

# Mixed Reality Research: The European Dimension

*ISMAR 05 6/10/05*



*Eric Badiqué*  
*European Commission*



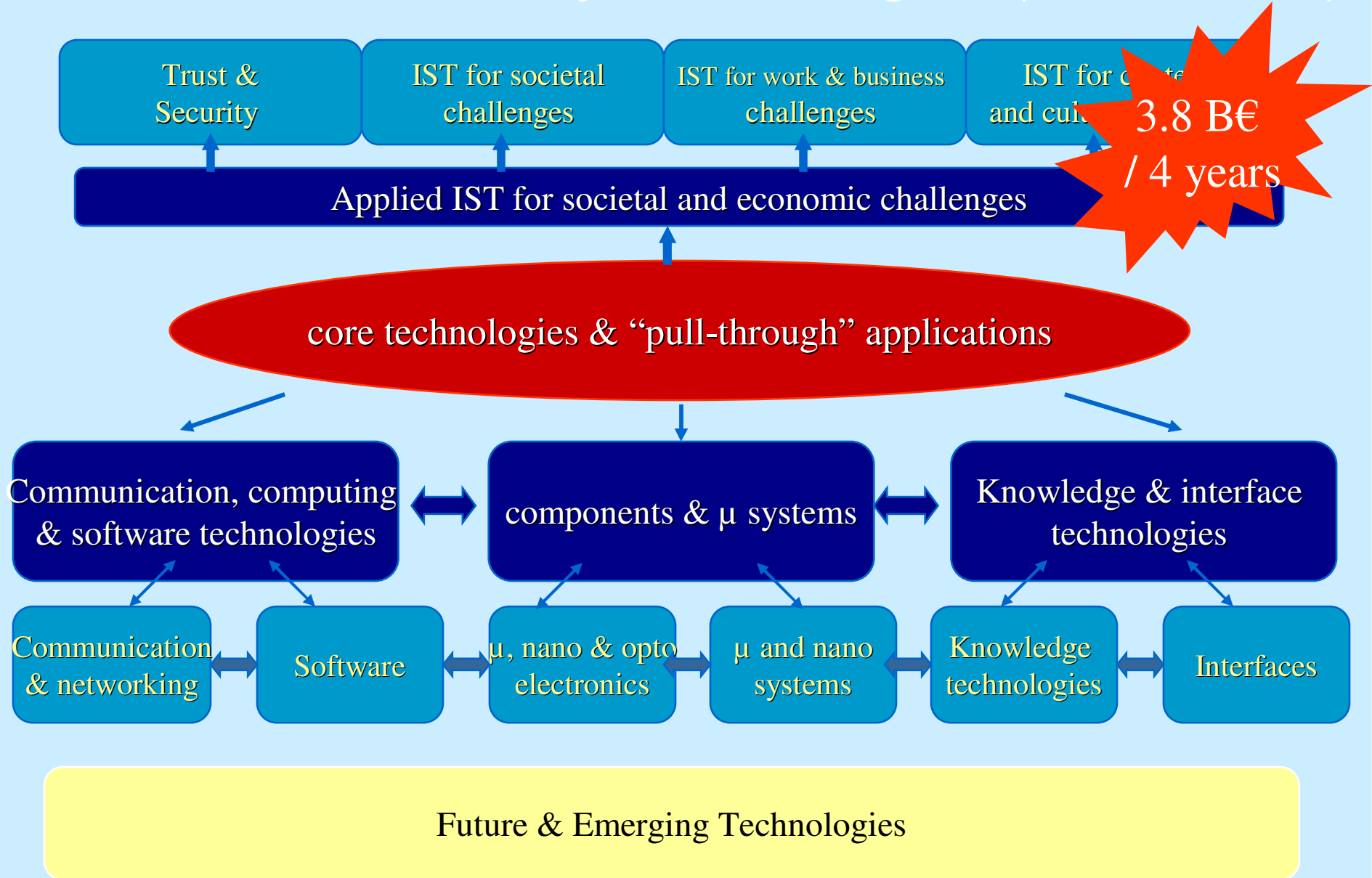
# Outline of presentation

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- European Programmes: Where are we today ?
- Support to Mixed and Augmented Reality research
- The future: Main trends and drivers
- The proposal for the next Framework Programme
- Options for supporting MR research
- Conclusion

