Information and Communication Technologies

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Chair DC ICT

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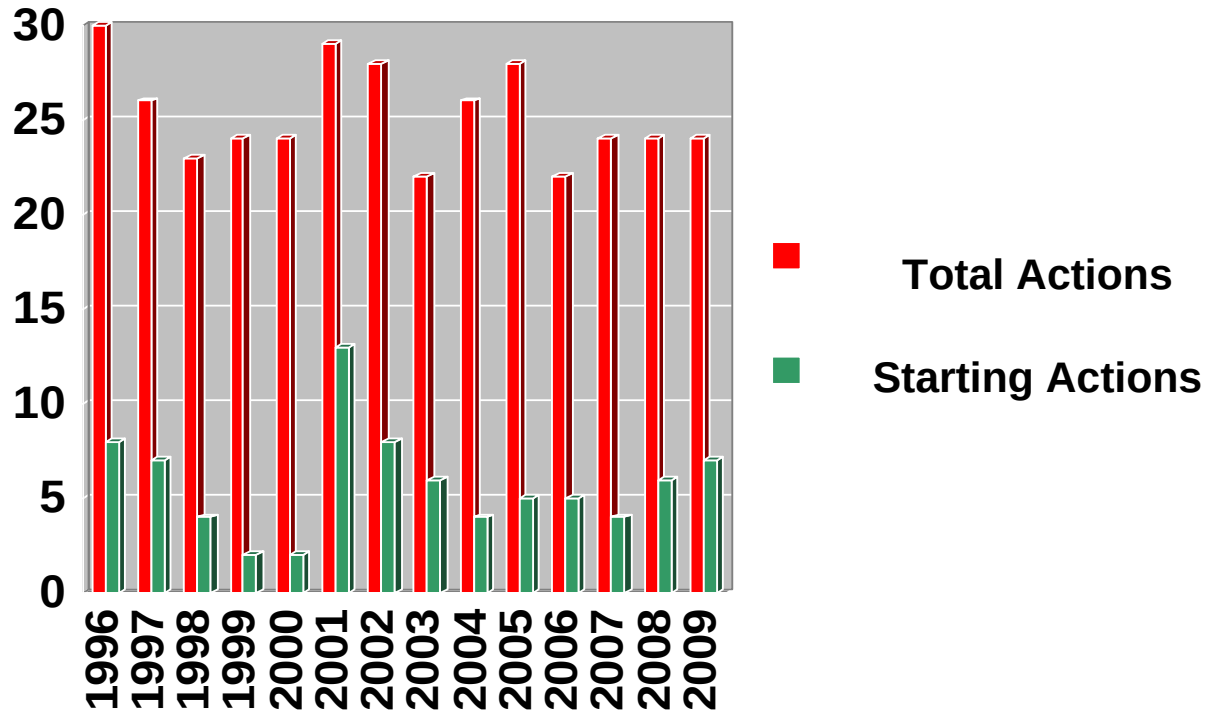
ICT – Domain Description

- **Scope**: Coordination of research on:
  - ❖ Information science and technologies
  - ❖ Communication technologies
  - ❖ Societal aspects of ICT

- **Brief history**:
- Until 1999: Telecommunications only
- 1999-2006: TIST (Telecommunications and Information Sciences and Technologies)
- 2006: Creation of **ICT Domain**

ICT Domain – Facts Sheet

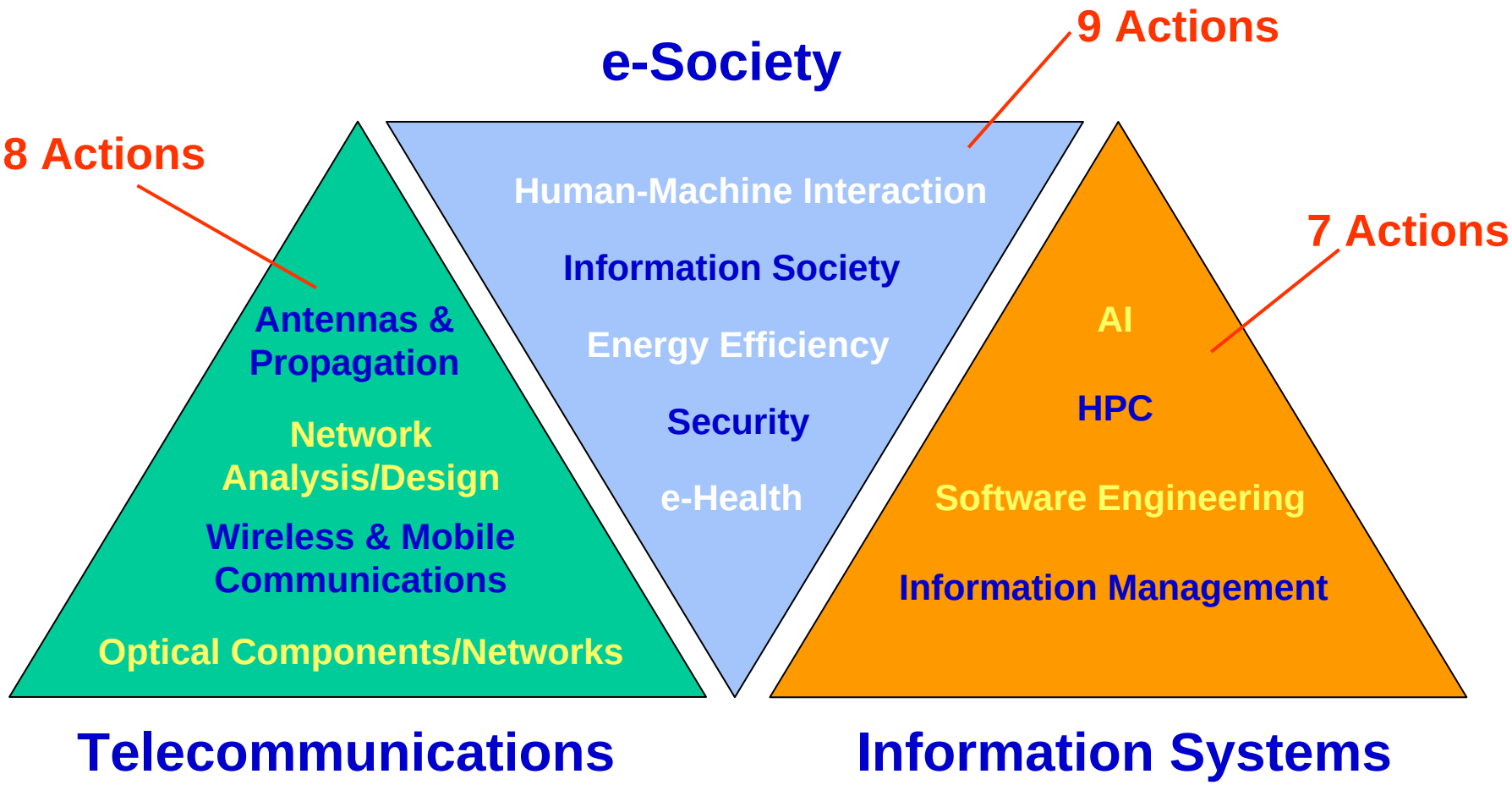
- Actions: 24 Actions (2010)
- Impact: ~1000 Organisations, ~3000 Researchers
- Evolution of no. of Actions:



List of 2010 Actions

Action	Start Date	End Date	Title	CHAIR	DC RAPPORTEUR
298	23-01-2006	22-01-2010	Participation in the Broadband Society	B. Sapio	G. Worsley
299	19-01-2006	18-01-2010	Optical Fibres for New Challenges Facing the Information Society	L. Thevenaz	M. Dado
2100	12-12-2006	11-12-2010	Pervasive Mobile & Ambient Wireless Communications	R. Verdone	J. Simsa
2101	07-12-2006	06-12-2010	Biometrics for Identity Documents and Smart cards	A. Drygajlo	D. Hammershoi
2102	01-12-2006	30-11-2010	Cross-Modal Analysis of Verbal and Non-verbal Communication	A. Esposito	G. Balodis
2103	19-12-2006	18-12-2010	Advanced Voice Function Assessment	P. De Jonckere	D. Simunic
IC0601	24-04-2007	23-04-2011	Sonic Interaction Design (SID)	D. Rocchesso	M. Ansorge
IC0602	03-05-2007	02-05-2011	Algorithmic Decision Theory	A. Tsoukias	V. Malbasa
IC0603	07-05-2007	06-05-2011	Antenna Systems & Sensors for Information Society Technologies (ASSIST)	J. Mosig	O. Koudelka
IC0604	06-11-2007	05-11-2011	Telepathology Network in Europe: EURO-TELEPATH	M. Garcia Rojo	D. Banciu
IC0701	11-03-2008	10-03-2012	Formal Verification of Object-Oriented Software	B. Beckert	G. Ariely
IC0702	31-03-2008	30-03-2012	Combining Soft Computing Techniques and Statistical Methods to Improve Data Analysis Solutions	C. Borgelt	L. Van Der Torre
IC0703	13-03-2008	12-03-2012	Data Traffic Monitoring and Analysis: theory, techniques, tools and applications for the future networks	F. Ricciato	M. Jagodic
IC0801	17-10-2008	16-10-2012	Agreement Technologies	S. Ossowski	M. Muraszkiewicz
IC0802	19-11-2008	18-11-2012	Propagation tools and data for integrated Telecommunication, Navigation and Earth Observation systems	A. Martellucci	M. Aydos
IC0803	13-10-2008	12-10-2012	RF/Microwave Communication Subsystems for Emerging Wireless Technologies (RFCSET)	A. Georgiadis	G. Balodis
IC0804	05-05-2009	04-05-2013	Energy efficiency in large scale distributed systems	J-M. Pierson	V. Malbasa
IC0805	07-05-2009	06-05-2013	Open European Network for High Performance Computing on Complex Environments	E. Jeannot	V. Lazarov
IC0806	11-05-2009	10-05-2013	Intelligent Monitoring, Control and Security of Critical Infrastructure Systems	E. Kyriakides	K. Goossens
TD0801	19-05-2009	18-05-2013	Statistical challenges on the 1000€ genome sequences in plants	M. Bink	R. van den Berg
IC0901	30-10-2009	29-10-2013	Rich-Model Toolkit - An Infrastructure for Reliable Computer Systems	V. Kuncak	G. Ariely
IC0902	11-12-2009	10-12-2013	Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks	M-G. di Benedetto	K. Markus
IC0903	27-10-2009	26-10-2013	Knowledge Discovery from Moving Objects (MOVE)	R. Weibel	H. Schmiedel
IC0904	26-11-2009	25-11-2013	Towards the Integration of Transectorial IT Design and Evaluation	E. Law	D. Banciu
IC0905	07-05-2010	06-05-2013	TERRA - Techno-Economic Regulatory Framework for Radio Spectrum Access for Cognitive Radio/Software Defined Radio	To be confirmed	To be confirmed
IC0906	To be confirmed	To be confirmed	WiNeMO - Wireless Networking for Moving Objects	To be confirmed	To be confirmed

