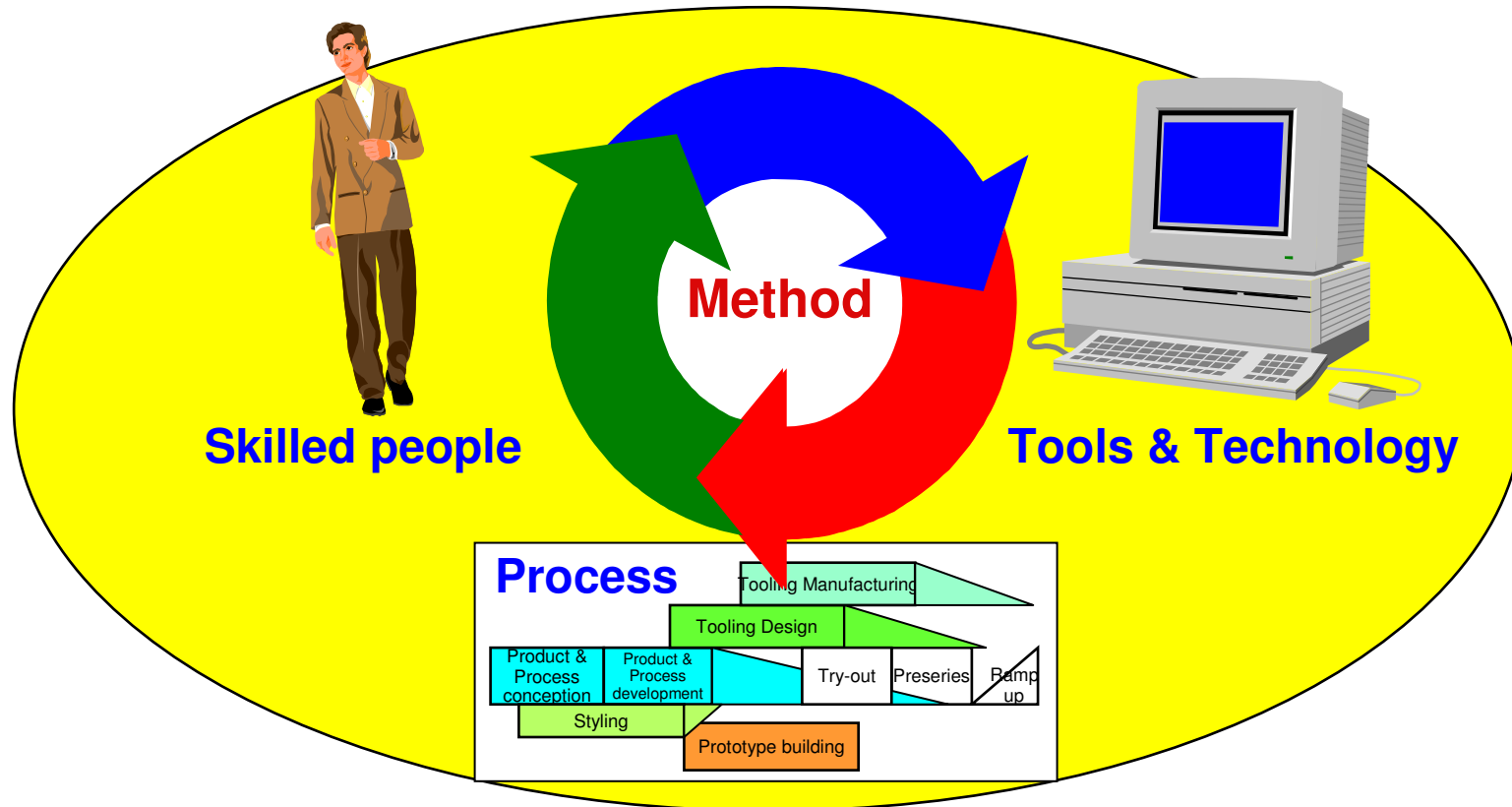
From Drawing-board to CAD in a large enterprise