# Information Society Technologies (2003-2006)





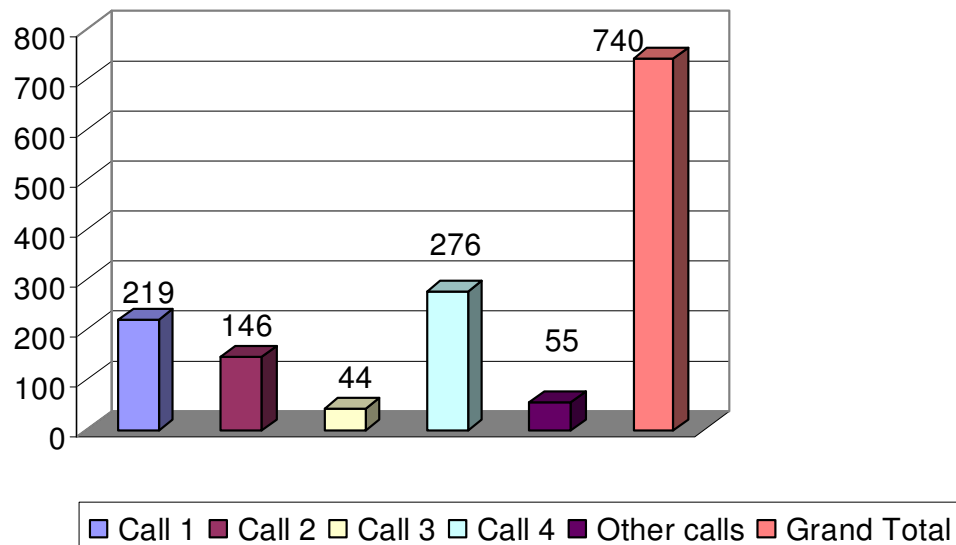
# Types of projects: Forgive the jargon..

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- **Integrated Projects (IPs)**
  - ✓ Integrate a critical mass of activities and resources
  - ✓ Ambitious objectives of a clear European dimension
- **Specific Targeted Research Projects (STREPs)**
  - ✓ Improves existing or develops new products, processes or services
  - ✓ Proves the viability of new technologies
- **Networks of Excellence (NoEs)**
  - ✓ Overcome the fragmentation of the European research landscape in a given area
  - ✓ Establish a durable restructuring/shaping and integration of efforts
- **Coordination Actions (CAs) and Specific Support Actions (SSAs)**
  - ✓ Support, networking, co-ordination of research and innovation activities



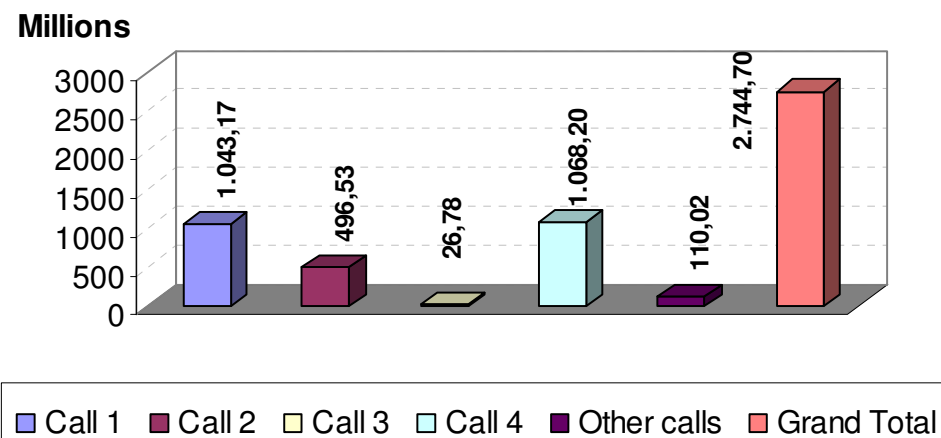
### Total Number of retained projects per Call



740\* projects launched so far...