ICT Domain – Thematic Areas

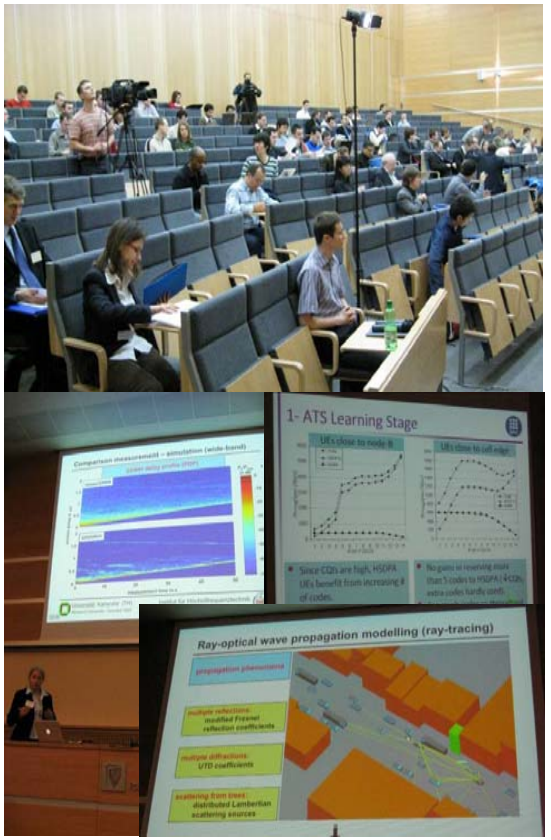


Example 1: Telecommunications

COST Action 2100: Pervasive Mobile & Ambient Wireless Communications (2006-10)

- **Goal:** Develop paradigms of pervasive and ambient wireless communications for next-generation mobile communications (4G)

- **Scientific Focus:**
- Transmission Techniques and Signal Processing
- Radio Channel Modeling
- Network Aspects: Heterogeneous networks; network planning and network optimisation



Example 1: Telecommunications

COST Action 2100: Pervasive Mobile & Ambient Wireless Communications (2006-10)

- Has several success stories ranging from publications in high impact journals to contributions to standards (3GPP - 3rd Generation Partnership Project, IEEE - 802.15.TG6, Wireless Next Generation Standing Committee)

- After three years of activity, the Action was able to attract:
  - the 7major industry players in the field of mobile terminal manufacturing (Nokia, Samsung, LG, Motorola, Sony Ericsson, RIM, Apple) which together have more than 90% market share, some of the leading mobile network operators (e.g. Vodafone and NTT DoCoMo),
  - 11 institutions from Japan, US, Korea, Singapore, China and Columbia
  - almost one hundred among the leading Universities and Research Centres from 28 European countries

Example 1: Telecommunications

COST Action 2100: Pervasive Mobile & Ambient Wireless Communications (2006-10)

- In addition, SWG2.2 works in close liaison with 3GPP RAN4 and CTIA, who set the standard/certification for test methodologies of current and future mobile devices.

- The first two Training Schools attracted about 110 and 130 attendees from academic and industry institutions.

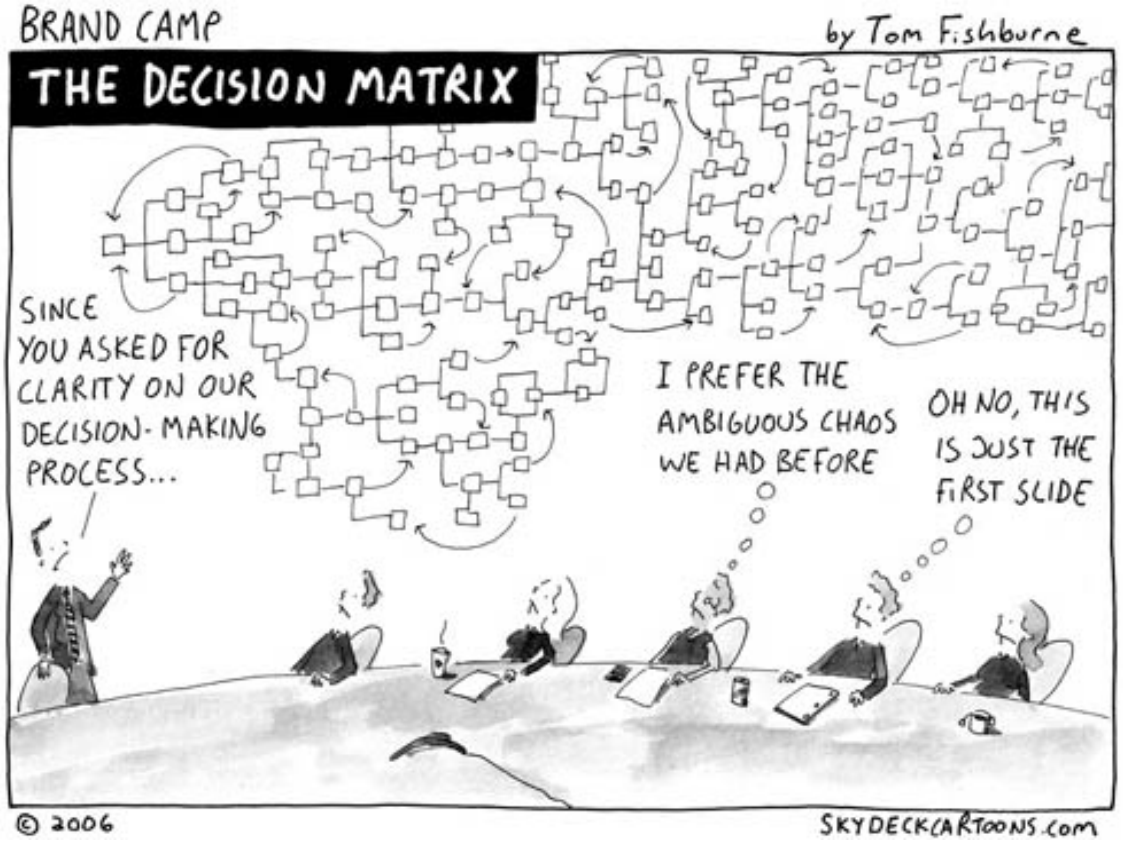
- After the second Training School, a commercial publisher is publishing a COST2100 book.

