Micro-assembly
Sophisticated architectural approaches

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Philips Innovation Services
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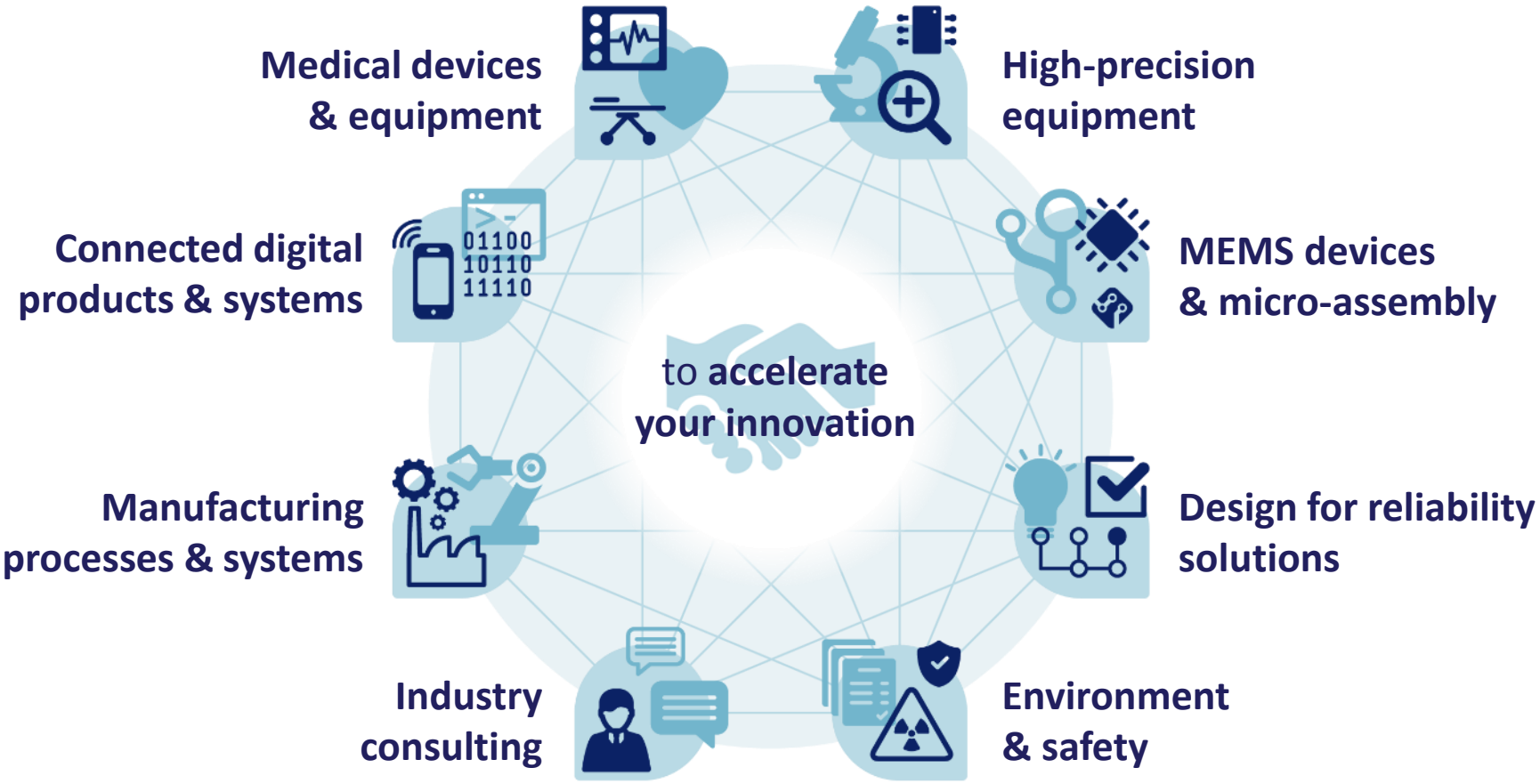
Introduction