..for a total of 2.74 BEuros

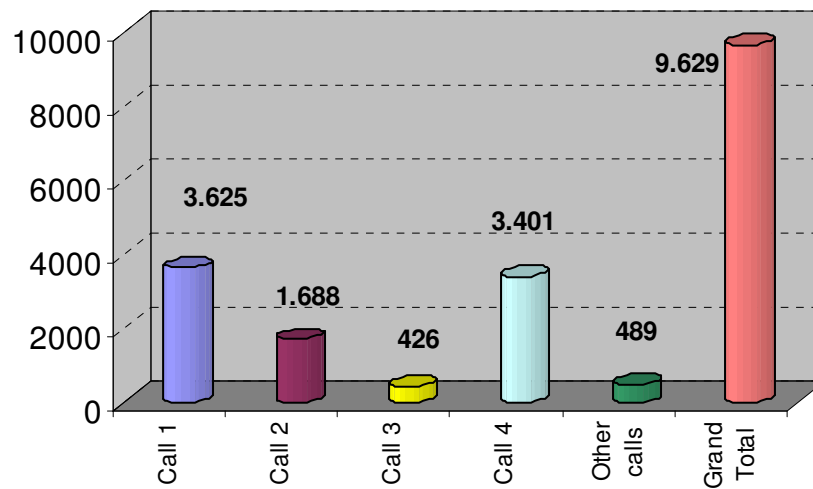
### Total Funding per Call



\* Call 4 under negotiation



**Total Number of Participants per Call**

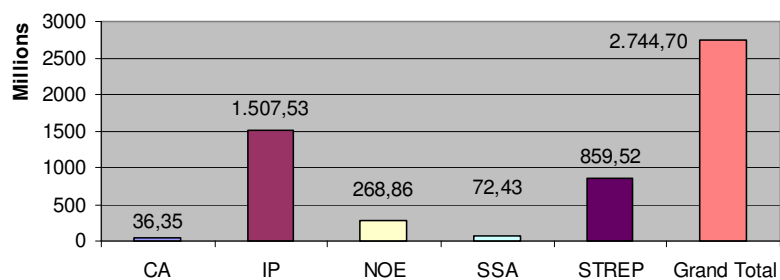


More than 9600  
participating organisations

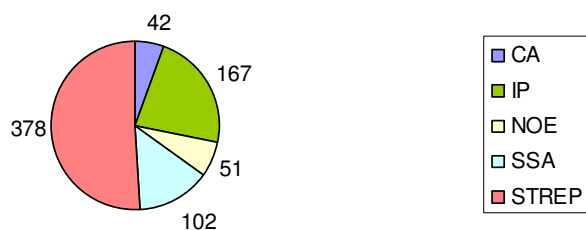


## Concentration of efforts on more strategic projects...

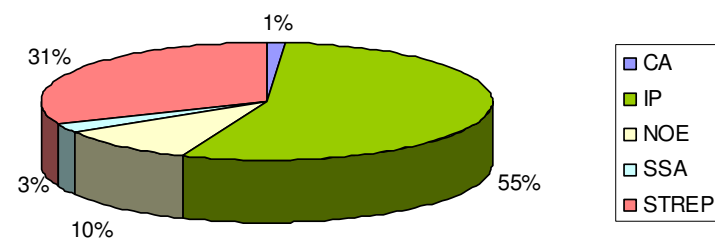
Total Funding per instrument (call 1-4)



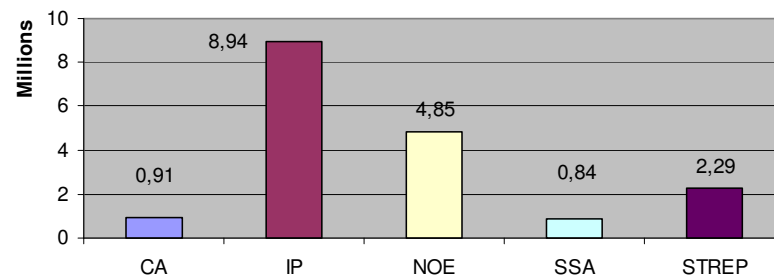
Number of Projects per Instrument (Call 1-4 / Total =740)



Total Funding per instrument (call 1-4)



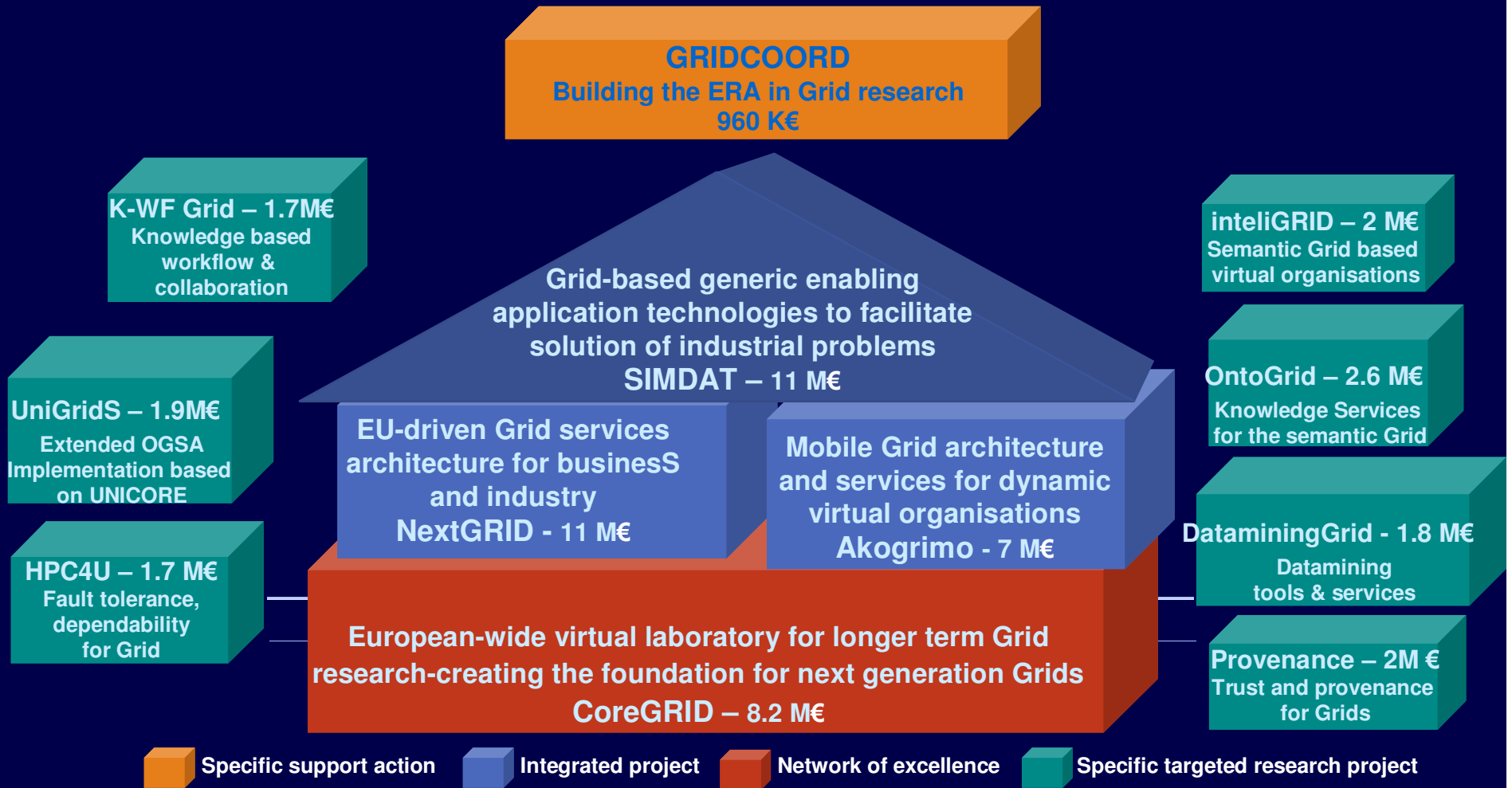
Average Project Funding per Instrument (Call 1-4)





