

How can Brazilian industry (SMEs in particular) benefit from European and Worldwide Developments in the Sector of Electronics?

ABINEE TEC 2007 Innovation Forum Brasil-Europe

Helmut Kergel

VDI/VDE Innovation + Technik GmbH

Berlin/Germany

- Independent daughter company of
 - VDI (Association of German Engineers) and
 - VDE (Association for Electrical, Electronic & Information Technologies)
- Founded 1978, 120 interdisciplinary employees
- Supports and accompanies innovation processes at the link of research/technology, economics, and politics
- Specific emphasis on the needs of small/medium size enterprises
- Contracted by governments (EU, federal, state, city), industry, and financial investors
- Main technology focus: Microsystems technology, Multimedia
- Increased international activities in the area of initiation and implementation of regional innovation and high-tech policies
- Largest contract: Federal Ministry of Education and Research for design, execution and monitoring of the national funding programme „Microsystems Technology“ in Germany (public spending > 50 M€/a) (= R\$ 150 million)

„Electronics Sector“ – An Approach for Description

- Electronic (end-)products (Mobile phones, PCs, consumer electronic goods, ...)
- Industrial electronics (automation technology, sensors, ...)
- Components (semiconductors, passives, PC-boards, ...)
- Materials (silicon, polymers, ceramics, precious metals, ...)
- Manufacturing equipment (lithography, etching, assembly, soldering, ...)
- Measurement, test, quality control (in-circuit tester, optical inspection equipment, ...)
- Services and software
- ...

→ Products of the „Electronics Sector“ are keys for innovation in nearly all industrial branches

Brazilian Electronics Market

- Increasing market with more than 10 % yearly growth
- Large domestic market (180 mio. people), therefore:
 - Electronics imports grow by > 20 %/a
 - Electronics exports grow by < 5 %/a
- The main exported electronic products:
 - Mobile phones (\approx 2.8 bn US\$ in 2006*)
 - Automotive electronics (\approx 0.7 bn US\$ in 2006*)
- The main imported electronic products:
 - Semiconductors (\approx 3.5 bn US\$ in 2006*)
 - Components for telecommunications (\approx 2.0 bn US\$ in 2006*)

- Brazilian trade balance deficite is increasing due to growth of the electronics market!
- The introduction of digital TV in Brazil will further accelerate this problem!

* figures according elctronicAmericas 2007 / Munich-Messe website

The „Brazilian Challenge“

Economic view, first priority:

- Decrease the dependency on imports
- By strengthening the electronics components supply from domestic sources

This means:

- Initiation and implementation of a broad and networked industrial infrastructure in the area of electronics
- Increase research and development, industrial R&D in particular
- Enforce entrepreneurship

The overall aim: To become internationally competitive !

Economic Development with High-tech – General Remarks

- Economic Development based on high-tech should be grounded equally on:
 - Research and development
 - Industrial exploitation and implementation
 - Education
- An unique and holistic strategy is required, taking into consideration the existing situation, the strenghts in particular
- Attractiveness on an international level for researchers and industry is required in order to attract foreign investments
- Public funds are necessary, but not sufficient – private capital has to be activated

“People are the basis!”

Thesis: High-tech Education and Training „pushes“ the implementation of high-tech!

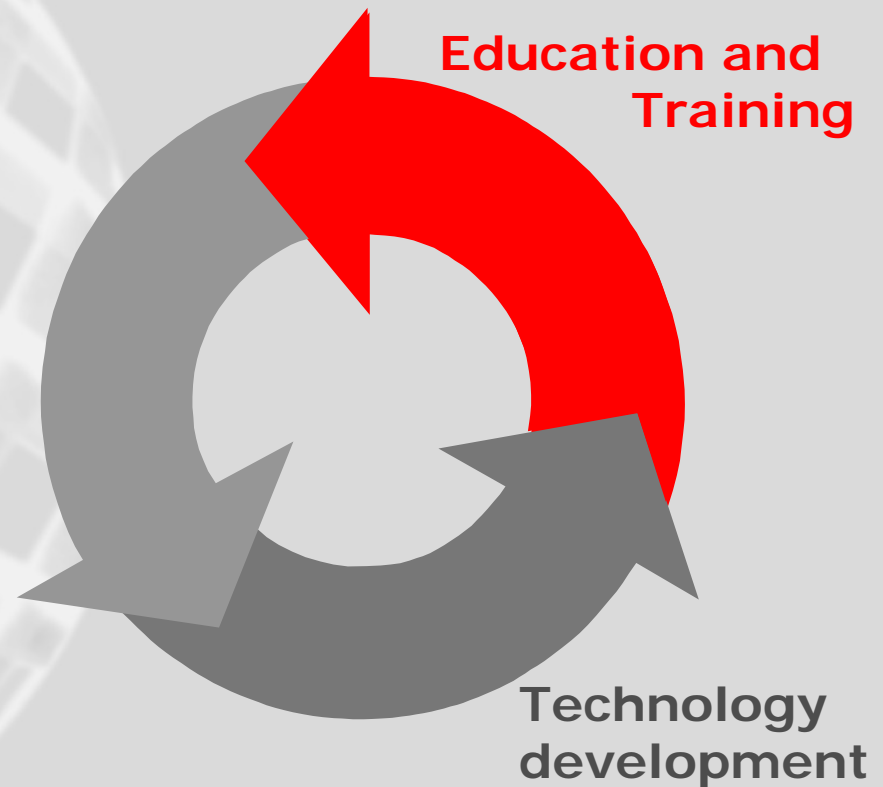
Premises:

- Key technology
- Dynamic development
- Various fields of application
- ...

