12 YEARS *of* ITEA

Achievements & results of the EUREKA programmes ITEA & ITEA 2

ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

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EUREKA

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October 2010

ITEA 2

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EUREKA

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FOREWORD

ITEA – a unique approach

ITEA offers a unique approach to software-intensive systems and services development. This uniqueness comes from a programme management led by an industrial community, closely connected to public authorities. ITEA's founding companies (IFCs) have put a major and continuing effort into organising the ITEA programme through a series of co-design events, project evaluations, project steering and community events.

Our great success is visible through the well-balanced split of effort observed between the IFCs, other large companies, small and medium-sized enterprises (SMEs), research institutions and academia. In particular, the mobilisation of SMEs in this programme is exceptional in view of the difficulties to ensure real SMEs involvement in such co-operative research and development programmes. And we are proud of the now well-established and strengthening ITEA community.
Continuous involvement of IFC experts in managing the programme has allowed ITEA to build success over the long term, encouraging a set of coherent projects dealing with important and successful areas such as automotive, healthcare and wellbeing, multimedia content creation, delivery and sharing, and 'agile' software development.

The third edition of the ITEA Roadmap has helped define the ITEA domain and technologies and their main trends, which set the scene for the creation of new projects and consortia. Within ITEA, matchmaking and project creation are purely bottom-up processes and project topics come directly from market needs. The administrative burden is kept as low as possible. The principal objective of ITEA is to promote the birth of top-ranking projects; our three keywords are: flexibility, innovation and market impact.


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ITEA – A vital resource for Europe

ITEA (Information Technology for European Advancement) is the leading trans-national co-operative industry-driven research and development (R&D) programme in software-intensive systems and services and a vital resource for Europe. ITEA and its successor ITEA 2 have been a major success story for the European information and communications technology (ICT) sector. Driven by industry with the support of the national public authorities, these EUREKA Clusters have enabled Europe to maintain its global leadership in ICT and to be in the vanguard in the emerging services revolution. Continuing R&D in this critical area is essential for the European economy and society.

ICT innovation is essential for the competitiveness of the European economy and for the health and wellbeing of Europe's citizens. Major challenges include:

- Society – the needs of an ageing population, demands for increased personal wellbeing and the necessity for environmental sustainability;
- Business – anywhere/anytime connectivity, cloud computing which provide utility-like services over the Internet and the new business models required for that; and
- Technology – the need for massive scalability and reliability in information storage and access, compute power, connectivity and complexity in systems development.

ITEA and ITEA 2 have built strong industrial expertise in ICT in Europe to master the technology for the software and software-intensive systems and services upon which much of the rest of industry now depends. The success has confirmed that public co-funding stimulates the necessary private R&D efforts in an environment of open innovation.

THE EUREKA FRAMEWORK

- EUREKA is a pan-European network for market-oriented industrial R&D with 40 full members, including the European Union, 2 national information point (NIP) countries and 1 associated country.
- Every member country has a EUREKA national project co-ordinator (NPC).
- ITEA 2 is one of EUREKA's ICT Clusters – others are CATRENE nanoelectronics, CELTIC telecommunications and EURIPIDES integrated smart systems.
- Funding is obtained at national level.

THE ITEA 2 AUTHORITIES COMMITTEE (ITAC)

ITAC consists of representatives of public authorities in Austria, Belgium, the European Commission, Finland, France, Germany, Israel, Italy, the Netherlands, Norway, Spain, Sweden, Turkey and the United Kingdom .

THE ITEA 2 FOUNDING COMPANIES (IFCS)

Airbus, Alcatel-Lucent, Barco, Bull, Daimler, European Federation of High Tech SMEs, Italtel, Nokia, Philips, Robert Bosch, Siemens, Telefonica, Telvent, Thales and Technicolor (formerly Thomson).

Results over the past 12 years have been tremendous. ITEA has had a huge impact on technological abilities and employment, not only in software and microelectronics directly but more importantly also in other sectors increasingly dependent on such technologies – particularly automotive, avionics and other forms of transport, manufacturing industry, communications, entertainment and healthcare and wellbeing sectors to the benefit of all.

Industry-driven public-private partnership

ITEA was launched as an industry-driven EUREKA Cluster programme in 1999 to achieve highly competitive results in software development, software engineering and software platforms. The intention was to cut time-to-market for world-class products and services, bring European businesses into globally leading positions, to foster innovative new businesses and stimulate an ICT research community in Europe. Industry believed an evolution towards software-intensive systems would help strengthen European leaders, fuel economic growth and meet societal needs, supporting the preservation and creation of employment.

While Europe led in many software-intensive sectors, a growth of ICT in other regions and the recurring 'European paradox' – low levels of achievement in turning excellent R&D results into commercial success – called for a common, co-ordinated effort between the public and private sectors in Europe to face the emerging challenges and retain global market leadership.

Cross-border, public-private R&D programmes were seen as crucial, with EUREKA as the best instrument. This inter-government initiative promotes cross-border and market-oriented collaboration. It enables industry and research institutes from 40 member countries to co-operate in a bottom-up approach to develop and exploit innovative technologies.

The public authorities in the countries involved have played a major role in the success of ITEA and ITEA 2 by harmonising and synchronising measures related to the programmes to ensure continuity and optimal execution. The proximity of the ITEA Authorities Committee (ITAC) and the industrial committee has always been a strength in steering the ITEA programme.

