Embedded Systems INSTITUTE

Industry-as-Laboratory: a research format for high-tech industry?



Ed Brinksma
Embedded Systems Institute,
Eindhoven, NL

Artemis & Itea Co-summit,
Rotterdam, October 22, 2008

Central Issue

Embedded Systems INSTITUTE

What are suitable research formats for open-innovation research for the European high-tech industry?

Session Programme

Embedded Systems INSTITUTE

- Ed Brinksma (ESI, NL):
  The Industry-as-Laboratory Concept
  for High-Tech Systems
- Jozef Hooman (ESI, NL):
  An Industry-as-Laboratory Project: TRADER
- Kim Larsen (CISS,DK):
  CISS - Interaction between Danish Industry and
  Research on Embedded Systems

Session Programme

Embedded Systems INSTITUTE

- Ed Brinksma (ESI, NL):
  The Industry-as-Laboratory Concept
  for High-Tech Systems
- Jozef Hooman (ESI, NL):
  An Industry-as-Laboratory Project: TRADER
- Kim Larsen (CISS,DK):
  Academic-Industrial Research in Denmark:
  The DaNES Project

The European Context

Embedded Systems INSTITUTE

- **Embedded systems & technology represent great economic and societal value for Europe**
  - *strong high-tech industry*
  - *source of new economic activities*
  - *enabling solutions for economic and societal challenges*
- **Strong organizational basis**
  - *national competence clusters*
  - *successes past programmes (EU IST,EUREKA ITEA,MEDEA)*
  - *new structures: ARTEMIS, ENIAC*
- **Need to grow productive European & national ecosystems**
  - *joint research agendas*
  - *sharing knowledge, resources,networks*
  - *developing open innovation models*

High-tech ecosystem trends

Embedded Systems INSTITUTE

- **Growing complexity high-tech systems exceeds span of control of individual companies:**

  multidisciplinarity, technology development by suppliers
- **R&D expenditure under pressure**

  OEMs: global competition

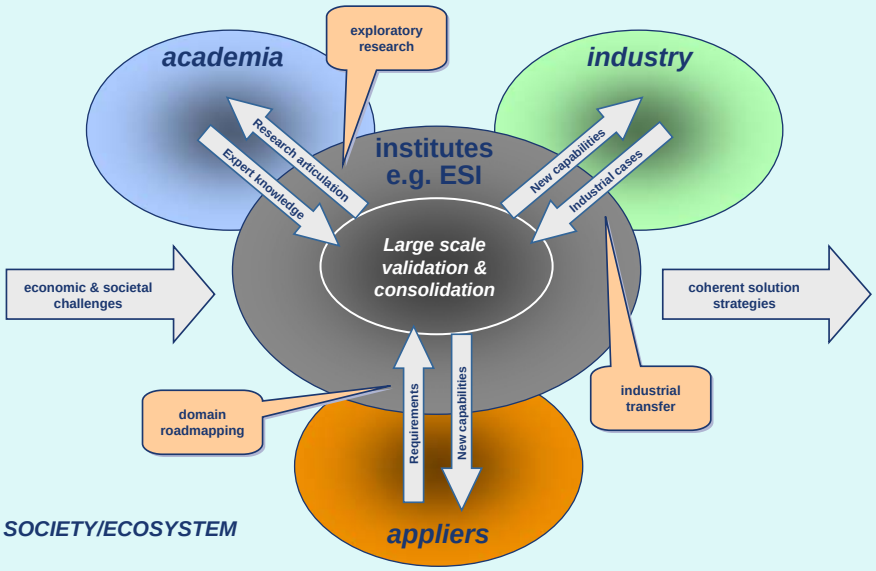
  SMEs: limited resources
- **R&D shifts from individual companies to ecosysteem (open innovation).**

  Unclarity about direction, financing, final responsibility, knowledge consolidation.

  Great need for neutral entities with a coordinating and integrating role in kinowledge creation and consolidation.