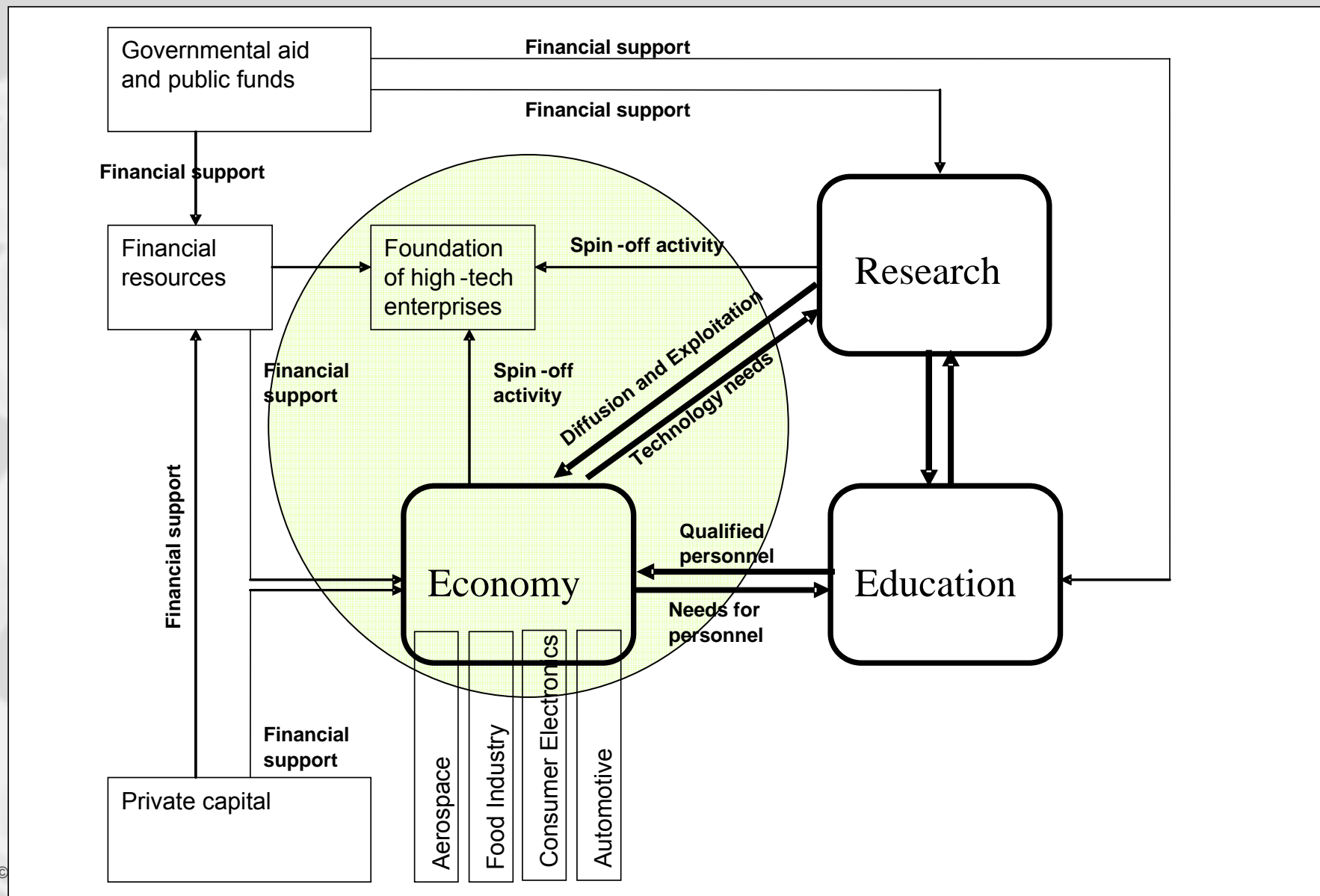
Diffusion

Aim of the measures and activities in the area of education and training:

- To accelerate the wide implementation and further technology development



High-tech and Innovation (Regional) Development Model



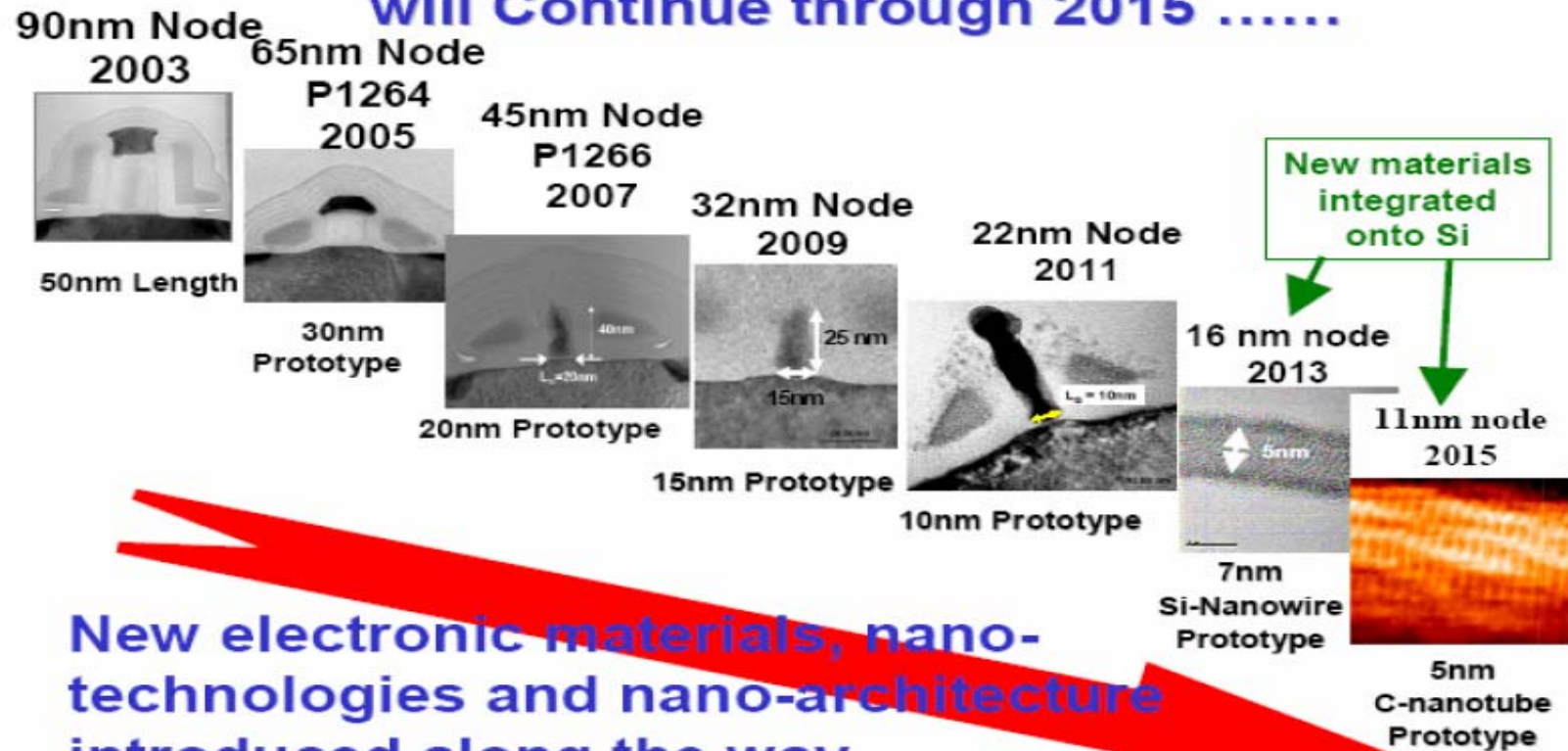
Worldwide Trends in Microelectronics/Electronics

- General Trend: „from components to systems“
- Make use of the the functionality increase and cost decline to identify and develop new application areas for electronics/microelectronics (automotive, consumer, industrial technology, ...)
- Technological approaches:
 - Systems on chip: „More Moore“
 - „More than Moore“ and Hetero-Integration

More Moore....

