Innovation and Manufacturing Brokerage Event
6 November 2019, Santiago de Compostela

Jürgen Tiedje
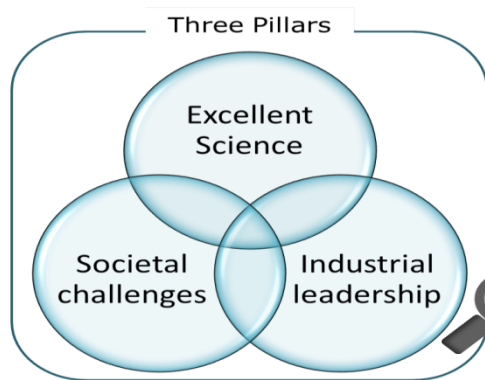**DG Research and Innovation**
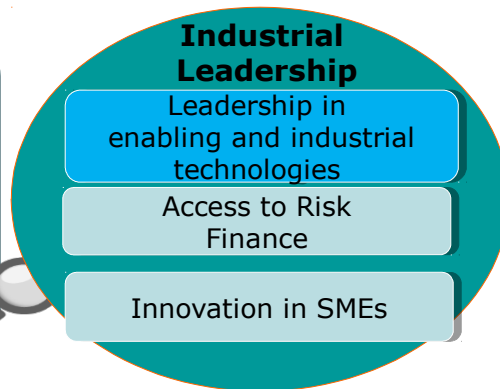**European Commission**
Unit Sustainable Industry Systems
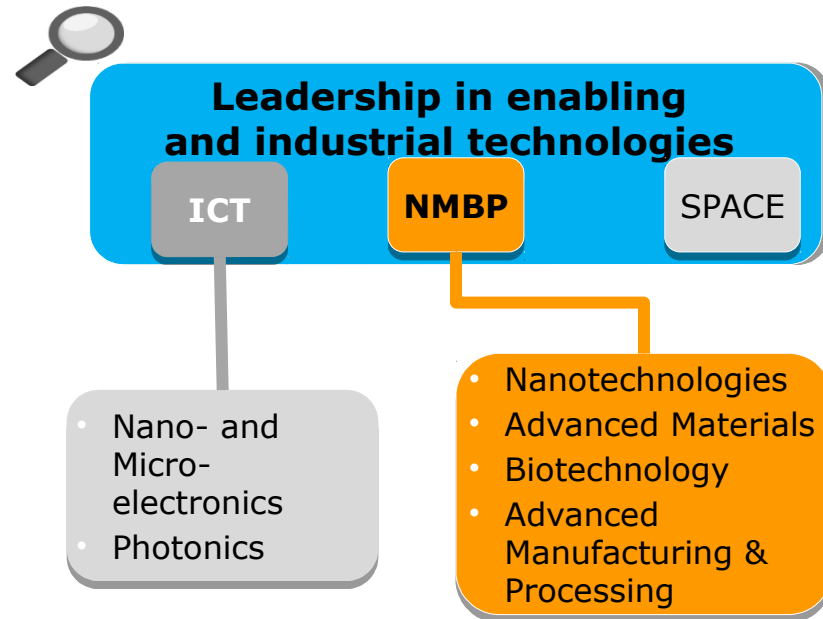
Research and
Innovation

NMBP in Horizon 2020

Three Pillars

- Excellent Science
- Societal challenges
- Industrial leadership

Indicative budget: 75 billion € *

Industrial Leadership

- Leadership in enabling and industrial technologies
- Access to Risk Finance
- Innovation in SMEs

Indicative Budget: 16.5 billion € *

Out of it for NMBP: 3.8 billion € *

Leadership in enabling and industrial technologies

ICT **NMBP** SPACE

ICT:
- Nano- and Micro-electronics
- Photonics

NMBP:
- Nanotechnologies
- Advanced Materials
- Biotechnology
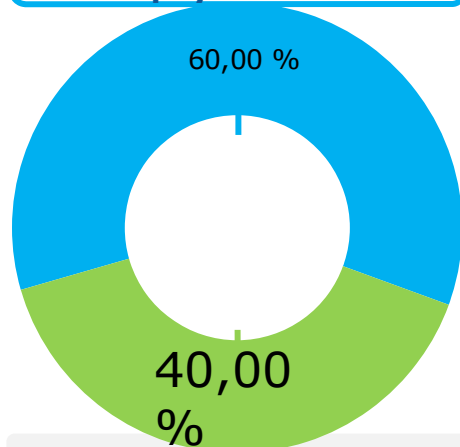- Advanced Manufacturing & Processing

* July 2015 – includes EIT, JRC, "Science with and for Society", "Spreading Excellence / Widening Participation", in addition to three priorities above

Research and Innovation

NMBP 2018-2020

Priorities

Bringing the digital to the physical world

60,00 %

40,00 %

Circular Economy (20%)

Climate, Energy (20%)

Climate, Energy and the Circular Economy

Calls

FOUNDATIONS for tomorrow's industry (~ EUR 433M)

