

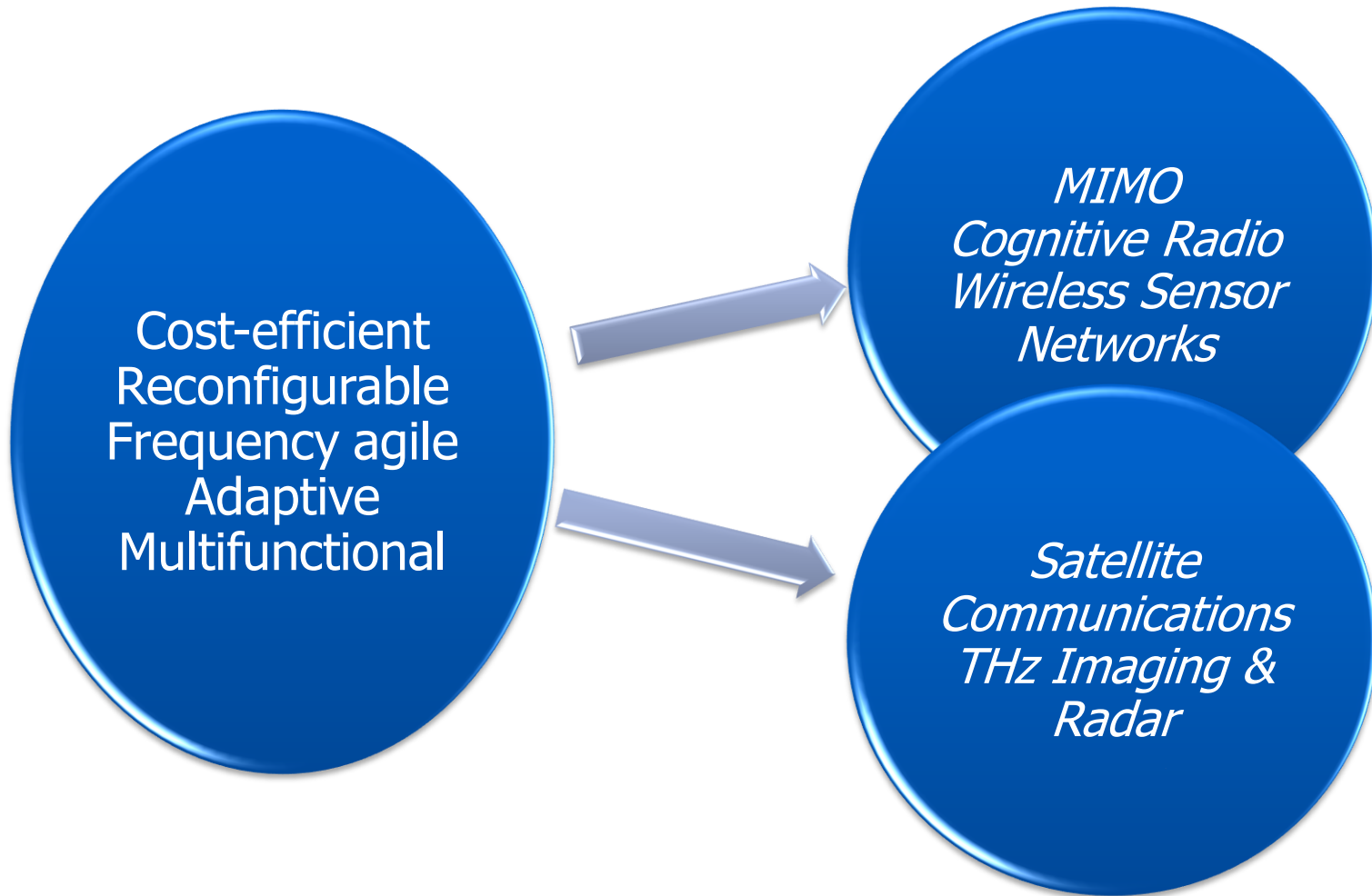
# An overview of European cooperation on antenna research

M. Martínez-Vázquez  
IMST GmbH

31-8-2012

August 31, 2012

# Wireless systems of tomorrow



# Antennas: an «interfacing» activity in COST

*Antennas:*

**The tyres !!**

Channel propagation,  
Navigation systems,  
Global Integrated Networks ,  
Atmosphere; Meteorology

*RF-Electronics:*

**The engine**

**The track**



# Why so important?

Present day  
(information)  
technology



# Antennas are the « **tyres** » of ICT Actions

**We should never ignore them!**



# Translated to antennas:



# European Antenna Research

## *Targets:*

- Research, but also
- Networking
- Educational and Societal aspects
- EU strategic aspects

## *Instruments:*

- Networks of Excellence, Coordinating Actions, Marie Curie initiatives, Training Networks, European Schools, “COST” projects...

# What is COST?



COST is supported by  
the EU RTD Framework Programme

ESF provides the  
COST Office through an EC contract



Founded in 1971, COST is an intergovernmental framework for European Cooperation in the field of Scientific and Technical Research. COST Actions cover basic and pre-competitive research as well as activities of public utility.

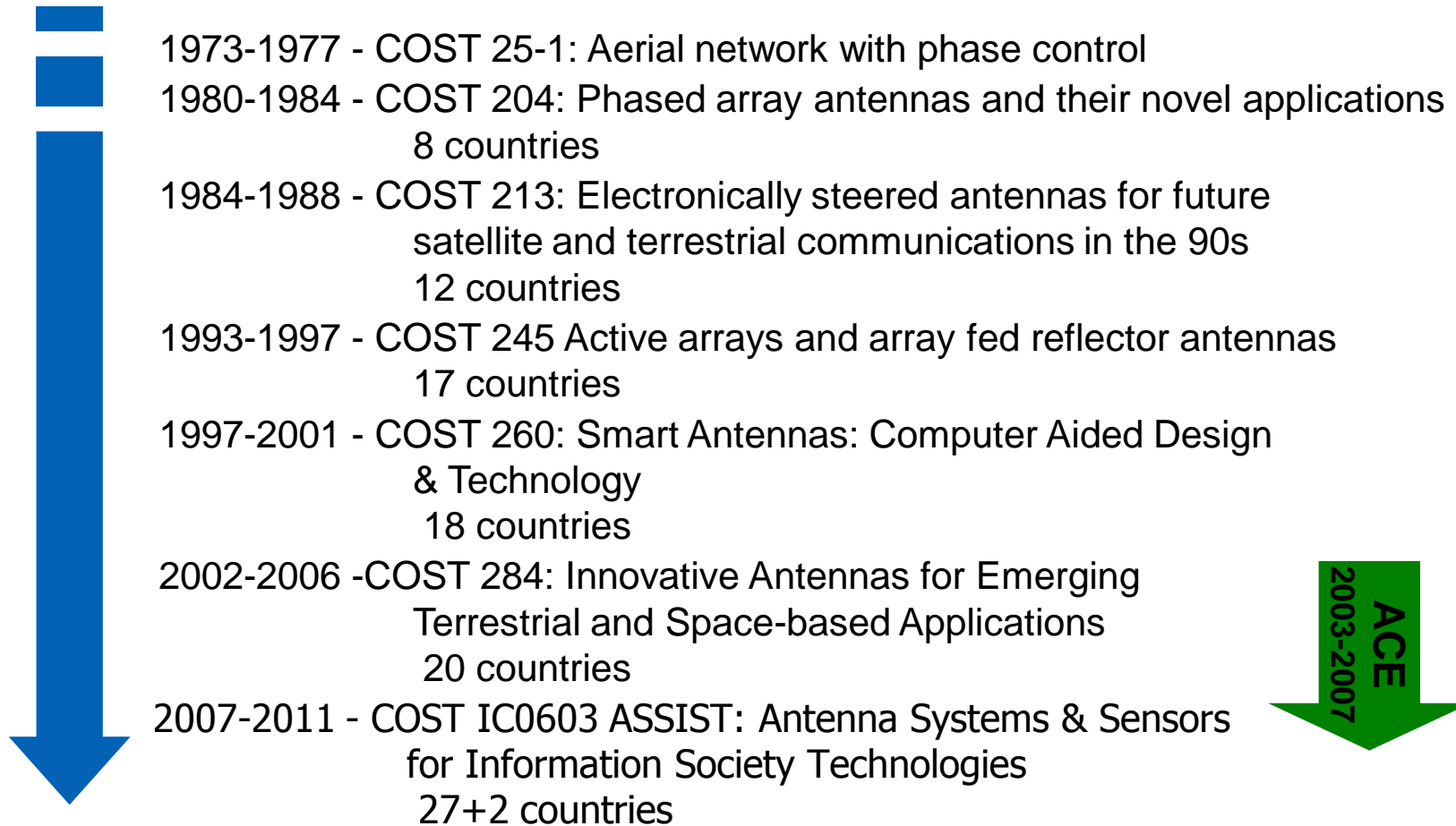
COST has been successfully used to maximise European synergy and it is a useful tool to further enhance European integration.