... double number of devices on chip every 18-24 months ...

Silicon Transistor Scaling and Moore's Law will Continue through 2015



Following the trend „More Moore“ ... becoming smaller

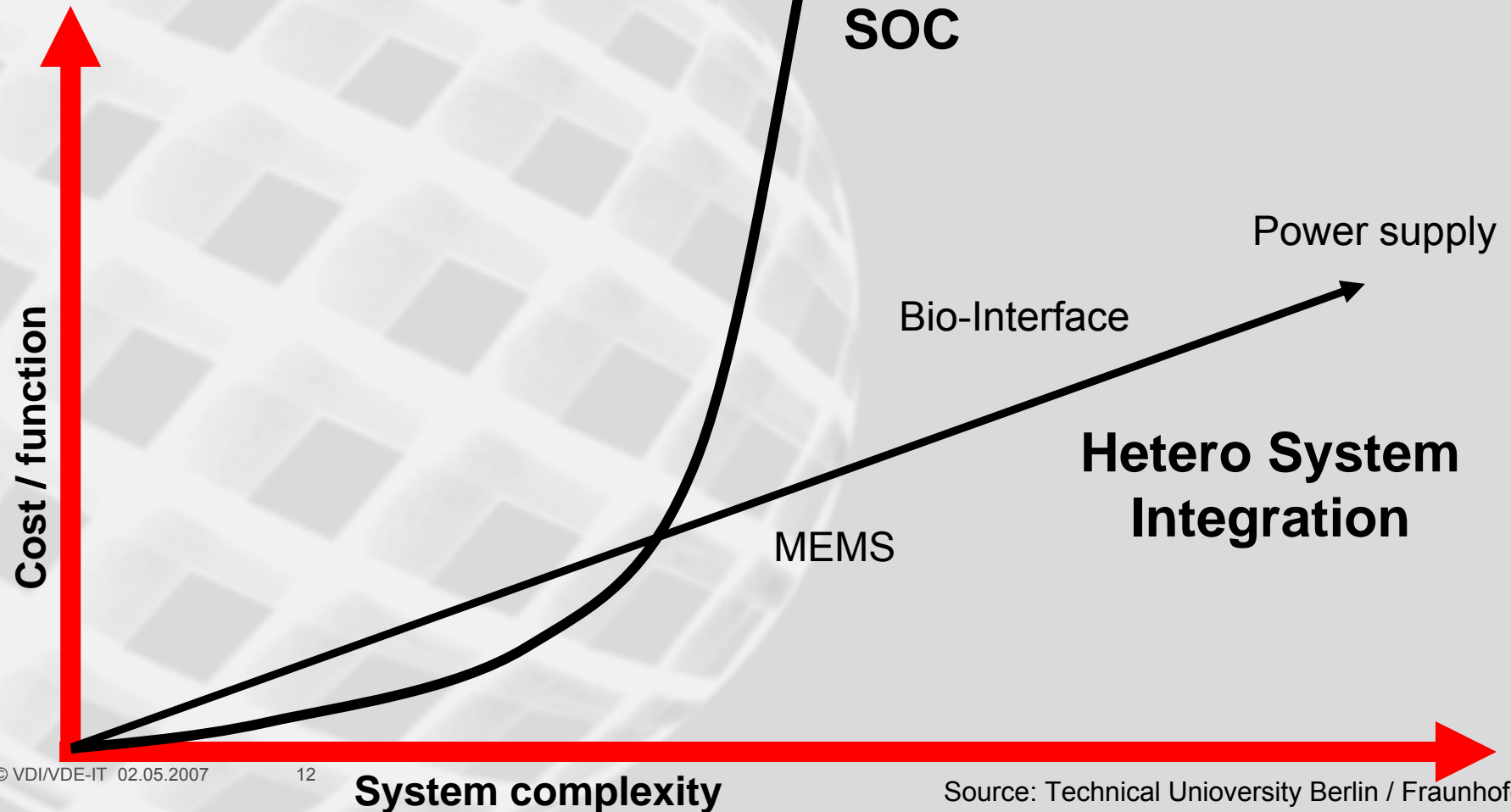
- Worldwide competition of global players
- Enormous investments for new facilities required
- Strategic alliances among global players required to cope with the technical and economical challenges

No business for industry (SMEs in particular), when starting now!

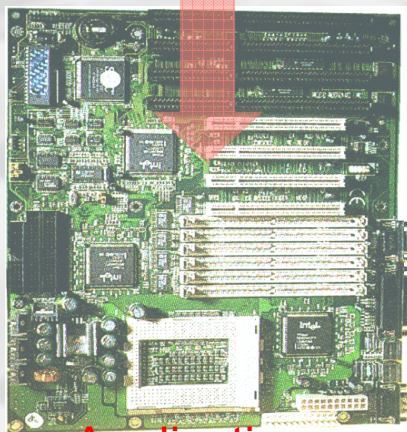
Following the trend „More than Moore“ ... becoming smarter

Innovation + Technik

Smart Systems, Systems in Package, 3-D Integration, Hetero-Integration, Microsystems



„More than Moore“ - Miniaturisation by Hetero System Integration



Applications



Medical

Automotive

Telecom

SiP



Telecom:
RF, MEMS, optical, high density

Medical:
bio-MEMS, human interface, reliability

Automotive:
MEMS, high temp, high power, reliability

Logistic & Security: ultra low cost, sensors

Drivers

- Functional integration
- Simplifies solution
- Lower cost
- Smaller footprint
- Thinner profile
- IP integration
- Higher reliability
- Environmentally friendly

Following the trend “More than Moore”:

Smart Systems Integration - The Basis for Future Products

Smart Systems, Systems in Package, 3-D Integration, Hetero-Integration, Microsystems ...