Key areas of expertise Innovation Services



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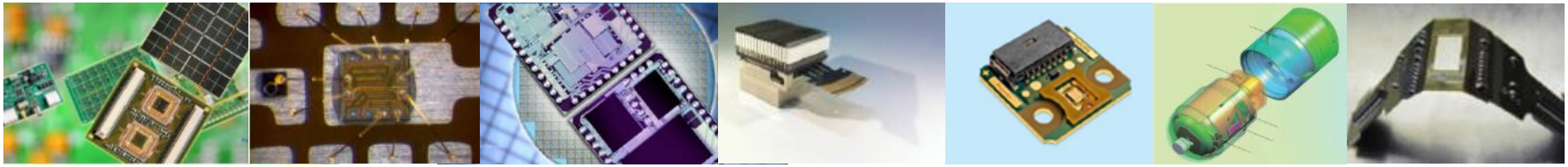
Trends in micro-systems

Increased functionality

Miniaturization

Increased commoditization

Increased freedom of design needed



These trends lead to design conflicts

Increased functionality	⟷	Smaller size
More power dissipation	⟷	Less cooling area
Low cost materials	⟷	High accuracy requirements
Temperature restrictions	⟷	Higher process temperatures
3D product geometry	⟷	2D assembly processes
Lower price targets	⟷	More complex processes

Sophisticated architectural approach needed!

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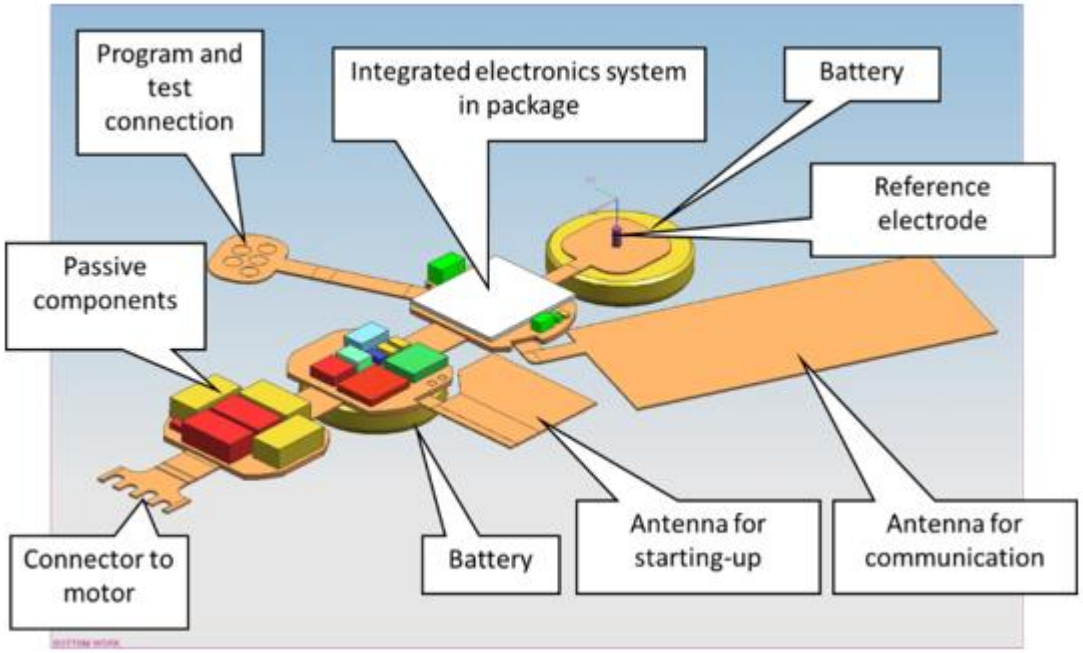
Example of a micro-system device