Vittorio Romagnoli

October 21, 2008

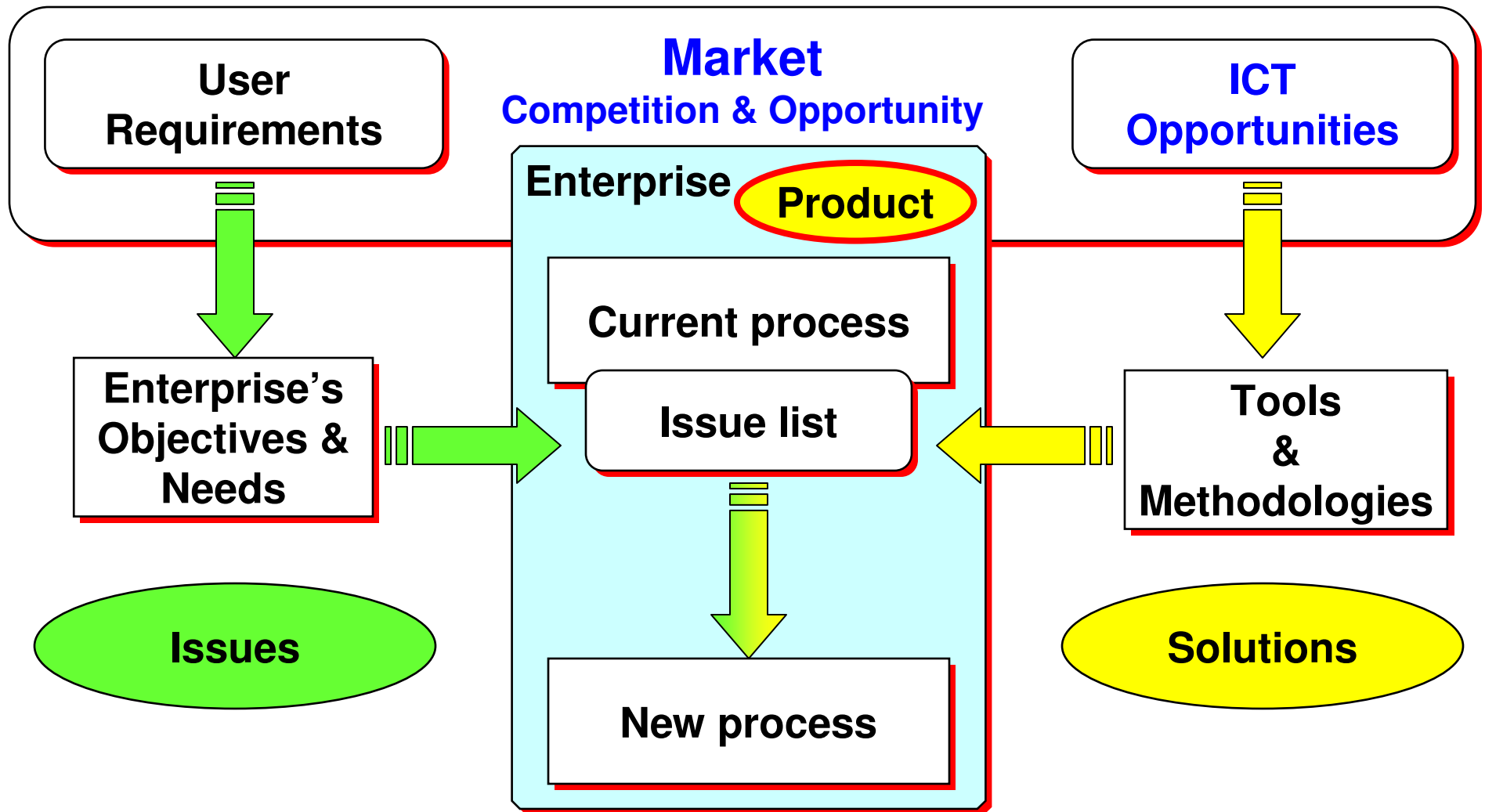
vrdoor@inrete.it

Design CAD environment

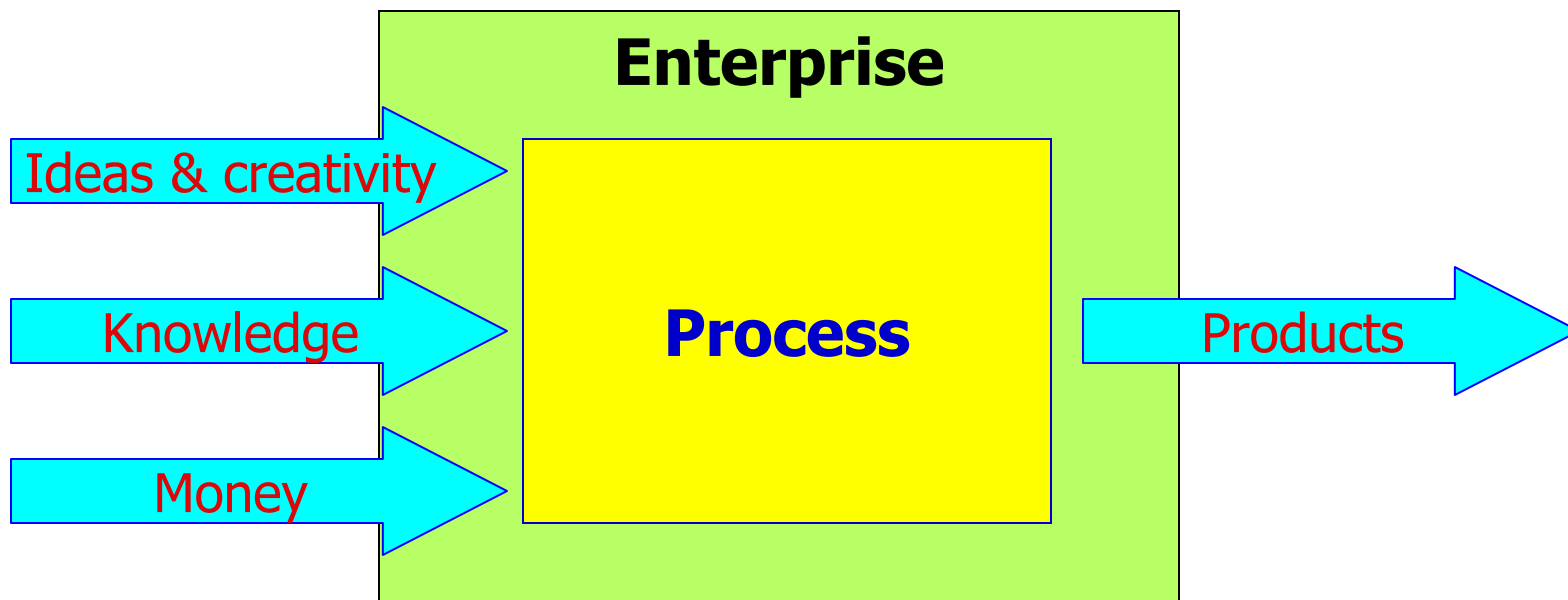


- **Virtual tools** are extending the skills of **people** involved in the **organization** in which they work by incrementing the quality of both the product and production process

