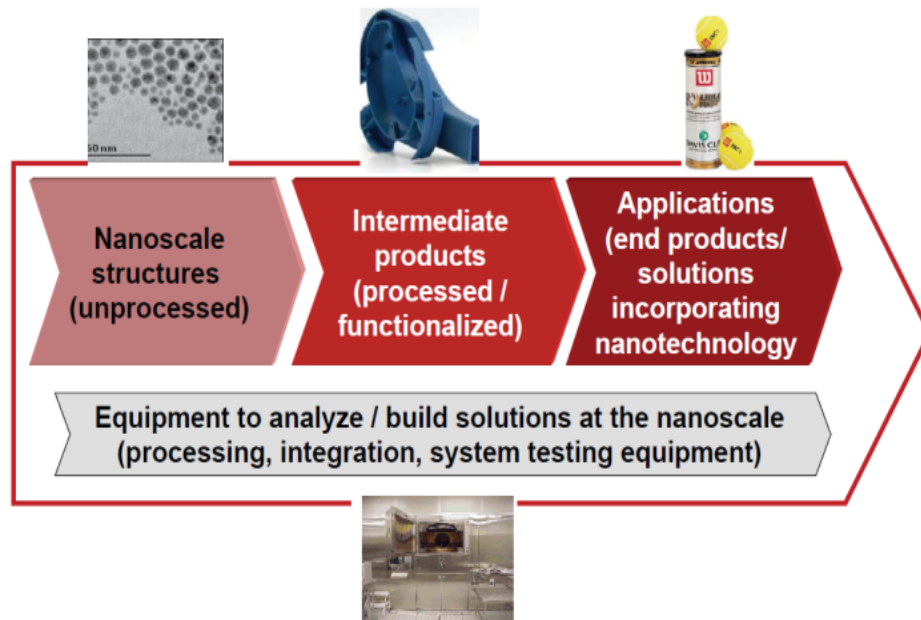


# Nanotechnology markets and value chains - selected examples

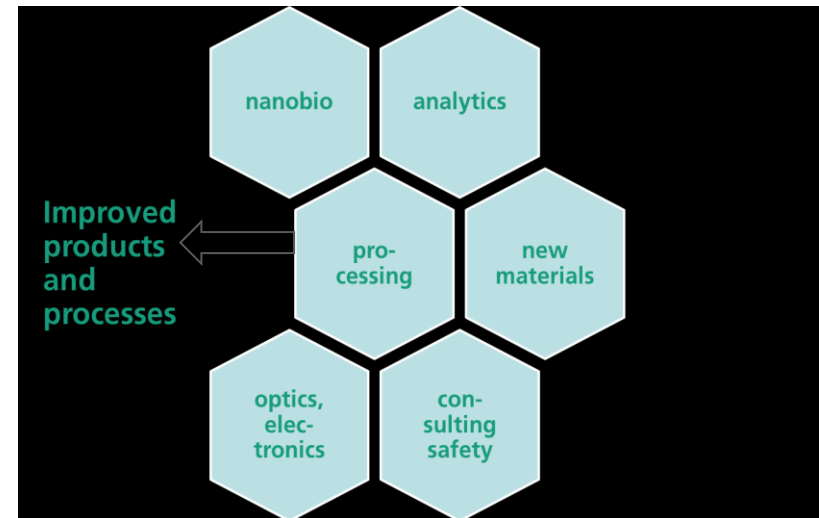
EuroNanoForum Bukarest, June 12-14, 2019

## 6.2 Nano from fab to market

Dr. Karl-Heinz Haas – Nanotech-Alliance  
FHI für Silicatforschung, D-Würzburg



## Fraunhofer Nano-Alliance: Integrated R&D value chain



Source: Teichert EPO-OECD-UKPO International Conference IC09-2006., Patents: realising and securing value" 21 NOV 2006, British Library, London, UK 3405.pdf /