- are able to diagnose a situation, describe it and qualify it,
- mutually address and identify each other,
- are predictive,
- are able to decide and help to decide,
- enable the product to interact with the environment.

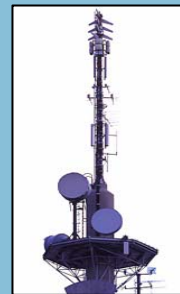
They are miniaturised, networked, energy autonomous and highly reliable.



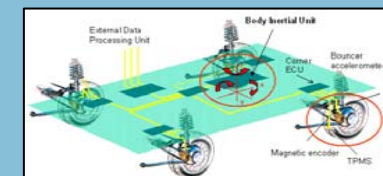
Smart biotest



Smart RFID



Smart Antenna



Smart car

European Situation in this Global Competition

- „More Moore“ is concentrated in a limited number of regional technology clusters, strongly supported by the national governments:
 - Grenoble/France
 - Leuven/Belgium
 - Dresden/Germany
- Massive spendings by national governments and the European Union for research and development („More Moore“ and „More than Moore“)
- R&D in the area of „More than Moore“ and Hetero-Integration is becoming more and more important and increasingly being in focus of national funding, and European funding in particular

Grenoble/France:

- Complete value added chain with a specific focus on R&D and micro-/nano electronic components manufacturing
 - > 90 enterprises, > 16.000 direct jobs
 - > 3 bn € (8 bn R\$) investments during the last five years
- Opening of MINATEC in March 2006 with planned yearly investments of 300 mio. € (800 mio R\$)
- Crolles2 industrial alliance:
 - Co-operation STMicroelectronics, NXP (Philips), Freescale (Motorola)
 - Baseline CMOS processing: 90 nm, 65 nm, 45 nm, goal 32 nm
- CEA-Leti co-operates mostly with local industry (STMicroelectronics in particular) and is less networked with international activities (following national interests/policies)



Leuven/Belgium

- IMEC (Interuniversity MicroElectronic Center) is the largest European (non-profit) research centre of micro and nanotechnology
- Together with the Katholieke Universiteit of Leuven this is the core of the Belgian microelectronics and nanotechnology cluster
- Main research domains:
 - Process technology: sub-45 nm CMOS (similar to Grenoble)
 - Packaging technologies
 - Next generation mobile and data communication
- The IMEC business model allows and supports entrepreneurship and spin-outs, 85 start-ups until now
- The industrial research partners of IMEC are international global players like NXP, Chartered Semiconductors oder TSMC
- IMEC does not have many linkages to regional industry



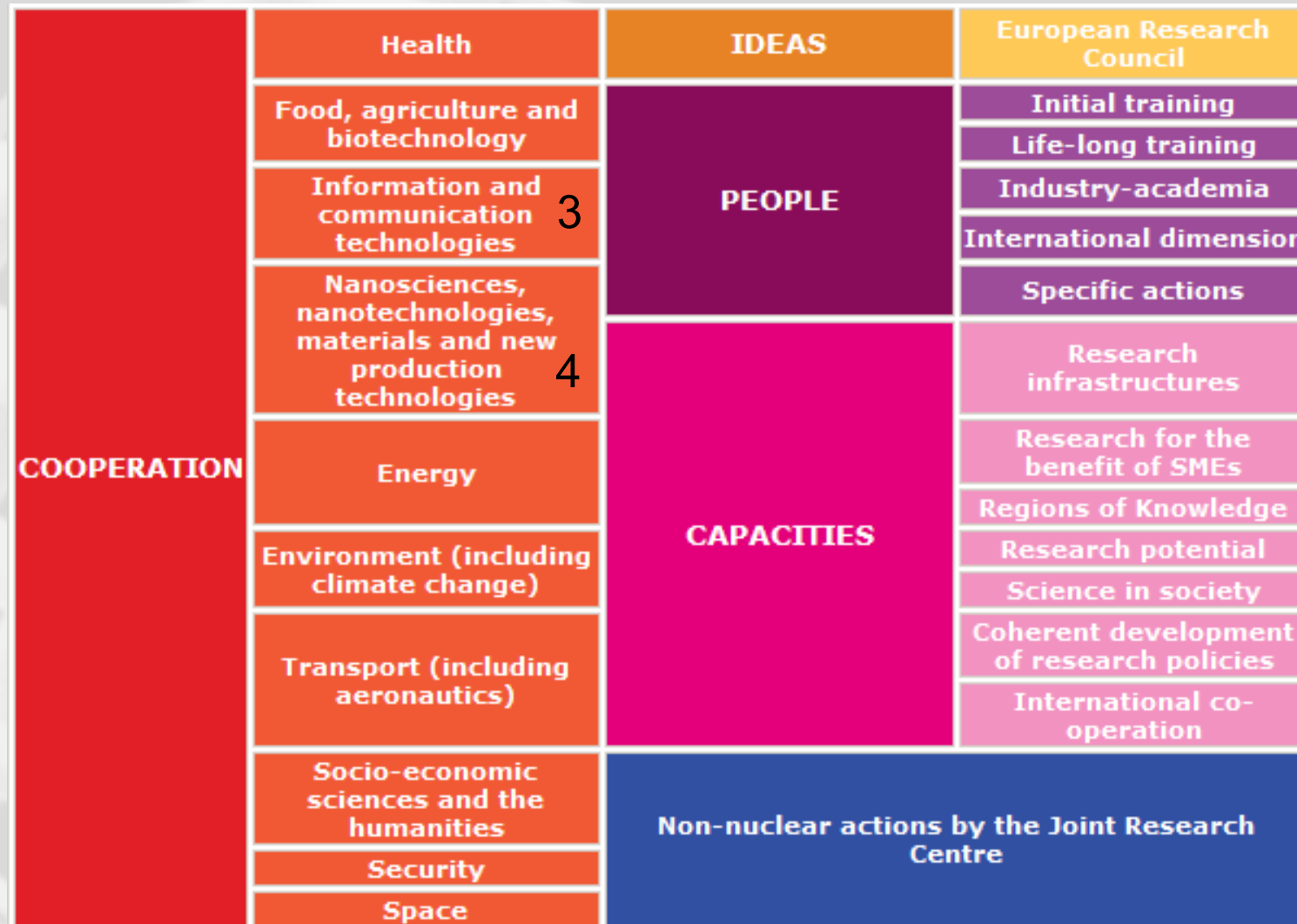
Dresden/Germany

- Microelectronics/Electronics centre of former East-Germany (before 1990) with enormous concentration of activities in the areas of semiconductor technology, packaging and PCB-board manufacturing and assembly, materials, equipment, ...
- After 1990: National policy to maintain the workforce, know-how, etc.
 - Massive public support for universities (Dresden, Freiberg, Chemnitz) and other research institutes (Fraunhofer, Max-Planck, ...) in the area
 - Massive public support to Infineon/Siemens for setting up the first 300 mm facility (estimation > 500 mio. € \approx 1.3 bn R\$)
 - Public support to AMD for building Fab 30 and 36 (investments by AMD until today: 4.7 bn US\$ \approx 9.4 bn R\$)
 - ...