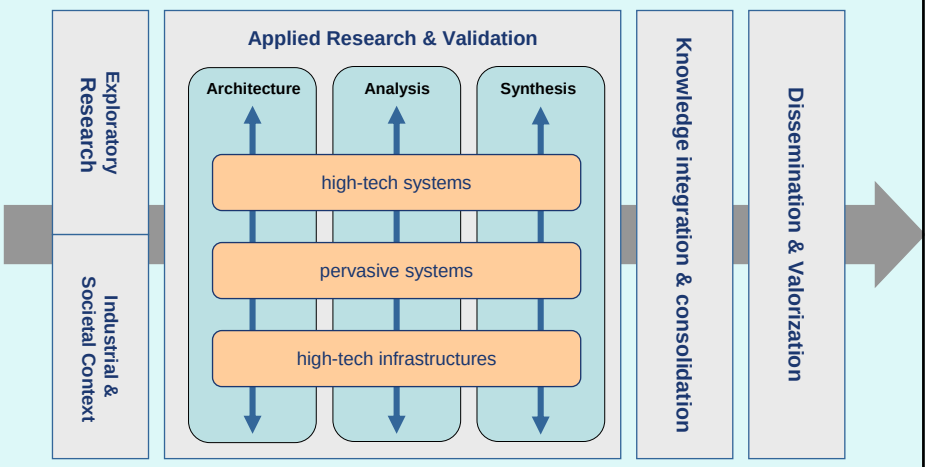
Validation & consolidation in ecosystem

Embedded Systems INSTITUTE



ESI programme structure

Embedded Systems INSTITUTE



ESI Research Collaboration (national funding)

Embedded Systems INSTITUTE

2008: approx. 150 fte

Industrial Network

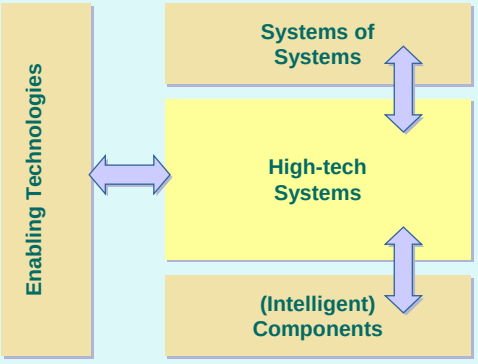
Academic Network

ESI

Research cooperation with leading Dutch high-tech multinational industries & SME's

Research cooperation with all Dutch universities with embedded systems research

Focus: high-tech system integration

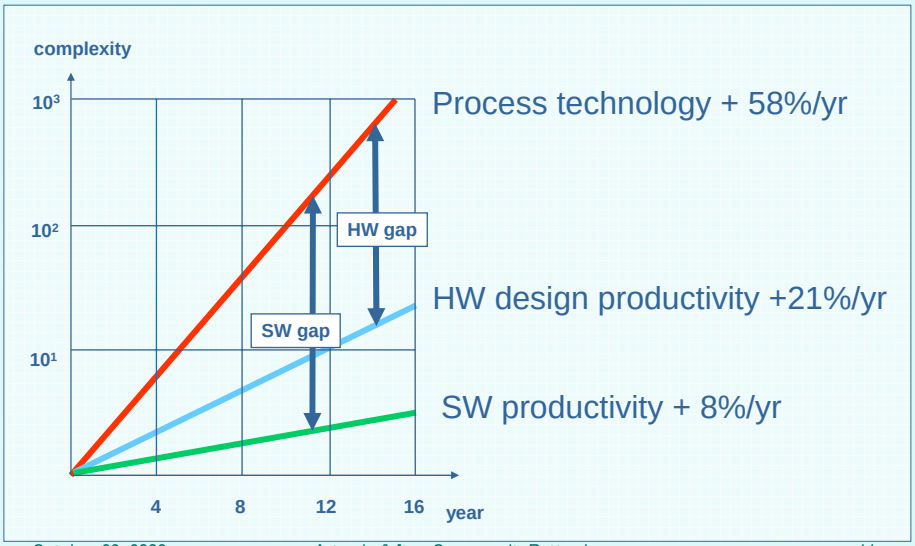


Boundaries are vague:

- increasing openness: networked systems
- increasing miniturization: systems on chip

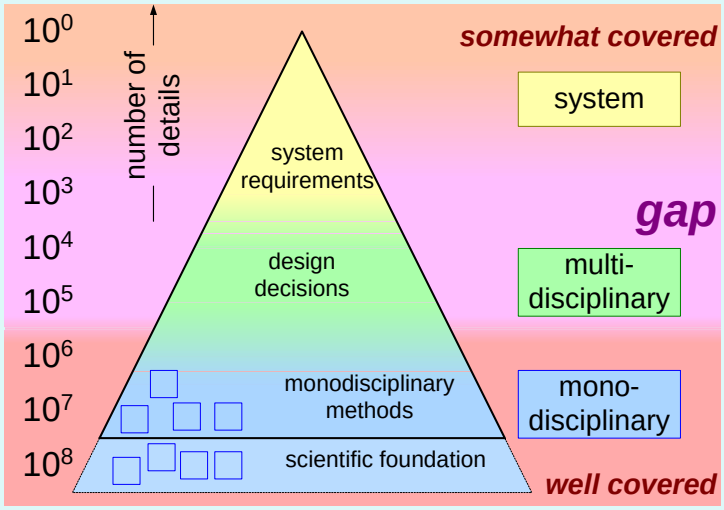
The productivity gaps

Embedded Systems INSTITUTE

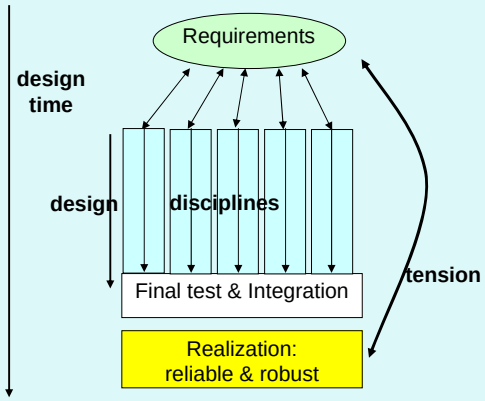


The design gap

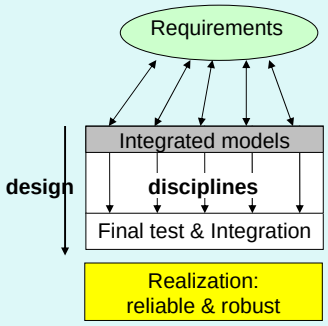
Embedded Systems INSTITUTE



Late integration problem



Current practice
early partitioning



Advocated practice
early integrated modeling
late partitioning

System design tensions

Trade-offs between crucial *cross-cutting* design objectives:

- **Performance**
  quantified hard and soft real-time behaviour, use of resources, optimization of cost functions, etc.
- **Dependability**
  availability, reliability, safety, integrity, confidentiality
- **Evolvability**
  easy modification or extension by re-use of available design assets, product families, generic system components, etc.
- **other -ilities**

A bewildering variety

Embedded Systems INSTITUTE







	Digital Television	Lithography Systems	Medical Systems	Mobile Phones	Automotive Systems	Digital Printers	Military Systems
Life Span	Medium	Long	Very Long	Very Short	Long	Long	Very Long
Lead Time	Short	Short	Medium	Very Short	Long	Medium	Long
Volume	Very High	Low	Low	Very High	Very High	Medium	Low
Cost	Very Low	High	High	Very Low	Medium	Medium	High
Feature Extension	Growing	Medium	High	Growing	Growing	Low	Growing