Smart electronic pill



Flex is the carrier onto which the different components are placed

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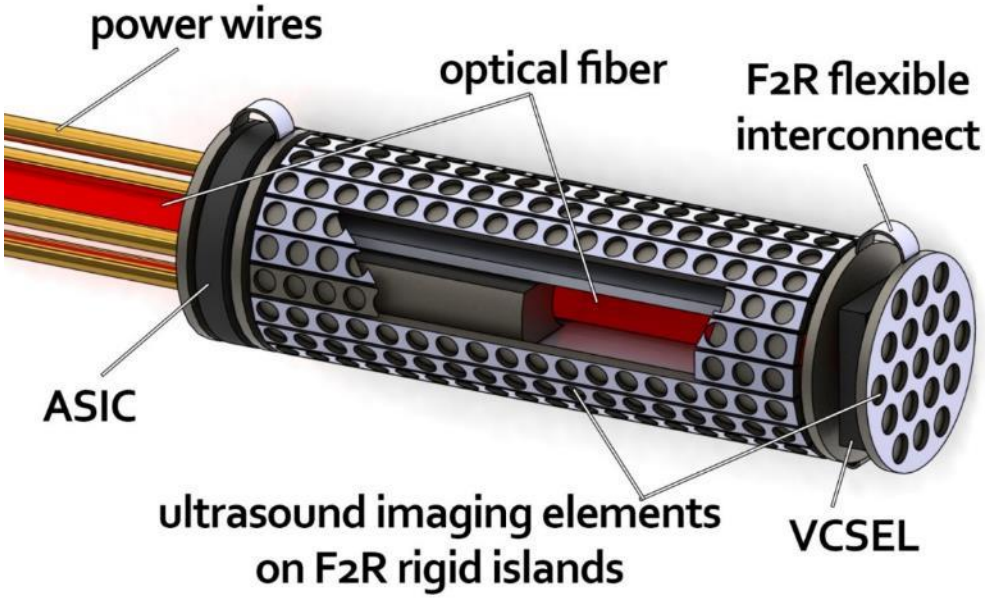
But what if we want to do this?

Smart catheters

- IVUS on a guide wire with optical data link
- Ø 360 µm!



IMIT: Instruments for Minimally Invasive Techniques

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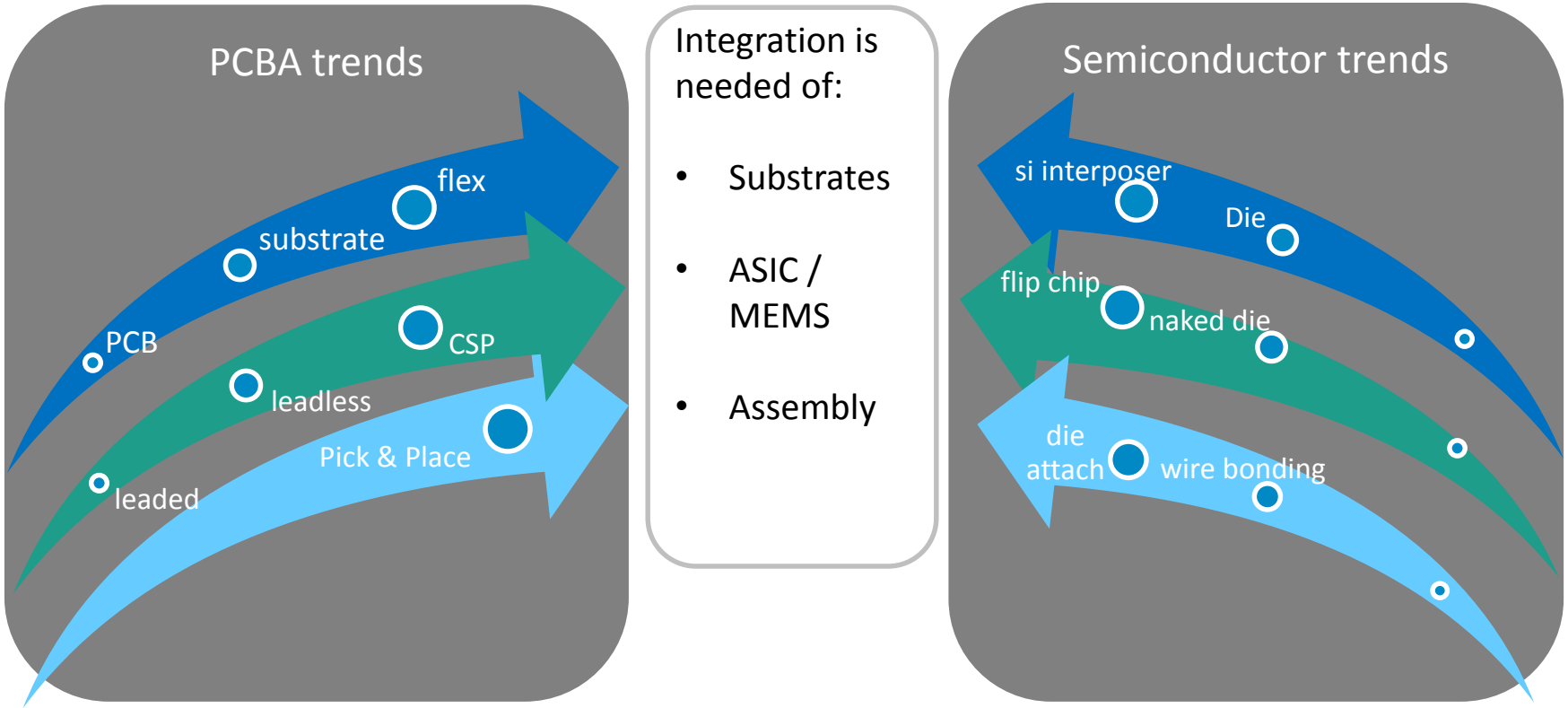
Manufacturing and design trends