Europe: Seventh Framework Programme (FP7), 2007-2013

- The Programme bundles all research-related EU initiatives together under a common roof playing a crucial role in reaching the goals of growth, competitiveness and employment,
 - along with a new Competitiveness and Innovation Framework Programme (CIP),
 - Education and Training programmes, and
 - Structural and Cohesion Funds for regional convergence and competitiveness.
-
- More information, FP7 website:
http://cordis.europa.eu/fp7/home_en.html

Structure and budget FP7 (2007-2013)



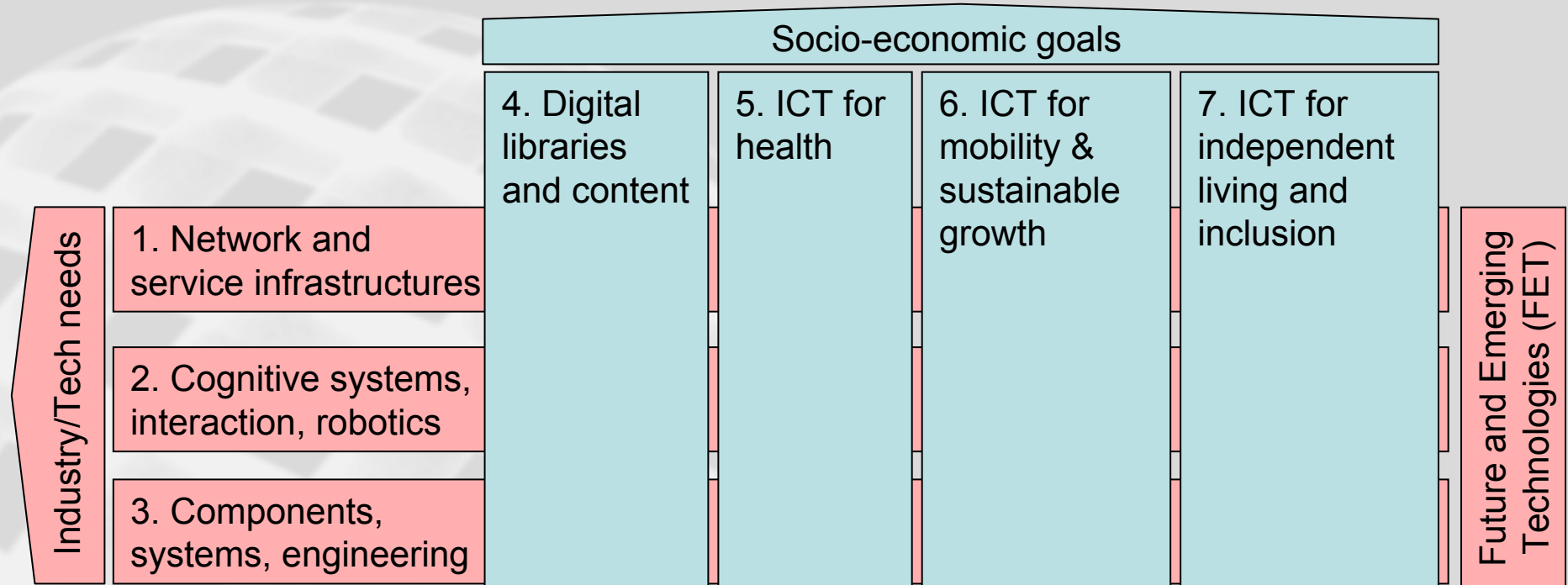
3: 9050 Mio €

4: 3475 Mio €

Total coop.:
32413 Mio €

Total FP7
(non-nuclear):
50521 Mio €

FP7-ICT Work Programme 2007/2008 (Theme 3): The *Challenges*



- A *Challenge* is addressed through a limited set of Objectives that form the basis of Calls for Proposals
- An Objective is described in terms of
 - target outcome - in terms of characteristics
 - expected impact - in terms of industrial competitiveness, societal goal, technology progress
- There are a total of 25 Objectives expressed within 7 *Challenges*
- More information, FP7-ICT website: <http://cordis.europa.eu/fp7/ict/>

FP7/Cooperation – Most Important Funding Instruments

- CP: Collaborative Projects
 - LA: Large scale collaborative project
 - SM: Small scale collaborative project
 - SME-dedicated:
LAs especially dedicated to SMEs (co-ordinated by an SME)
- NoE: Networks of excellence (mostly for research institutes)
- Projects within FP7/Cooperation are open for non-EU partners as well, more information (brochure 22 pages):
http://ec.europa.eu/research/iscp/pdf/newapproach_en.pdf

ICT Call 1

Open: Dec 22, 2006
Close: May 08, 2007

Challenge 1: Network and service infrastructures

1. The network of the future
2. Service & software architectures, infrastructures & engineering
3. ICT in support of the networked enterprise
4. Secure, dependable and trusted infrastructures
5. Networked media

Budget

171 M€
102 M€
26 M€
77 M€
73 M€

Challenge 2: Cognitive Systems, interaction, robotics

1. Cognitive systems, interaction, robotics

82 M€

Challenge 3: Components, systems, engineering

1. Next generation nanoelectronics components and electronics integration
2. Organic and large-area electronics and display systems
3. Embedded systems design
4. Computing systems

73 M€
54 M€
34 M€
21 M€

... ICT Call 1:

Challenge 4: Digital libraries and content

1. Digital libraries and technology-enhanced learning
2. Intelligent content and semantics

Budget

44 M€

44 M€

Challenge 5: ICT for health

1. Personal health systems for monitoring and point-of-care diagnostics
2. Advanced ICT for risk assessment and patient safety

60 M€

26 M€

Challenge 6: ICT for mobility & sustainable growth

1. ICT for the intelligent vehicles and mobility services

49 M€

Challenge 7: ICT for independent living and inclusion

1. ICT and ageing

26 M€

ICT Call 2

Open: May/Jun 2007

Close: Sep/Oct 2007

Challenge 1: Network and service infrastructures

6. New paradigms and experimental facilities

Critical infrastructure protection (open: Sep, close: Dec 2007)