# COST main characteristics

- “Bottom-up” – no fixed programmes / priorities
- Flexible participation – join in if you are interested
- Focus on multidisciplinary cooperation
- Enabling agent – Promotion of Early Stage careers in Research
- Open to global cooperation in the mutual interest
- “Non-competitive” – pre-normative; public utility
- Networks based on national funding of researchers and projects – national responsibility

# Timeline: Antenna COST Actions



# The ACE Network (2003-2007)



## The final answer to existing problems

- No real European antenna community
- Weak cooperation industry – university
- Research not always relevant
- Little cooperation in PhD education
- Little reuse of software and test facilities
- Too much duplication
- Weak dissemination

# ACE outcomes



- European Association on Antennas & Propagation (EURAAP)
- EUCAP Conference (5<sup>th</sup> edition next year)
- European School of Antennas
- Benchmarking and standardisation activities (software/measurement)
- Follow-up FP7 coordinating actions: Antenna Research & Technology for the Intelligent Car (ARTIC), Coordinating Antenna Research in Europe (CARE)



# European school of Antennas (ESoA)

- Geographically distributed post graduate school
- Founded in 2004 by ACE
- Objective: reinforce European training and research in antennas and relevant applications.
- Presently financed by a Marie Curie Action (MCA) project.
- Courses are distributed in the most accredited European research centres on antennas and wireless systems.

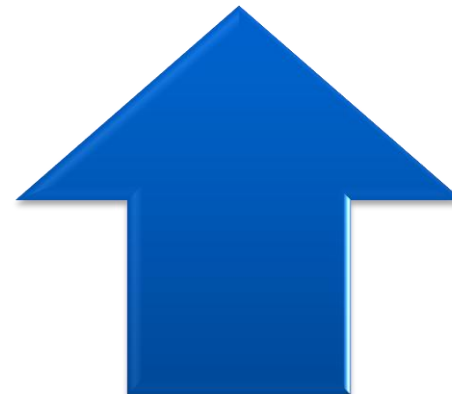
# COST IC1102 „VISTA“

- Versatile, Integrated and Signal-aware Technologies for Antenna
- COST domain: Information and Communication Technologies
- Duration: 2011-2015
- Website: [www.cost-ic1102.eu](http://www.cost-ic1102.eu), [www.cost-vista.eu](http://www.cost-vista.eu)

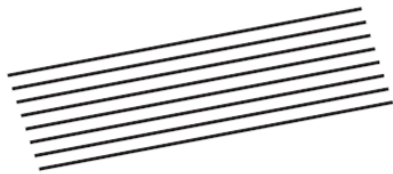
# Trends...










**Theory:** Antennas  
as *physical layer*:  
physics  
(electromagnetics)  
& technology  
(materials science).



**Practice:** Antenna  
systems spread  
into many layers!!!



	$\nabla \times \mathbf{E}$	
		
$z^{-1} + z^{-2}$	...11010011...	
		

# New challenges call for new paradigms



Demand for **more and better ICT services** explodes



Increased use of **energy and spectrum** limited resources!

Solution: signal-antenna joint techniques for **lower energy and spectrum usage**

**MIMO:** multi-radio in small devices

**Cognitive radio:**  
*opportunistic*  
frequency/coding

**WSN:**  
distributed  
*cooperative*  
communication



# Old and new challenges, new solutions

## Satellite communications

- Higher frequency (Ka-band) for higher data rates
- Reconfigurability: adapt the coverage/extend lifespan
- Receivers: improved tracking possibilities

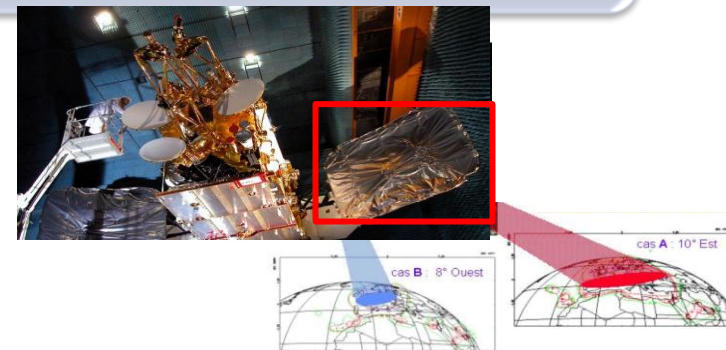
## THz imaging and radar

- Reducing the system complexity
- Real-time images.

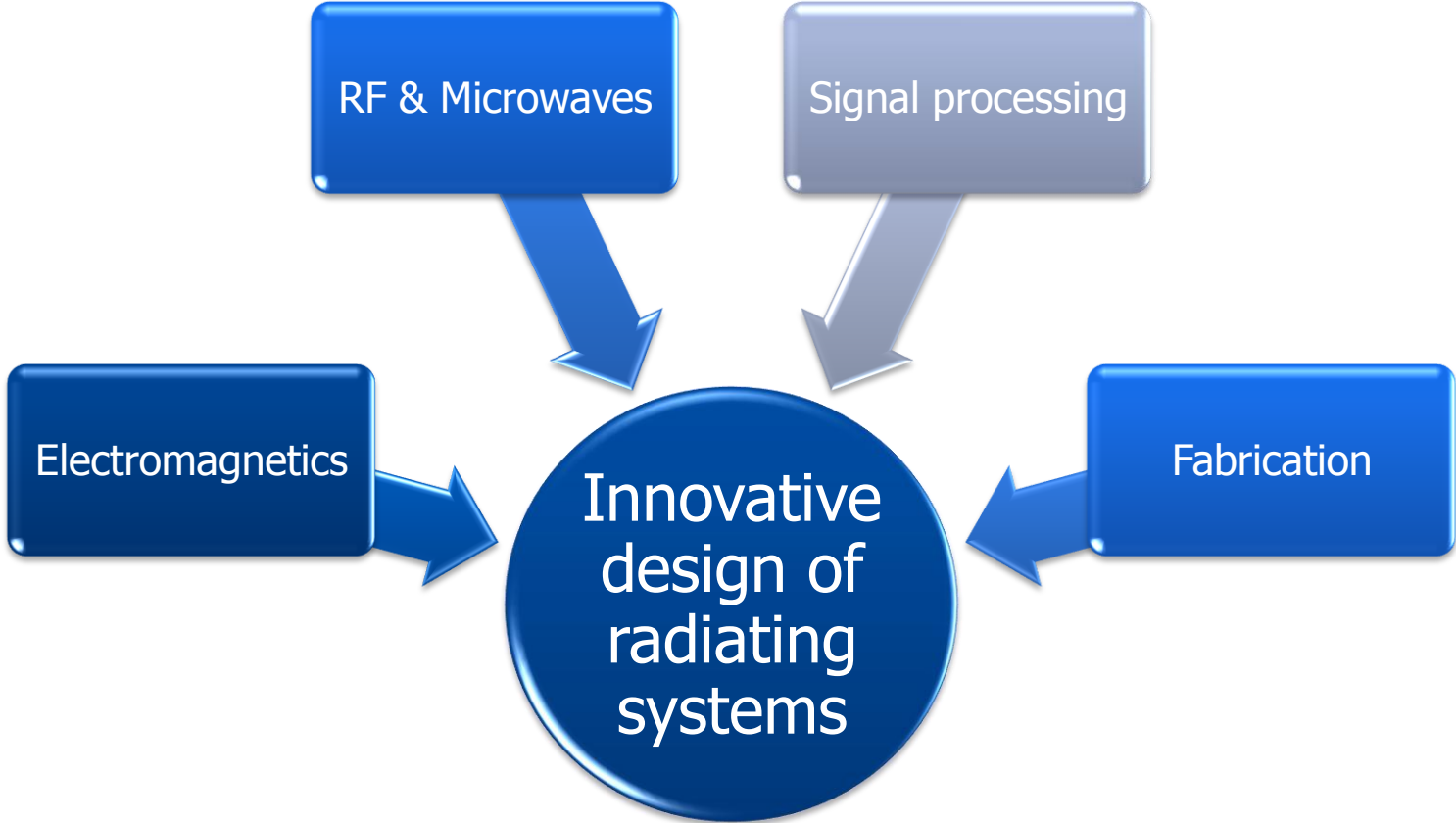
## Intra/on/off body communication

- imaging and diagnosis
- radio-controlled, "intelligent" medical devices

## New fabrication technologies



# Cross-disciplinary research



# Benefits of VISTA



# COST VISTA: Objectives

Coordinate cross-disciplinary research on integrated and versatile antennas for wireless applications,

