What are the options forward?

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Directorate General for Communications Networks, Content and Technology - DG CONNECT, Components & Systems, Components

MNBS'14 Workshop, LAAS CNRS
Toulouse 21 & 22 October, 2014

Gaps and the Way Forward? Work Programme 2016-17
Learning from FP7

H2020-WP2014-15
Lessons & Opportunities

WP2016-17:
Challenges & Opportunities

Taking Home
The policy context

J-C Juncker
2 out of 10 proposed priorities

Commissioners-designate

ANDRUS ANSIP
VICE-PRESIDENT

Digital Single Market

GÜNTHER OETTINGER

Digital Economy & Society
Serving the EU Policies: The renewed Lisbon agenda

- **Markets & Competition**: Europe - A more attractive place to invest & work
  - Extend & deepen the internal market
  - Improve European and national regulation
  - Ensure open & competitive markets inside & outside Europe
  - Expand & improve European infrastructure

- **Knowledge & innovation** for growth
  - Increase & improve investment in R&D
  - Facilitate innovation & uptake of ICT & the sustainable use of resources
  - Contribute to a strong European industrial base

- **Employment & Skills**: Creating more & better jobs
  - Attract more people into employment & modernise social protection systems
  - Improve the adaptability of workers & enterprises & the flexibility of labour markets
  - Invest more in human capital through better education & skills
Learning from FP7
Electronic Components - scope of R&I

Smaller. Smarter. Cheaper

European Commission

Micro-Nanoelectronics (Si-Platform)

Miniaturised Smart Systems (heterogeneous integration)

Sub-Domain
Beyond CMOS / Beyond Si
More Moore
More than Moore

Technologies
Nanotechno*:
Spintronics
Single e- Trans.
NEMs...

Advanced materials*:
Ge, III-V, Comp. SC
CNT, Graphene...

Graphene Anal.
RF

Integration of photonic devices

Critical size
nm
10s nm
mm
Few mm to few cm
mm x cm

Organic electronic
Flexible substrates
Smart textile
High Power el.

Bio-on-Si → Biotech*
μ-Fluidics → Wet-Ware
Si-MEMS → μ-Mechanics

3-D transistors
CMOS 22 nm
3-D stacking
Sub-THZ telecom (iPHOS)

Lab-on-Chip (PYTHIA)

Many Miniaturised Systems:
Endoscopic capsules (H2SOLAR)
Neural probes (NEURAPROMES
Implantable electrodes (neuWALK)

Plastic electronics (Place-it)
MNBS (25 FP7 projects)

**Food/beverage contamination**
- Food pathogens detection & safety
- Point-of-need detection
- Miniaturised complete solution
- Lab-on-chip

**Point of care testing & IVD**
- Allergy detection
- Tropical diseases detection
- Tuberculosis detection
- Chronic diseases monitoring
- Malaria and fevers detection
- Foetal mutation detection
- Cancer early detection/diagnosis
- Pathogen, drugs detection
- Lab-on-Chip

**Treatment of phantom limb pain**
- Neuro stimulation
- Motricity restoration
- Parkinson disease treatment
- Hearing impairment treatment
- Cochlear stimulation
- Drug monitoring POC in transplanted patients
- Cardiovascular repairing
- Invasive MNBS
- Smart Implants and stimulators
- Actuators-EAP, Infrared Laser

**BIOFOS**
- Biological samples
- Trace contaminants
- Lab-on-Chip

**SYMPHONY**
- Single cell
- Detection & manipulation

**FOODSNIFFER**
- Positive
- PodiTrodi-EU
- Pocket
- NextDx
- DiscoGnosis
- ANGELab
- CanDo
- MIRACLE
- LabOnFoil

**LOVE-FOOD**
- Design-Manufacturing-Production
- Flexible (multilayer) Integrated microfluidics
- Lab-on-chip

**PASCA**
- In vivo MNBS and Clinical Platforms

**ARROWS**
- Clinical platforms
  - Breast cancer
  - Magnetic guided drug delivery
  - Minimally invasive surgery
  - Robotics
  - Nanoma
  - ARAKNES