Budget

40 M€

20 M€

Challenge 3: Components, systems, engineering

+20/security

5. Photonic components and subsystems

90 M€

6. Micro/nanosystems

83 M€

7. Networked embedded and control systems

47 M€

Challenge 5: ICT for health

3. Virtual physiological human

72 M€

Challenge 6: ICT for mobility & sustainable growth

2. ICT for cooperative systems

48 M€

3. ICT for environmental management and energy efficiency

54 M€

Challenge 7: ICT for independent living and inclusion

2. Accessible and inclusive ICT

43 M€

Note: Budget allocations are indicative, implementation issues still under discussion

ICT Call 3

Open: Dec 2007

Close: Mar 2008

Challenge 2: Cognitive Systems, interaction, robotics

Budget

1. Cognitive systems, interaction, robotics

97 M€

Challenge 4: Digital libraries and content

1. Digital libraries and technology-enhanced learning
2. Intelligent content and semantics

50 M€

50 M€

Note: Budget allocations are indicative, implementation issues still under discussion

New in FP7: European Technology Platforms - Objectives

Develop
long term
vision

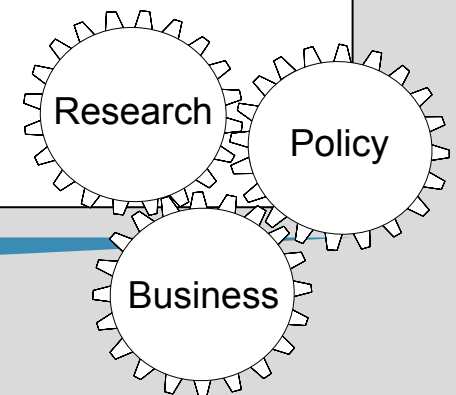
Address
challenges

Define
research
policy

Improve
funding

Leverage
technology
investment

- ▶ A framework for stakeholders engaged in a specific field of technology, led, organized and promoted by industry
- ▶ A community to bring together all stakeholders (research, industry, regulators, policy makers), thus optimizing fragmented efforts
- ▶ Define research and development priorities and action plans on strategically important issues to stimulate investment in RTD
- ▶ A place to find partners for future projects and help to secure the „critical mass“ for projects in the European context
- ▶ Participation can help to improve success of FP7 project proposals
- ▶ Open to all interested parties
- ▶ Active participation is crucial!



ETPs are important in all areas where RTD plays a vital role!

New in FP7: European Technology Platforms¹

ARTEMIS

eMobility

ENIAC**EPoSS**

EUROP

ISI

NEM

NESSI

PHOTONICS21

MANUFUTURE

ACARE

ECTP

ERRAC

ERTRAC

ESTEP

ESTP

EuMaT

Food

Forestry

FTC

GAH

HFP

IME

IndustrialSafety

NanoMedicine

Photovoltaics

Plants

SusChem

Waterborne

WSSTP

ZEP

Embedded Computing Systems

Mobile and Wireless Communications

European Nanoelectronics Initiative Advisory Council**European Technology Platform on Smart Systems Integration**

Robotics

Integral Satcom Initiative

Networked and Electronic Media

Networked European Software and Services Initiative

Photonics for the 21st century

Future Manufacturing Technologies

Advisory Council for Aeronautics Research in Europe

European Construction Technology Platform

European Rail Research Advisory Council

European Road Transport Research Advisory Council

European Steel Technology Platform

European Space Technology Platform

Advanced Engineering Materials and Technologies

Food for Life

Forest based sector Technology Platform

Future Textiles and Clothing

Global Animal Health

Hydrogen and Fuel Cell Platform

Innovative Medicines for Europe

Industrial Safety ETP

Nanotechnologies for Medical Applications

Photovoltaics


Plants for the Future

Sustainable Chemistry

Waterborne ETP

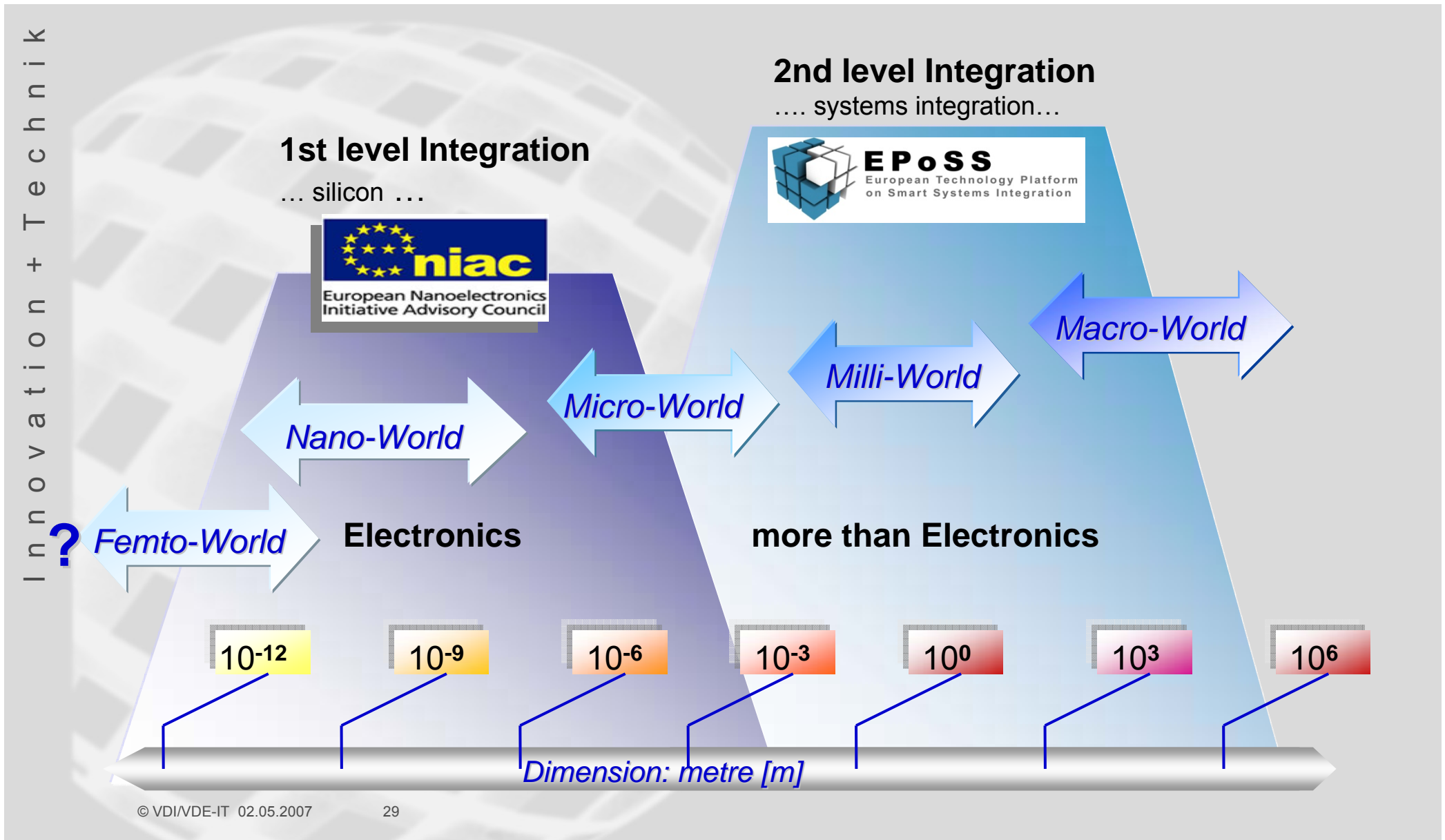
Water Supply and Sanitation Technology Platform