TRANSFORMING European industry (~ EUR 561M)

Industrial **SUSTAINABILITY** (~ EUR 690M) incl. Next-Gen. Batteries, Low-carbon, Circ. Industries
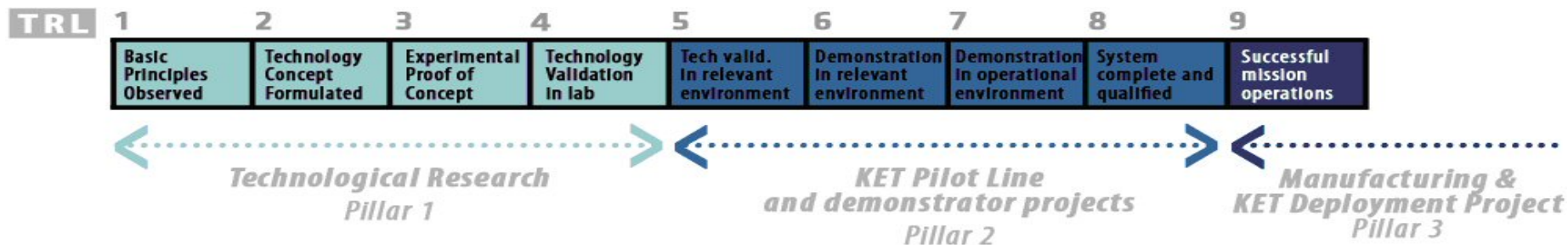
Impacts

Eco-system for design/testing/upscaling

Global industrial leadership for re-industrialisation

Energy/ Resource efficiency Low emissions

Recap: Technology Readiness Levels

- TRL Target: from 3-4 up to 7 with a centre of gravity on 5-6
- Highest TRLs for cases with a strong industrial commitment

TRL	1	2	3	4	5	6	7	8	9
	Basic Principles Observed	Technology Concept Formulated	Experimental Proof of Concept	Technology Validation In lab	Tech valid. In relevant environment	Demonstration In relevant environment	Demonstration In operational environment	System complete and qualified	Successful mission operations

Technological Research
Pillar 1

KET Pilot Line and demonstrator projects
Pillar 2

Manufacturing & KET Deployment Project
Pillar 3

- Beyond TRL 7: explore paths to commercial exploitation, to deploy technologies funded under Horizon 2020

Overview of NMBP topics related to Factories of the Future

Four topics in the call "Transforming European industry

- *DT-FOF-07-2020*
- *DT-FOF-09-2020*
- *DT-FOF-10-2020*
- *DT-FOF-11-2020*

FOF-07-2020 – Assembly of micro parts

Specific challenge

- *Investments in R&D of **new micro-manufacturing techniques** are necessary to maintain European manufacturing advantage*

- *Manufacturing technologies used for larger parts cannot be directly applied to micro part assembly because of physical phenomena.*

- *European industry has technology to produce & assemble micro-scale objects (**total volume < 1 mm3 & dimensions between 10μm and 300μm**)*

- *Further efforts needed to **combine accuracy, speed, productivity, efficiency and reliability***

- *New **production lines** must be able to detect & adapt with minimum human involvement to variations in the environment or the components*

- ***Models of micro systems assembly processes** are needed that take these effects into account*

FOF-07-2020 – Assembly of micro parts

Scope:

Focus: **new assembly technologies** *(e.g. additive manufacturing) especially for products that contain micro-parts and which are assembled manually because of technical limitations*

Proposals to cover **min. 3 of the following areas***:*

- **Design for micro-assembly & micro-disassembly** *including procedures, standardisation & performance*
- **High throughput systems for micro-handling & assembly** *(including robust strategies to grasp & release parts)*
- **In-line monitoring & quality assessment** *for parts & assembly*
- **Closed-loop error** *compensation & optimisation models & algorithms adaptable to specific working conditions*
- **Advanced control methods** *and/or human-in-the-loop strategies*

Proposals to include pilots where industrial end-users will validate demonstrated processes. Proposed solutions to respect environment & workers, economically viable & easily transferable to other sectors or product types.

FOF-07-2020 – Assembly of micro parts

Expected impact:
The developed manufacturing process should deliver all of the following:

- A **decrease of production time** by at least 15%
- A measurable increase of automation levels, especially the self-adaptation to changes, e.g. machine learning
- A **higher or similar precision** level
- A **reduction of at least 20% in rejection rates** during the production process

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

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FOF-09-2020 – Energy-efficient manufacturing system management

Specific challenge

- *Improving **industrial energy efficiency** requires **the integration of energy data** (historical data, real-time data and real-time predicted energy cost) into **complex production management systems**.*

- *The challenge is **to combine energy efficiency technologies** into a holistic, intelligent and interoperable approach to **ensure comprehensive implementation** that provides significant energy savings.*

FOF-09-2020 – Energy-efficient manufacturing system management

IA 70%

TRL 5-7

Scope:

Near real-time intelligent, transparent management of production systems *can improve traditional LCA/LCCA approaches towards more ambitious energy saving.*

Proposals are expected to address **all of the following**:

- *Application of ICT (e.g.* **digital twins, big data, IoT, cloud technologies & AI**) *allowing a shift* **from diagnosis to prognosis** *of energy consumption & cost in manufacturing*
- *Info collection & compilation linking the* **environmental footprint** *of each equipment/component to the complete factory/plant & entire value chains*
- *Demonstration of design approaches & technologies, through min. 2 complex* **industrial case studies**, *with application focus across manufacturing sectors*
- **Certification/standardisation** *of proposed solutions with focus on compatibility of energy/environmental data across manufacturing sectors*

FOF-09-2020 – Energy-efficient manufacturing system management

Expected impact:

- *Energy consumption reduction* for improved production processes at least 25%

- *Life Cycle Cost reduction* of at least 15%

- *Improved environmental performance* of the involved products

- Development of *standardised European energy-efficient best practices* to overcome the barriers limiting their application in the manufacturing sectors

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal

FOF-10-2020 – Pilot lines for large-part high-precision manufacturing

Specific challenge

- *Production of **large-scale parts** displays a **low level of mechanisation & automation** because of the need for non-standard machines & design procedures*

- ***Repair of large parts** is difficult, causing problems in quality & repeatability*

- *A more **automated production & in-situ repair** is needed for large innovative & multi-functional products*

- *Recent research in the large-scale parts production has delivered **high-quality demonstrators***

- *Full-scale, **reconfigurable, modular and flexible pilot lines**, are needed to accommodate processing, e.g. for thermal treatment, control & characterisation*

FOF-10-2020 – Pilot lines for large-part high-precision manufacturing

Scope:

*Proposals to **cover min. 3 of the following** & **to demonstrate** them in relevant industrial environments:*

- **Upgrading manufacturing equipment** *using several innovative steps for high precision manufacturing in an integrated & modular process*
- **Implement design, modelling & simulation tools** *to support the selection of processing parameters*
- **New methods & instruments** *for process characterisation & in-line control of large-scale parts (for quality & high precision, e.g. non-destructive testing)*
- **Work-holding devices** *reducing repositioning of components, as well as new methods for equipment calibration & in-process fast recalibration*

Provide open access to pilot lines for training purposes

FOF-10-2020 – Pilot lines for large-part high-precision manufacturing

Expected impact:

*The developed manufacturing process should deliver **all** of the following:*

- **Reduction of production cost** *by at least 15% through process integration, flexibility of the production cells, improved quality and reduction of assembly costs*
- **Reduction of production time** *by at least 20% by a significant automation increase*
- *A* **higher or similar precision level**
- **Reduction of the scrap** *generated by the process by at least 20%*
- **Reduction of the environmental impact and of safety hazards**

Relevant indicators & metrics, with baseline values, should be clearly stated in the proposal

FOF-11-2020 – Quality control in smart manufacturing

Specific challenge

- *Smart factories are characterised by processes involving **interlinked work pieces** & associated tools as well as **logistics** operations*

- *They generate **large amounts of data**, which can be used for analysis and prediction as well as to **optimise the quality** of manufacturing operations and manufactured products*

- *A major challenge for manufacturing is the **reliability of data***

FOF-11-2020 – Quality control in smart manufacturing

Scope:

Measurement traceability should ensure optimal manufacturing quality. *Suitable modelling & simulation approaches & data fusion techniques are needed to interpret & use sensor/actuator data in a factory.*

*Proposals to **address min. 3 of the following aspects**:*

- ***Integrate** intelligent, cognitive, adaptive & cost-effective instruments & **systems of sensors/actuators** for process monitoring & control (e.g. virtual sensors and digital twins) **into existing production or pilot lines***

- ***Showcase real-time data validation** within an actual production line & **incorporate data integrity strategies** based on, e.g., distributed ledger (blockchain) technology*

- ***Demonstrate** how distributed, time stamped & persistent solutions for automated collection, storage, analysis & use of production data can lead to **an integrated approach to zero-defect manufacturing***

- *Develop **strategies for rapid line qualification & reconfiguration** based on large pre-existing data sets & related open protocols*

Certification, regulatory & standardisation activities related to the proposed solutions should be included in the proposal.

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FOF-11-2020 – Quality control in smart manufacturing

Expected impact:

- *Increased equipment productivity* *through rapid error localisation (10%)*
- *Reduction of ramp-up time* *(> 15 %) using smart sensors/actuators & existing production data sets*
- *AI-driven instrumentation stimulating the* *transformation towards smart & fast processes* *leading to decreased time-to-market (time reduction >10%)*
- *Significant* *increase in quality* *of manufactured products leading to a* *reduction of scrap* *of at least 50%*

Relevant indicators & metrics, with baseline values, should be stated clearly in the proposal

Thank you!

For more information please refer to National Contact Points:

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/ncp