Example 2: Information Systems

COST Action IC0602: Algorithmic Decision Theory (2006-11)

Objectives:
New algorithmic solutions for decision theoretic problems arising from: Use of **large amount of information**, in the presence of **uncertainty** as well as of **complex** structures of data

→ Cross-fertilization between AI & Computer Science



Example 2: Information Systems: COST Action IC0602: Algorithmic Decision Theory (2006-11)

- They have organized the 1st International Conference on Algorithmic Decision Theory, Venice (IT), 21-23 October 2009 (www.adt2009.org). Some facts:
  - 80 participants from 25 countries;
  - 30 full presentations and 10 posters
  - 4 invited speakers and two tutorials
  - an edited volume with the proceedings, Springer Verlag Lecture Notes in Artificial Intelligence, vol. LNAI 5783.

Example 2: Information Systems: COST Action IC0602: Algorithmic Decision Theory (2006-11)

- The USA community is coming behind. The 2nd International Conference on Algorithmic Decision Theory will take place at DIMACS, Rutgers University, NJ, USA the last week of October 2011. This is part of a 4 years special focus of DIMACS (to be funded by NSF) on Algorithmic Decision Theory (see more at http://dimacs.rutgers.edu/SpecialYears/2010_ADT/).

- A nice by-product of the Training Schools and Meetings is a site with all tutorials and courses given up today. You can find the link at the first page of the site: www.algodec.org. This site is going to be soon updated in order to include some videos from the Venice conference.

Example 3: e-Society

COST Action 219ter: Accessibility for All to Services and Terminals for Next-Generation Networks (2002-08)

Rationale: A major issue as we move towards a fully connected society is maintaining accessibility for all

→ How new telecommunications services can benefit elderly people as well as people with disabilities?

Achievements:

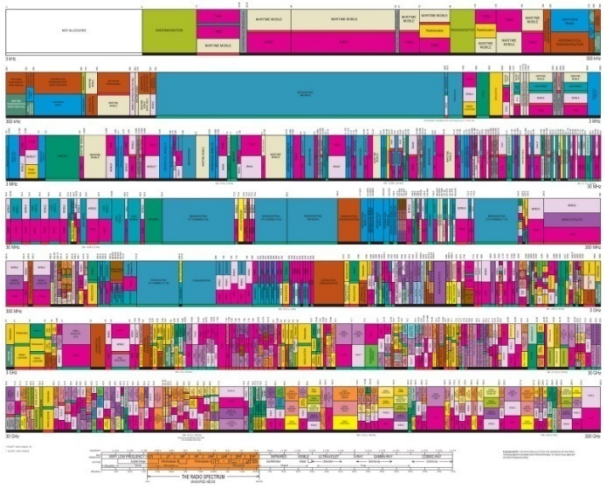
• Promoted a communications infrastructure that is **accessible to all**

• Took part in adapting and designing the equipment accordingly—"**Design for all**" concept

• Created liaisons with relevant organisations (e.g. ETSI, ITU) and raised awareness among policy makers

New ICT Actions (2010)

- **IC0905 - Techno-Economic Regulatory Framework for Radio Spectrum Access for Cognitive Radio/Software Defined Radio (TERRA)**
  - → Develop a techno-economic **regulatory framework** of radio spectrum access rules for CR (Cognitive Radio)/SDR (Software Defined Radio)-based wireless applications



- **IC0906 - Wireless Networking for Moving Objects (WiNeMO)**
  - –→ Advance the state-of-the-art concerning networking aspects of scenarios integrating moving objects of the most varied kinds, ranging from personal use devices to sensors, into the **Internet of Things**

Where are we going?

Classification of Thematic Areas

A. DEVICES

1. **Components** (Sensors, Spintronics, Photonics, Quantum computing, Nano-electromechanical systems, Opto-mechanics, Energy-harvesting devices)

2. **Electronics** (Nano-electronics, Molecular electronics, Organic electronics, Biochemistry-based electronics)

3. **Bio-ICT Convergence** (Lab-on-Chip, Hybrid (e.g. neurons/silicon) devices, 'In-body' technologies, Brain implants, Bio-informatics, 'In silico' experiments, Bio-sensors/actuators (e.g. drug delivery))

B. SYSTEMS

4. **Cognitive Systems & Robotics** (AI (Artificial Intelligence), Artificial life, Machine learning, Context-awareness, Cognitive/adaptive systems, Bio-inspired robots, Swarm robotics, Humanoids, Autonomous robots)

Classification of Thematic Areas

5. **Human-Computer Confluence** (Presence technologies, Virtual/augmented reality, Wearable computing, Brain-computer interfaces, Medical imaging (e.g. UWB radar), Speech recognition/automatic translation, 3D Internet

6. **Computer Architectures & Novel Computing Paradigms (beyond Turing)** (Multi-cores CPU, 'Grid-on-chip', Self-configuring computer, Bio-inspired computers (e.g. brain), Tera-device computing, Global computers (beyond Grid), Software Defined Radio (SDR), Virtualisation)