Zero Emission Fossil Fuel Power Plants

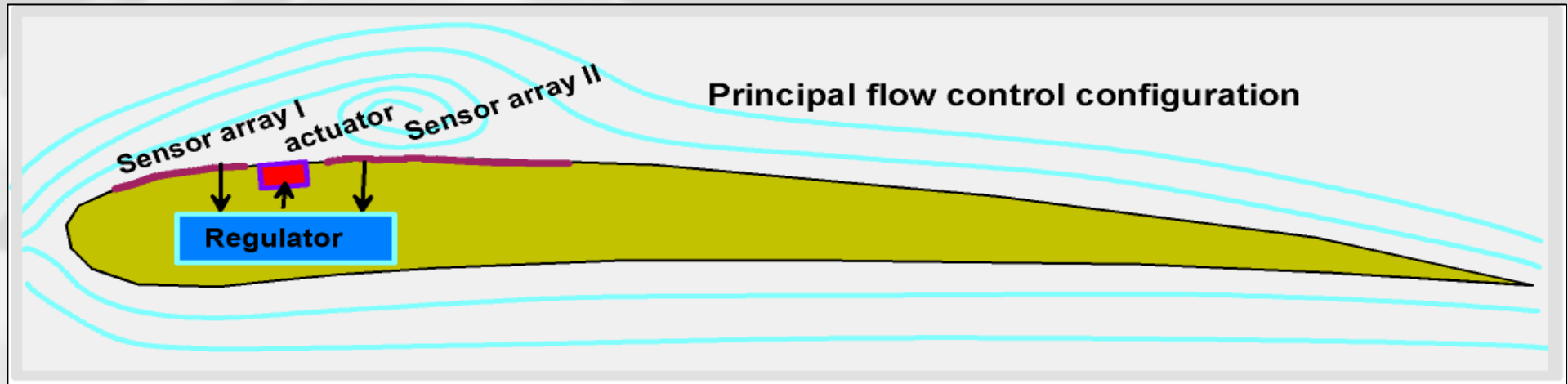


31 technology
platforms have
been established

ENIAC and EPoSS - Range of Activities



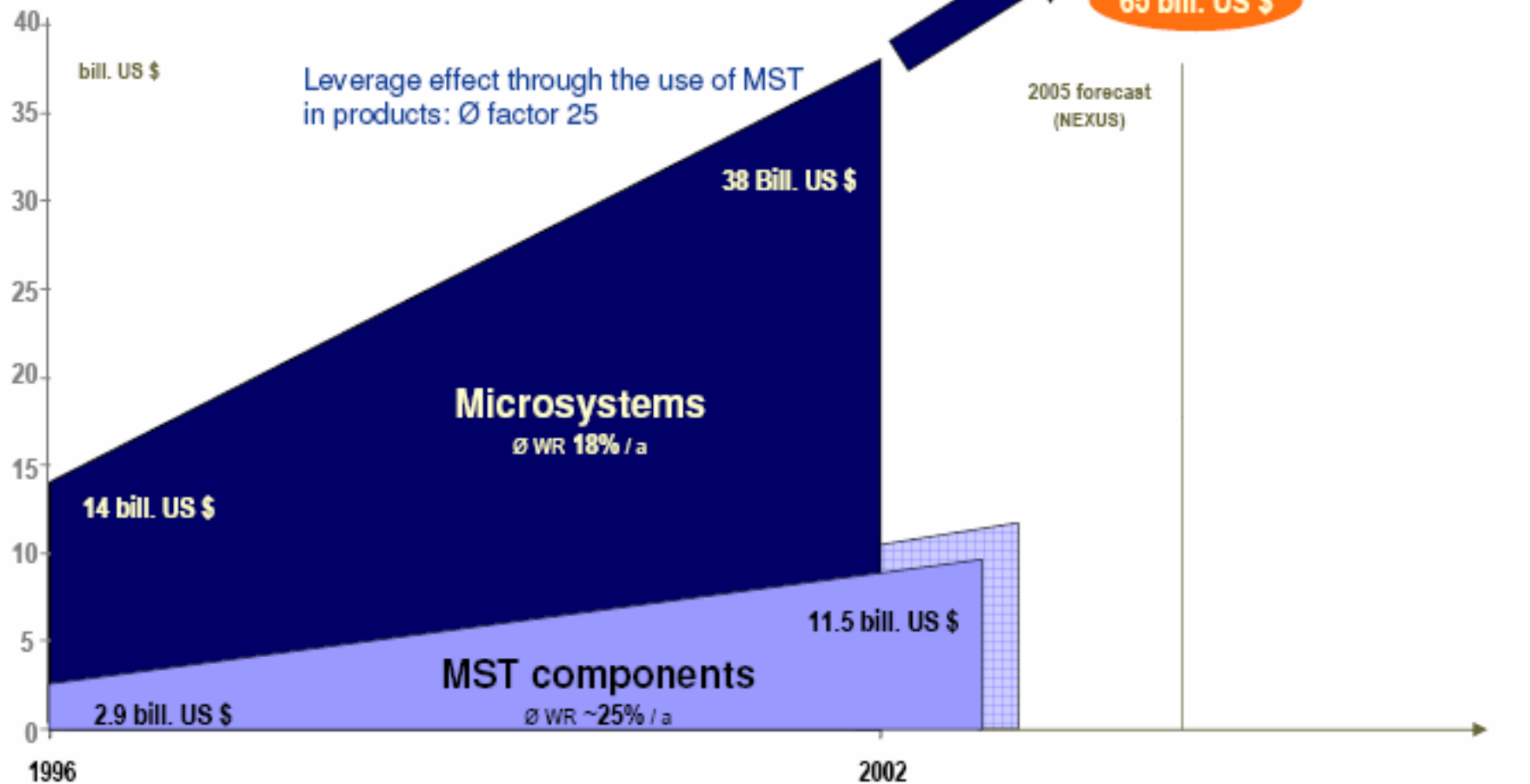
Example: Adaptive Airplane Wing with Smart Systems / Microsystems