Integration of technologies



New applications require technologies that bridge the gap between the conventional worlds of semiconductor and PCB assembly

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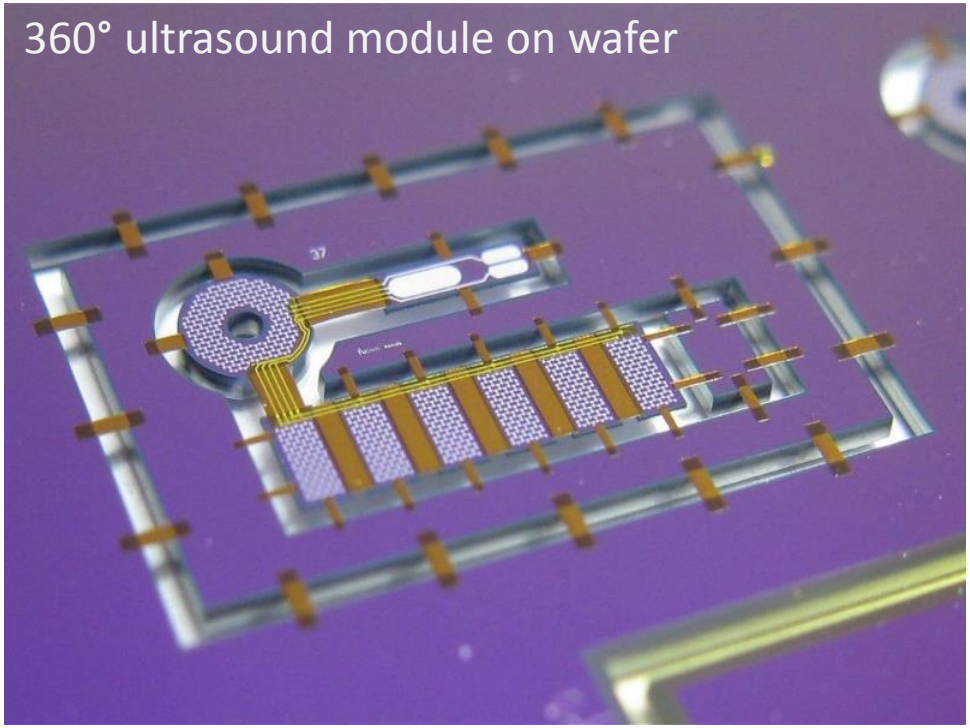
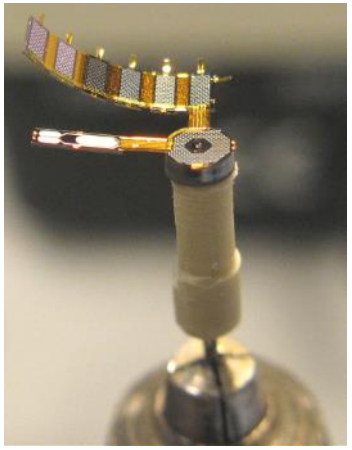
Flex-2-Rigid platform enables further integration