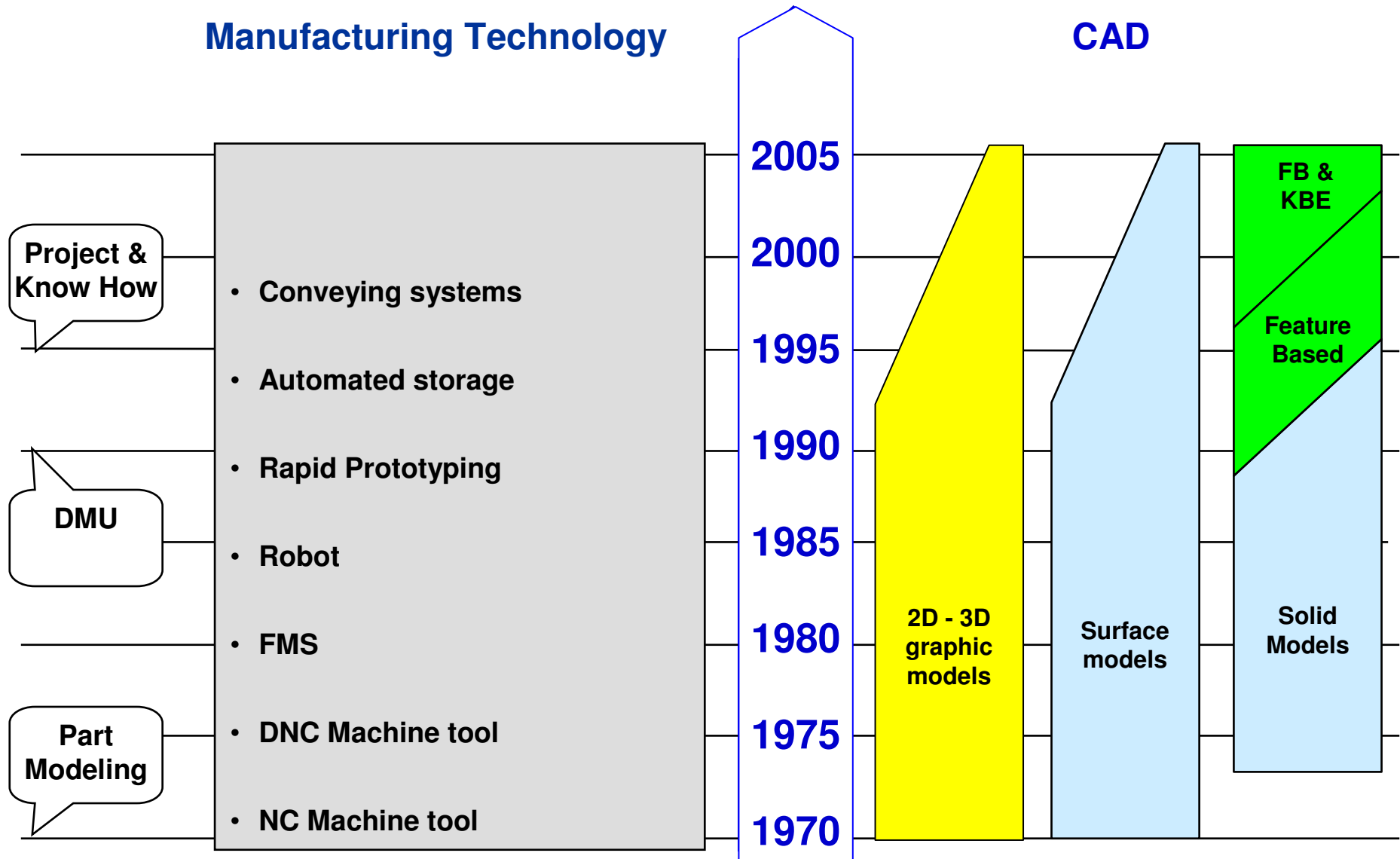
Process Dynamics



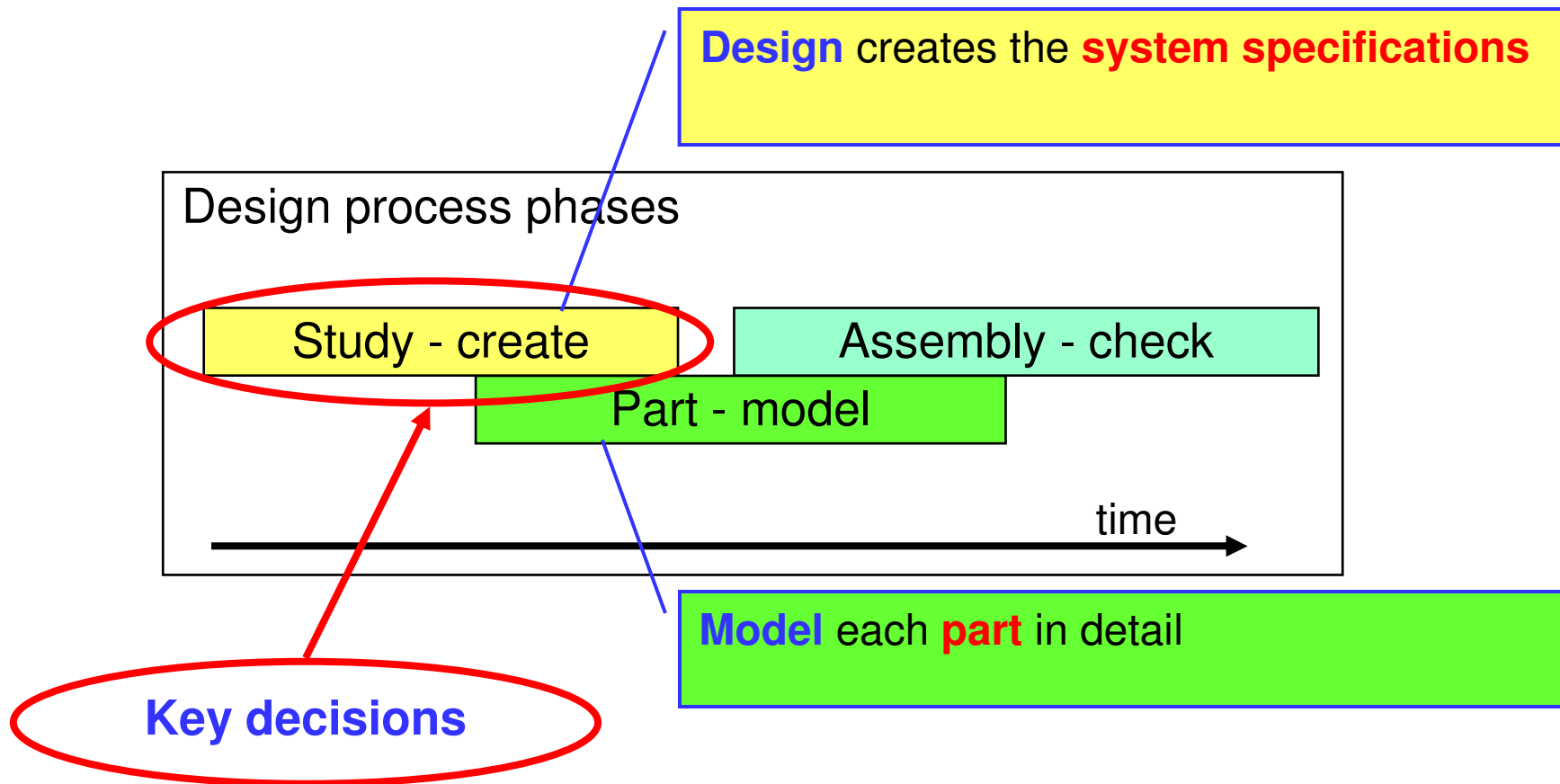