**PASCA**
- Chronic wounds & ulcers Monitoring & Therapy
- Wearable Systems
- Therapy
- Body sensors
- SWAN-iCARE

**In vivo MNBS**
- TIME
- NEUWalk
- ACTION
- NANODEM
- Heart-e-Gel
• **Biophotonics**

- **19 projects**
  - 76 M€

- **4 IPs, 13 STREPs, 1 NoE,**

**CIP pilot B actions:** Biophotonics solutions for diagnosis, monitoring or treatment of disease

**Outcome:** solutions which have been evaluated by professional end-users and which demonstrated significant advantages with respect to current approaches, with the ultimate goal being their introduction into the market place.

**Co-funded** by EC and DE, IL, IT (Toscana), UK, BE (Flanders), ES (Catalonia), LV

**Line A. Translation into practical applications**
- addresses end-user-oriented industrial research projects.

**Line B. Investigation on new tools or methods**
- smaller projects only (up to 1 M€ total costs);
- addresses projects at an early stage of industrial research.
Personal Health System and Patient Guidance Services supported by ICT

- 90+ PHS, PGS projects funded under FP7 (2007-2013)
- EC contribution 348 M€ (FP7)

Nanomedicine

- 85 Projects in FP7 NMP, ~ 400 mio € funding
- 31 Projects in Health, ~ 150 mio €
Smart System Integration: Areas and Numbers in FP7

- 81 projects in FP7
- Total costs 441 M€
- EU funding 311 M€ (45% of the total from Components)
- 890 participants with 23% SMEs
EC funding to MNBS projects

- Health: 45 million €
- Clinical & healthcare platforms: 30 million €
- Generic MNBS technologies: 25 million €
- MNBS in vivo: 20 million €
- Food & environment: 10 million €

Legend:
- IND
- SME
- RES
- HES
Total costs for the top 25 participants

Millions €

- PHILIPS (NL)
- STMICROELECTRONICS (IT)
- VTT (FI)
- IMEC (BE)
- CEA (FR)
- FRAUNHOFER (DE)
- CSEM (CH)
- IKERLAN (ES)
- EPFL (CH)
- UNIVERSITA DI BOLOGNA (IT)
- MICROFLUIDIC CHIPSHOP (DE)
- Toppun Photomasks (FR)
- NXP SEMICONDUCTORS (BE)
- DEMOKRITOS (GR)
- MEDTRONIC (NL)
- TNO (NL)
- ATOS (ES)
- CNR (IT)
- ROBERT BOSCH (DE)
- ALBERT-LUDWIGS-UNIVERSITAET FREIBURG (DE)
- GUGER TECHNOLOGIES (AT)
- UNIVERSITAIR MEDISCH CENTRUM UTRECHT (NL)
- INSTITUT FÜR MIKROTECHNIK MAINZ (DE)
- SCUOLA SUPERIORE SANT'ANNA DI PISA (IT)
- UNIVERSITAET FREIBURG (DE)
Total costs for the top 26 to 50 participants

Millions €

<table>
<thead>
<tr>
<th>Institution</th>
<th>Costs</th>
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<tbody>
<tr>
<td>BARCO (BE)</td>
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<td>UNIVERSITE EINDHOVEN (NL)</td>
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<td>Micronit microfluidics (NL)</td>
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<td>TECHNISCHE UNIVERSITEIT DELFT (NL)</td>
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<td>FIMI (IT)</td>
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<td>KTH (SE)</td>
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<td>AGENCIA ESTATAL CSIC (ES)</td>
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<td>Silex Microsystems (SE)</td>
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<td>LIFE Nijmegen Medical Centre (NL)</td>
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<td>FEI (NL)</td>
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<td>MediMetrics (NL)</td>
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<td>UNIVERSITAT ZURICH (CH)</td>
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<td>Centrum für Angewandte Nanotechnologie (DE)</td>
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<td>EXODUS ANONYMOS ETAIREIA (GR)</td>
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<td>DURST PHOTO &amp; TECHNOLOGIE (IT)</td>
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<td>IMPERIAL COLLEGE (UK)</td>
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<td>ZorgGemak (NL)</td>
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...some technological breakthroughs, and industrial successes

