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Manufacturing in FP7: Review of the NMP Call 2007 and outline of future actions

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**DG RTD G2 “New Generation of
Products”**

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Content

- **Call 2007: Results**
- **Multi-annual Plan for Manufacturing in FP7**
- **Call 2008: Outline**
- **Strategic considerations and R&D investment for manufacturing** ►
- **Concluding Remarks**



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NMP Programme - Theme 4- Year 1

Overview of the Work Programme 2007

43 topics

(N. Topics) - EU Fund.

	LArge		SMall	Other			
	Large scale integrating projects		Small or medium scale focused research projects	Support Actions (SSA)	Coordination Actions (CA)	ERA Net	ERA Net Plus
	General	SME					
NANO (15) - 85 M€	2	1	3	6	2		1
MATERIALS (11) - 156M€	4	1	5		1		
PRODUCTION (10) - 171M€	4	2	4				
INTEGRATION (7) - 109M€	4	2				1	
Totals (43) - 521 M€	14	6	12	6	3	1	1
TOTAL EC budget:	295	75	150	13.5	2.5	8	

~544 M€

4.3.1 Development and validation of new industrial models and strategies (3 topics)

4.3.1-1 Beyond Lean Manufacturing – New industrial models for product and process life cycle - LA

MANUFUTURE, STEEL

4.3.1-2 New added-value user-centered products and product services – LA for SMEs

SME

MANUFUTURE

4.3.1-3 Integrated risk management in (plants, industrial parks,) industrial systems (and networks) - LA

INDUS. SAFETY

4.3.2 Adaptive production systems (2 topics)

4.3.2-1 Rapidly configurable machines and production systems - SM

MANUFUTURE

4.3.2-2 Process intensification in chemicals production - SM

SUSCHEM

4.3.3 Networked production (1 topic)

4.3.3-1 Innovative custom-driven product-service design in a global environment - SM

MANUFUTURE

4.3.4 Rapid transfer and integration of new technologies into the design and operation of manufacturing processes (2 topics)

4.3.4-1 Rapid manufacturing concepts for small series industrial production – LA for SMEs

SME

MANUFUTURE

4.3.4-2 Innovative pathways in Synthesis – improving efficiency by smart synthesis, design and reduction of the number of reaction steps - SM

SUSCHEM

4.3.5 Exploitation of the convergence of technologies (2 topics)

4.3.5-1 Processes and equipment for high quality industrial production of 3-dimensional nano-surfaces - LA

MANUFUTURE, STEEL

4.3.5-2 Production technologies and equipment for micro-manufacturing - LA

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Activity 4.4 Integration of technologies for industrial applications

Year 1

Large

Small

Other

Several cross-cutting dimensions could be considered while handling the vast array of sectors and applications and could further inspire the emergence of topics: (a) **Transforming traditional industry** (b) **Fostering scale-intensive and specialised suppliers industry** (c) **Promoting science-based industry** (d) **Towards a sustainable supply industry**

Comments

(SMEs, ETPs concerned, etc.)

4.4.-1 Advanced wood-based composites and their production - LA

FORESTRY

4.4.-2 Application of new materials including bio-based fibres in high-added value textile products – LA for SMEs



TEXTILES

4.4.-3 Multifunctional materials for the future vehicles - LA

ERTRAC-Road, ERRAC-Rail, STEE

4.4.-4 Substantial innovation in the European medical industry: Development of nanotechnology-based smart multi-tasking targeted agents for diagnosis and therapy (“theranostics”) - LA

4.4.-5 Resource efficient and clean buildings - LA

CONSTRUCTION, STEEL

4.4.-6 Innovative added-value construction product-services – LA for SMEs



CONSTRUCTION, STEEL

4.4.-7 ERA-Net on Construction – ERA-net

CONSTRUCTION



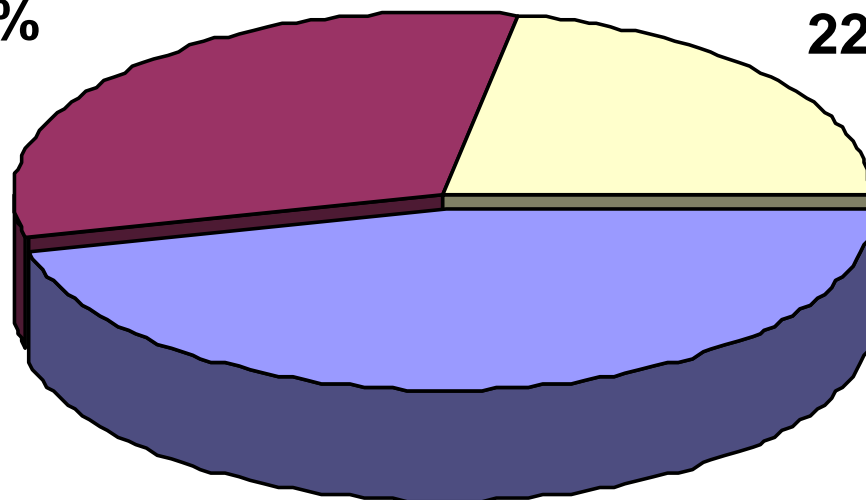
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Distribution of budget for retained proposals in NMP

Materials
31%

Nano
22%



Production
47%



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G2 proposals addressing manufacturing by topic

Topic NMP Call 1 - 2007	N. of Retained proposals	EC Funding (M€)
Industrial Models	3	18,7
User-centred products	4	16,4
Risk Management	2	22,1
Mechatronics	5	17
Process Intensification	3	9
Global Design	4	12,7
Rapid manufacturing	4	14,9
Innovative Pathways	3	10,2
3-D Nanosurfaces	2	19,2
Micro-Manufacturing	5	30,7
Wood-Based	3	18,4
Textiles	4	12,2
Clean Buildings	4	28,5
Construction	4	11,1
Grand Total	50	241,1 €



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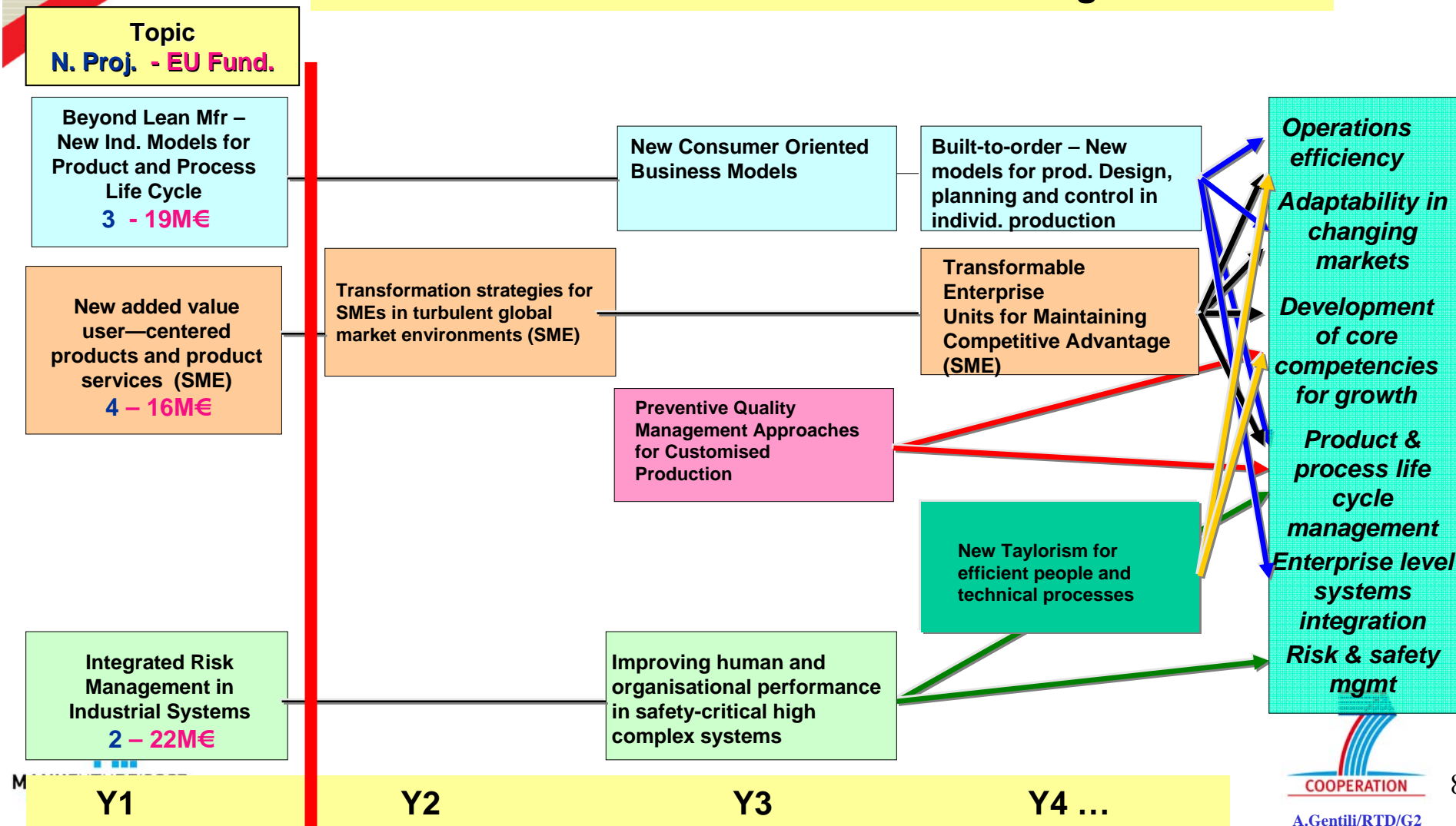
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Multi-annual implementation plan