Assessment and survey

Technological development

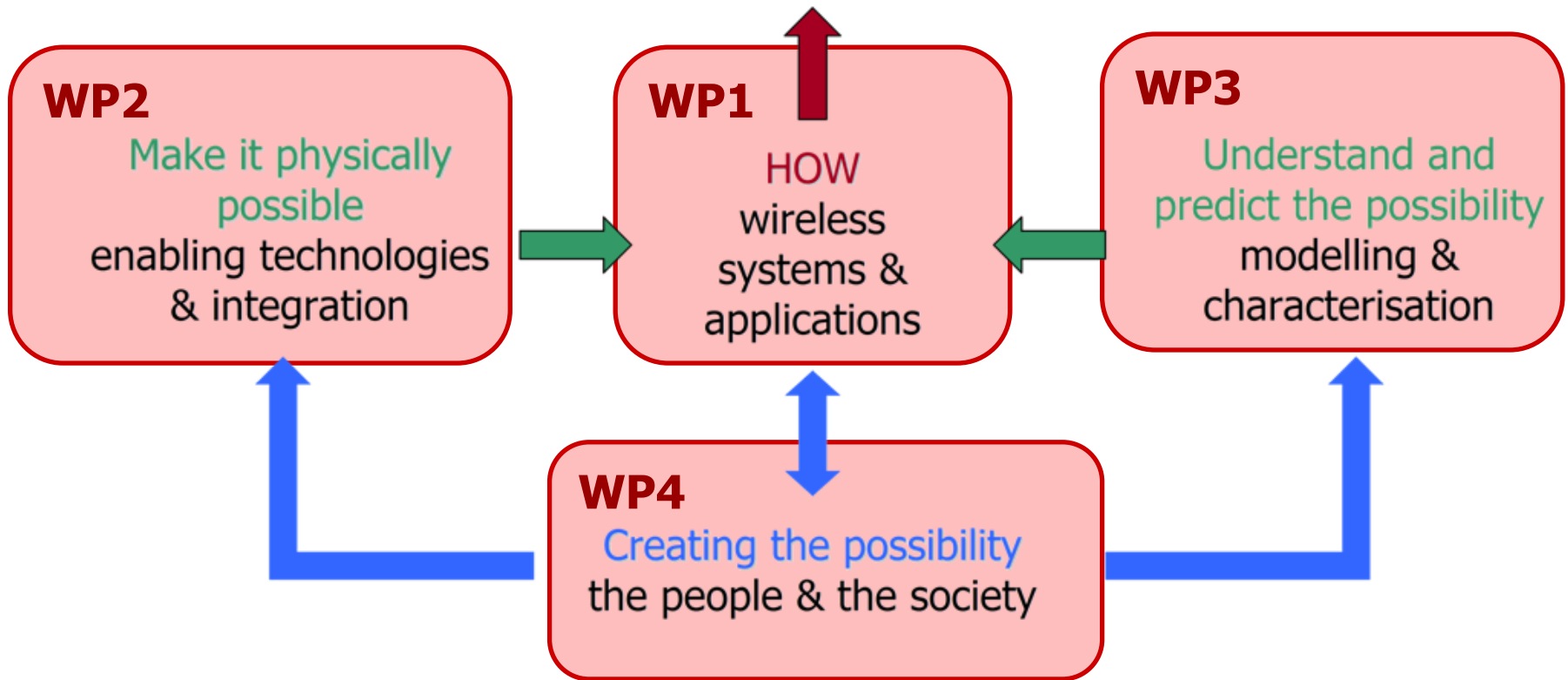
Supporting technologies

Cooperation & Networking

Training and education

# Scientific focus

Information harvested, transferred and delivered  
**wherever needed**  
**whenever needed**  
**however needed**



# WP1: What? Applications and requirements

## Wireless home & office

- enhanced systems for indoor data exchange
- Fast data synchronisation
- Cognitive & SW defined radio

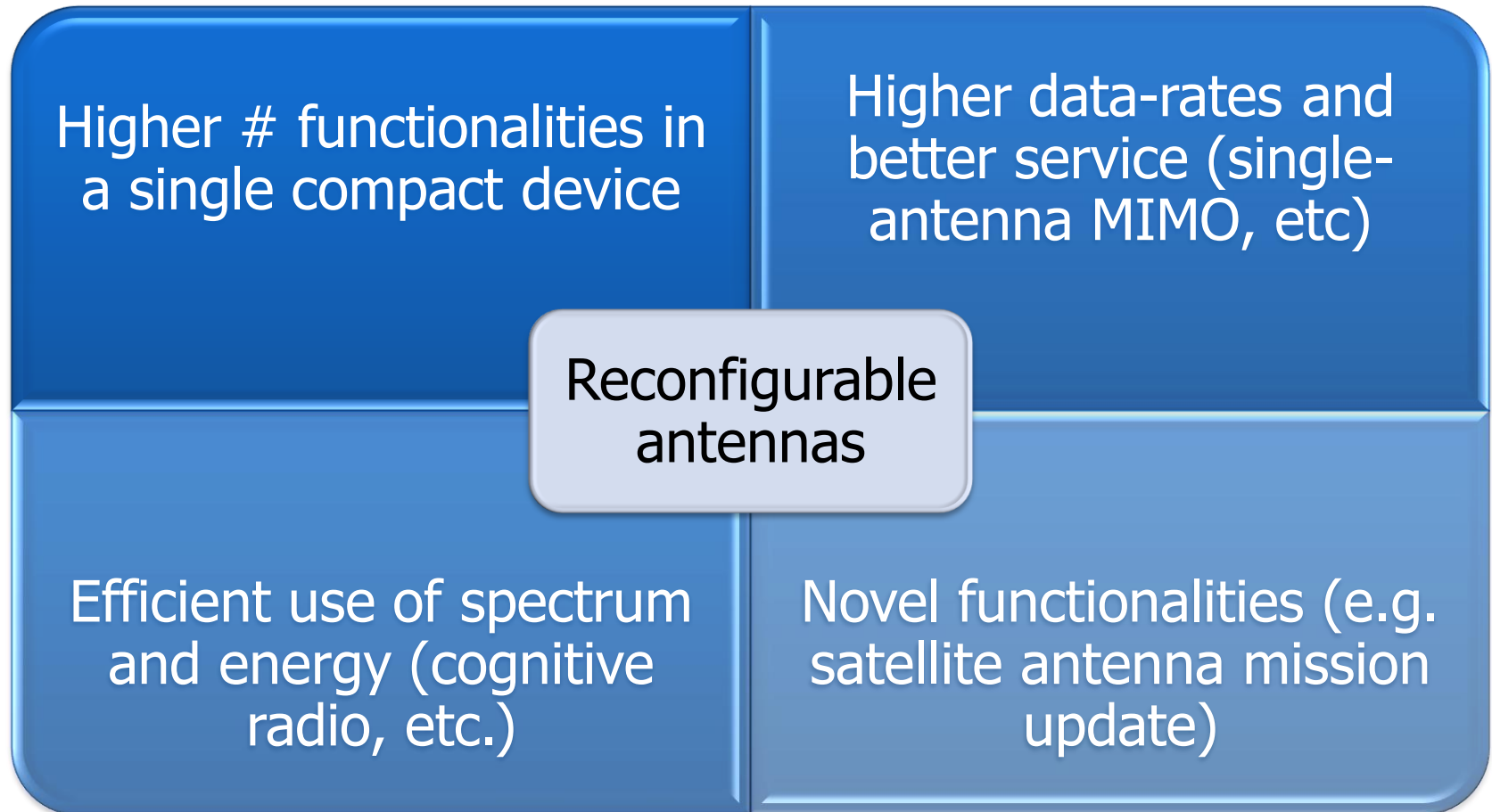
## Mobility

- Radar sensors
- Vehicle communications
- On-board infotainment
- Positioning systems

## Enhanced quality of life

- health & medical applications
- business & industry automation
- Safety critical communications
- Remote sensing
- Non-invasive diagnostics
- Environmental monitoring