ENF-Haas-2019

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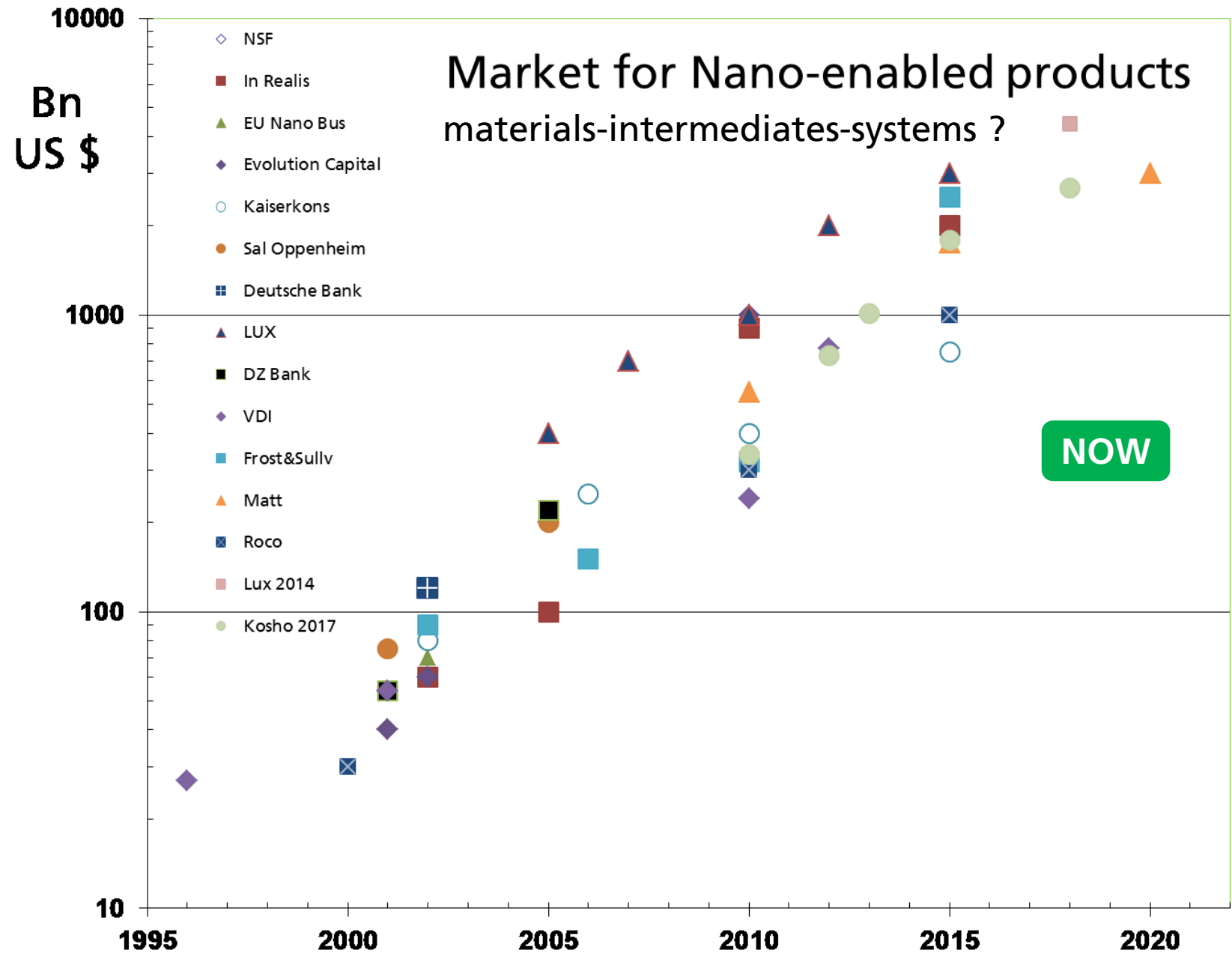