Flex on wafer: integrates MEMS/Actives and flex circuit



- ✓ Highly flexible interconnects
- ✓ Based on micro fabrication
- ✓ Arbitrary shape devices
- ✓ Platform technology



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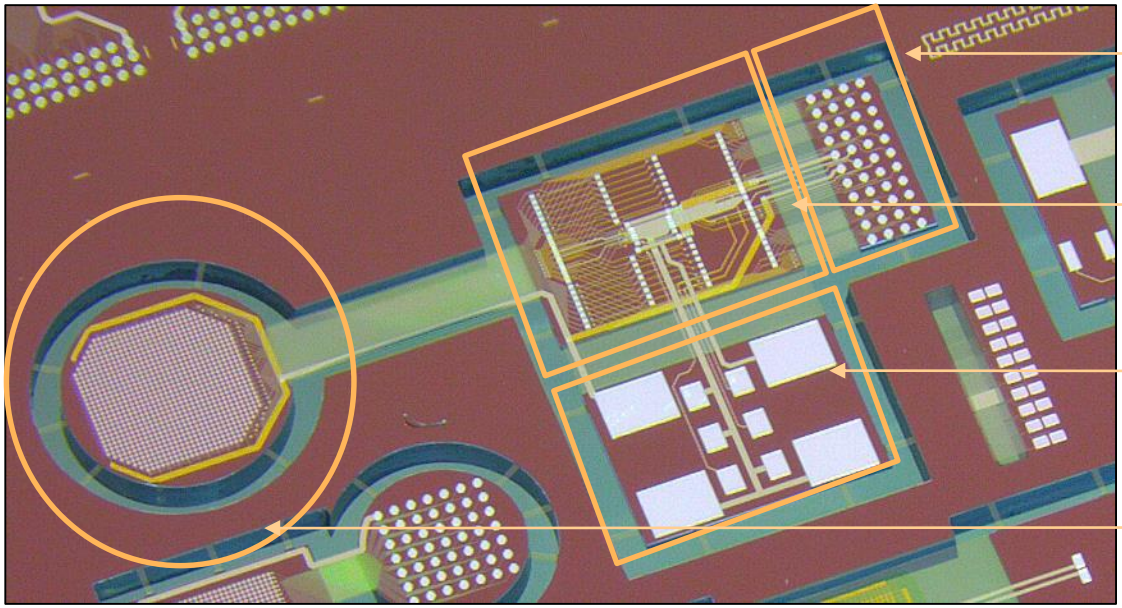
Integral micro-system design

Example: forward looking Inter-Cardiac Echo (ICE)



- Lay-out of F2R to accommodate required functionality
- Definition of functional building blocks in combination with interconnect technologies
- Co-design F2R silicon islands and ASIC/Connector

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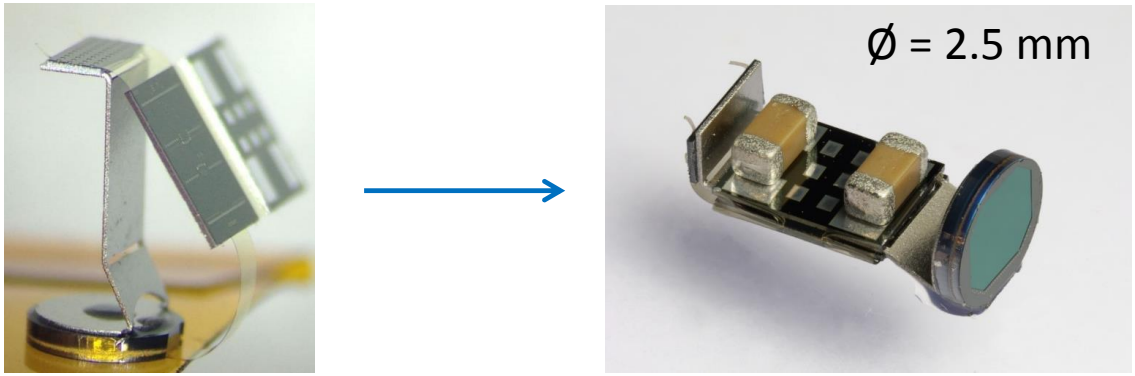
Integral micro-system design