(note – all topic titles are tentative & only indicative of future WP priorities)

New Industrial Models and Strategies





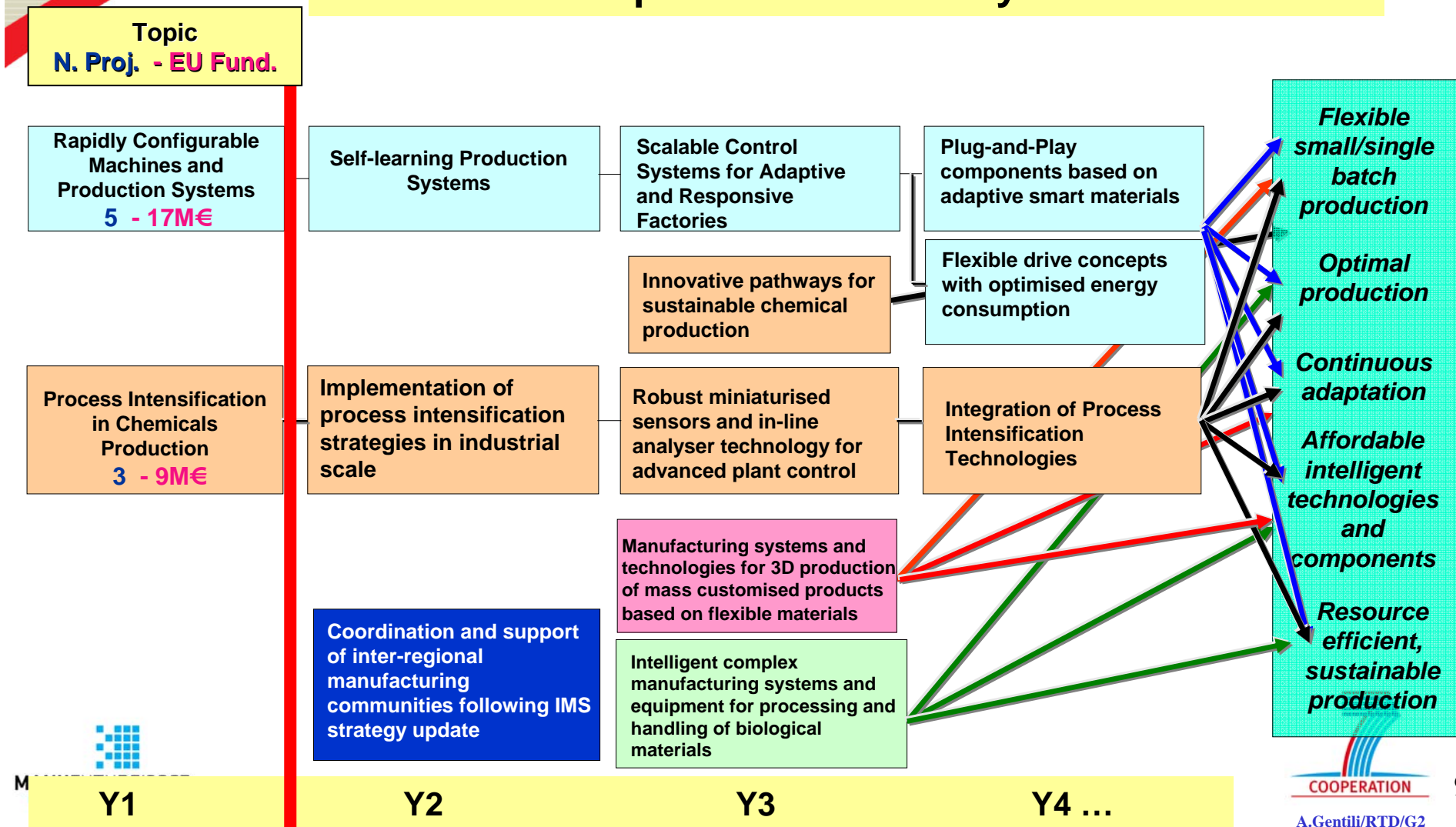
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(note – all topic titles are tentative & only indicative of future WP priorities)

Adaptive Production Systems





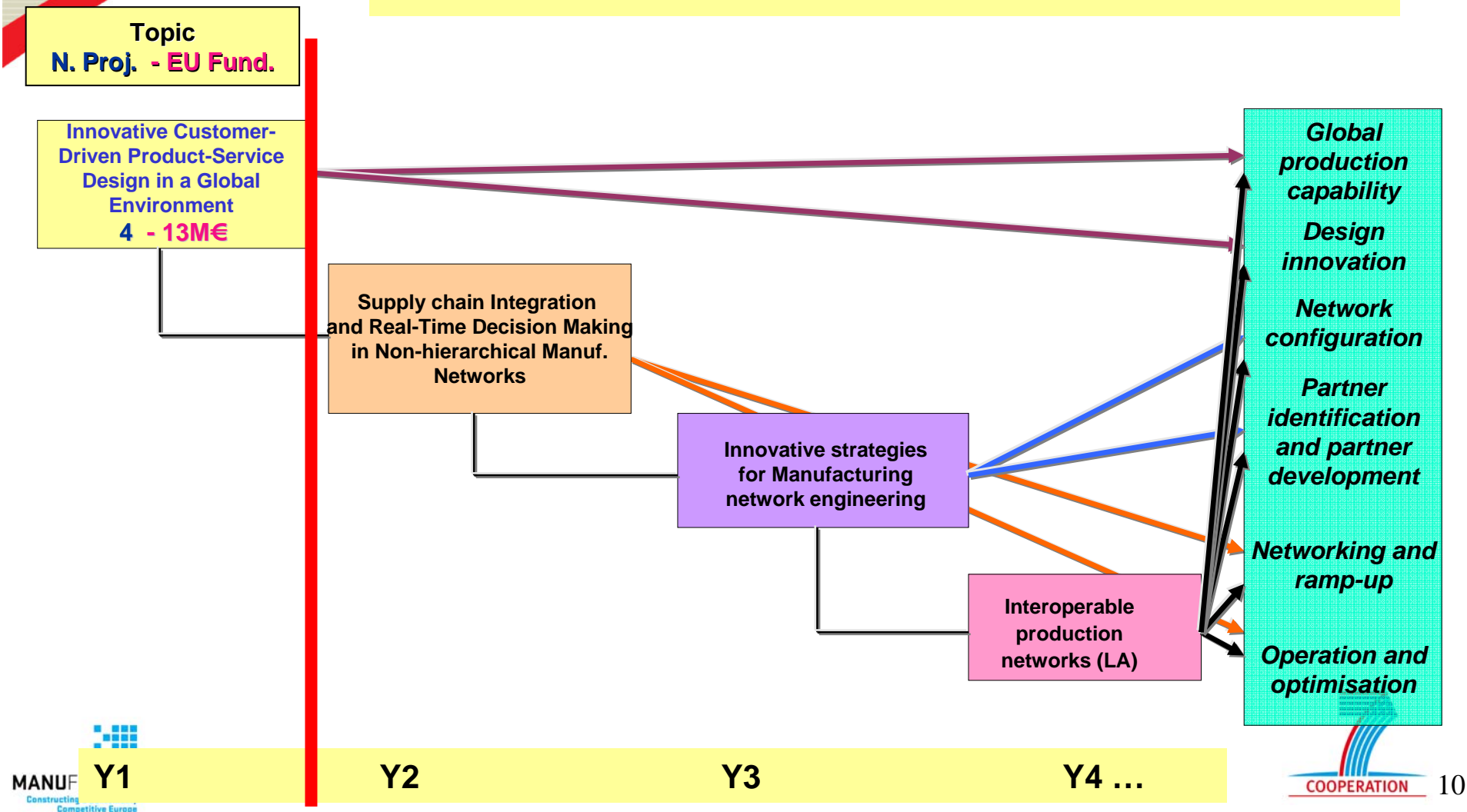
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Networked Production





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Rapid transfer and integration of new technologies into the design and operation of manufacturing processes

Topic
N. Proj. - EU Fund.