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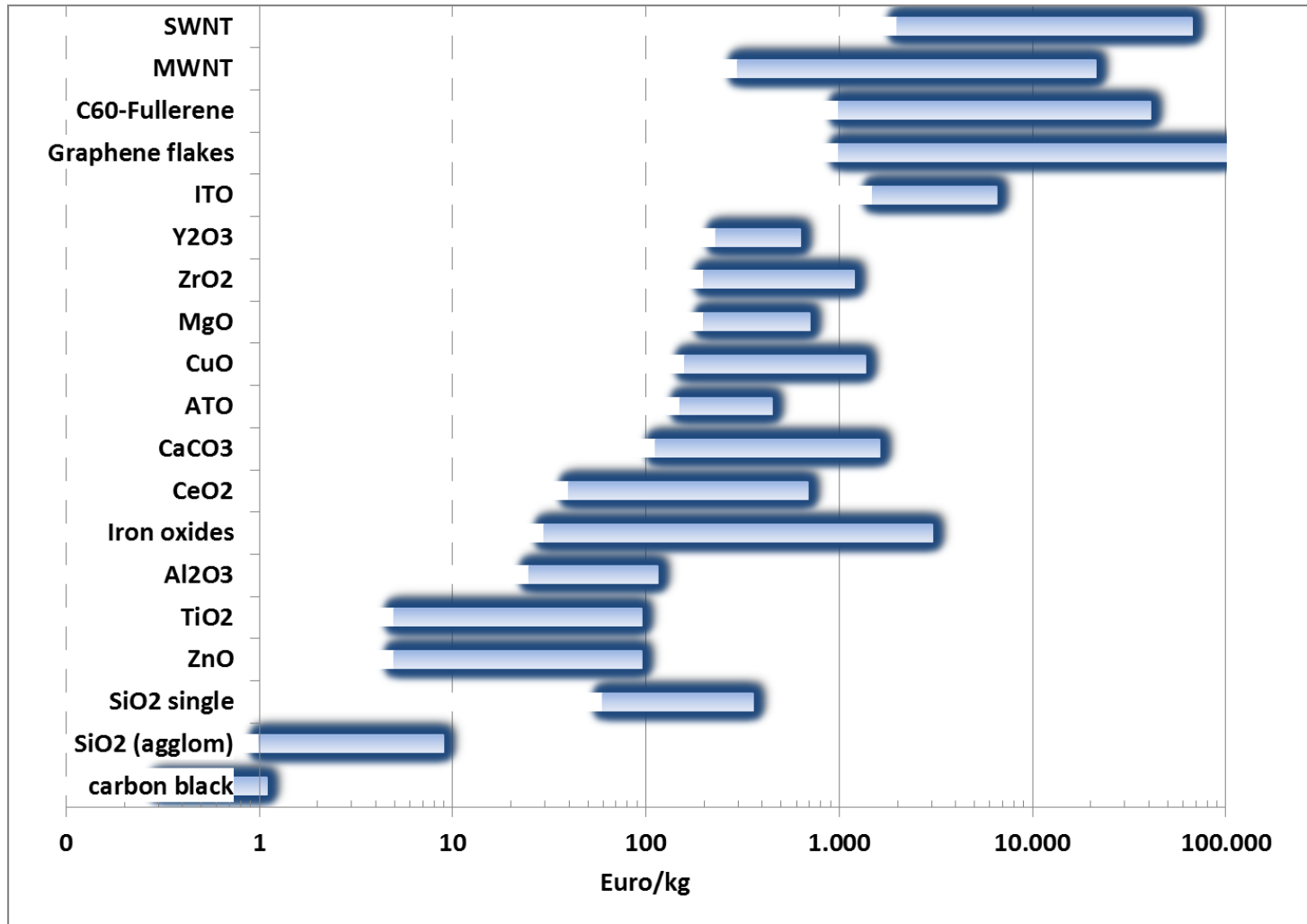


# Overview

- nanotechnology and value chains (VC)
- application dependent VC for nanotechnology
- example: EU-project Co-Pilot-Project <http://www.h2020copilot.eu/>
- short outlook