Competitiveness & Knowledge



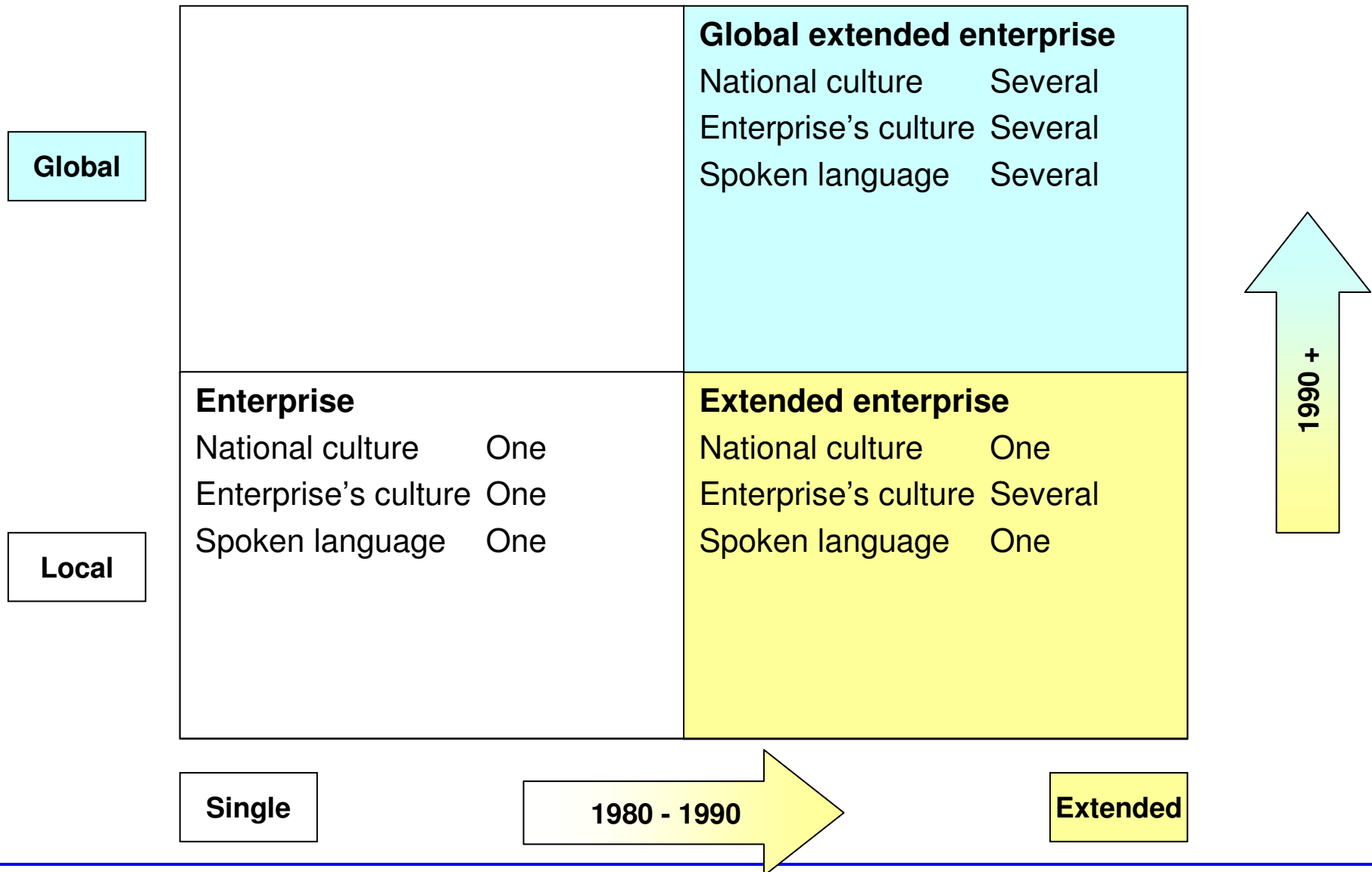
Manufacturing Technology & CAD Evolution