Rapid Manufacturing
Concepts for Small
Series Industrial
Production
4 - 15M€

Supply Chain
Approaches for Small
Series Industry

Automation and Robotics for
Sustainable Crop & Forestry
management

Engineering processes for
advanced industrial
agricultural machinery

Holistic approach to
machine tool design and
production

Rapid Design and Virtual
Prototyping of Factories

Manuf. Systems &
Technologies for 3D prod
of mass customised
flexible materials products

Industrialisation through
new integrated
construction processes

High throughput tools for
formulation engineering

Innovative Pathways
in Synthesis
3 - 10M€

Formulation engineering
for designed products
with particulate structure

Integrated separations
for high purity products

*Development of
Knowledge
based
Engineering
capacities*

*Integration of
Modeling,
simulation and
virtual tools*

*In-depth
understanding of
machine &
process
behaviour*

*Quick and
efficient
integration of
new
technologies*



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Multi-annual implementation plan

(note – all topic titles are tentative & only indicative of future WP priorities)

Topic
Poj. nb - EU Fund

Exploiting the convergence of technologies

Technologies for
Industrial Quality
Production of 3-
Dimensional
Nanosurfaces
2 - 19M€

Automation and
economical
production of
nanostructured
surfaces

Automation and
economical
production of
functionalised
surfaces and
nanolayers

Production
Technologies
and equipment
for Micro-
Manufacturing
5 - 31M€

Volume production
process chains for
high throughput
micro-manufacturing

Manufacturing
Platforms for
integrating micro
and nano scale
processes and
features into
meso/micro
components and
devices

*Enable smaller structures
and smart surfaces by
Industrialised
nanoprocesses (high
quality, function, flexibility,
integration, yield)*

**A clear strategic
contribution to
establishing a European
high value added nano-
manufacturing industry
for potentially disruptive
high value-added
products**

*Volume production chains,
systems and factories for
function and meso-/micro-
/nano-scale integration in
emerging new products*

*Extending range of μ -
fabrication capabilities
enabling the future
emerging single and
multimaterial
microcomponents*



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Y1

Y2

Y3

Y4 ...

COOPERATION

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Multi-annual implementation plan

(note – all topic titles are tentative & only indicative of future WP priorities)

Topic
N. Proj. - EU Fund.

Integration

Resource efficient and
clean buildings
4 - 29M€

Innovative added-value
construction product-
services
4 - 11M€

Embedded intelligence for
construction products and
systems to support use
and life cycle management

Advanced technologies
for structural safety and
extension of service life

Innovative use of
underground space

Retrofit and upgrade of
existing underground
structures, bridges and
infrastructures

Healthy, safe, accessible
and stimulating built
indoor environments

Expanding the limits of
advanced materials
processing applications
through a new generation
of high brilliance lasers

Innovative and
knowledge-based tooling
industry

Advanced wood-based
Composites and their prod
3 - 18M€

Sustainable new
products and markets
through bio-production
of green forest based
chemicals
and materials

Closer integration of
the forestry
value chain through
converging
technologies

A more sustainable,
energy efficient
production of forest
based products

*Fostering scale-
intensive and
specialised
suppliers
industry*

*Transforming
traditional
industry*

*Towards a
sustainable
supply industry*

*Promoting
science-based
industry*

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Y1

Y2

Y3

Y4 ...

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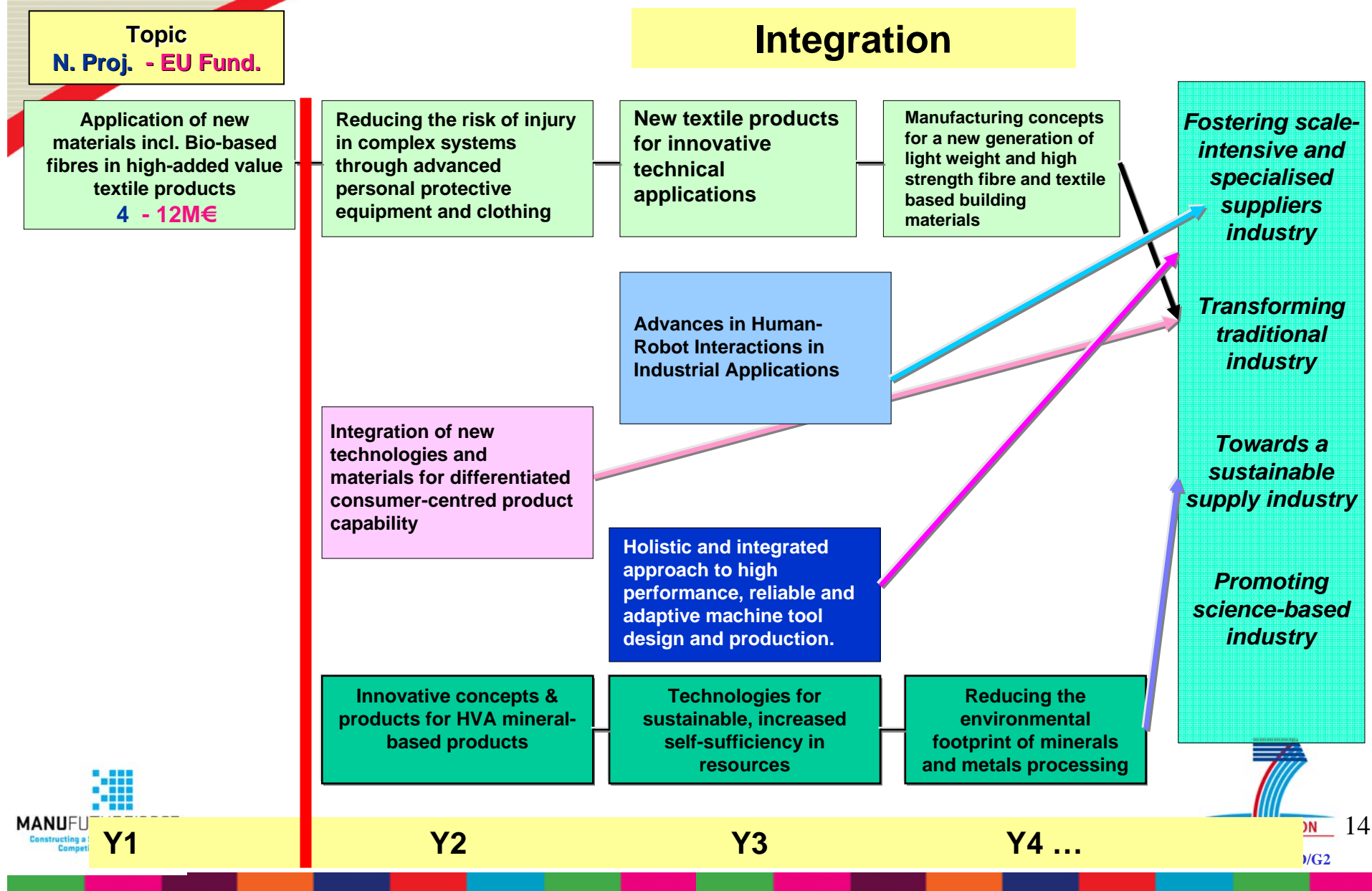


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Multi-annual implementation plan

(note – all topic titles are tentative & only indicative of future WP priorities)