# Price regime of selected nanomaterials



Source: various references, own research

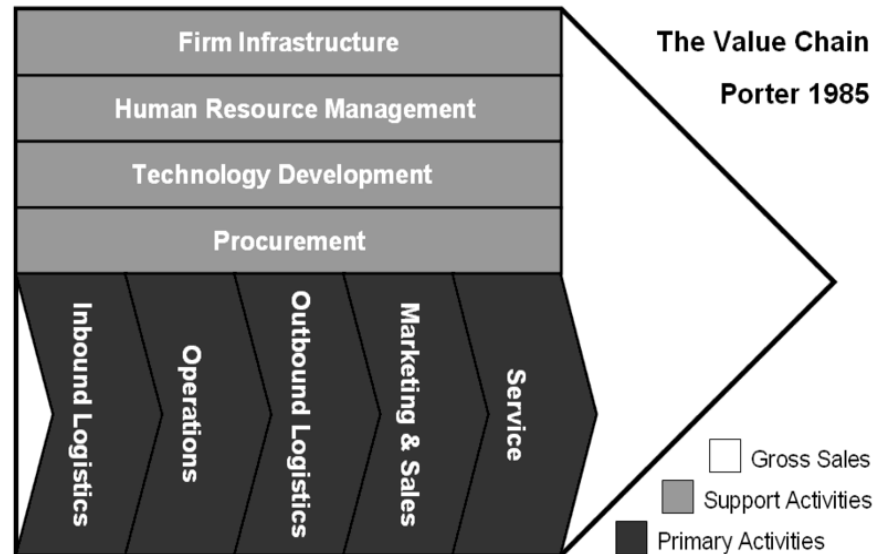
page 4

# The value chain approach (Porter)

<http://www.nano2market.eu/> N2M-project

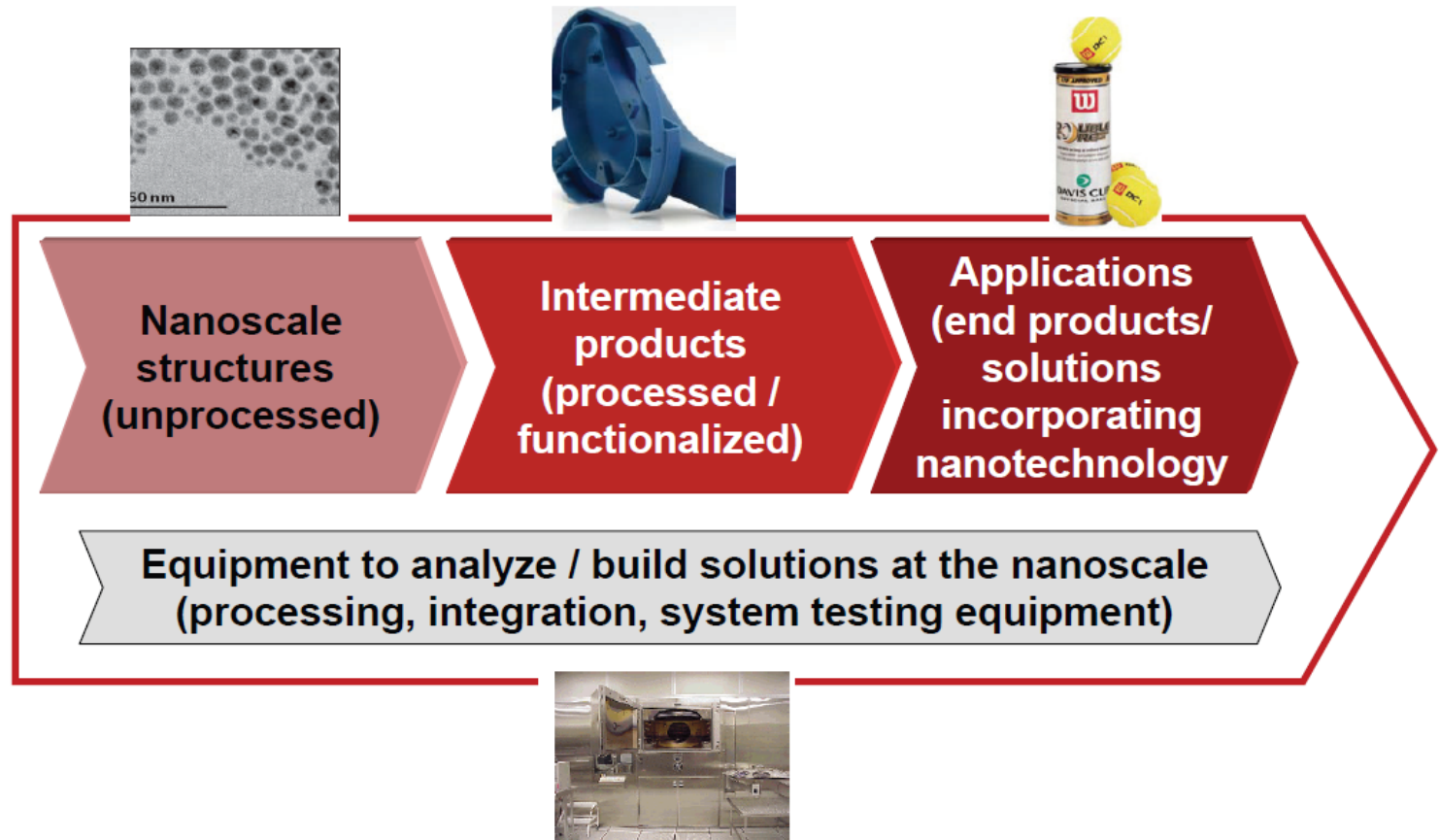
Six business functions of the value chain (Wikipedia):