Design process



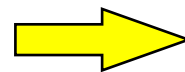
Enterprise & Business evolution



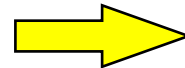
Customers' requirements impact

On product

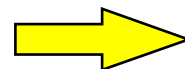
 Diversity

 More variants

 Freshness

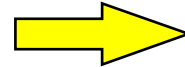
 Reduce Time to Market


 Complexity


 More parts per variant

On process

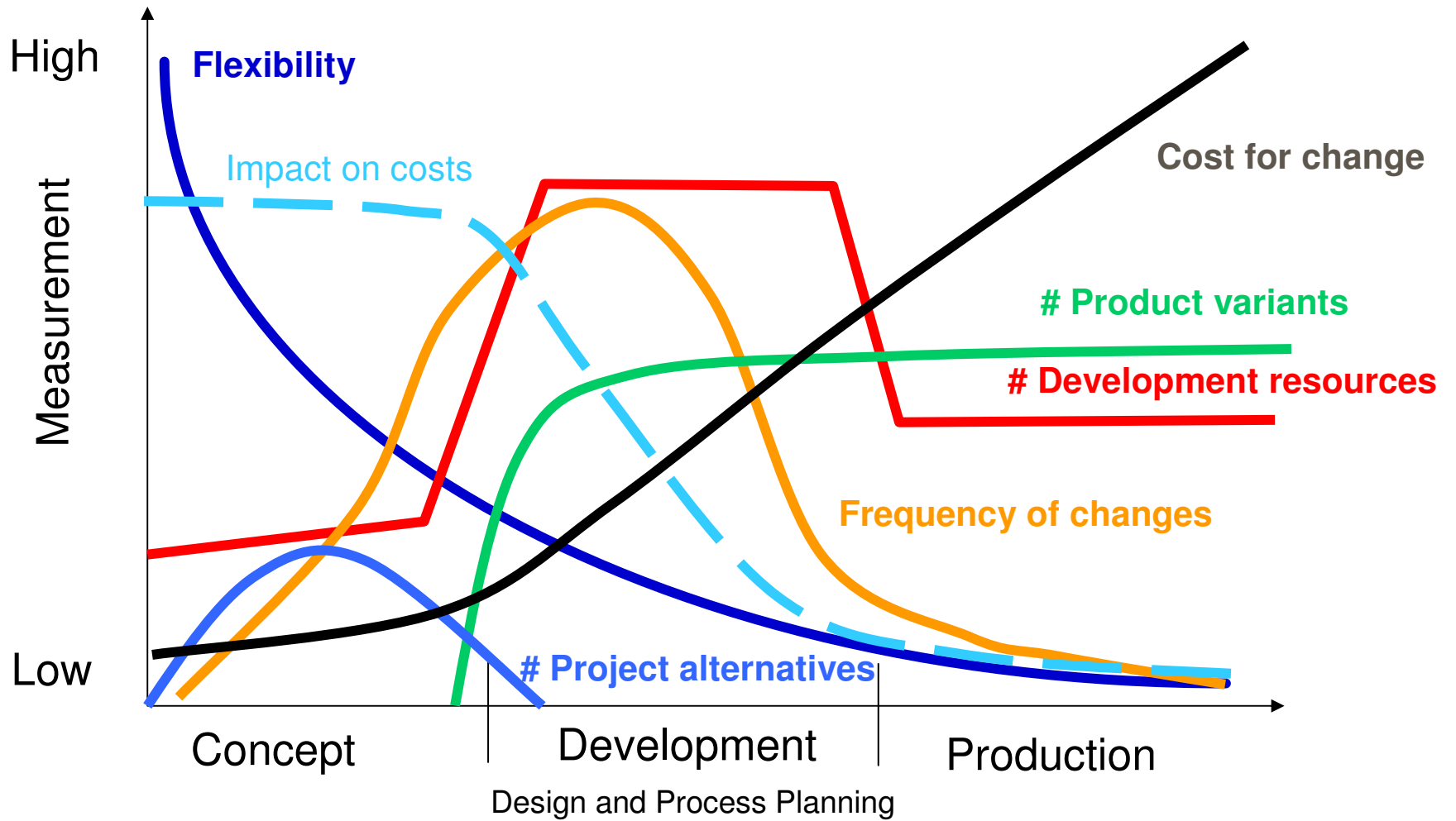
 Development time

 Concurrent Engineering
Digital Mock-Up
Simulation

 Decentralized R&D
&
Project Outsourcing

 Heterogeneous environment

Process Characteristics



Enterprise Objective & Product Development process

Enterprise's core value is **its products**
Building and delivering **Great Products**
that Customers are **Excited to Buy**

Market Requirements

- Higher performance (fuel consumption, weight, HP, etc.)
- Less pollution
- Higher product quality
- Higher reliability
- Lower product cost