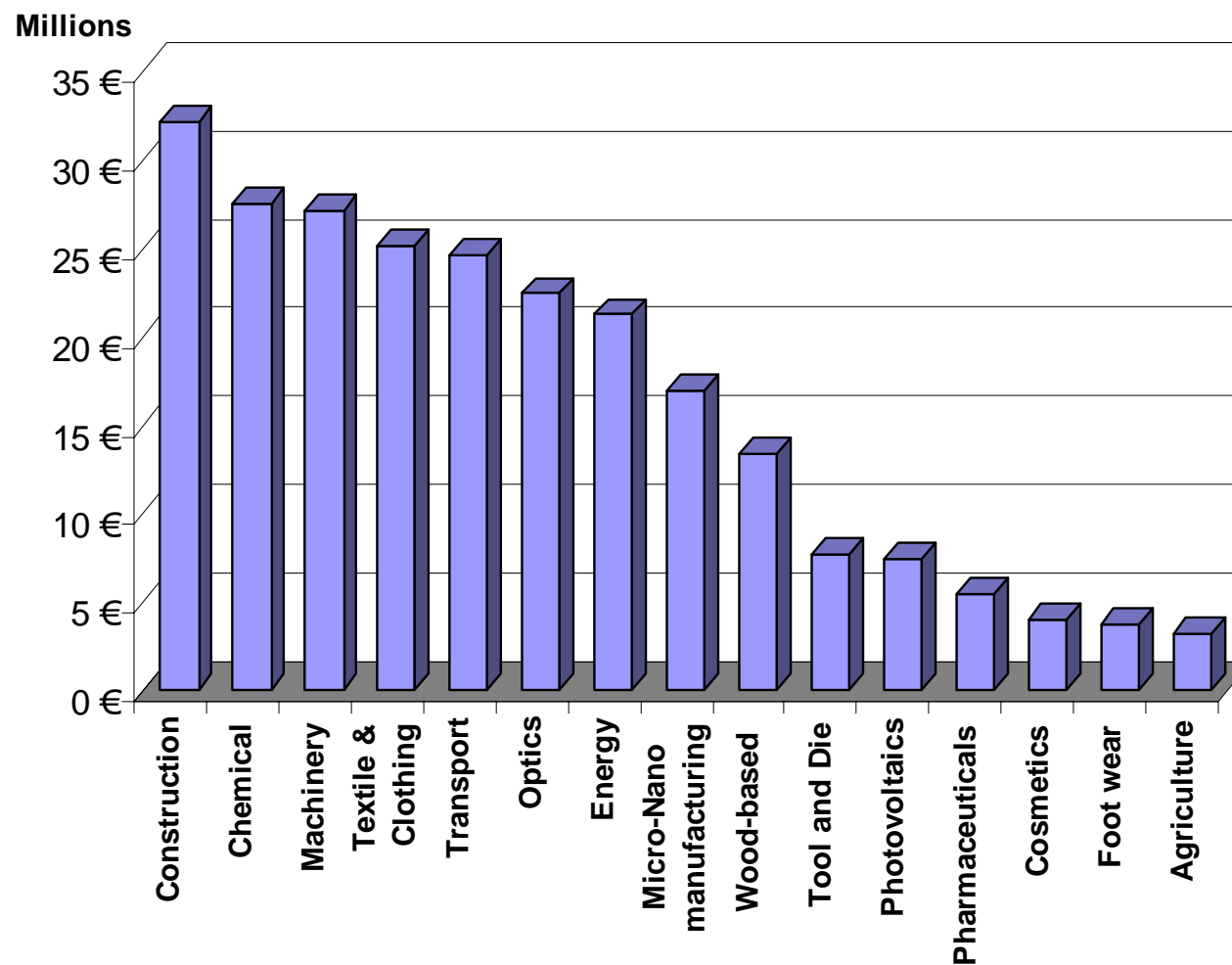




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Investment impact of G2 retained proposals by Manufacturing area



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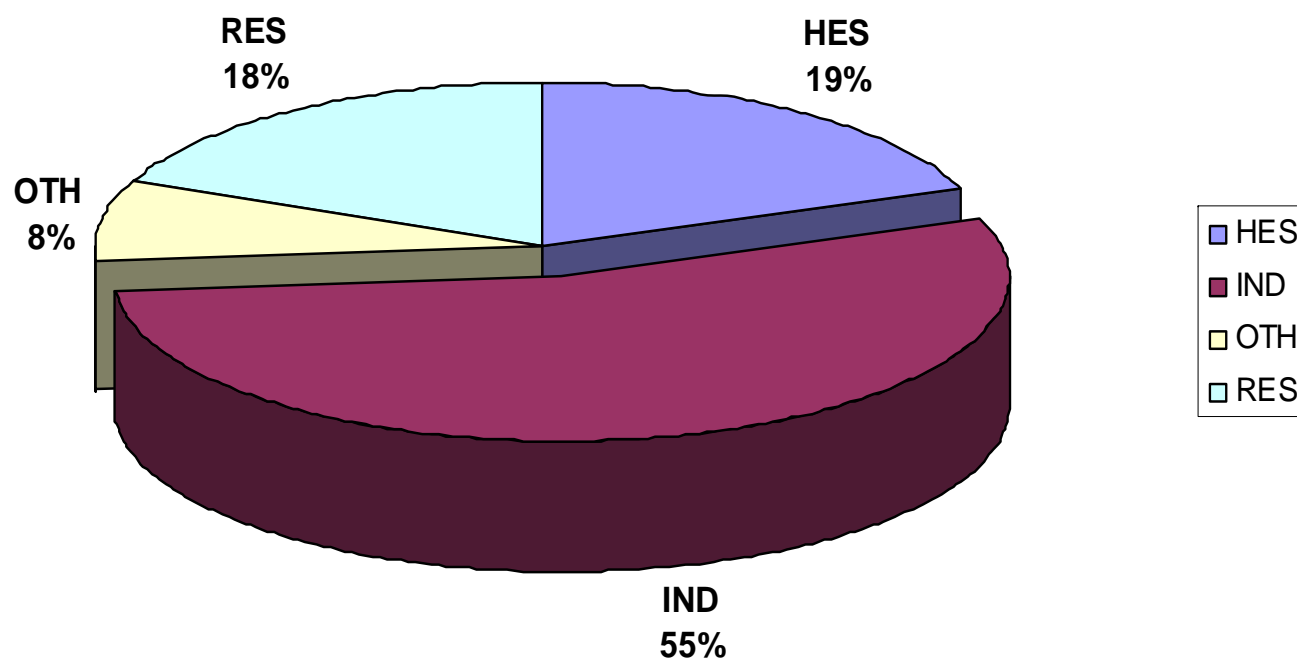
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Retained Proposals in Production (Manufacturing) by Organisation Type



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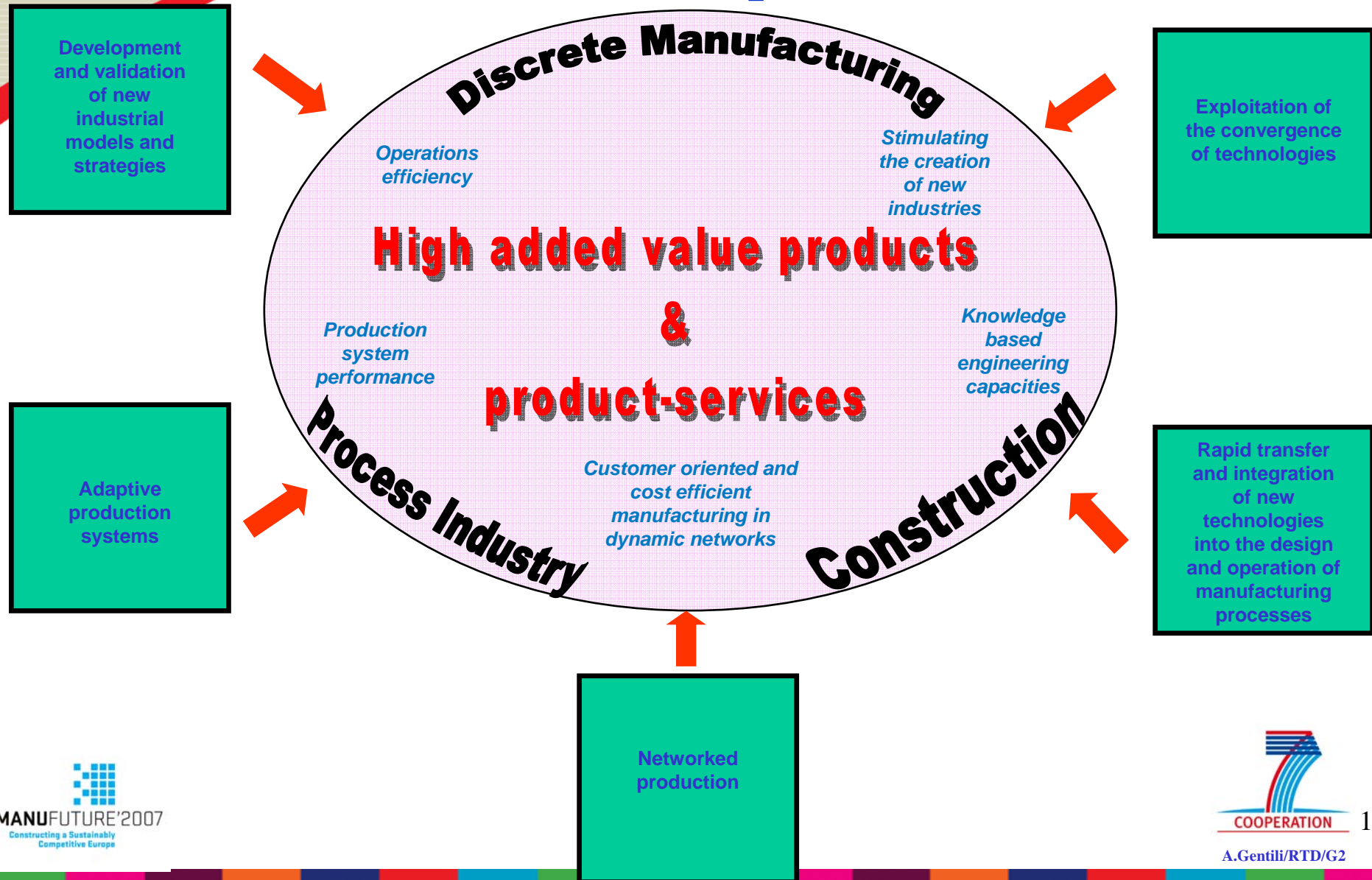
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Production's approach: Holistic response to industrial needs