- Research and Development
- Design of Products, Services or Processes
- Production
- Marketing & Sales
- Distribution
- Customer Service



Products pass through all activities of the chain in order, and at each activity the product gains some value. The chain of activities gives the products more added value than the sum of added values of all activities

# Value chain for NT: Product oriented and R&D



Source: Teichert EPO-OECD-UKPO International Conference IC09-2006., Patents: realising and securing value" 21 NOV 2006, British Library, London, UK 3405.pdf /

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# Development value chain

funded by the  
SEVENTH FRAMEWORK PROGRAMME THEME 4  
Nanosciences, Nanotechnologies,  
Materials and New Production Technologies  
CSA-SA 233476 NANO2MARKET

Development value chain:

all steps that have to be undertaken in order to place a particular product in the market, starting from basic R&D up to commercialization

basic  
research

development

proof of  
concept

regulation

marketing &  
commercializ.

service

Technology Name

Value Chain:

Step 1	Step 2	Step 3	...	Step n:
--------	--------	--------	-----	---------

Key activities

--	--	--	--	--

Output

--	--	--	--	--

Estimated cost

--	--	--	--	--

Estimated total cost

Estimated time

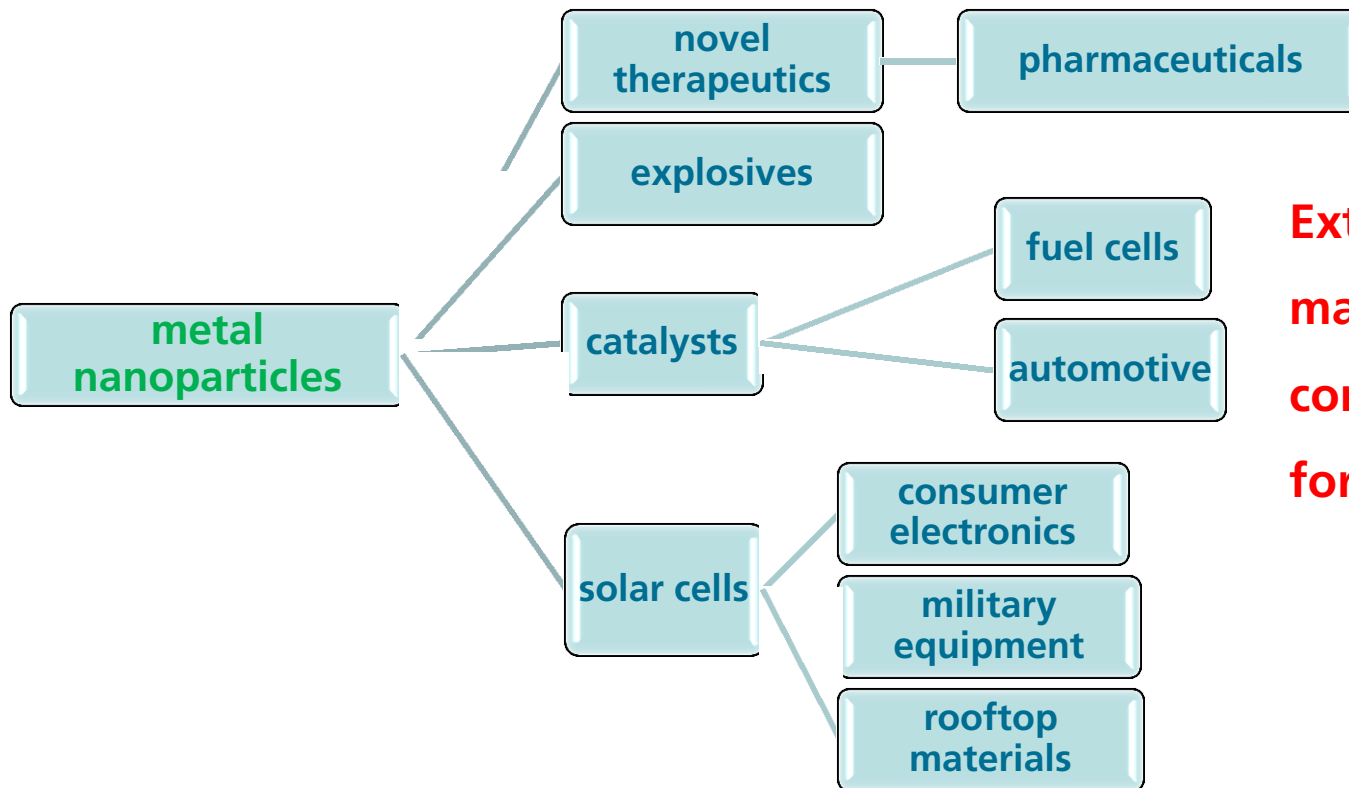
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Estimated development time