7. **Future Networks/Internet** (Pervasive computing/networking, Situated & autonomic communications (SAC), Bio-inspired networks, Cognitive radio/networks, Complex networks, Sensor networks (Internet of Things), Quantum cryptography, Security

Classification of Thematic Areas

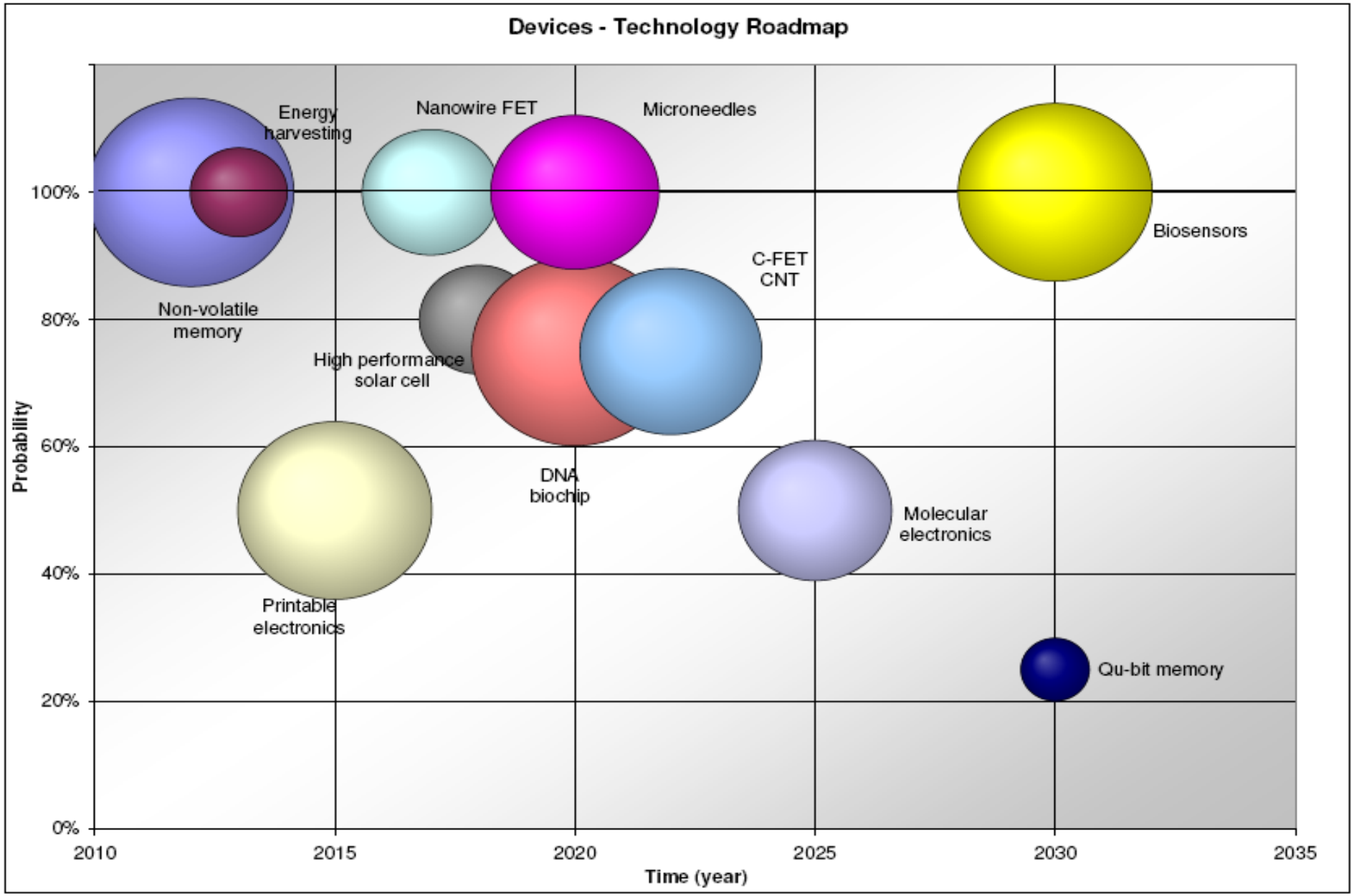
C. SOFTWARE & SERVICES

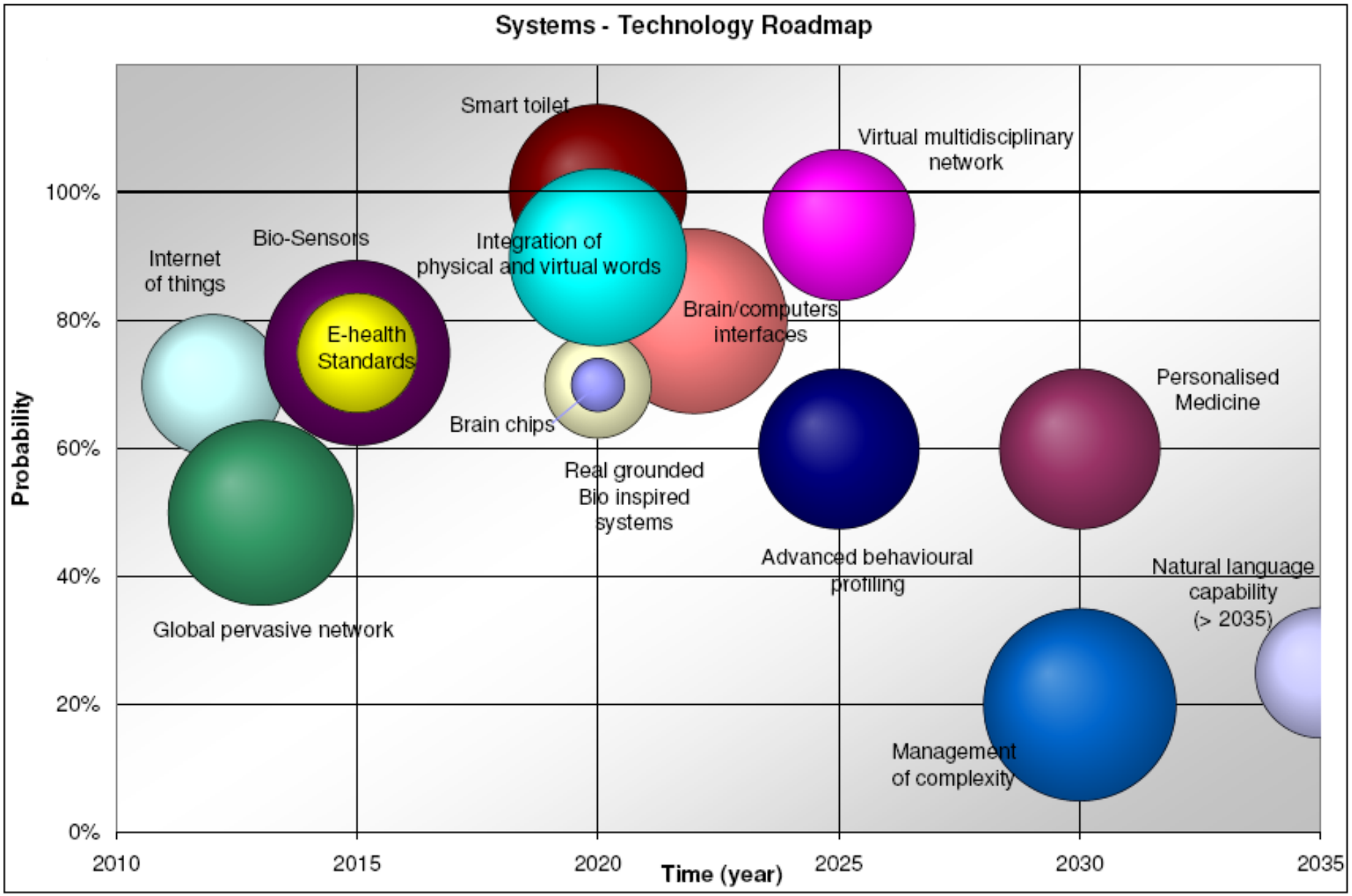