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NMP Programme - Theme 4 - 2ND CALL - 2008

Outline of the FINAL DRAFT Work Programme for NMP

45 topics

	Large	SME	Small	Other		
	Large scale cooperative projects	SME-focused cooperative projects	Small or medium scale cooperative projects	Coordination & Support Actions (CSA)	ERA Net	ERA Net Plus
NANO (9)	2		4	3		
MATERIALS (13)	2		9	1		1
PRODUCTION (8)	3	2	2	1		
INTEGRATION (15)	6	3		3	3	
Totals (45)	13	5	15	8	3	1
TOTAL EC budget:						
500 M€ (indicative)	240	65	170*	15	4	6



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NMP - Year 2

Activity 4.3 New Production

(8 topics)

Large

SME

Small

Other

Comments

4.3.1 Development and validation of new industrial models and strategies (1 topic)

4.3.1-1 Transformation strategies for SMEs in turbulent global market environments - SMEs



4.3.2 Adaptive production systems (3 topics)

4.3.2-1 Implementation of process intensification strategies in industrial scale - LA

4.3.2-2 Self-learning production systems - SM

4.3.2-3 Coordination and Support of inter-regional manufacturing communities following IMS strategy update – CSA – Coordination & Support

4.3.3 Networked production (1 topic)

4.3.3-1 Supply chain integration and real-time decision making in non-hierarchical manufacturing networks- SM

4.3.4 Rapid transfer and integration of new technologies into the design and operation of manufacturing processes (2 topics)

4.3.4-1 Rapid design and virtual prototyping of factories – LA

4.3.4-2 Industrialisation through new integrated construction processes - LA



4.3.5 Exploitation of the convergence of technologies (1 topic)

4.3.5-1 Volume production process chains for high throughput micro-manufacturing – SMEs





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New Production approach for the Integration area:

Manufacturing transition strategy to knowledge economy, meeting the demand for high quality, high added value products & product-services

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- High added value products and product-services delivered with Knowledge -based factories



- Manufacturing science-engineering-technology
Integrating
Physical-nano-materials-bio-ICT



- New manufacturing infrastructure
- New education, skill and training infrastructure



- Knowledge intensive industries
- Strategic focus of technologies
- Manufacturing knowledge-base resources
- The learning society



LEGISLATIVE, SOCIAL and REGULATORY ENVIRONMENT



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Integration of technologies for industrial applications

Objectives :

Several cross-cutting dimensions are considered while handling the vast array of **sectors and applications**

- **Transforming traditional industry**, which faces the challenge of low-cost competition. It must increase its productivity through new processes & new business models and meet the market demand for high-added value products and product-services;
- **Fostering scale-intensive and specialized suppliers industry** through the adoption and integration of new advanced technologies thus enabling the industry to increase its leadership in the global markets;
- **Promoting Science-based Industry** which will play a key role in establishing a high-value European industries in new domains & markets.
- **Towards a sustainable supply industry** is another key objective in supporting product & productivity innovation, especially for sectors with a large environmental footprint.



COOPERATION

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Activity 4.4 Integration of technologies for industrial applications (15 topics)

NMP - Year 2

Large

SME

Small

Other

Comments

4.4.0-1	Development of nanotechnology-based systems for diagnosis and/or therapy for diabetes, musculo-skeletal or inflammatory diseases - LA	In coordination with HEALTH
4.4.0-2	Catalysts and sustainable processes to produce liquid fuels from coal and natural gas - LA	
4.4.0-3	Nano-technology enabled applications for integrated, cost-effective volume production - 2008 focus on Nano-structured surfaces for the manufacturing equipment industry - LA	
4.4.0-4	Expanding the limits of advanced materials processing applications through a new generation of high brilliance lasers - LA	
4.4.0-5	Innovative concepts and processes for strategic mineral supply and new high added value mineral-based products - LA	
4.4.0-6	Sustainable new products and markets through bio-production of green forest-based chemicals and materials - LA	
4.4.0-7	Integration of new technologies and materials for differentiated consumer-centred product capability - SME	SME
4.4.0-8	Smart materials for applications in the sectors of construction and of machinery and production equipment - SME	SME
4.4.0-9	Reducing the risk of injury in complex systems through advanced personal protective equipment and clothing - SMEs	SME
4.4.0-10	Organisation of events related to the Presidencies of the EU – CSA - Support	
4.4.0-11	NCP transnational activities – CSA - Coordination	
4.4.0-12	Horizontal activities responding to emerging and policy needs in the context of ERA – CSA - Support	
4.4.0-13	ERANET on Nanomedicine	
4.4.0-14	ERANET on trans-national cooperation for new innovative products in the forest-based value chains	
4.4.0-15	ERANET on implementing micro- and nano-manufacturing technologies within Member States industry	



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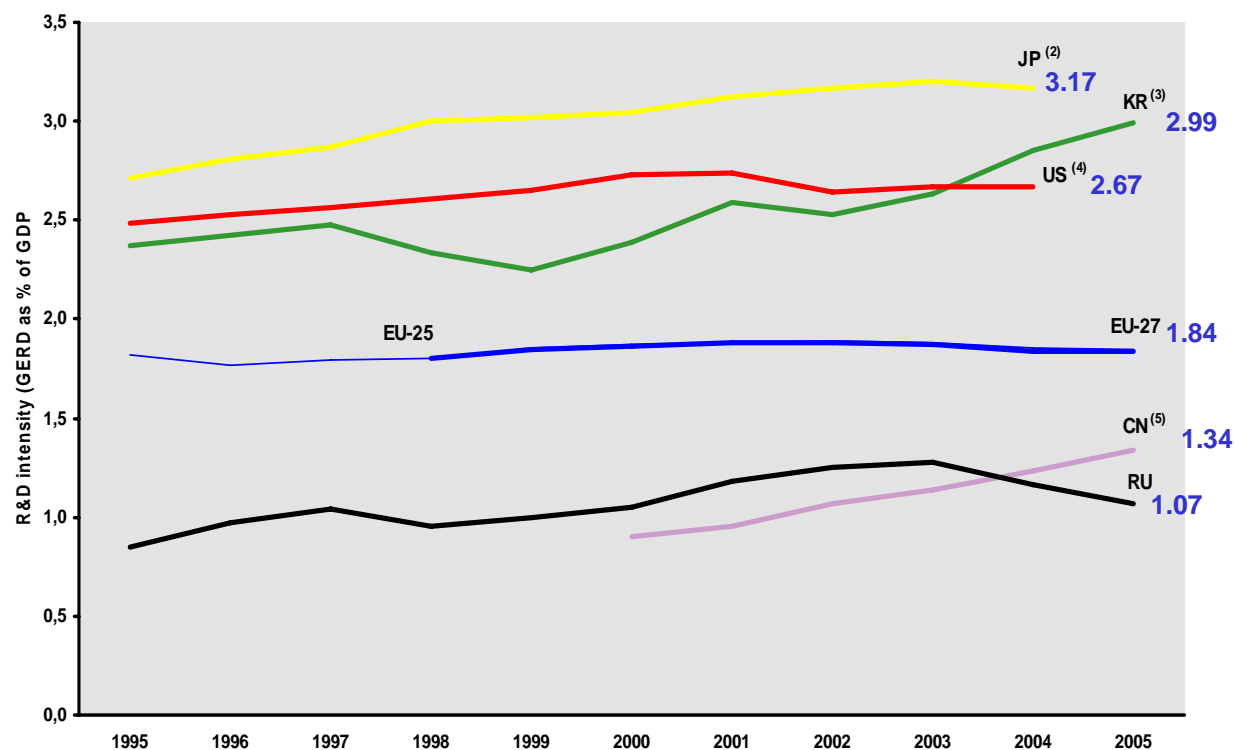
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Europe's RTD intensity as world competitor