Example: forward looking Inter-Cardiac Echo (ICE)

- Assembly of ASICs and passive components on 2D surface
- Attachment F2R substrate to carrier
- Folding of F2R substrate to create 3D structure



Combination and integration capabilities within Philips Innovation Services

- MEMS foundry : thin film technology and MEMS manufacturing
- Micro-assembly : interconnects to active devices and external wiring
- Device assembly : micro machining with laser and catheter assembly

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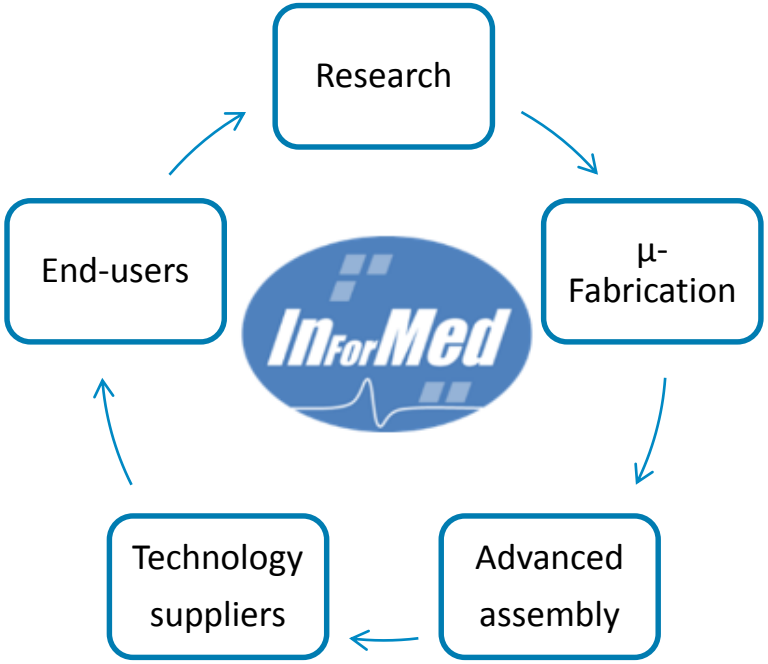
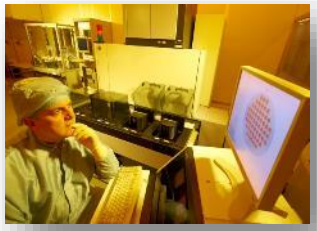
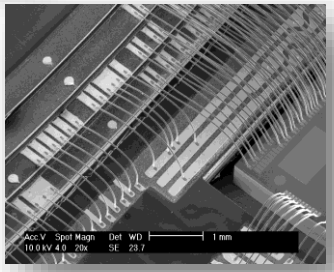
ECO system in progress

Integrated pilot line for medical devices

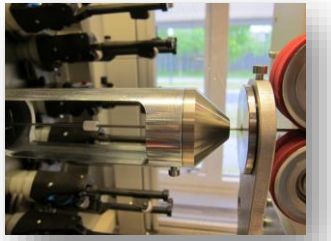




Micro-fabrication medical devices



Micro-assembly & prototyping die/board interconnects



Smart catheter prototyping

ECSEL Joint Undertaking

Grand no: 2014-2-662155

- 35 participating organizations
- 10 countries

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Key take-aways

How to realize the next generation micro-systems?

- Further increasing functionality and design freedom and at the same time decreasing size and cost **creates design conflicts**

- Therefore **integration of components and processes** is necessary

- **Flex to rigid technology** is a perfect carrier for an integral development approach:
  - Integration of MEMS elements and silicon interposers for interconnects
  - Co-design of ASIC's and F2R silicon interposers
  - Flex foil allows for 2.5/3D design freedom.

- **Early involvement of assembly** is essential to safeguard manufacturability
  - Interconnect technology selection, e.g. soldering, joining, wire bonding, coating
  - 2D assembly followed by folding to create a 3D structure

More information?

- Direct contact

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