8. Software, Algorithms and New Programming Paradigms (beyond von Neumann) (Algorithms & complexity, Data deluge, Cellular computers, Cloud computing, Modeling/simulation of complex systems, New programming for tera-scale ICT, Software-intensive adaptive systems, Quantum information theory & algorithms)

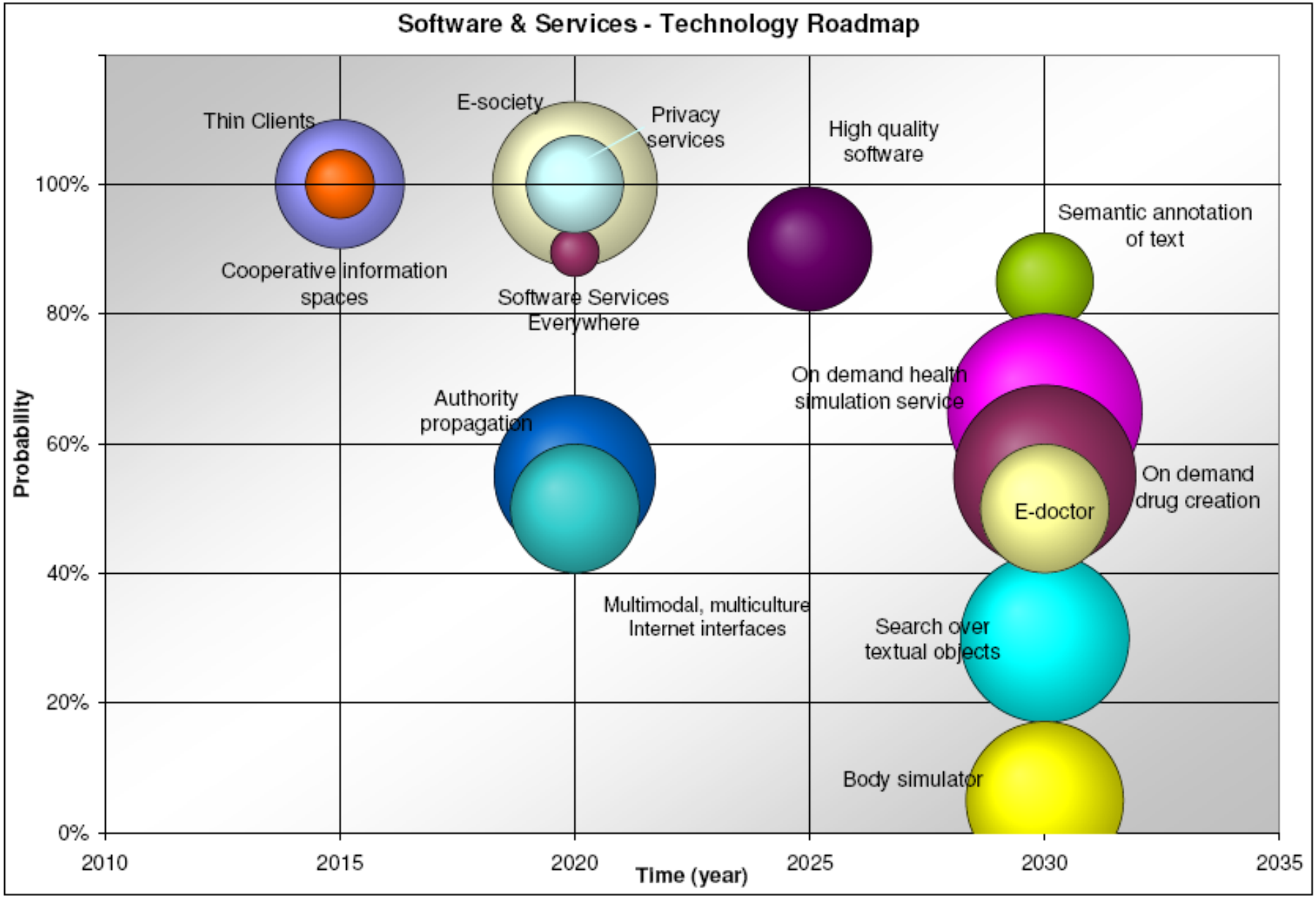
9. Web 2.0/3.0 (Semantic web/ontologies, Search engines, Contents personalisation, User-generated contents, Web services, Social networking)