% GDP

Figure I.1.1 R&D in RTD intensity in world regions



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Source: "Key RTD Figures 2007 on Science, Technology and Innovation" - Towards a European knowledge Area



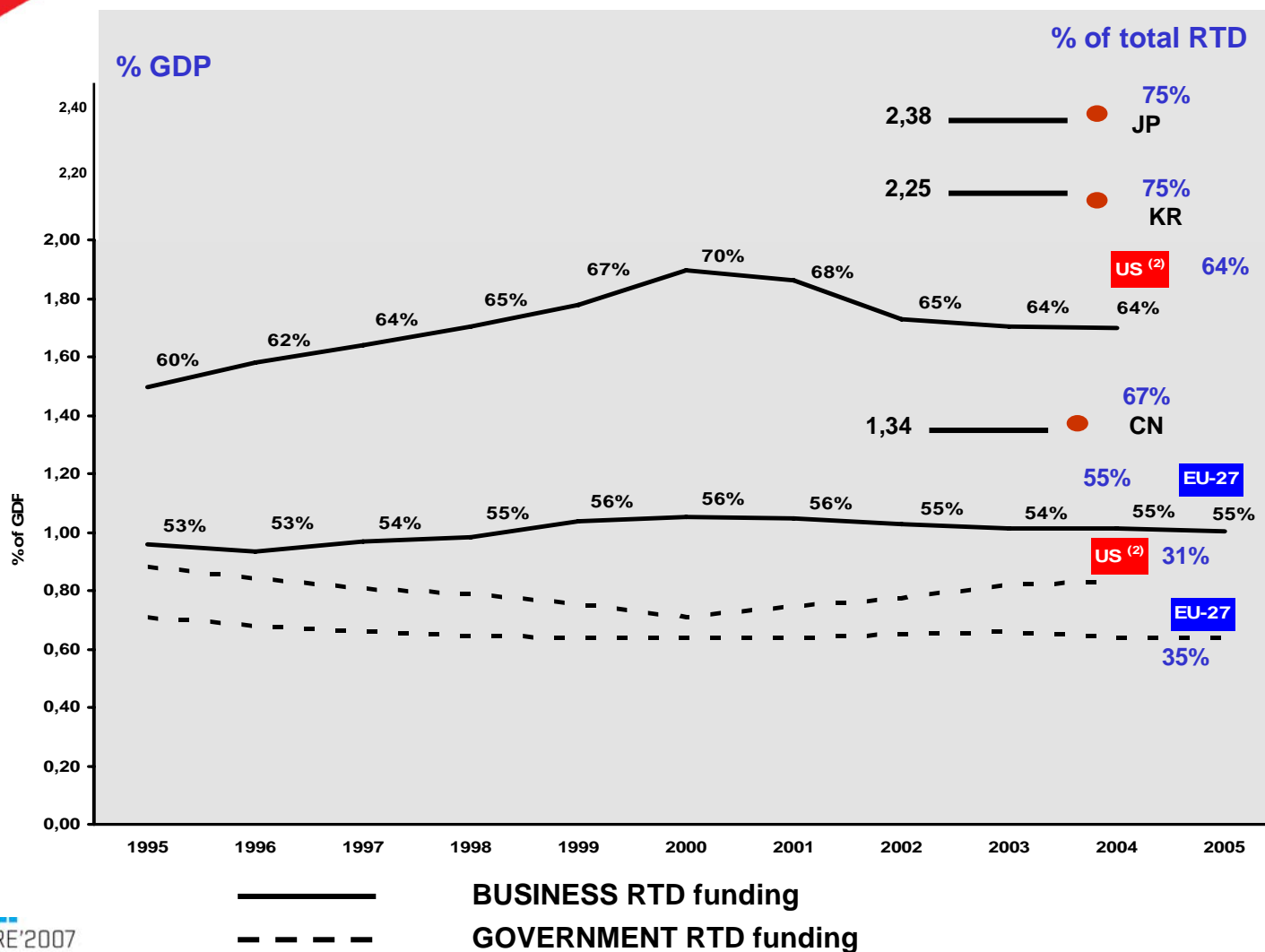
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EU RTD funding sources as world competitor





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Manufacturing still driving Europe's economy and is HIGH TECH.

**EU-25 manufacturing industries
employ about 34 million (30.4%) people
and generate annually €1,535 billion (41.5%)
of value added**

Source: Eurostat (2005)

Industrial economy

- Tangible resources
- Certainty, little change
- Traditional skills
- Mass markets
- Simple products
& processes

Knowledge Economy

- Tangible + intangible
resources
- Uncertainty, highly dynamic
- New skills
- Personalised product-services
- Complex products
& processes



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Trajectory for turning “Knowledge-into-Product”

Benefits for you

Gat ing

**International Products
& Markets**

DEPLOYMENT
under
Favourable regional
Conditions

IMPLEMENTATION
The regional dimension.

VISION

- Industrial needs
- SRA
- Priorities

**Wat./Reg.
SRA**

VALUE PATH
SYSTEM based on
➤ Product-oriented Knowledge (Intelligent products)
➤ Knowledge-intensive services
➤ Life-cycle orientation



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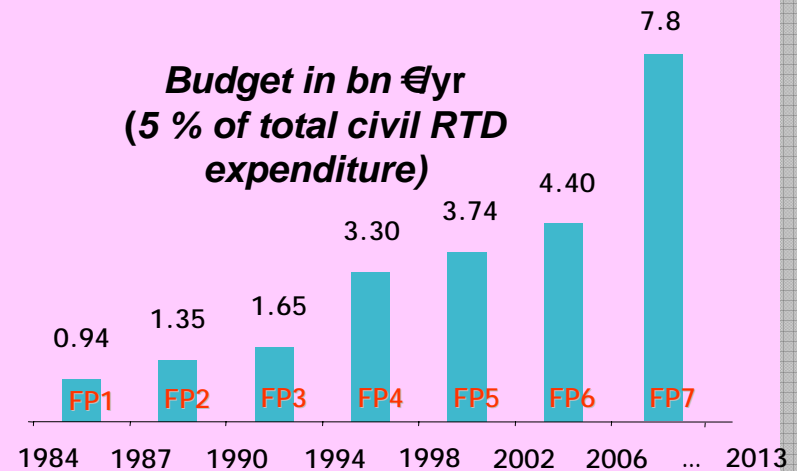
Vision and Aim: Building the European Research Area for Manufacturing

Nat'l
Programmes

Framework
Programme

Inter-
governmental
Programmes
(Eureka, COST)

Budget in bn €yr
(5 % of total civil RTD
expenditure)



A “single market” for research

- An area for the free movement of knowledge, researchers & technology
- Aiming to increase co-operation, aggregate fragmented efforts, achieve better allocation of resources



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Concluding Remarks

- First results capture the evolving RTD strategy for manufacturing;
- First results underline the importance of manufacturing for all sectors;
- Multidisciplinarity is evidenced in all submissions;
- Despite the seemingly high level of EU funding more resources are needed across EU.
- Cooperative research effort is gaining ground with strong industrial presence.