# WP2: Enabling technologies and integration

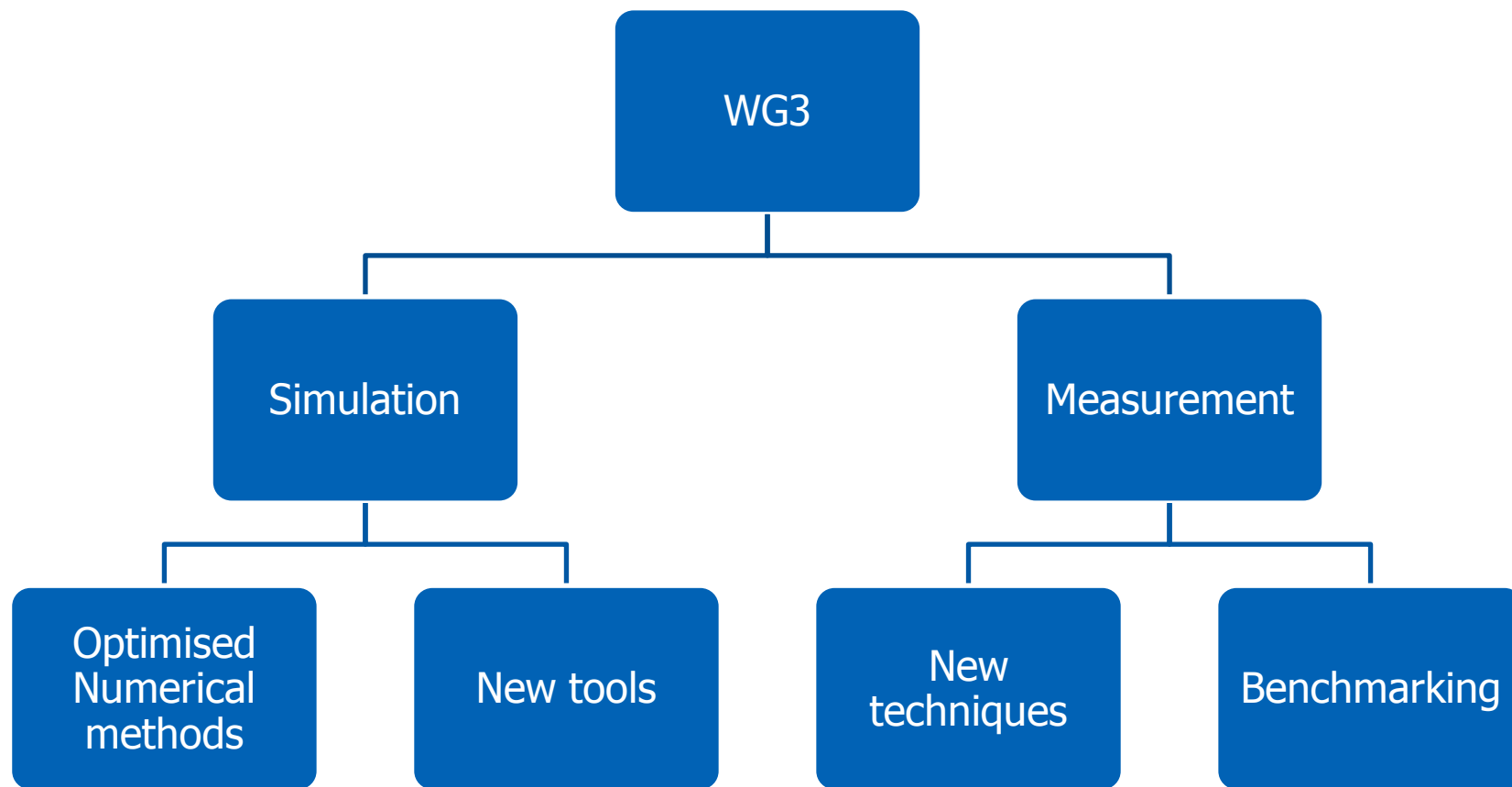


# Topic-wise...

- Remember that “**VISTA = Versatile, Integrated, and Signal-aware Technologies for Antennas**” !
- Focus on:
  - Multidisciplinary topics:
    - Link with novel fabrication technology
    - Evaluation of system-level performance, cross-layer design, in particular in radio coding (MIMO, cognitive, etc.)...
  - Higher frequencies up to THz (real time images, etc.)
  - Integration notably for mm-wave (60 GHz, 77GHz...) and reconfiguration
  - ‘Classical’ antennas requiring special evolution for ‘novel’ applications in WSN, medical, IR-UWB...



# WP3: With what? Supporting technologies



# WP3: With what? Modelling and Characterisation

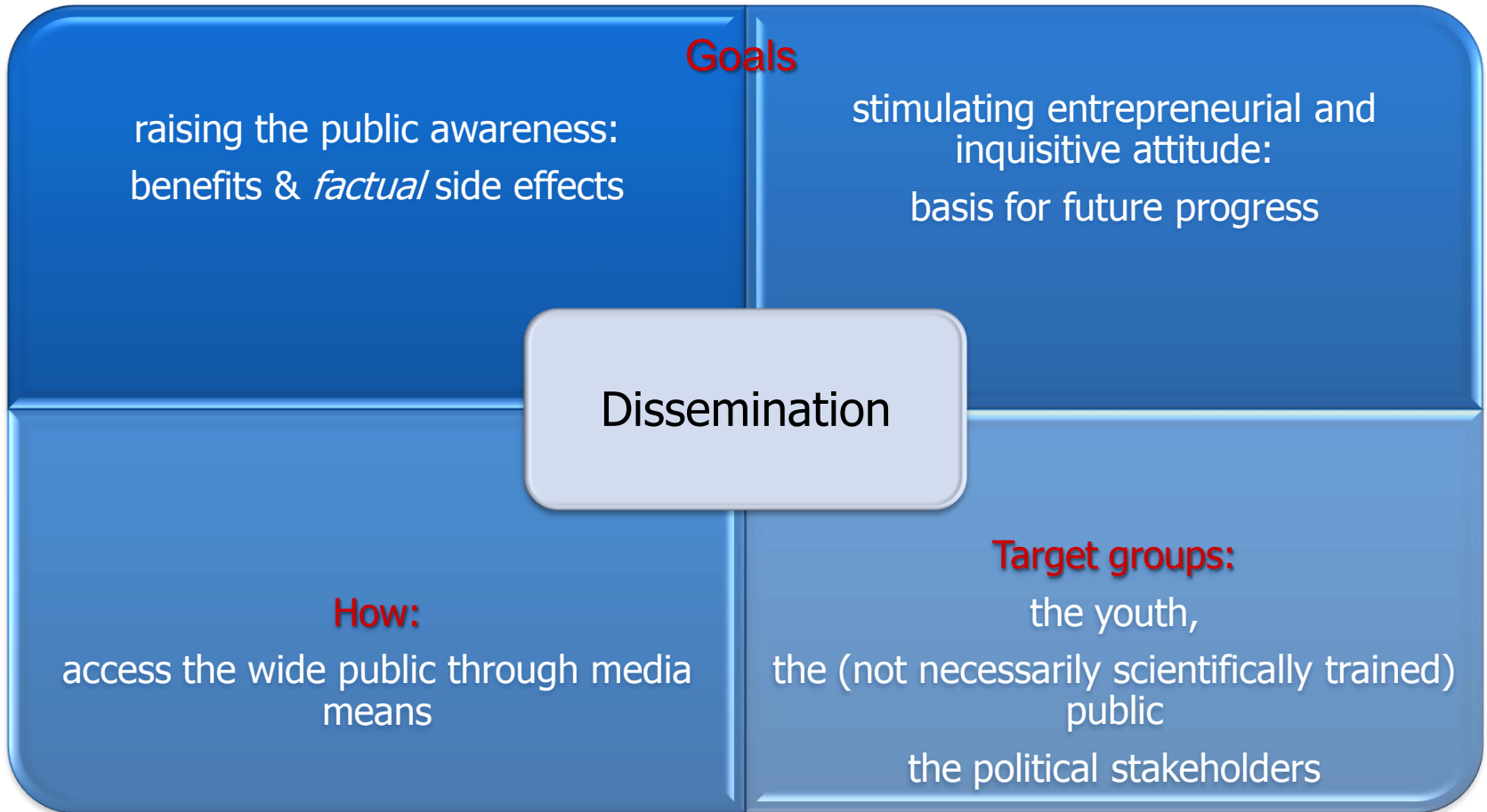
## Antenna modelling including environment

- Faster solvers
- Algorithms requiring less memory.
- Hybrid methods,
- Link with fast approximations
- Multi-physics calculation
- Software tools for optimising matching circuits.
- Parallelization of algorithms
- New analytic approaches for complex media