10. Information Society (e-Society, e-Business, e-Governments, e-Environment, e-Learning

- **Green ICT (Energy Efficiency)**
- **Energy harvesting/scavenging**


Devices - Technology Roadmap
Energy harvesting
Nanowire FET
Microneedles
Biosensors
C-FET CNT
Non-volatile memory
High performance solar cell
DNA biochip
Molecular electronics
Printable electronics
Qu-bit memory
100%
80%
60%
40%
20%
0%
Probability
2010
2015
2020
2025
2030
2035
Time (year)


Systems - Technology Roadmap
Smart toilet
Virtual multidisciplinary network
Bio-Sensors
Internet of things
Integration of physical and virtual words
Brain/computers interfaces
E-health Standards
Brain chips
Personalised Medicine
Real grounded Bio inspired systems
Advanced behavioural profiling
Natural language capability (> 2035)
Global pervasive network
Management of complexity
Probability
100%
80%
60%
40%
20%
0%
2010
2015
2020
2025
2030
2035
Time (year)

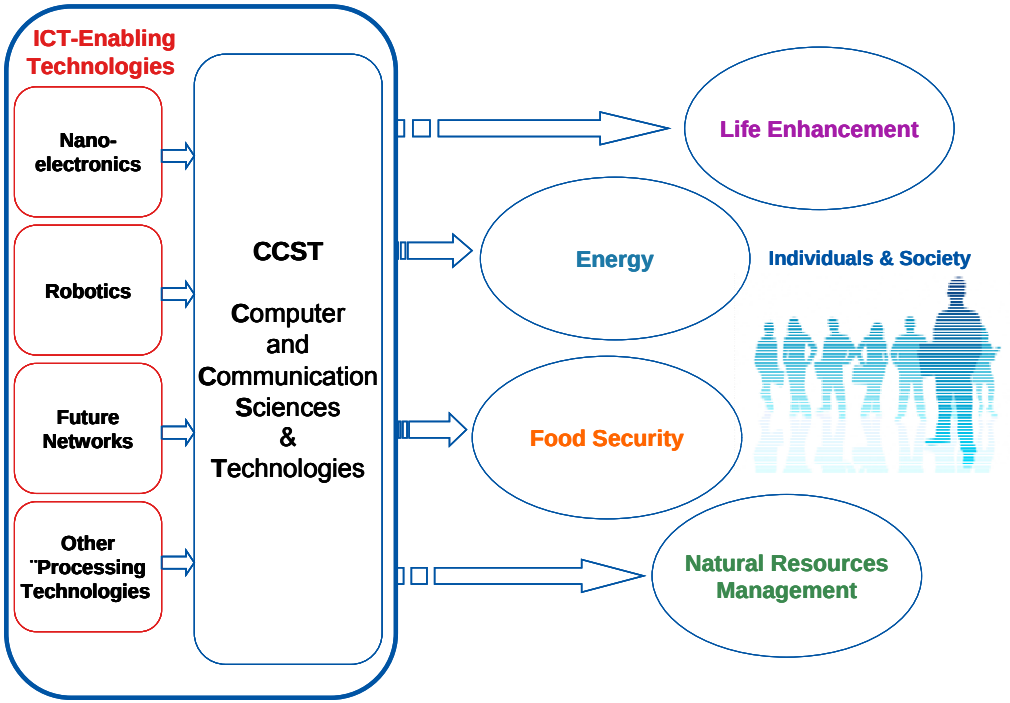

Software & Services - Technology Roadmap
Thin Clients
E-society
Privacy services
High quality software
Semantic annotation of text
Cooperative information spaces
Software Services Everywhere
On demand health simulation service
Authority propagation
On demand drug creation
E-doctor
Multimodal, multiculture Internet interfaces
Search over textual objects
Body simulator
Probability
100%
80%
60%
40%
20%
0%
2010
2015
2020
2025
2030
2035
Time (year)

Strategic Activities

COST Strategic Workshops

COST Foresight 2030: A New Society in the Making – A COST Interdisciplinary Strategic Initiative in the Wake of the Digital Revolution (2009-10)

- **COST Foresight 2030** aims at stimulating discussions on potential future scenarios in a world permeated/shaped by the **Digital Revolution**
- ICT as **enabling technology**
- The 6 Workshops focus on **societal-driven research** topics and favour **inter-disciplinary** exchange