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Topic 3.1-1 Beyond Lean Manufacturing – New Industrial Models for Product and Process Life Cycle

Proposa I	Objectives	Strategy/Technology	Application/Sector
1	To develop and validate an architecture and a set of tools, methodologies and structures assisting European companies (especially those in the 50-150 employee range) operating in High Mix Low Volume manufacturing environment to attain a competitive position in the world markets.	Deliver and demonstrate solutions for SMEs in relation to strategic planning , cultural and structural issues preventing adoption of best practises, modified lean and six sigma tools tailored for SMEs, virtual manufacturing and collaboration methods etc.	Approach multi-sectoral 13 individual end users (mainly SMEs) + a sub-supply network representing e.g. Components Machinery Vehicles Electronics
2	To develop an innovative technology platform and a methodological framework for supporting all aspects of manual work throughout the system life cycle.	Employment of virtual and augmented reality technologies for an efficient and natural communication between the human and the system , enabling a bi-directional flow of knowledge and its accumulation and re-use throughout the entire life cycle.	Approach multi-sectoral End-users represent Space Heavy machinery Nuclear power Assembly lines
3	A new production model based on lean thinking that will cover the entire product life cycle as opposed to manufacturing phase only	Development of novel set-based lean design tools that ensure the concurrent consideration and development of lean product design as well as its lean manufacturing system .	Approach multi-sectoral End-users represent Aeronautics Automotive White goods





Topic 3.1-2 New added value user-centred products and product services

Proposal	Objectives	Strategy/technology	Application/sector
1	Business modelling methods focusing on the personalisation of spectacles.	Combination of new business models and rapid manufacturing technologies enabling real personalisation.	Ophthalmology (Spectacles)
2	A system and a new business model that will enable the customer to act more directly in the garment supply chain.	Applying open innovation and creating open manufacturing concepts enabling the creation of individualised garments and accessories	Clothing
3	The main goal is to develop personalised products for skin diseases treatment based on consumer's biological multifunctional skin diagnostics.	A combination of different disciplines, nanotechnologies and ICT technologies, are correctly integrated to achieve a product/service for diagnosis and treatment of skin diseases.	Cosmetics
4	Introducing customer co-design philosophy and networked SME manufacturing in the garment supply chain.	Development of personalised applications and services to specific target groups (style oriented, disabled, professional, XXL, sports)	Clothing and accessories





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Topic 3.1-3 Integrated Risk Management in Industrial Systems

Proposal	Objectives	Strategy/Technology	Application/Sector
1	Management of emerging risks in the innovative industry by building a new risk management paradigm based on a set of principles supported by a common language, agreed tools and methods and integrated Key Performance Indicators.	The project will be initiated from 17 individual emerging risk issues and generalize solutions addressing new technologies, products, materials, production and policies.	Chemical – petrochemical Hydrogen Nanotechnology industry Energy Construction
2	Focus on diverse industrial safety problems and transform industry requirements into integrated, knowledge-based safety technologies, standards and services. The new safety concepts relate to technical, human, organisational and cultural aspects.	Risk reduction is to be achieved by a total safety concept based on integrated risk assessment and management, on-line monitoring of facilities and work environment, remote sensing, pattern recognition, damage detection and other ICT technologies.	Nuclear energy Chemical, petrochemical Construction Oil and mining Energy production



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Topic 3.2-1 Rapidly Configurable Machines and Production Systems

Proposal	Objectives	Strategy/technology	Application/sector
1	Vibration control and thermal compensation of a novel type of high precision machine tool, partially built of new materials.	Adaptronic module methods and tools development.	Machine tool
2	To develop a generic modular adaptive control platform for metal cutting processes which is expected to facilitate quicker response to market and production changes.	A number of research challenges are addressed including strategy, position, parameter and machine state adaptation. Development of an adaptive control scheme which integrates on-line manufacturing control strategies with sensor and actuator systems.	Machine tool
3	To develop a simulation system of the physical properties of the textile structures with the purpose of rapid set-up of the machines involved in the whole textile manufacturing process.	Simulation, FE, AI for predicting weaving scenario and reconfiguring manufacturing plant.	Textile
4	To develop a new concept of machine tool completely configurable and adaptive, based on mechatronic devices in order to deal with multiple and even opposing requirements of machining operations, so that the range of target machining operations is increased.	Focus on creating radically new, self-adaptive machine structures with online self-optimisation based on mechatronic concepts . Development of "adaptronic" modules and interfaces.	Machine tool
5	To develop swarms of robotic fixtures which can freely move on a bench repositioning itself under an object needing support using a flexible sustain/clamp tool.	Development of a self optimising and adaptable robotic swarm fixture . Each fixture operates autonomously, given "higher goals" from a coordination level.	Machine tool



Topic 3.2-2- Process Intensification in Chemicals Production

Proposal	Objectives	Strategy/technology	Application/sector
1	To develop and validate a design methodology & criteria for dealing with two-phase liquid/liquid-reactions leading to a new generation of flexible and high-performance process equipment for continuous manufacturing	A state-of-the-art experimental research facility will be designed and constructed; this will be modular, flexible and expandable (micro through to meso structured) to ensure flexibility of process and operation.	Continuous production of added value chemicals.
2	To design, manufacture and implement a microdevice able to synthesise radiopharmaceuticals for Positron Emission Tomography (PET) analysis	Multidisciplinary approach to develop a modular microfluidic architecture which can be used for standard synthesis protocols as well as for R&D of new radiopharmaceuticals	Production of radiopharmaceuticals, new intensified device
3	To provide a powerful tool for the separation of a wide range of both neutral and charged components	Combination of high separation efficiency of capillary electrophoresis with high performance liquid chromatography	Production of fine chemicals and pharmaceuticals





Topic 3.3-1 Innovative Customer-Driven Product-Service Design in a Global Environment

Proposal	Objectives	Strategy/technology	Application/sector
1	Develop a novel MNT (Micro-Nano-Technology) product engineering methodology to assist in sharing and distributing design & fabrication knowledge for a strong customer-driven approach.	Provide product engineering methodology and tools to reduce time-to-market and support rapid manufacturing processes.	Micro-Nano Technology production industry
2	Develop a methodology and create platforms, systems, interfaces and databases for the integration of shoe manufacturers directly with their customers by empowering the consumer in respect of shoe style and design features.	Focus on three different research clusters, i.e. design tools for customer driven and customer fit shoe, design tools for advanced industrial engineering of multi-site multi-nation production systems and factories, new business models for the multi-site multi-nation shoe industry.	Shoe manufacturing & Wood Processing sectors. International collaboration through the IMS scheme is foreseen
3	Development of suitable tools to enable toolmakers to improve their local and global performance. The planned solutions will allow a synchronising of the tool manufacturing process with the customer's product development process by means of an early and continuous simultaneous engineering .	Development and establishment of customer specific ICT-supported networks. It is focused on the need to fill the gap between localised and global markets for European Tool and Die makers.	Tool and Die industry. The consortium includes organisations from International countries which should participate through the IMS scheme.
4	Develop a platform supporting knowledge based virtual collaborative design and secure partnership building, addressing the whole product life cycle dedicated to the Clothing & Leather/Footwear SMEs.	The integration of a decision making support derived from a knowledge based environment related to performance, environmental, health and toxicological aspects will allow SMEs operating more productively and bringing projects to market more quickly.	Textile, clothing, leather & footwear sectors.