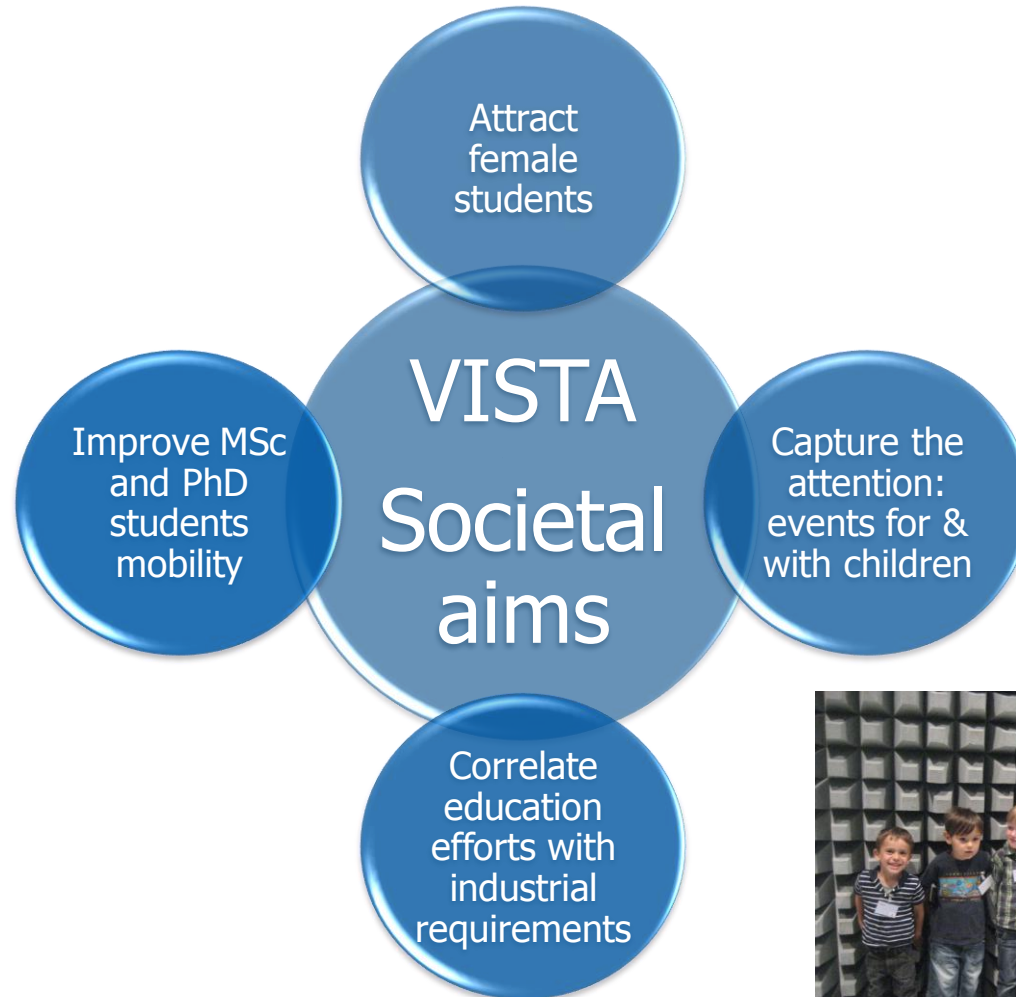
## Advanced measurements

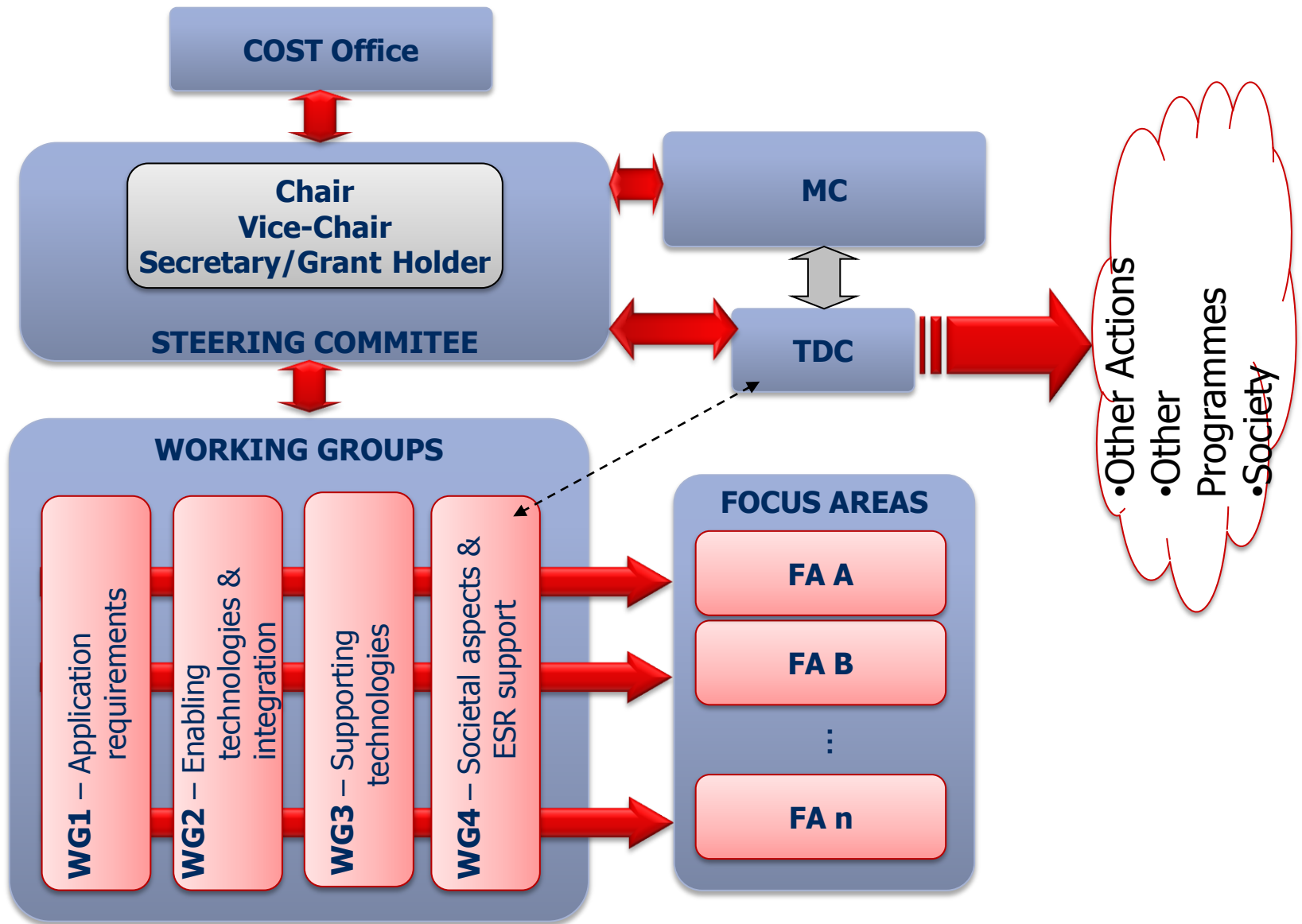
- Experimental validation of modeling techniques
- Near-field methods for new applications
- Advanced methods for OTA test procedures
- Millimetre-wave and TeraHertz measurement techniques
- Measurement of ultra-small radiators and time-varying media.
- Imaging and inversion techniques (e.g. antenna diagnosis)
- Characterization of structured materials (e.g. metamaterials)