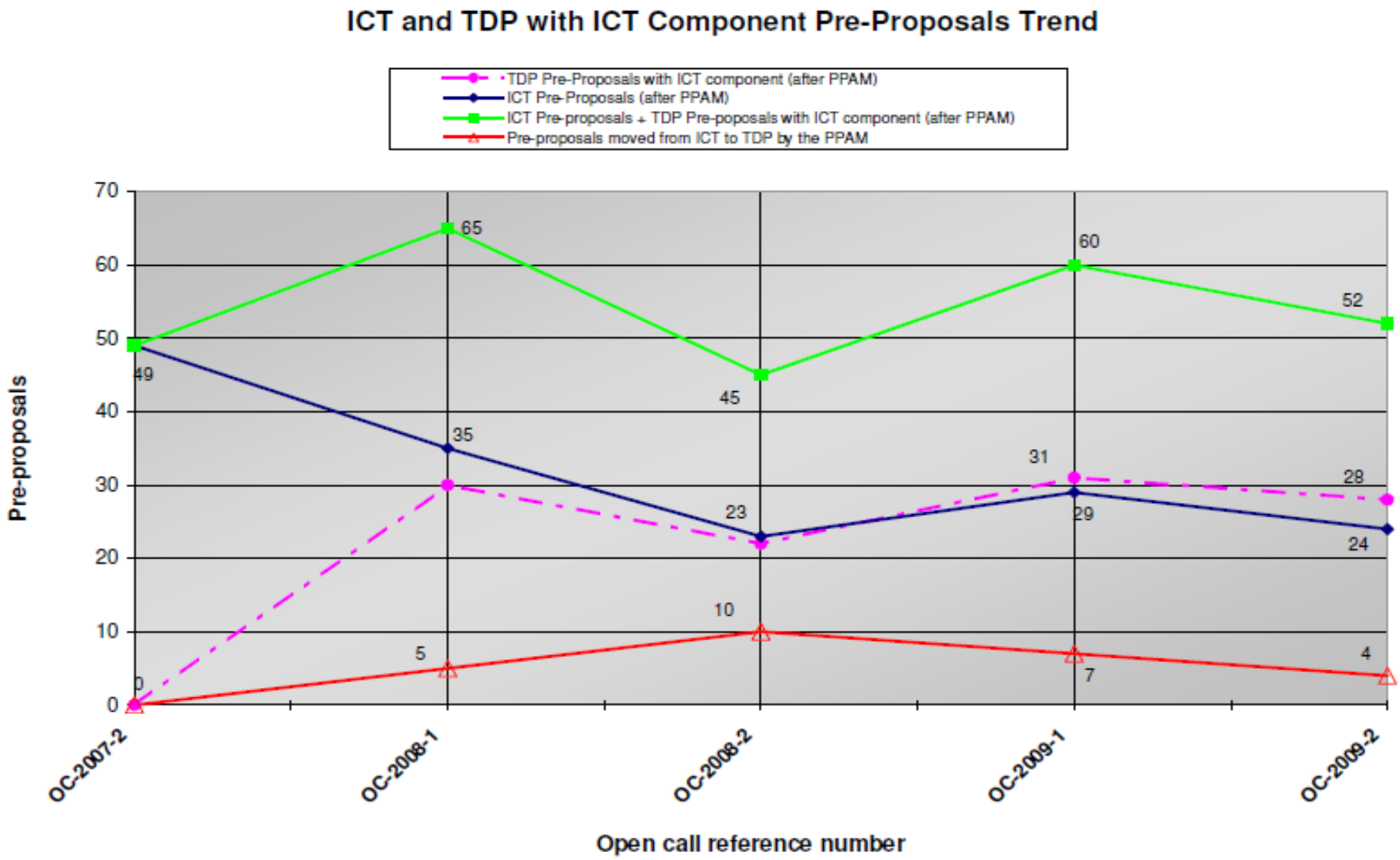


COST-ESF Conferences

- **Future Internet & Society:**
- **A Complex Systems Perspective**
- **(Maratea di Acquafredda, 4-8 Oct. 2010)**

- **Scope**: This conference will bring together experts in **ICT**, **social scientists**, as well as experts in the area of **complex systems**
- **Topics:**
  - Internet topology and modeling
  - Complex techno-social networks
  - Spreading and epidemics in techno-social systems
  - Virtual social systems
  - Co-evolution of Internet and society
  - Internet as a socio-economical system
  - Mobile social networks
  - Internet-enabled applications/businesses
  - Future Internet as a techno-social system

Role of ICT within the context of TDP



Some thoughts on COST- ESR & Gender Balance

- It is necessary to encourage COST-ESR to join ERA so that they can open new frontiers for all of us, especially in ICT.

- The EC “She Figures” show that women account only for 30% of researchers in EU (2006)

- Need to update our ESR strategy to address the issue of gender balance in relation to ESRs.

Some thoughts on COST- ESR & Gender Balance

- As DC-ICT, we would be willing to set up a project. OR
- The DC-ICT is willing to award up to 1? COST action(s) to a team of gender balanced Early Stage Researchers (ESRs) and senior researchers from COST countries.

- The selection process will be in a different category (the proposal will be accompanied by statement that it is in that special category).

Some thoughts on COST- ESR & Gender Balance

- The **first-order selection criteria** such as:
  - Presentation and clarity of the proposal
  - Innovation
  - Potential impact of joint research findings on COST community
  - Quality of research design and methodology
  - Adequacy of Work Plan
  - Gender sensitivity of research proposal
  - Impact on ERA research capacity.
  - Active interaction between ESRs and senior scientists in the proposed action

Some more thoughts……&…Future of COST

- COST's bottom-up approach along with its distinctive ways of integrating young researchers with the senior ones, makes it unique.

- Make COST known to European ESRs outside Europe, even during their studies.
- Utilization of the dynamic that exists outside Europe

- COST is science-driven and has to remain like that.
- => Need for independent COST

Thank you for your attention!

Questions ??