# A coherent set of projects

## Example: Grid Research



# Austrian participation in the Programme



## Call 1 – 3

- 196 participations – 18 coordinations
- Financial contribution: 47 MEuros (2.9%)

### – Top 5 Participants

- JOANNEUM RESEARCH
- ARC SEIBERSDORF RESEARCH GMBH
- UNIVERSITAET INNSBRUCK
- KARL-FRANZENS-UNIVERSITAET GRAZ
- TECHNISCHE UNIVERSITAET WIEN

### – Main domains of activity

- Dependability and security
- Embedded Systems
- Semantic-based Knowledge Systems
- e-Health
- e-Culture
- Applications for mobile workers
- Micro and Nano systems



## Call 4

- 95 participations – 10 coordinations
- Financial contribution: 38 MEuros (3.5%)

-> *Under negotiation*

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# Between 1999 and 2004: more than 40 projects related to MR

## FP5 (1999-2004)

- Overall 40+ projects
- Estimated funding: 70M€ +

### 1 Action Line on 'Mixed Realities and New Imaging Systems'

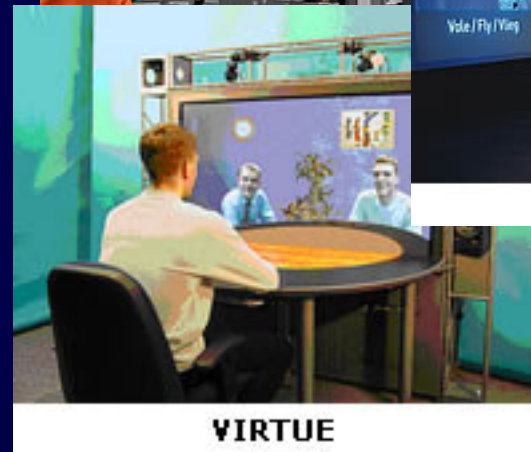
#### 25 projects

#### ● key technologies

- high realism visualisation
- computer vision
- active 3D-acquisition
- mixing of real and synthetic live action in virtual studios
- animation' & virtual humans
- Augmented Reality
- 3D displays (single and multi-user)

#### ● Applications

- MR authoring and digital story telling
- Large screen MR experiences for entertainment
- MR for design and education
- MR for industrial maintenance and training
- VR for team working
- shared AR-based working spaces for architecture design
- AR-based interior design and e-Commerce
- Enhanced interactive TV experience
- Cultural and industrial applications of AR
- 3D TV



**VIRTUE**



**Art-Live**

#### Other activities within the Programme

- AR guide for museums
- MR for artistic expression
- MR for presence research
- AR and VR for mental health applications
- AR for minimal invasive surgery
- MR for tourism applications
- VR for emergency simulations

# Current framework



FP6 (2003-2006)

No dedicated action line

- 8 projects
- < 20 M€ EC contribution
- Areas of activity
  - Virtual environments in the work place
  - Scalable VR platforms
  - Cross-media content production
  - VR for medicine
  - Haptic interfaces for virtual environments
  - Increased realism for computer games
  - AR for industrial maintenance
  - ...



# Example: INTUITION Network of Excellence



*“Virtual reality and virtual environments for future work spaces”*



**48 Months – 6 M€ funding – 58 partners**

## Working groups

- Aerospace
- Automotive and Transport
- Constructions
- Energy
- Engineering/Design
- Entertainment and Culture
- Evaluation and Testing
- Education and Training
- Haptic Interaction
- Medicine/Neuroscience
- VR / VE Technologies



## Reduced support

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- Only one large related initiative supported
- MR-related activities scattered around Programme
- No coordinated activity covering MR
- Very little visible activity on MR-enabling technology
- Has support been reduced at National level (in other regions) as well ?
- Has the hype faded away or have we missed an opportunity?
  - **Should this domain be reinforced in next framework ?**

# Where is MR on the hype cycle?





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# Europe's Challenges



- Global

- Increasing global competition
- De-localisation (including of R&D !)
- R&D investment gap

- Societal

- Ageing population
- Security
- Transportation
- Environment
- Energy
- Content and culture

ICT R&D	EU-15	US	Japan
Private sector investments	23 B€	83 B€	40 B€
Public sector investments	8 B€	20 B€	11 B€
Inhabitants	383 m	296 m	127 m
Investments / inhabitant	80 €	350€	400€.
ICT R&D as % Total R&D	18%	34%	35%

Source: IDATE (for EU-15); OECD

# Information and Communication Technologies



## Key to Future Wealth & Welfare

- ICT – a key enabler for productivity growth & competitiveness
  - ICT investments contribute half of Europe's productivity gains
- ICT – an important sector in its own right
  - From 4% of EU GDP in early 90s to more than 6% today
- ICT – a facilitator for more efficient public services
  - ICT also allows more participation in democracy and public life
- ICT – providing tools for addressing societal challenges
  - Ageing population, health and social care, security etc.
- ICT – underpinning progress in all science & technology fields
  - GÉANT, the world-leading research network, Grid infrastructures etc.