# WP 4: Who? Message to the broad public

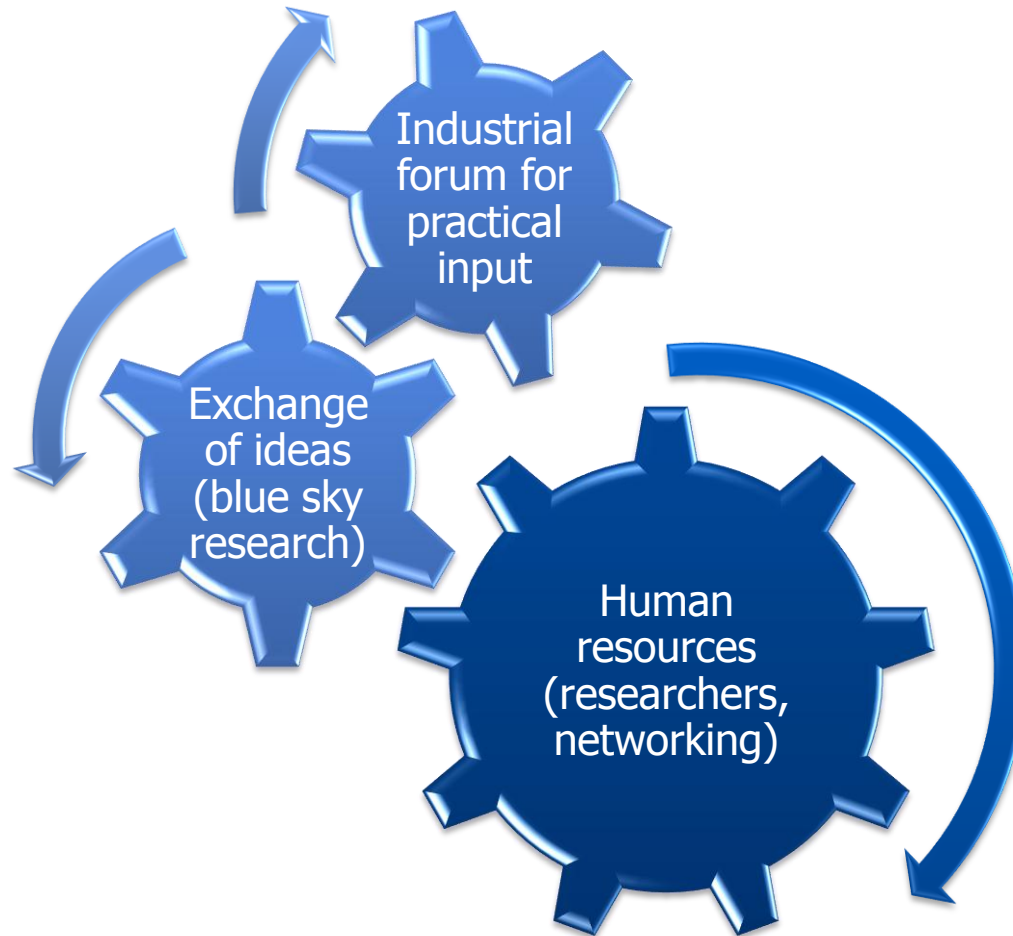


# WP 4: Who? Training and Education





# VISTA & Industry



# Output

## Training and education

- Mobility through STSM (>10/year)
- Courses
- Teaching material

## Durable cooperation

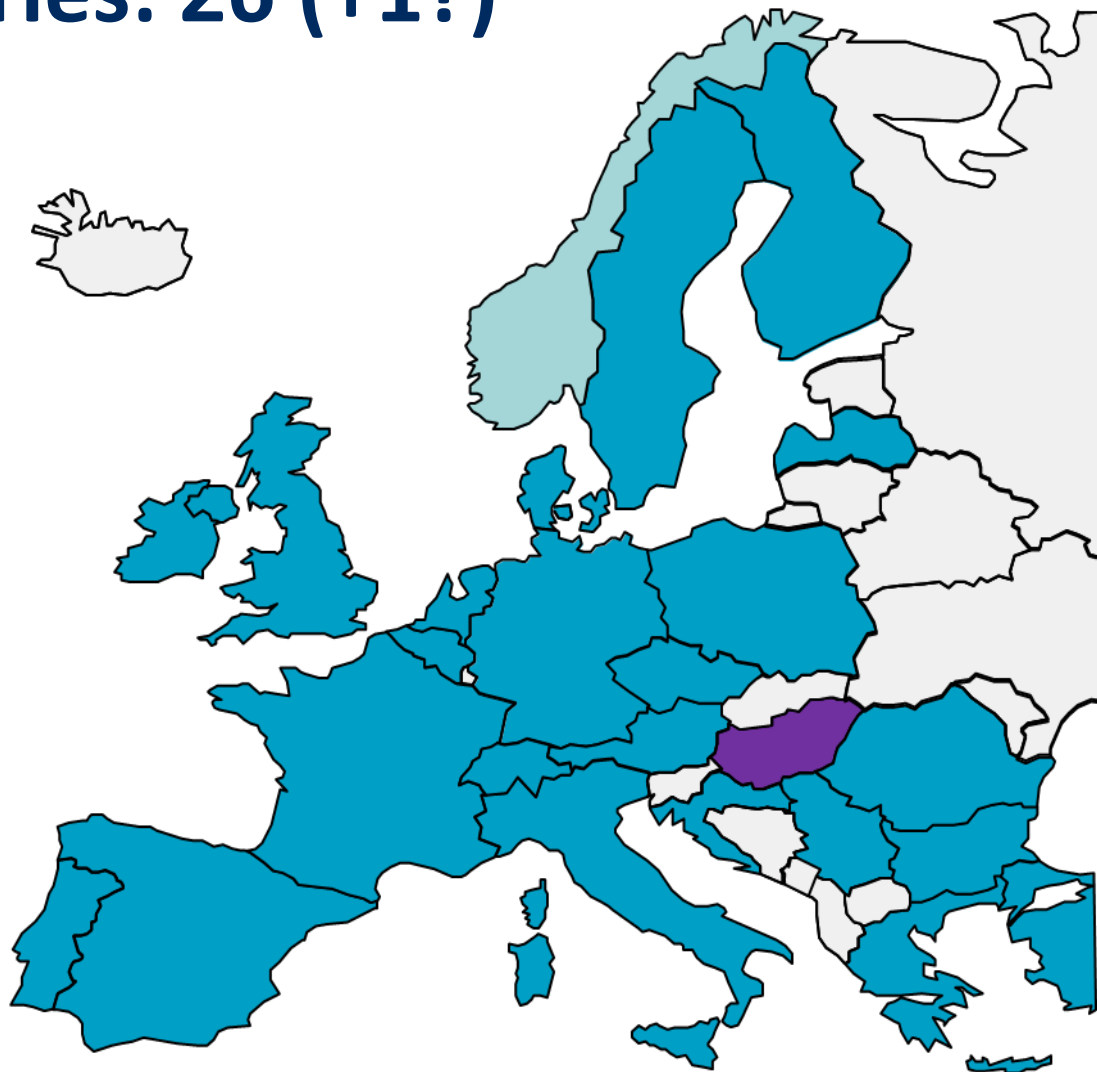
- Industry-University
- Spin-off projects

## Technical outputs

- Recommendations for future applications
- Technical documents
- Algorithms & measurements
- Benchmarking activities

# Signatory countries: 26 (+1?)

Country	Date
Austria	23/01/2012
Belgium	12/07/2011
Bulgaria	19/08/2011
Croatia	06/12/2011
Cyprus	03/10/2011
Czech Republic	15/06/2011
Denmark	01/11/2011
Finland	21/06/2011
France	12/08/2011
Germany	27/06/2011
Greece	21/11/2011
<b>Hungary</b>	<b>20/04/2012</b>
Ireland	11/08/2011
Israel	06/06/2011
Italy	10/08/2011
Latvia	18/07/2011
Netherlands	14/06/2011
Poland	01/07/2011
Portugal	16/06/2011
Romania	21/06/2011
Serbia	18/10/2011
Spain	07/07/2011
Sweden	15/09/2011
Switzerland	07/07/2011
Turkey	29/09/2011
United Kingdom	18/07/2011