Topic 3.4-1- Rapid Manufacturing concepts for small series industrial production

Proposal	Objectives	Strategy/technology	Application/sector
1	Develop new rapid manufacturing methods and solutions to improve the design of complex lightweight parts with internal channels or porous structures	Multiprocess (3D printing, DMLS, SLM, DLF, DMLS) / Design rules, optimised process parameters, software interface / Demonstration pieces, training & exhibition	Metallic components / Automotive, aerospace, medical and electronics
2	Develop new systems, i.e. materials design and development, through the mechano-chemical modification, based on the high energy ball milling technology in polymers, for RM applications.	Advanced SLS/SMS processes / User needs, material properties & process technology / tests pieces with geometry & size effects	Polymers / Automotive, medical and MEMS
3	Deliver spare parts on-demand in large industries using RM techniques, so reducing the need for large store houses, wasted spare parts and large inventories	Multiprocess (EBM, IserCUSING, Prometal, SLM & SLS, etc) / Design and simulation, material specifications, process optimisation business models / Case studies	Metals & polymer / Automotive, aerospace, medical and electronics
4	Develop a rapid manufacturing process using a laser-based process to produce customized small and medium volume parts from powders .	Advanced Laser Manufacturing (bed & powder) Processes / Material specification & characterisation, software, process & equipment development / Demonstrators	Metals, ceramics & polymers / Tools & dies, dental, biomedical, mechanical components & MEMS





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Topic 3.4-2 Innovative Pathways in Synthesis – Improving efficiency by smart synthesis, design and reduction of the number of reaction steps

Proposal	Objectives	Strategy/technology	Application/sector
1	preparation of ceramic coatings by an alternative synthesis technique called Chemical Solution Deposition (CSD).	Application of so called Chemical Solution Deposition based on ink-jet printing	Chemistry, engineering, electronics, physics
2	discovering new, and more active, metathesis catalysts synthesis of fine chemicals useful in a number of industrial applications	Development of new metathesis catalysts , comparative screening, molecular modelling, catalyst anchoring, microreactors	Petrochemistry, fine chemistry, agrochemistry, pharmaceuticals, material engineering
3	developing general protocols to improve and optimise the synthesis and purification of single enantiomers of biologically active substances such as drugs, flavours, fragrances, food additives, and agrochemicals.	Development of new technologies and tools, using advanced concepts and flexible production systems	Fine chemistry, pharmaceuticals, food, cosmetics, agrochemistry



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Topic 3.5-1 Processes and equipment for high quality industrial production of 3-dimensional nanosurfaces

Proposal	Objectives	Strategy/Technology	Application/Sector
1	Atmospheric plasma based equipment for in line production of 3D functionalized surfaces exploring new materials,	Elimination of vacuum for in the plasma process can strongly impact their industrialization and create a new market for low cost and flexible surface functionalisation. Approach includes etching for nanostructures, and CVD coatings.	Demonstrators focus on structures for solar cell surfaces, biocidal surface structures and direct growth of aligned carbon nanotubes on electrode surfaces . End-user industries represent photovoltaics, aeronautics, automotive, steel
2	Develops nanoimprinting lithography for 3D nanosurfaces on large area surfaces for production of any kind of topographically 3-dimensional nanostructured surfaces in the area of optical surfaces .	Investigating thermal nanoimprint (hot embossing) and UV imprint technologies.	Key application are 1) a diffuser to provide warm light with homogeneous intensity using only a few LEDs as a source for housing, theatres and sunlight manipulation, 2) an emissive headup display for automotive applications or other type of displays, and 3) diffractive optical element for LED illumination needs, e.g., in mobile devices, street lamps and general illumination.





Topic 3.5-2 Production technologies and equipment for micro-manufacturing

Proposal	Objectives	Strategy/Technology	Application/Sector
1	Fabrication of flexible materials in the form of high added value smart fabrics/textiles which are able to sense stimuli and react or adapt in a predetermined way.	Add advanced functions to textiles incorporating MEMS structure on flexible textile/fabrics using micro-fabrication (i.e. thick film printing/sacrificial etching) to produce, using custom printing processes, active functions in a cost efficient way.	Textile and Clothing.
2	The development of new approaches of micro manufacturing based on advanced technology convergence processes in order to propose hybrid solutions for high added value cost effective manufacturing.	The strategy is to generate new technology convergence processes through the integration of technologies related to micro-manufacturing such as compression injection moulding, embossing, laser structuring, and wet coating.	Transport, bio-medical and energy.
3	The development of a new high precision manufacturing technologies to respond cost efficiently and eco-friendly to the mass customisation paradigm within the production of complex shape micro parts, embedded systems and miniaturized products at micro/meso-scale level.	The strategy is to develop hybrid reconfigurable multitasking machines and combined processes using the Integration of different ultra high precision techniques for the generation of 3D complex shape micro-components showing a complex shape and made from different kinds of materials.	Medical and bio-medical, automotive, environmental monitoring, aeronautic and aerospace
4	The development of a highly flexible process for the patterning of large area complex micro structure, allowing the low cost, high volume production of large area micro structured surfaces for the use in diffractive optics (DO).	The strategy is to develop flexible patterning of complex micro structures using adaptive embossing and micro machining technologies.	Optics
5	Development of low cost mass production technologies for manufacturing complex non silicon multifunctional 3D-micro parts.	The “rolled multi material layered 3D shaping technology” will be used together with concepts of tape casting and advanced printing techniques. This would open up a new process for the large-scale production of complex non-silicon micro products.	White goods, optics, construction, chemical and medical.



Topic 4.0-1 Advanced Wood-Based Composites and their production

Proposal	Objectives	Strategy/Technology	Application/Sector
1	Creating new types of composites by replacing petrochemical polymers with natural polymers in Wood Plastic Compounds	New cost-efficient materials and processes	Demanding, high-value technical applications in various sectors
2	New laminates and sandwich panels reinforced with continuous long wood fibers	Find optimal sources of raw materials for matrix and fibre of laminates, and core of sandwich panels. Definition of laminates and sandwich panels' structures, fibre sizing and bonding elements.	Building, Construction, transportation and other fields
3	development of a series of completely new wood-based sustainable composite materials for use in a wide array of market sectors	The approach is to better utilize the inherent properties of cellulosic fibres and nano-cellulose fibrils in such materials. E.g. tailoring of fibres & nano-reinforced foams	Wood-based high end-value products in medical applications, transport and packaging





Topic 4.0-2 Application of new materials including bio-based fibres in high-added value textile

Proposal	Objectives	Strategy/technology	Application/sector
1	New fiber generation with temperature regulation , bio-degradability, strength and durability characteristics.	Introduction of a large amount of phase change materials (PCM) into fibers for thermal management	Conventional clothing with special features, home textiles, sports, leisure
2	100% renewable and biodegradable agrotextiles , via natural fibres and bio-based polymers	Extrusion processes processing into knitted, woven or non-woven structures; a number of test/demonstration cases.	Agriculture (webs for soil covering)
3	Flexible photovoltaic cells (development of novel conductive fibers) directly on textile substrates	Selection of suitable deposition techniques and final characterization of the resulting solar cells.	Home textiles , sports, leisure power generating textiles, outdoor applications such as garments or tents
4	Bio composite materials from modified natural fibers combined with thermoplastics and thermosets	New processing technologies in the whole chain of production from the fibers extraction and modification, to the development of the composite,	Structural application in transport , energy, agricultural machinery and shipbuilding





Topic 4.0-5 Resource efficient and clean buildings

Proposal	Objectives	Strategy/technology	Application/sector
1	A affordable energy storage management systems for buildings	Integration of Phase change materials (PCM), ground storage, flywheels and vanadium batteries	Reducing peak demands and total energy requirements both at a building and district level.
2	To optimise indoor air quality and climate conditions whilst minimising overall energy consumption	Intelligent and multifunctional windows, multifunctional insulated exterior walls, clean air-conditioning systems and advanced sensors and control systems.	The project will commence at laboratory level, but will also consider large-scale tests before implementing real world applications
3	Reduction to CO ₂ -emissions through the achievement of energy savings, the use of renewable energy sources (RES)	Transparent solar thermal façade collectors, glazing with integrated PV, façade integrated solar thermal vacuum tube collectors, unglazed opaque façade collectors and a façade integration ventilation	All kind of new energy gaining multi-functional components which will be incorporated into the façade of large buildings . These facades will be used for energy conversion
4	Development of an intelligent self-sustained and zero CO₂ emission hybrid system for residential/commercial buildings and districts buildings	Energy will originate from RES and will flow through hydrogen as an energy carrier to cover its electrical, heating and cooling needs	The design, implementation, operation and monitoring of RES (Renewable energy sources) such as sun, wind and hydro power at building and district level.





Topic 4.0-6 Innovative added-value construction product-services

Proposal	Objectives	Strategy/technology	Application/sector
1	Development of a novel device for low cost monitoring of the building structure	Radio Frequency Identification (RFID) technology, Micro-Electro-Mechanical Systems, lower-power wireless networking	Construction, Building Structural safety
2	Improvement of sandwich panel design and design tools, energy savings during production and installation , prediction of product lifecycle	Multidisciplinary approach with material testing, assembling and design competences united	Construction, Building Sandwich panels
3	Nanomaterials to be used in retrofitting technologies for natural and artificial stones	Development and application of nano materials	Construction, Building Nanomaterials, Natural and Artificial Stones
4	Innovative solutions for collaborative SME-RTD communities for knowledge creation / reusing, bidirectional learning	ICT solution, SOA based platform integrating existing knowledge into a knowledge management tool for a group of specialized companies	Construction, Building ICT application for SMEs-RTD communities