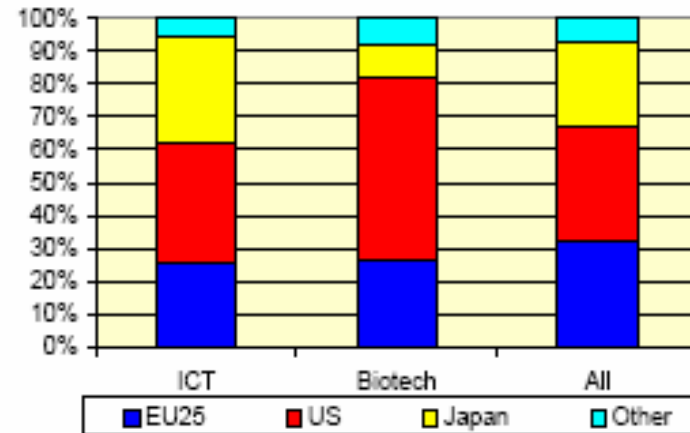
# The way to increase Europe competitiveness ?



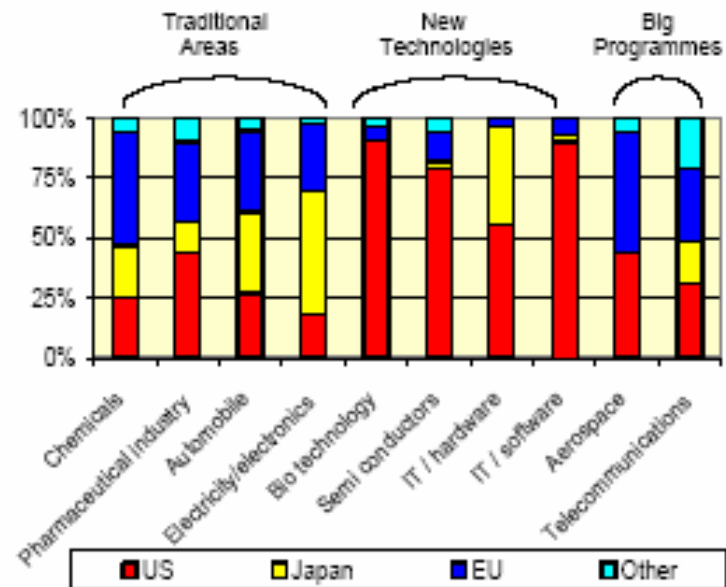
*“Creating value from new knowledge resulting from research and innovation”*

- More R&D investment
- More researchers and a more attractive environment
- More mobility
- More competition to stimulate excellence
- Better coordination of National research efforts
- Better innovation systems