**Accelerate
decision process**
T ↓ € ↓ Q ↑

Product Concept

Validated Product Alternatives

Alternative_1

Alternative_2

Alternative_n

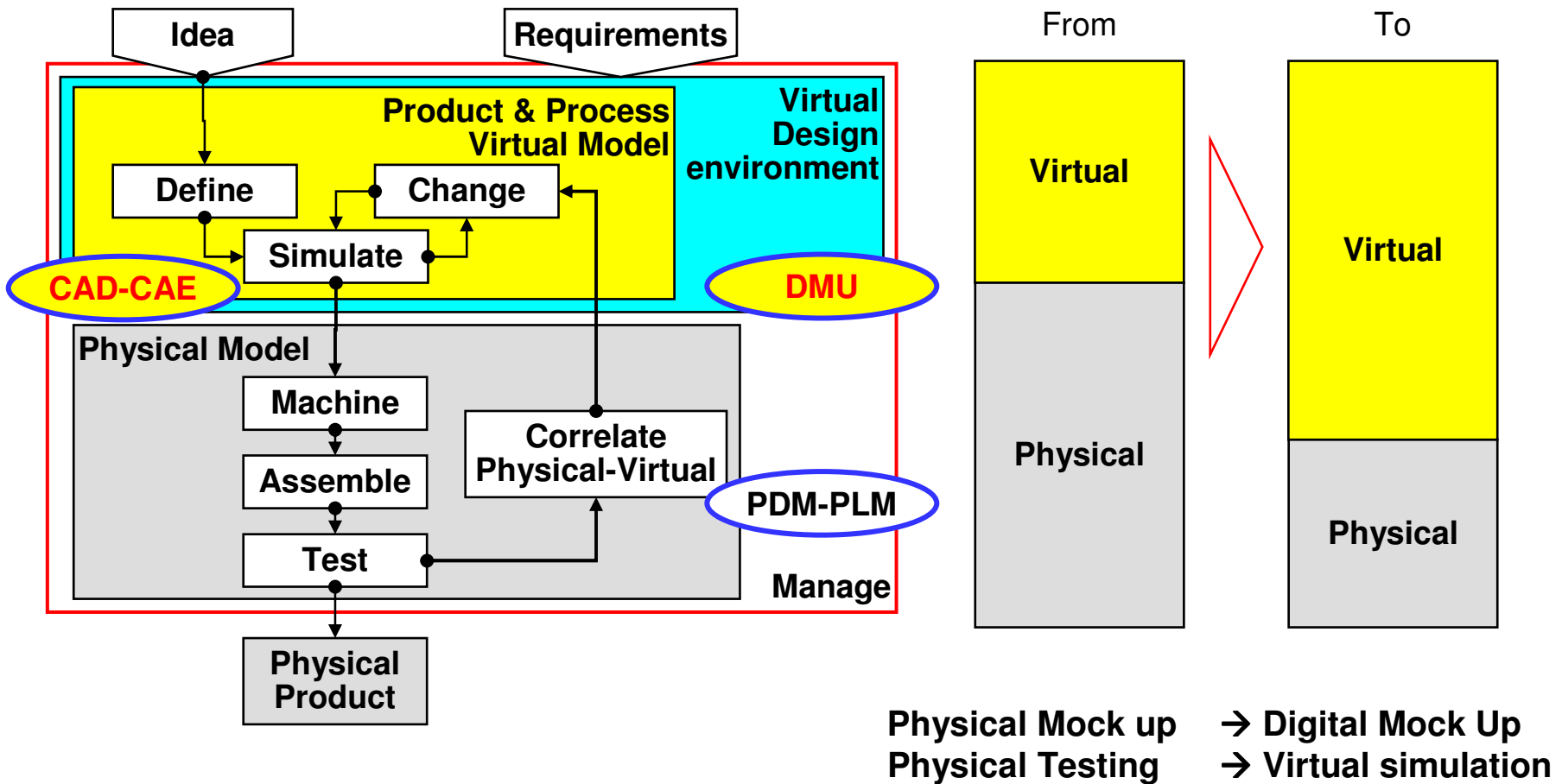
**Great
Product**

Product Development

**Develop
Great Product**

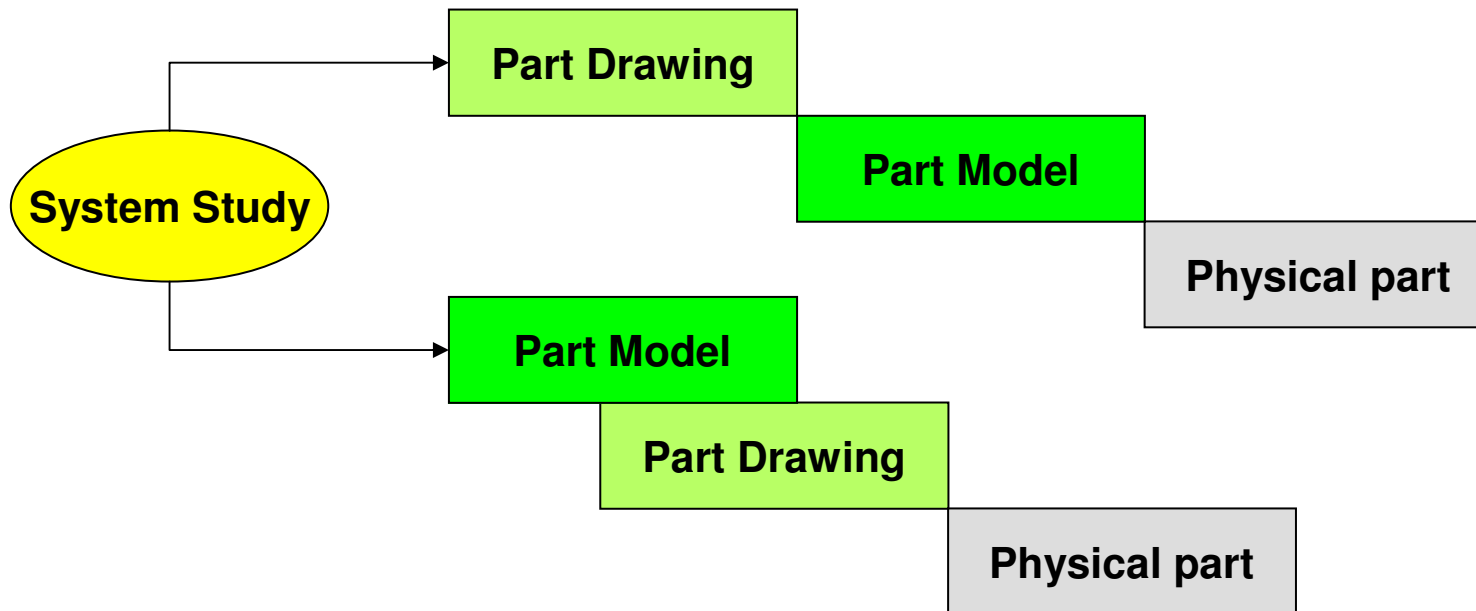
Process from Idea to Physical Product and Expectation

- Define and validate more alternatives
- Increase Product & Process virtual development



CAD Achieved advantages

- TTM reduction
- Part modeling
- Product Digital Mock up
- Product Complexity management