<table>
<thead>
<tr>
<th>ICT project</th>
<th>Technology</th>
<th>Application</th>
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<tbody>
<tr>
<td>NEUROPROBES</td>
<td>Smart Probes</td>
<td>In Vivo extra-cellular neurons recording</td>
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<tr>
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<td></td>
<td>Spin-off: ATLAS Neuroengineering: <a href="http://www.atlasneuro.com/">www.atlasneuro.com/</a></td>
</tr>
<tr>
<td>PASTA</td>
<td>Packaging of Electronic threats</td>
<td>Smart Textile with integrated sensors, LED and RFID</td>
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<td>Incubator: Primo1D: <a href="http://www.grain-incubation.com/projets/primo-1d/">www.grain-incubation.com/projets/primo-1d/</a></td>
</tr>
<tr>
<td>LabonFoil</td>
<td>Molecular Biology on Chip/foil</td>
<td>In Vitro diagnostics portable solutions</td>
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</table>
Grand Challenge: Overcome current limitations and reach the market

- **Innovation**: translating technology and process in usable & commercial new service or goods
- R&I approaches that combine the supply push with the demand pull/drive for innovation and that aim at addressing Europe's socio-economic challenges.
- Opening to a wider stakeholder community and integration with the whole ecosystem
- Concentrating and pulling efforts to achieve breakthroughs

But... slow industrialisation, few patents, low SME and civil society participation, inexperience of regulatory...and remaining technical issues
H2020*
WP 2014-15 Lessons & Opportunities

* Other EU programmes on e.g. the Competitiveness of Enterprises and Small and Medium Sized Enterprises (covering access to finance and markets) or Structural Funds are very relevant but not covered in this presentation
Creating Industrial Leadership and Competitive Frameworks

- Leadership in enabling and industrial technologies
  - ICT
  - Nanotech., Materials, Manuf. and Processing
  - Biotechnology
  - Space
- Access to risk finance
- Innovation in SMEs

Tackling Societal Challenges

- Health, demographic change and wellbeing
- Food security, sustainable agriculture and the bio-based economy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate, resource efficiency & raw material
- Inclusive, innovative & reflective societies
- Secure Societies

Excellence in the Science Base

- Frontier research (ERC)
- Future and Emerging Technologies (FET)
- Skills and career development (Marie Curie)
- Research infrastructures

The budget is on the basis of 2011 "constant" prices
H2020: From basic research to innovation

In addition to collaborative projects for R&D

- Piloting, testing, demonstrations
- Access to finance (loans, guarantees, equity investments)
- Specific measures for SMEs
- Support to PPPs
- Pre-commercial procurement
- Support to infrastructures for R&I
• Work programme essentially is a short description of topics with details on expected impact
• More funding to Research and Innovation Actions
• Cover technology development, design and manufacturing
• Stress the importance of innovation – potential innovation for lower TRL. Innovation is a key differentiator.
• Involve actors along the value chain. High industrial participation.

• Technology drive vs. application pull – application pull proposals are somewhat more successful
• Innovation actions on access on design and manufacturing – however no projects on evaluation of equipment, process and building blocks for smart systems
• No proposals on pre-Commercial Procurement, no CSA
2015 Calls in ICT-LEIT and SC1

**ICT28.a Innovation Actions**  ICT KET integrated platforms for the healthcare and food sectors  **11 M€**

PHC 11– 2015 Development of new diagnostic tools and technologies: in vivo medical imaging technologies  **45 M€**

PHC 21 – 2015) Advancing active and healthy aging with ICT: Early risk detection and intervention  **48 M€**

PHC 29-2015) - Public procurement of innovative eHealth services  **10 M€**

Open (April-2015)  Open (Oct-2014)
ICT 28 – Cross-cutting KETs

Innovation Actions

ICT-KET integrated platforms for the healthcare and food sectors

Pilot lines for advanced KET products
- Set-up and validation of pilot production for advanced products
- Pilot line for OLEDs on flexible substrates
- Pilot line for analytical mid-infrared (MIR) micro-sensors
- Pilot line for PIC fabrication on III-V and/or dielectric based platforms