R&D  
Spending  
Lemonde/OECD

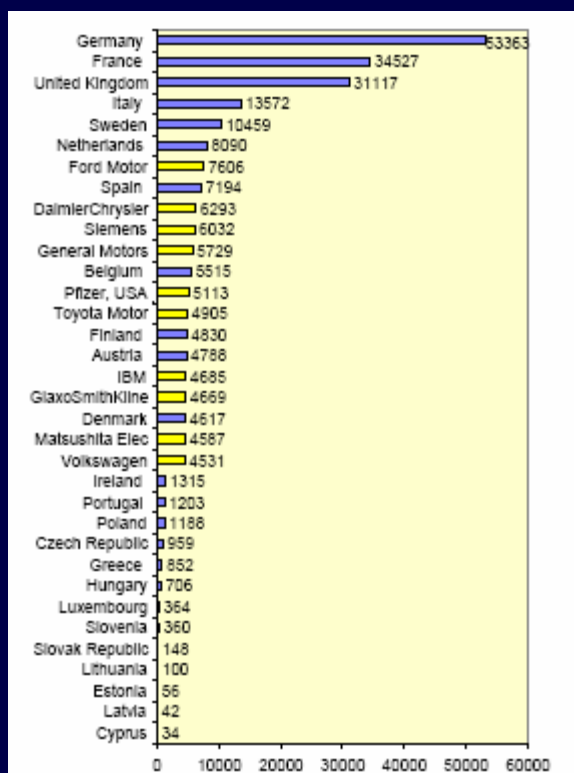


Triadic  
patents  
DG RTD  
/OECD





## Joining forces to Reach critical mass



Source: DG RTD, Eurostat Data: OECD, Eurostat, UK R&D Scoreboard



R&D expenditure of  
EU 25 compared  
with top 10 multinationals

# R&D: What for ?

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## The 7 years horizon

*"everything that can be invented has been invented"*

Charles H. Duell, Commissioner of the U.S. Office of Patents,  
1899

*"there is a world market for maybe five computers"*

Thomas Watson, chairman of IBM, 1943

*"there is no reason anyone would want a computer in  
their home"*

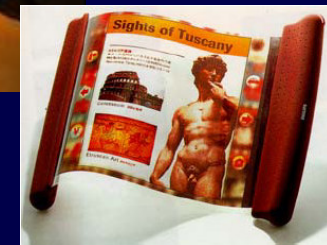
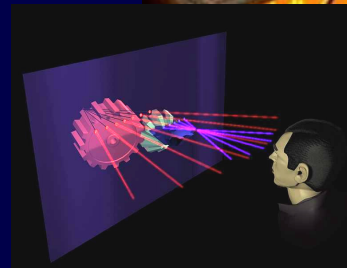
Ken Olson, founder of Digital Equipment Corp., 1977





# A few of the opportunities ?

- Technology
  - Mixed Reality and 3D
  - Search technology
  - Audio-Visual Networks
  - Sensor networks
  - Cognitive systems
  - ..
- Applications
  - Visual interfaces
  - Location-based services
  - Gaming and entertainment
  - Ambient assisted living
  - New forms of content and HD
  - Multimodal communication
  - ...



MR in 3 -5 years...

- Content will be (more, and) better
- UI approach becomes subtle, less intrusive
- Content will be available everywhere
- UI as a practical everyday help



Vision of the future



# More than just technology and research..

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- ✓ Understanding user requirements
- ✓ Understanding business and markets
- ✓ Regulatory framework
- ✓ Standards
- ✓ Take up and innovation

 Changing the mindset..

- How can we better exploit research results ?
- How can we create more successful start-ups ?
- How can we further promote an entrepreneur culture ?
- How can you help ?





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# FP7 Specific Programmes: 2007 - 2013



## Commission proposal (April 6)

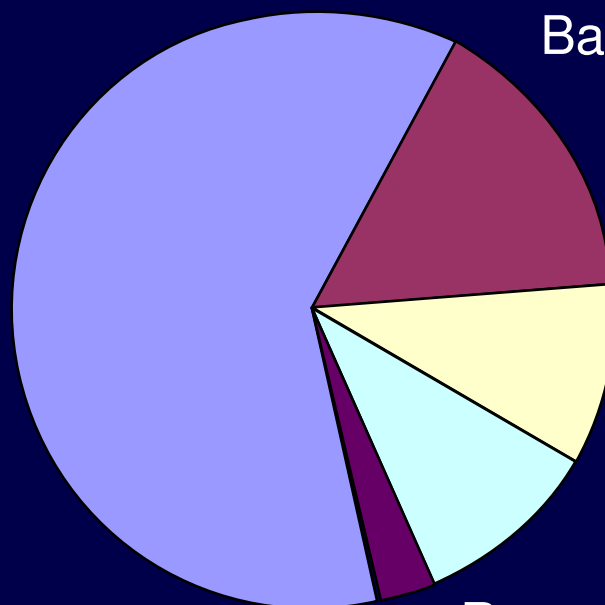
Collaborative R&D: 44 B€ (61%)

Basic research: 12 B€ (16%)

People: 7 B€ (10%)

Research infrastructure: 7 B€ (10%)

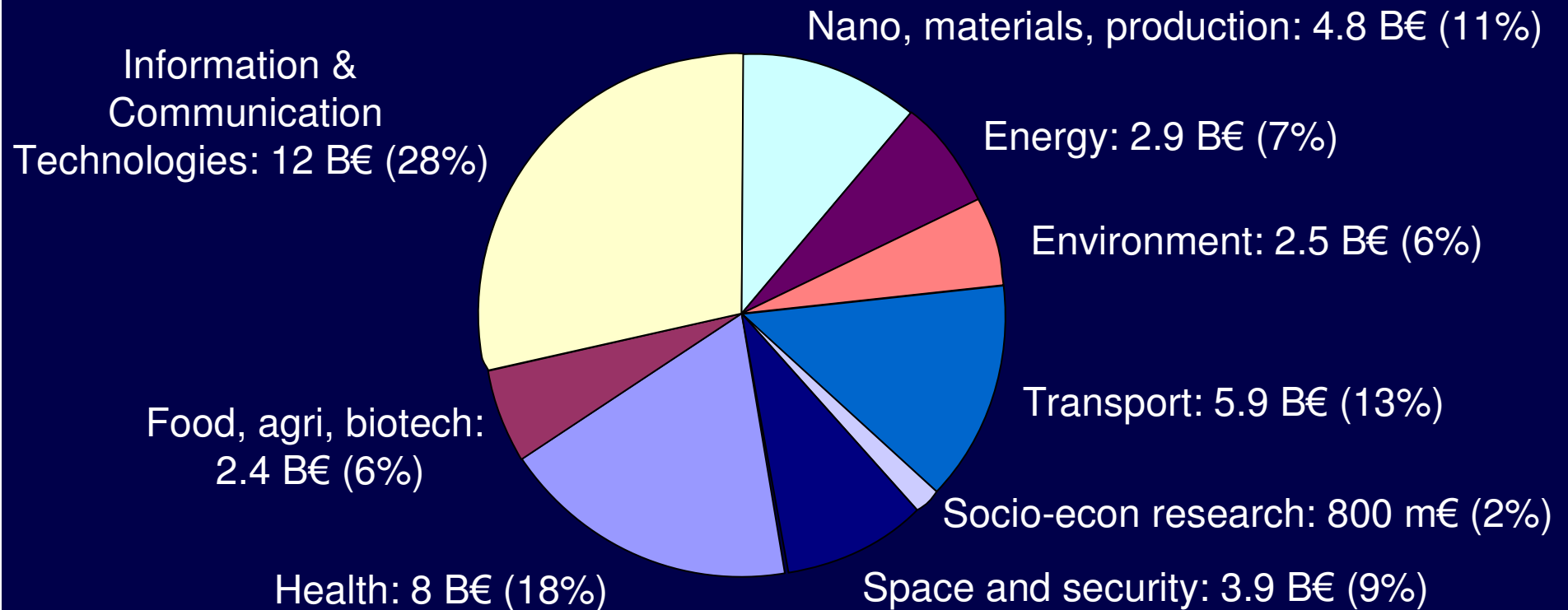
JRC: 1.8 B€ (3%)