Estimated time to market

# Value chain branching type 1:

- Some materials can be used in very different applications
  - **First** step in VC is identical



**Extremely different  
markets and  
conditions  
for applications**

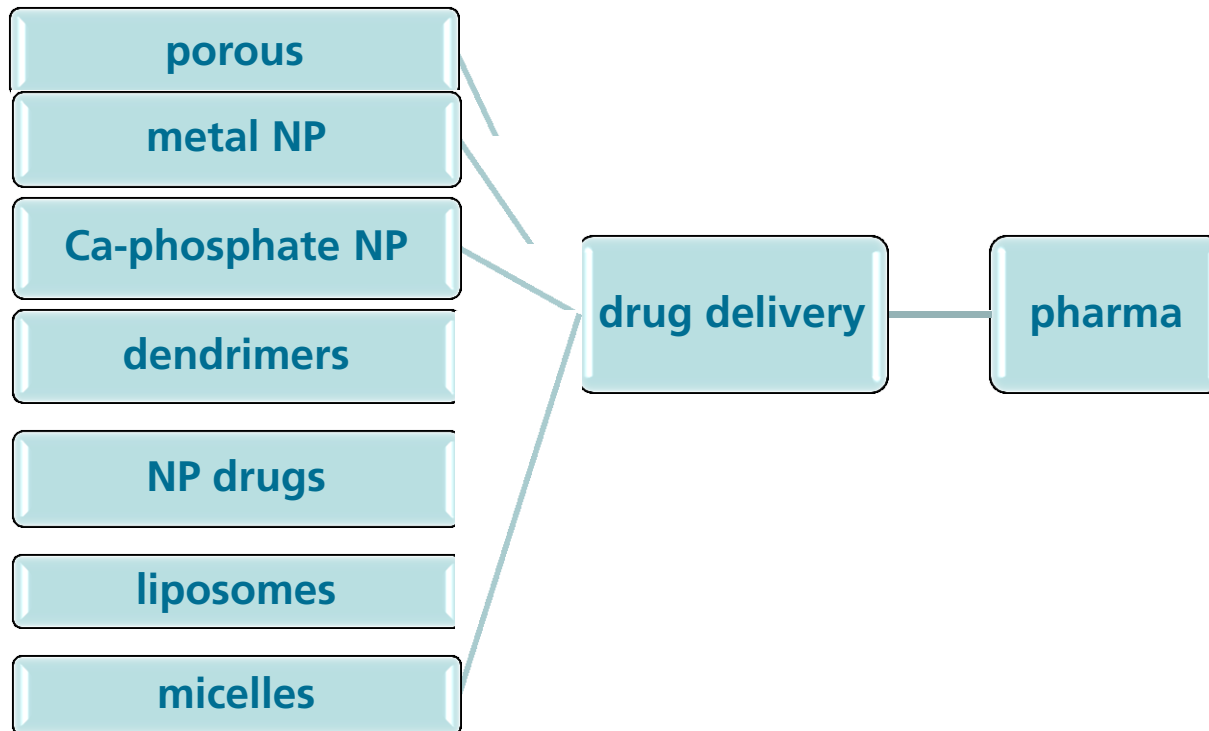
Source: L. Demiddeleer, Genesys Meeting Barcelona, 2010; I3577.pdf