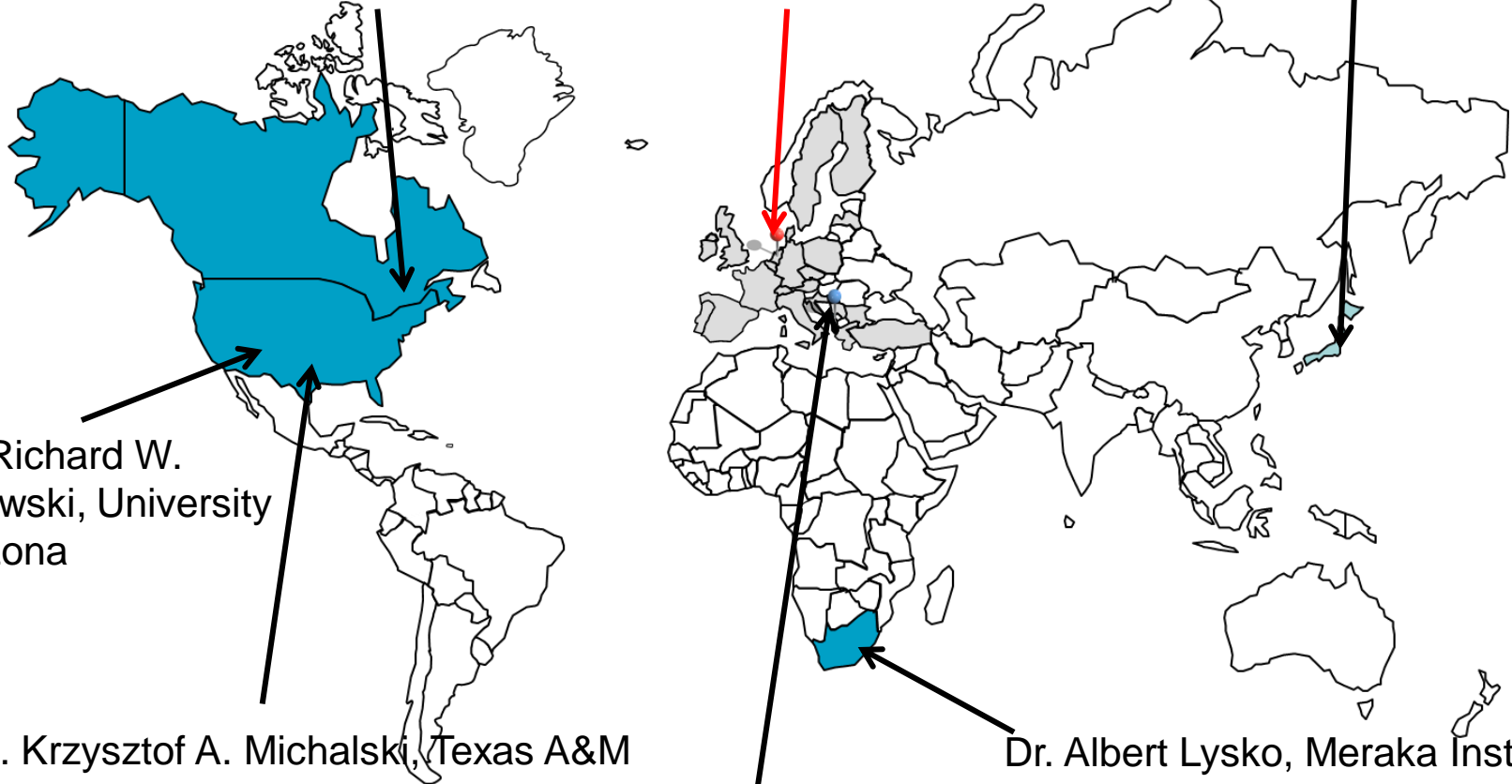


# Non-COST& others

Prof. Yahia Antar, Royal Military College of Canada

Prof. Takamaro Kikkawa, Hiroshima University

ESA



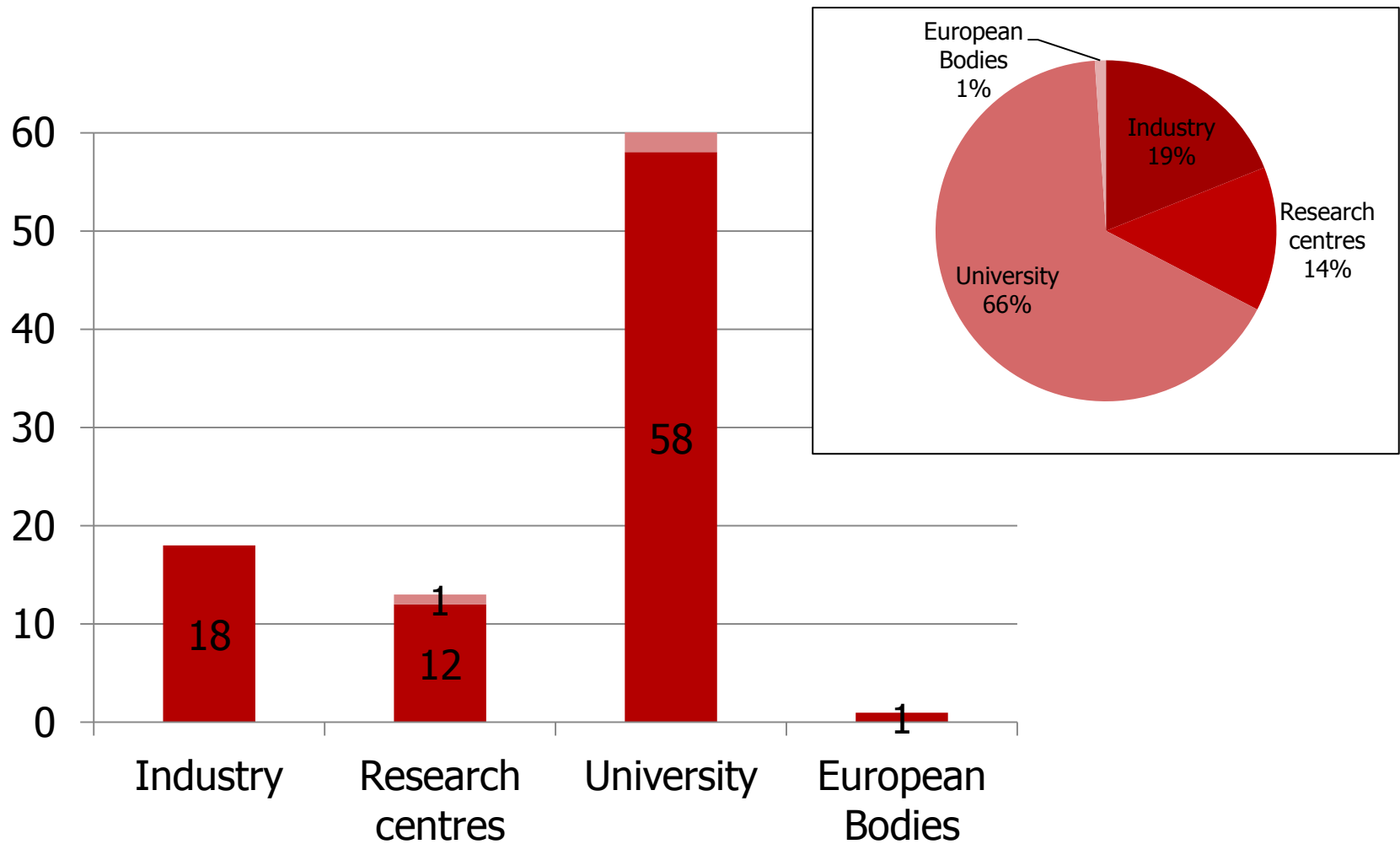
Prof. Richard W. Ziolkowski, University of Arizona

Prof. Krzysztof A. Michalski, Texas A&M University

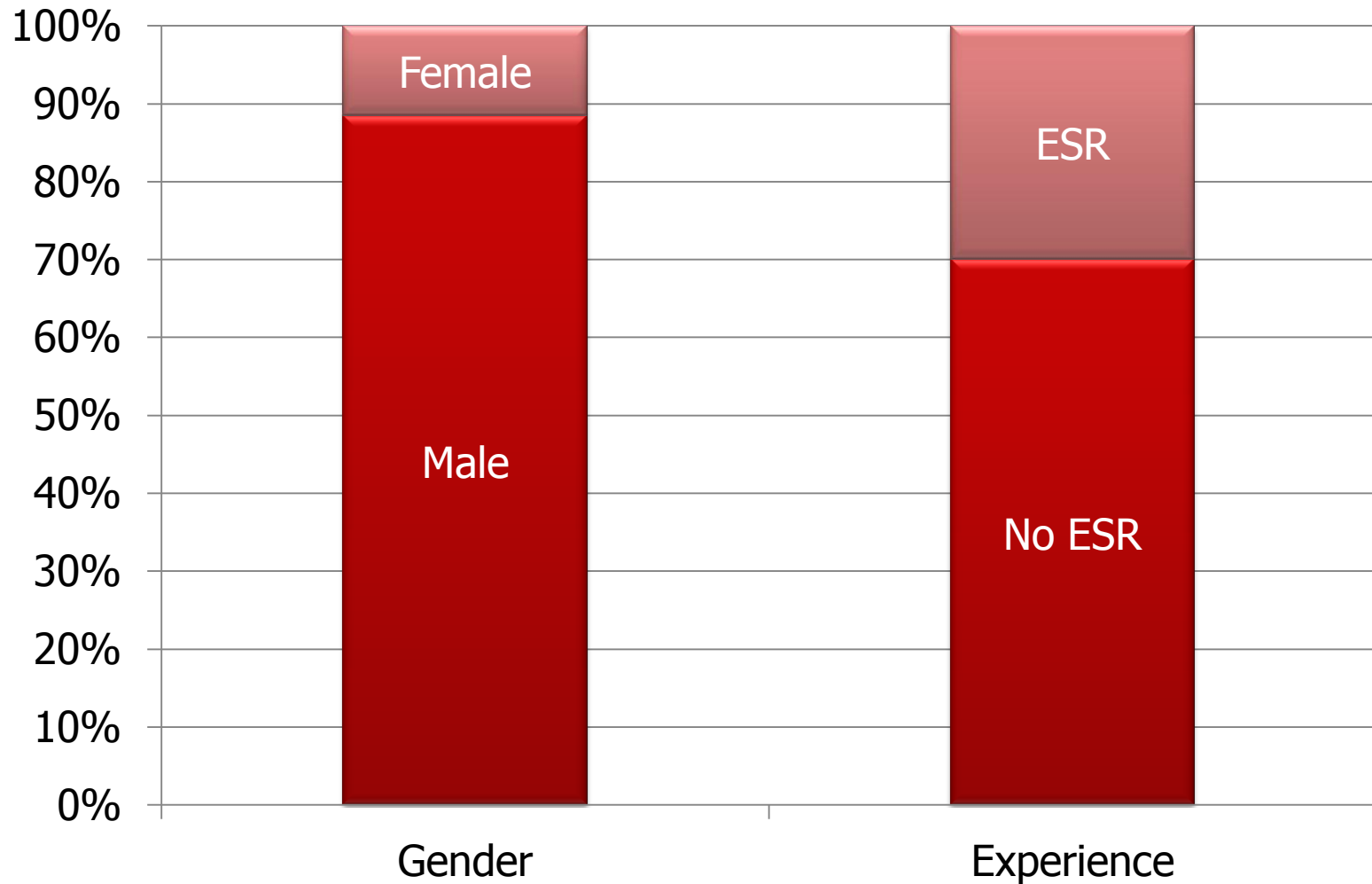
Prof. Igor Djurovic, University of Montenegro