# Collaborative Research Themes



## Commission proposal (April 6)



# FP7 – Continuity & New Impetus

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Commission proposal (April 6)

- Continuity
  - European Research Area
  - Thematic priorities
  - Researcher's mobility
  - SME measures
  - > Seven years duration
- New Impetus
  - Joint Technology Initiatives
  - European Research Council
  - New research infrastructures
  - Flexible instruments
  - > Doubling of budget ??



# Timetable



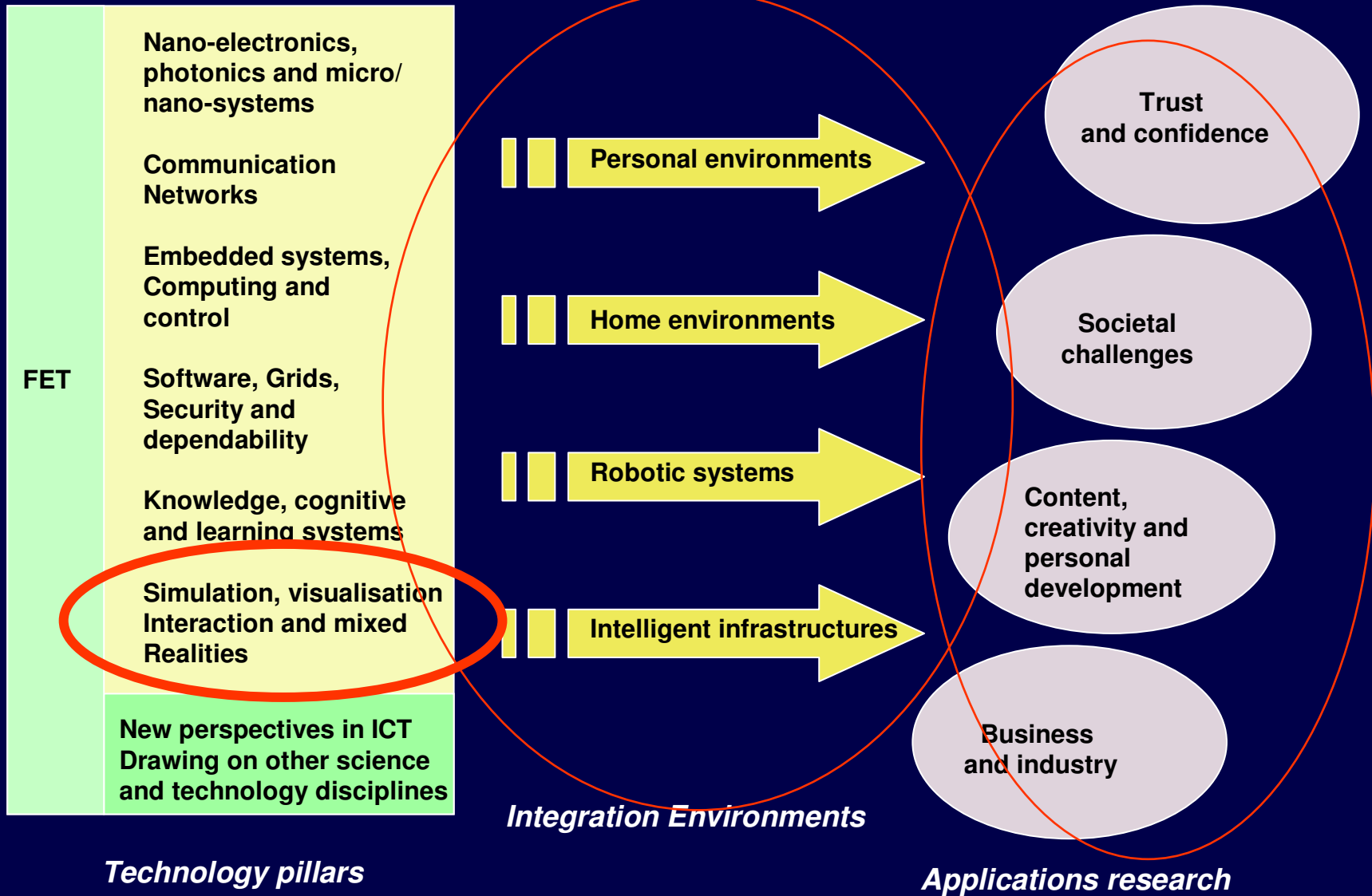
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# Proposed structure