- Concurrent Engineering Enabler



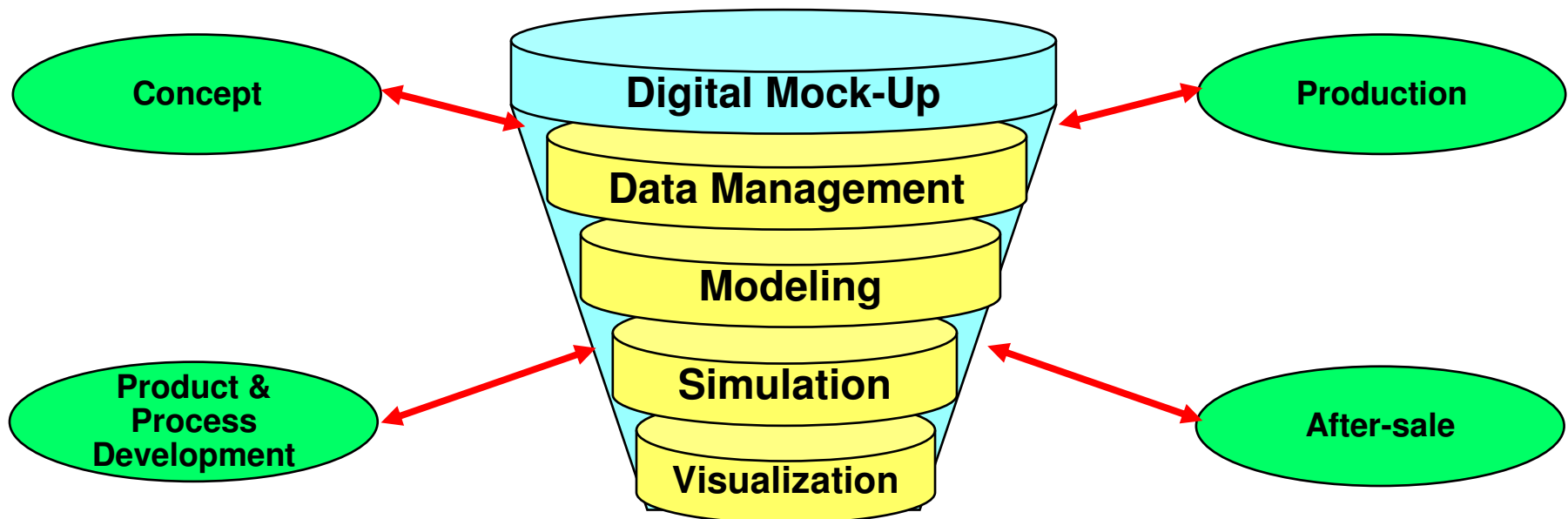
Digital Mock-up

Manage complexity
Ease transparency



Digital Mock-up is a ...

- realistic computer simulation of a product
- with all necessary functionalities to support design / engineering, manufacturing and product service environments
- which is used, within the extended enterprise, as a platform for
 - ▶ product and process development
 - ▶ communication, and
 - ▶ decision purposes
- from first conceptual layout up to maintenance and product recycling.