Dr. Albert Lysko, Meraka Institute Council for Scientific and Industrial Research

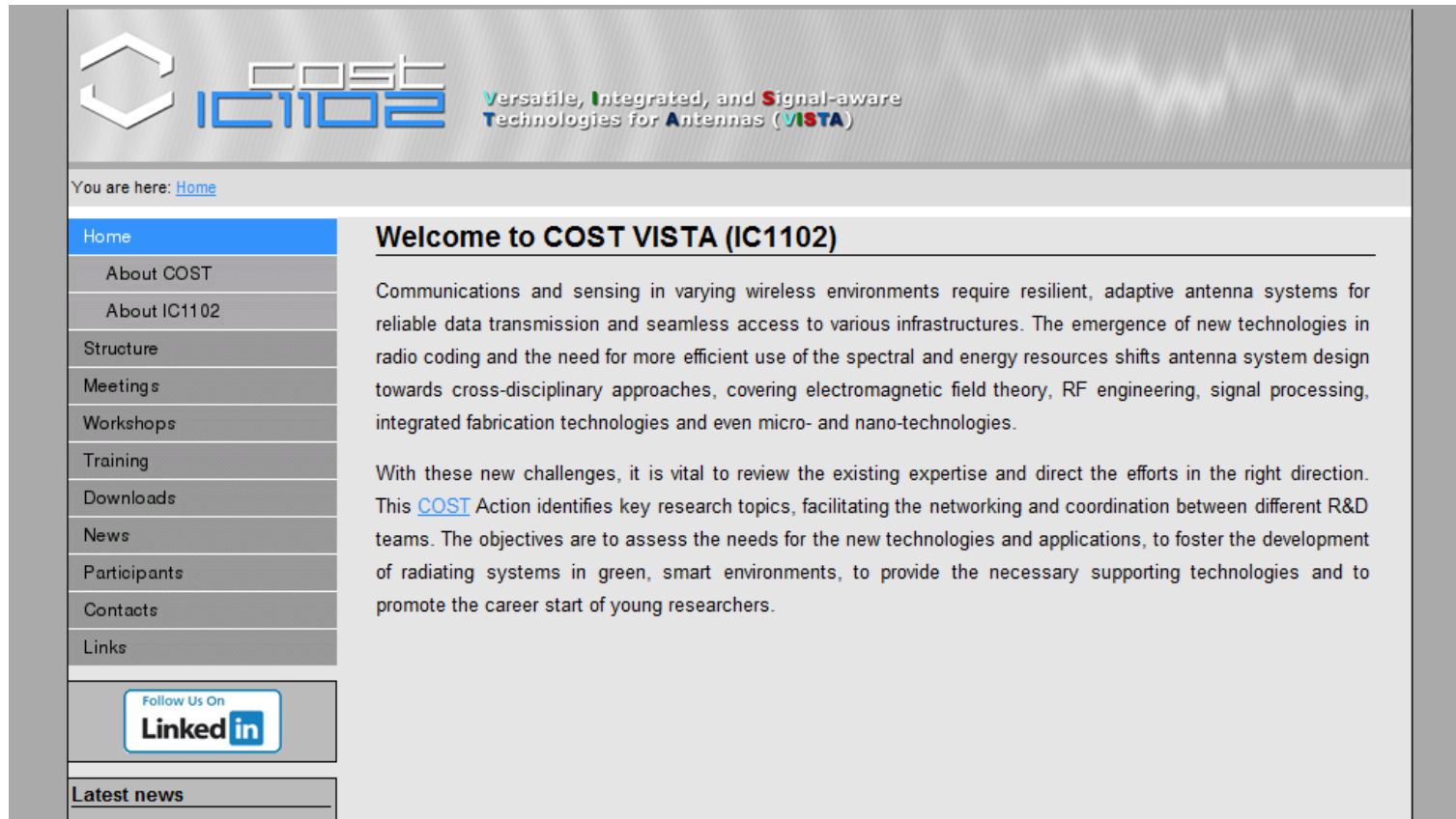
# Facts and Figures: 94 Institutions



# Facts and Figures: 130 Researchers



# COST VISTA website



The screenshot shows the homepage of the COST VISTA website. At the top left is the logo for COST IC1102, which consists of a stylized 'C' icon and the text 'cost ic1102'. To the right of the logo is the tagline: 'Versatile, Integrated, and Signal-aware Technologies for Antennas (VISTA)'. Below the logo and tagline, there is a breadcrumb trail: 'You are here: [Home](#)'. On the left side, there is a vertical navigation menu with the following items: 'Home' (highlighted in blue), 'About COST', 'About IC1102', 'Structure', 'Meetings', 'Workshops', 'Training', 'Downloads', 'News', 'Participants', 'Contacts', and 'Links'. Below the navigation menu is a 'Follow Us On' section with a 'LinkedIn' button. At the bottom of the navigation menu is a 'Latest news' section. The main content area on the right features a heading 'Welcome to COST VISTA (IC1102)' followed by two paragraphs of text. The first paragraph discusses the need for resilient, adaptive antenna systems in varying wireless environments. The second paragraph discusses the importance of reviewing existing expertise and directing efforts in the right direction, mentioning the COST Action and its objectives.

**cost ic1102** Versatile, Integrated, and Signal-aware Technologies for Antennas (VISTA)

You are here: [Home](#)

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- Structure
- Meetings
- Workshops
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Follow Us On  
**LinkedIn**

Latest news

## Welcome to COST VISTA (IC1102)

Communications and sensing in varying wireless environments require resilient, adaptive antenna systems for reliable data transmission and seamless access to various infrastructures. The emergence of new technologies in radio coding and the need for more efficient use of the spectral and energy resources shifts antenna system design towards cross-disciplinary approaches, covering electromagnetic field theory, RF engineering, signal processing, integrated fabrication technologies and even micro- and nano-technologies.

With these new challenges, it is vital to review the existing expertise and direct the efforts in the right direction. This [COST](#) Action identifies key research topics, facilitating the networking and coordination between different R&D teams. The objectives are to assess the needs for the new technologies and applications, to foster the development of radiating systems in green, smart environments, to provide the necessary supporting technologies and to promote the career start of young researchers.

[www.cost-ic1102.eu](http://www.cost-ic1102.eu) or [www.cost-vista.eu](http://www.cost-vista.eu)

# COST VISTA LinkedIn group

LinkedIn Account Type: Basic | Upgrade

Home Profile Contacts Groups Jobs Inbox 5 Companies News More

Groups Search...

**COST IC1102 VISTA** Discussions Members Promotions Jobs Search Manage More... Share group

Start a: Discussion Poll

Start a discussion or share something with the group...

Your Activity

Choose Your View **NEW** Show all RSS discussions

Latest Discussions

**Job opening @ Chalmers**  
Here is the information sent by Per-Simon Kildal:  
Assistant Professor in Information and Communication Technology at Chalmers ...  
**Vacancies at Chalmers University of Technology** [chalmers.se](http://chalmers.se)  
Please register with email and password. If it is the first time you are applying for a position at Chalmers please click on new user to create your own account. You can then always login and update your application or apply...  
posted 15 days ago

**8th International Summer School on RF-MEMS and RF Microsystems and European School of Antennas (ESoA) course, RFMEMS Based Antennas** [linkedin.com](http://linkedin.com)  
June 25-29, 2012 - Middle East Technical University, Department of Electrical & Electronics Eng., Ankara, Turkey  
posted 29 days ago

**Latest Updates**

**Marta Martínez Vázquez** started a discussion: Job opening @ Chalmers  
Like · Add comment · 15 days ago

**Albert Lysko** has joined the group.  
Send message · 15 days ago

**Ozlem Aydin Civi** started a discussion: 8th International Summer School on RF-MEMS and RF Microsystems and European School of Antennas (ESoA) course, RFMEMS Based Antennas  
Like · Add comment · 29 days ago

See all updates »

- 66 members
- Quick information exchange

# VISTA

## Working Groups

WG1:  
Requirements

WG2:  
Enabling  
technol.

WG3:  
Supporting  
technol.

WG4:  
Societal  
aspects

## Focus Areas

FA-A  
Medical  
apps

FA-B  
THz apps

FA-C  
Parallel  
computing

# Thank you for your attention...

31-8-2012