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# Value chain branching type 2:

- Some applications are possible with **different** nanomaterials and even **classical** materials
- **Last** step in VC is identical



Source: L. Demiddeleer, Genesys Meeting Barcelona, 2010; I3577.pdf

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# Typical cases selected (N2M)

- Classical material developments -> **Improving** properties
  - CNT for structural materials
  - fuel cell additives/batteries: CeO<sub>2</sub>, Li-Fe-Phosphate
- Nanomaterial as **enabling** component
  - organic photovoltaics
  - CNT displays and actuators
  - nanoparticles for environmental cleanup
- **Nano + Bio + (system, analytics)**
  - biosensor, drug delivery, smart tissue
  - SNOM
- **Material + Nano + Bio + ICT** integration
  - nanoinformatics

# Summary: VC and Nanotech

- NT value chains are more **complex** than usually presented (different types of branching)
- NT-applications which are mainly **improvement** of classical materials will have similar VC schemes for R&D and commercialization
- Enabling , nanobio and especially nanobioinfo applications will be **different** and in some cases the VC is **not even visible**
- Is nano different ? Yes and No !

# Example: VC chain polymer (nano)composites



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 645993.

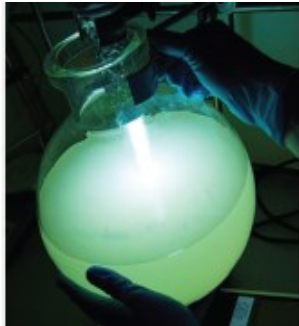
[www.h2020copilot.eu/](http://www.h2020copilot.eu/)

NP synthesis

masterbatch

injection molding etc.

Products /OEMs



Transnational enterprises

compounders

Processing

various

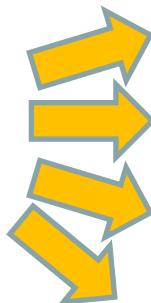
Few SME (nanocarbon)

Dispersion in matrix!

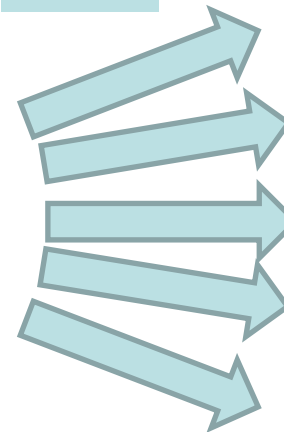
Step 2:

Step 1:

COPILOT  
open access  
many particles



Step 3:



# Top 10 product lines: Particles

Merging fundamental/applied research: Copilot-Project



Highly dispersible  
nanoparticle  
powders



Inductively  
heatable particles  
for reaction  
triggering



Photo(re)active  
coatings



Anti-dust  
coatings



Magnetic  
switches for  
smart surfaces



Storage  
& controlled release



Scavenger  
particles  
for fire & acid



Host particles  
for drugs,  
catalysts  
& sensor dyes



Marker / tracer  
particles  
(optical & magnetic)