Coordination and Support actions
- Cooperation and accelerating the sector

11 M€
70% funding

42 M€
70% funding

1 M€
100% funding
WP2016-17: Challenges & Opportunities
Electronic components and systems

Micro-Nanoelectronics

Smart Systems Integration

Smart everywhere,

Integration chain:

- nm to cm-

Technologies

More Moore

Beyond CMOS / Beyond Si

More than Moore

Heterogeneous integration

Autonomous systems, Smart connection to local data networks, big data or internet

More Moore

Beyond CMOS / Beyond Si

More than Moore

Heterogeneous integration

Si
Ge, III-V, Comp. SC
nanotubes, Graphene…

Si
Spintronics
Single e\textsuperscript{-} Trans.
NEMs…

Bio-on-Si

Bio-electronics, MNBS

Si-MEMs
\(\mu\)-Fluidics
\(\mu\)-Mechanics

RF

Thin electronics Microrobots

Photonics

Complex Systems, CPS

Platforms and Services

Integration chain:

- nm to cm-

Technologies

ICT 25
(Generic micro-and nano-electronics technologies)

ICT 2
(Smart System integration)

ICT 26-27
(Photonics)

ICT 3
(TOLAE)

ICT 23-24
(Robotics)

ICT 1
(CPS)

+ ICT 30-7-14
(IoT., Cloud., 5G-Future Internet..)

ICT 28 (Cross-cutting ICT KETs)
WP 2016 – 2017 Criteria to consider

• **General**
  - Maximising EU added value, need for collaborative projects involving several partners combining complementary skills
  - Areas addressing and anticipating key developments
  - Strong potential for uptake and impact, as well as leverage industry and SME participation

• **Impact – linked to key performance indicators**
  - Economic
  - Societal

• **Boundary conditions**
  - Limited budget, calls for focus
  - Unique Selling Proposition
Which focus MNBS should put forward in the next 2-5 years? What would be an acceptable oversubscription rate?

- By technology development? Miniaturisation and heterogeneous integration in Systems?
- By application area?
- By TRL?
- By impact?

Which instruments to use

- Research and Innovation Actions – technology driven/application pull?
- Innovation Actions – only access to design and prototyping? Testing zones? Other? In ECSEL?
- Pre-commercial Procurement and/or Procurement of Innovation Solutions?
- Any Coordination and Support Action?
- Access to finance?
• **Smart Systems Integration**
  - Focus on miniaturisation and integration? Autonomous behaviour? Cover the full value chain from design to manufacturing?
  - Should MNBS be a cross-cutting topic with photonics?
• **Internet of Things**
  - If cross-cutting focus area including full value chain up to applications, which SSI topics should be developed/demonstrated (e.g. zero power, specific sensing/actuating, ...)?
• **Cross-cutting KETs**
  - In 2015 health and food. Any other specific application areas?
• **Other?**
  - -
  - -...
## Next steps

<table>
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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>17 Oct - start-Dec</td>
<td>Discussions with thematic configurations on scoping papers</td>
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<tr>
<td>December</td>
<td>Presentation of proposed strategic programming document to new Commissioner(s)</td>
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<tr>
<td>Jan-July 2015</td>
<td>Preparation of the detailed work programme 2016/17 content, prepared on the basis of the endorsed strategic programming document, including input from advisory groups and discussion with PC configurations</td>
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<td>Summer 2015</td>
<td>Opinions of Programme Committee configurations</td>
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<tr>
<td>Third quarter 2015</td>
<td>Adoption by the Commission of the work programme 2016/17; publication of the calls for 2016</td>
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Taking Home
MNBS: Doing the right things and doing things right

- **Bold initiatives addressing demand and supply, addressing whole value and supply chains, linking research with innovation, combining resources**

- **Supporting innovation ecosystems and key regions – importance of clusters**

- **Focus, cooperate and invest!**
THANK YOU

DG CONNECT (Communications Networks, Content and Technology):
http://ec.europa.eu/dgs/connect/index_en.htm

Horizon 2020 on the web:
http://ec.europa.eu/research/horizon2020/index_en.cfm

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