# Rationale

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- Growing demand for increasingly interactive and visual content
- Emergence of rich multimodal interpersonal communication systems
- Need for industry and creators to efficiently prototype new designs
  - ➔ *key importance of simulation, visualisation, interaction and MR technologies*
  - ➔ *help European industry concentrate on high-value segments of the market where design and content play a key role*
  - ➔ *new enabling technology domain to provide basis for new, value-added products, systems and services*
- Existing research efforts are fragmented
- Multi-disciplinary and collaborative approaches to research are essential





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## A new “Technology pillar”: Simulation, visualisation, interaction and mixed reality

- Tools for innovative design, creativity in products, services and digital audio-visual media
- Tools for augmented personal capacities and new ways to interact with technology, machines, devices and other artefacts

### “Integration Environments”

#### Examples:

- closed loop system for surgery training and operation support
- integration of design, interaction (AR) and knowledge management for augmented engineering

# Interaction and MR

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- Visions

- Interaction within distributed environments
  - Create presence – provide applications support
- Richer interactions
  - Natural behaviour – affective, motivating and engaging interactions
- Richer mixed-reality environments
  - Populated worlds – content and creativity
- Ease of use
  - Ubiquitous cross platform usage concepts

- Challenges

- *Multi-disciplinarity (CV/CG/interfaces/different modalities..)*
- *Interactive entities (intelligence - realistic interactions)*
- *Human perceptions (how do we perceive MR environments?)*
- *Better interfaces (interaction concepts – integration in standard apps)*
- *Usability (ergonomy, cost, reliability..)*

# Key enablers for future research ?

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- reusable components, modules and frameworks
- open standards, specifications, architectures and open source
- new algorithms, models and tools
- better interfaces, displays and devices
- specialised processors and advanced rendering techniques
- secure and commoditised high performance computing and Grids
- usability issues – cognitive sciences
- Involvement of creative sector

And also..

- end-users involvement
- societal and economic impacts of new technology
- bridges between the academic community and industry (emphasis on proof-of-concept, demonstrators and test-beds)

# Consultation process – contributions welcome

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For ICT in general and MR ++ in particular:

- What are the main trends and challenges?
- What are the enablers?
- What are the main research issues?
- Who should be involved?
- What is the rationale for EU-level intervention?

➔ Time frame: end 05 – early 06

Could a common position  
on MR/AR be contributed ?

# MR-specific issues

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- Is the field mature ?
- What can MR contribute to the solving of society's problem and to industrial innovation ?
- How should the field be covered in future R&D Programmes ? (technology – integration - applications ?)
- Does the current thinking bringing simulation, visualisation, interaction and MR together make sense to you ?
- Is it necessary to get organised on a large scale or is it better to let things evolve organically ?
- Is it important to develop joint projects with non-European teams ?

# Conclusions

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- EU programmes play an important role in structuring research activities in Europe
- MR/AR/VR benefits significantly from EU research programmes (with ups and down)
- Information and Communication Technologies can help Europe respond to serious global and societal challenges
- MR can help provide some of the answers: You need to show how
- We need your support to refine future research priorities
- Beyond R&D, it is important to further develop a culture of entrepreneurship and innovation and you can help.

# For Further Information



IST:

<http://www.cordis.lu/ist/contacts>

General FP6/FP7:

[http://europa.eu.int/comm/research/fp6/  
.../research/future/index\\_en.cfm](http://europa.eu.int/comm/research/fp6/.../research/future/index_en.cfm)

IST infodesk

E-Mail : [ist@cec.eu.int](mailto:ist@cec.eu.int)

Fax : +32 2 296 83 88



# On to you...

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- How important is European Research to you ?
- Do you think the new orientations taken at the beginning of FP6 will lead to success ?
- What should be the main priorities for FP7 ?
- What needs to be changed ?
- ...





# Simulation

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- Visions

- *Multi-parametric and multi-level simulations*
- *Interactive and real-time simulations*
- *Social simulations*
- *Complex systems*
- *Predictive power*
- *Personalised interventions*

- Challenges

- *Coping with uncertainty*
- *Integrating simulation and experiment*
- *Scalable hierarchies and simulation coupling*
- *Better models, algorithms, parameters and tools*
- *Expert interaction*

# Visualisation

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- Visions

- *True Immersion*
- *Interactive visualisation*
- *'Smart' visualisation*
- *A "universal visualiser"*

- Challenges

- *Handling large datasets*
- *Multi-dimensional visualisation*
- *Purpose-driven realism*
- *Processing, rendering and display technologies*
- *Integrated visualisation*

# Integration

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- Visions

- *Closing the Loop*
- *Human-in-the-Loop*
- *User-centred approaches*
- *Seamless environments*
- *Integration across distributed environments*
- *Going mainstream*

- Challenges

- *Interoperability*
- *Application integration*
- *Building the community*