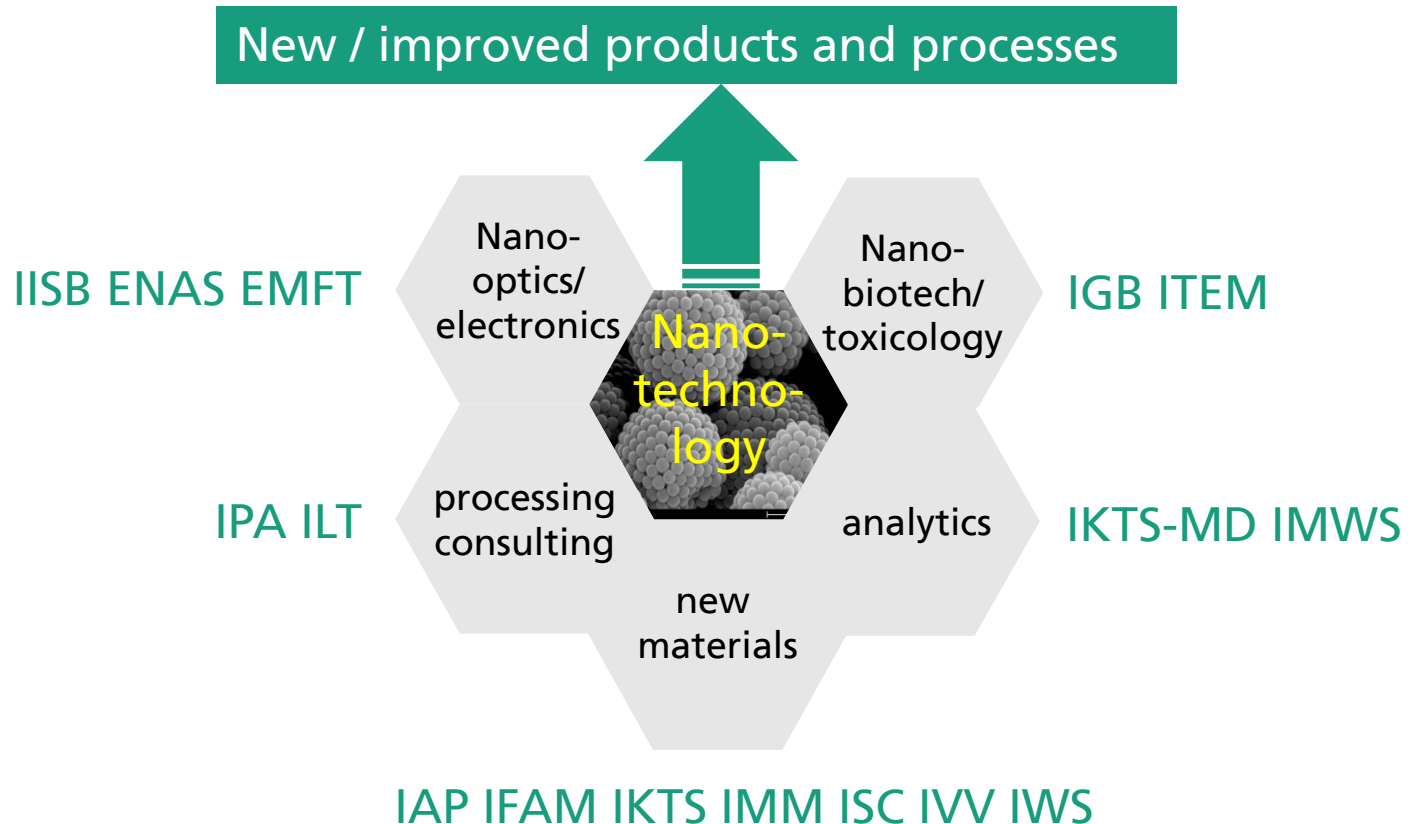
Magnetic  
carrier particles  
for fluid analysis  
& purification

# Outlook

- mesoscopic structures instead of only nano are becoming more important  
-> more system oriented approach needed
- recycling also relevant for VC
- digitalization: new VC structures
- additive manufacturing: improvements by nano
- use of more renewable resources

# Fraunhofer Nanotechnology Alliance

[www.nano.fraunhofer.de](http://www.nano.fraunhofer.de)



**Thank you for  
your attention!**

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**ZAHA HADID ARCHITECTS**

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