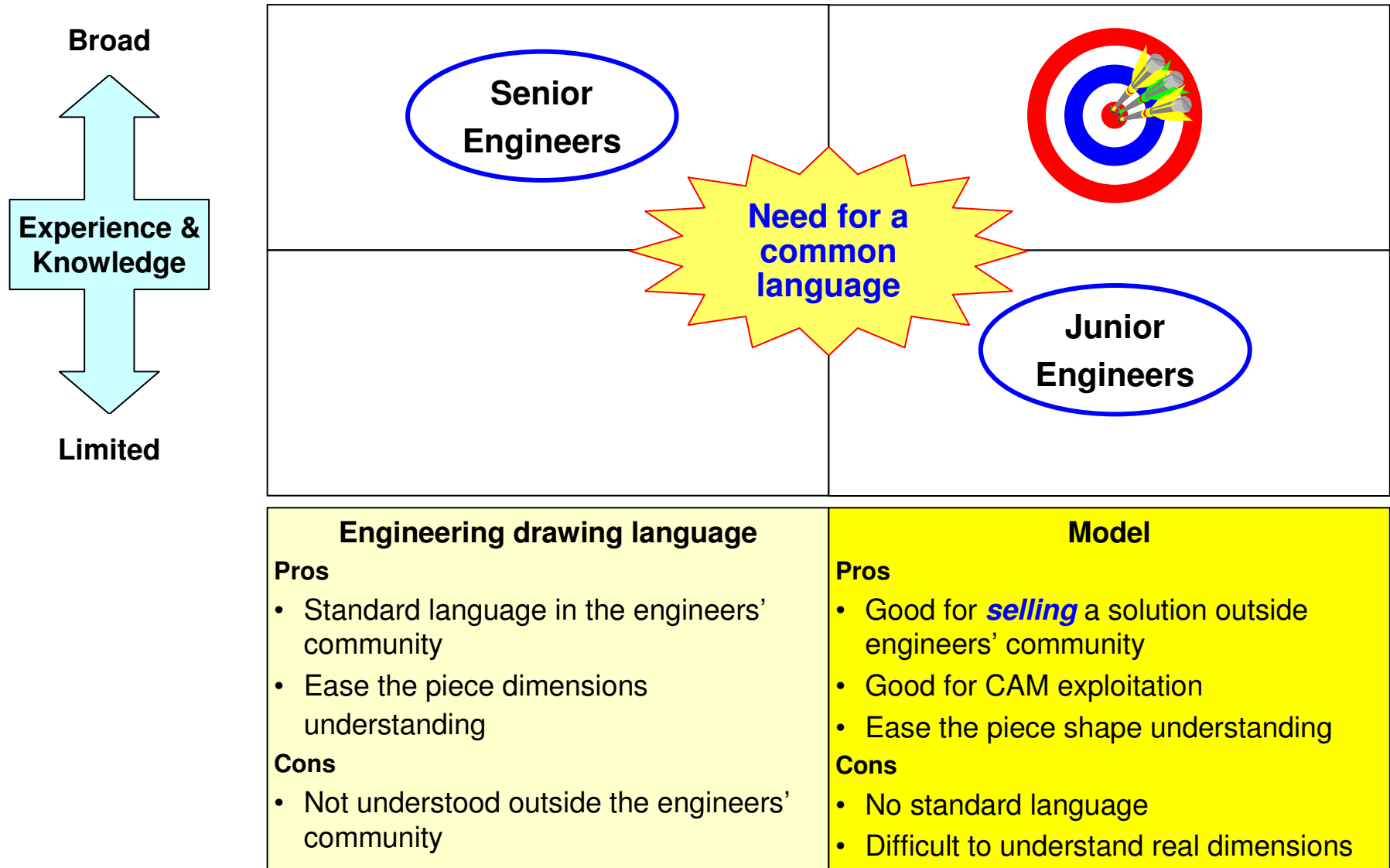
CAD implementation from Pilot project to Production

- Enterprise evolution
 - ▶ Enterprise → Extended enterprise → Global extended enterprise
- Enterprise priority
 1. Develop a good product concept
 2. Develop good parts' specifications (modeling & documentation)
- Pilot project
 - ▶ **Do the job with an ad-hoc selected and motivated team**
- Production
 - ▶ **Do the job every day, in every situation and with everybody**
- Effective communication in the global extended enterprise
 - ▶ Need for an evolving and agreed standard method and process
 - ▶ Use a standardized language independent of spoken languages

From Drawing board to CAD

- Enterprise culture must be an **evolution**, not a **revolution**
- CAD vendors message was **Modeling = Designing**
- Drawing board culture
 - ▶ Based on engineering drawing language
 - ▶ International standard, spoken language independent
- CAD culture
 - ▶ Based on modeling
 - ▶ Features have different meaning in different contexts, there is no international standard language, just enterprise's standards
- Communication troubles between
 - ▶ Senior designers with broad experience and Junior designers with limited experience
 - ▶ Product Engineering and Manufacturing Engineering

Culture and Language change



Change Culture – Wrong messages

We always did it in this way!

**All new ideas are OK!
Old stuff is rubbish!**

- Rethink the process in order to fulfill the enterprise needs
- People always developed the best synthesis between available **skills, knowledge** and **tools**
- Do the same with new knowledge and new tools, as new technologies are just enablers for the people's skills

Mechanical Design Vs ECU Design

- Design
 - ▶ Conceptual level
 - ▶ Detailed level
- Coherence between levels is a must as complexity increases

Mechanical Design Vs ECU Design

- Mechanical Design
 - ▶ Difficult to maintain coherence based on geometry
- ECU Design
 - ▶ Coherence is achieved

Implementation Strategies and Key factors

- The management support is a key factor for success
 - ▶ Help culture change
 - ▶ Motivate people
- Plan the transition and the implementation project by project
 - ▶ Do not mix old and new approaches – synchronization problem
- Effective communication in the global extended enterprise
 - ▶ Need for an evolving and agreed standard method and process
 - ▶ Use a standardized language independent of spoken languages
- Find tactics to lower the impact on process and people
 - ▶ Merge Model and Engineering Drawing language
- Remember that
 - ▶ People and Process are your main assets
 - ▶ Tools are just enablers