Objective ICT-2007.3.6: Smart Systems Integration

Target outcomes:

Next generation smart systems will help to solve key technological problems of future communication, health care, production, transportation, logistics, energy supply, safety and security. New features shall be created through integration at (sub-) systems level bringing together novel technologies from multiple disciplines including optics, mechanics, electro-magnetism, electronics, and biology. Smart systems will comprise devices for sensing, actuating, information processing, data storage, energy management, and wireless communication. They will range from an ensemble of strongly cross-linked but widespread parts to a miniature chip-in-package, they can be standalone, networked, or embedded into larger systems. Smart systems have the ability to sense, describe, and qualify a given situation, as well as to mutually address and identify each other. They are able to predict, decide or help to decide, and interact with their environment. Significant innovations are expected related to:

a) **Miniaturized and integrated smart systems with advanced functionality and performance**
These smart systems will comprise highly sensitive and selective sensors, predominantly multi-sensors, sensor networks and fusions creating synergy and providing multiple functionalities, which dynamically interact with precise actuators or tunable components. Integration will be supported by using multidisciplinary simulation and modelling tools. Applications shall focus on safe, fast and highly integrated biometric systems, centralised energy management of complex systems, tamper-proof and protected systems, and smart thermal management. Moreover, smart technologies for low power consumption, energy scavenging, power generation and accumulation that can be integrated in electronic adapters, electronic drives, and actuators shall be developed.

b) **Autonomously operating, power efficient and networked smart systems**
Such smart systems will advance functionality by applying and improving wireless and wired transmission techniques for sensor nodes and machine-to-machine communication. Energy management and integrating technologies for low power consumption, energy scavenging, power generation, and accumulation will allow the long-term autonomous operation of these smart systems. In particular, the focus shall be put on re-configurable, low-power, adaptive, miniature smart transceivers for short- and long-range communications, integrated millimetre wave communications, and sensor systems with integrated antennas and interfaces. Integrated sensors and RF communication for applications like lighting systems, networking matrices of medical sensors, implanted and in the body area, and energy management of large matrices of batteries and super-capacitors deserve close attention as well.

c) **Robust systems, compatible and adaptive to environment and lifetime requirements**
Smart systems will be operational in harsh environments. They are made from materials compatible with the operating environment and they provide an inherent reliability. Major topics shall be failure tolerant architectures supporting sensor systems adaptive to changing sensing requirements, smart implants, biocompatible systems, and other devices with in-vivo verification also able to tolerate interfacing body signals. In addition, systems sustaining extreme physical, chemical and architecture-implied conditions, like e.g., complexity, temperature, media, vibration, and mechanical shocks shall be addressed.

Precedence will be given to projects covering more than one area (a)-(c).

Support actions will ensure an efficient access to advanced tools for prototyping, testing and validation of smart systems for universities and SMEs. Appropriate measures include open-use, remote-access, and network concepts for shared facilities, effective, 'hands-on' training-programs, and marketplace services arranging contacts and consultancy. Specific measures aiming at community building, integration of SMEs in the smart system value chain, prevention of counterfeiting, and coordination and dissemination of smart systems technologies RTD at the European level shall be established.

Expected impact:

- Technological breakthroughs towards a vision of ambient intelligence and ubiquitous sensing with strong social and economic impacts like, e.g. a whole new world of convenience in logistics and distribution, mobility, communication and health care.
- Strengthening global competitiveness of European industry, particularly in sectors of high economic relevance as automotive, medical and others by serving the R&D needs of industry including a broad range of SMEs.
- Solutions for key future challenges including natural resource conservation, sustainability of energy/materials/spectrum use, climate protection, ambient assisted living, and safeguarding of networks, airports, and borders as well as homes, food, and water.

Budget distribution:

- CP: 45% to IPs and 45% to STREPs
- CSA: 10 %