- Growing market for microsystems (≈ 200 bn US\$/year)
- Leverage effect:
 - By the integration of microsystems in higher added-value products, a market 25x larger is influenced significantly
 - Example: Automobile, with more 20% value share by electronics

The microsystems technology market is growing

Worldwide dynamic developments in the past and in the future



26.11.2004 © - VDI/VDE-IT Public Relations

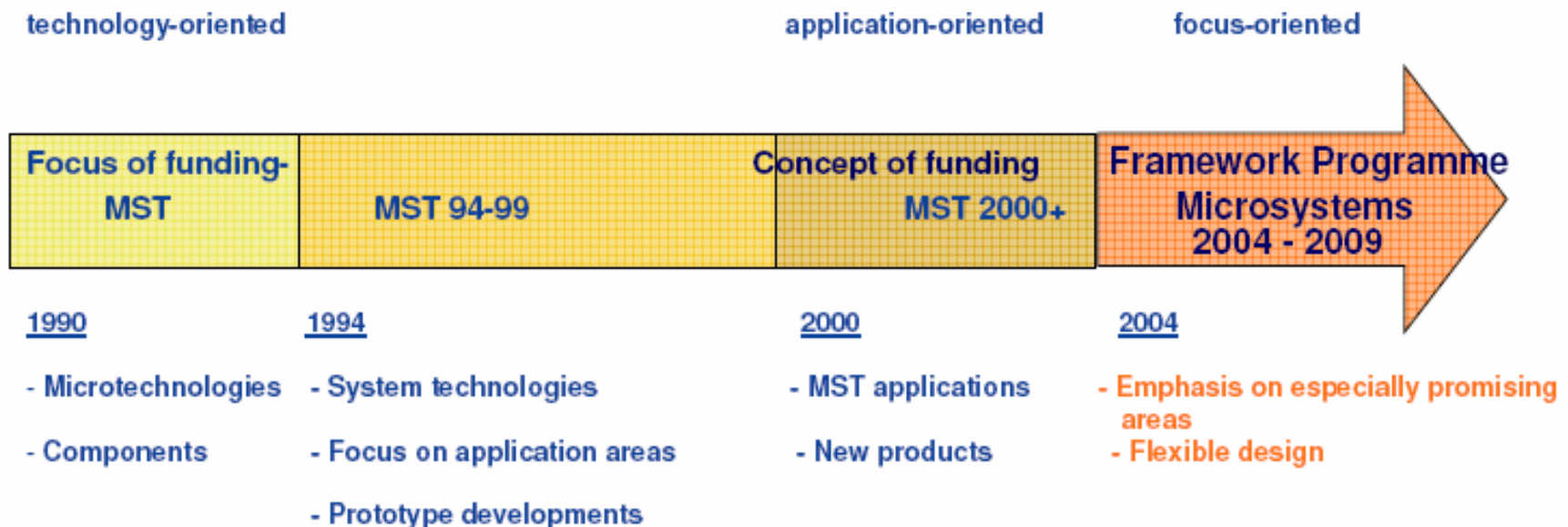
Bildquellen: NEXUS, VDI/VDE-IT

German Federal Funding of Microsystems Technology

Funding by the Federal Ministry of Education and Research: always geared to bottlenecks in MST development

Microsystems technology funding since 1990:

Successive transfer of resources from technologies to applications



- 2004-2009: \approx 120 M€/year spending (\approx 55 M€ public money)
- \approx 20 new collaborative R&D projects launched every year
- Acritical mass is reached !



Microsystems Framework Programme: Key areas of funding

- **Micro fuel cell**
Deadline of announcement: January 13, 2006
- Integrated microsystems for **biotechnological applications** (bioMST)
Deadline of announcement: January 13, 2006
- **Preventive micro medicine**
Deadline of announcement: February 11, 2005
- MST for **Smart Label applications** in the field of logistics (**MST Smart Label**)
Deadline of announcement: December 8, 2004
- MST for **Driver Assistance Systems**
Deadline of announcement: January 21, 2005
- First application of computer-assisted **tools** for **design** and **simulation** in MST
Deadline of announcement: September 30, 2005
- **Micro process engineering**, the New Chemistry
Deadline of announcement: June 19, 2004
- **Measuring and testing techniques** for the fabrication of microsystems
Deadline of announcement: June 19, 2004



Holistic Initiation of High-Tech Initiated by R&D: Example Microsystems Technology in Germany

- Today 2007, more than 15 years later, microsystems are part of the German Future Technology Policy :
 - Further diffusion and application of microsystems in various sector assisting the development of growth markets
 - Assuring the availability of qualified personnel (quantity and quality)
 - Further development of the technological competence
- **Critical mass reached !**

„The Outsider's View“ - Concluding Remarks

- The Brazilian electronics industry has to get involved in research and development, applied research and development in particular
- The Brazilian research organisations should focus on areas where an uptake of the developments by industry can be achieved
- Industrial implementation of semiconductor technology and micro/nano-electronics in Brazil seems to require extreme efforts
- Innovate strong industrial branches (aerospace, automotive, agricultural technology, ...) by introducing advanced electronic (smart) sub-systems
- Make use of trade fairs and major conferences in Europe to present and disseminate such new solutions and products
- There is a significant interest of German/European industry and academia in co-operation with Brazil → support Brazilian organisations for participating in European projects (policy issue)
- Make use of the opportunities for assistance international co-operation by the EU's 7th Framework Programme

Thank you for listening

Helmut Kergel
VDI/VDE Innovation + Technik GmbH
Steinplatz 1
10623 Berlin/Germany
Tel. +49 (0) 30 310078-154
Email: kergel@vdivde-it.de