Cross-sector co-operation in specific areas with the other major ICT R&D programmes within EUREKA as well as with the EU Framework Programmes has led to complementarities that have helped strengthen Europe's ICT-related industries. ITEA has also produced many European contributions to international standardisation, as illustrated later in this document.

An open and growing community

The identity of ITEA is based on the leading large companies which created a strong and open community around them, able to work together across company, market and national boundaries to the benefit of all participants and to the competitive strength of Europe. The ITEA programmes have enabled the community to access the latest and most innovative technologies in Europe to build new software-intensive systems and services.

The ITEA Founding Companies and Countries (IFCCs) co-operate closely and are together responsible for running the organisation of the ITEA programme, and for the processes required for project codesign, evaluation, labelling and monitoring.

The fast-growing ITEA community includes academic players as well as small and medium-sized enterprises (SMEs); SMEs now account for 30% of project manpower. University and research institute participation is an accelerator for breakthroughs and dissemination of the technological innovations in ITEA.

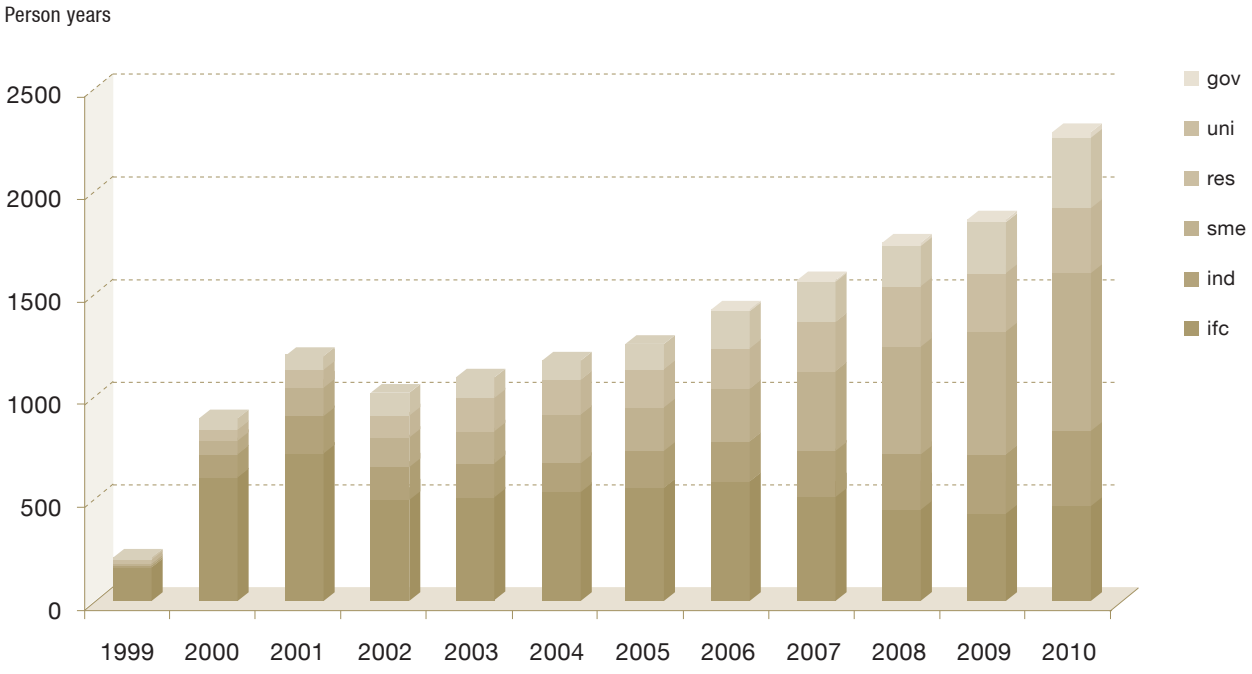

Figure 1 ITEA and ITEA 2 Full Project Proposal effort per partner type

Structured vision of the future

ITEA and ITEA 2 have developed three generations of a Roadmap indicating where innovation is likely to be fruitful. These roadmaps identified the market moving from pure embedded software to software-intensive systems and services. The third edition of the roadmap, published in 2009, has updated the definition of the ITEA domain and the main trends in software-intensive systems and services, as well as pointing to business model innovation.

Roadmap 3 provides an open and structured vision of future uses and services based upon deployment scenarios complemented by descriptions of related key categories of software technologies. It sets the scene for the creation of new consortia and projects built by large industries, SMEs, universities and research centres, while supported by the public authorities.

In ITEA, the creation of consortia and projects are bottom-up processes. Project selection is focused on innovation and potential business impact rather than purely scientific excellence. A project is based on the agreement of the partners and countries involved. Consortia are built by bringing together relevant national subconsortia to solve a problem or open a new opportunity. Moreover, ITEA is highly flexible, making it possible to change the direction of a project in progress in line with evolutions in business and technology.

Continuing impact of ITEA programmes

ITEA and ITEA 2 each involved an eight-year rolling research programme. The first series of eight calls led to a portfolio of 83 strategic projects involved participation from all over Europe and from all stakeholders – large industry, SMEs, universities and research institutes. Total investment was €1,300 million, either directly or in kind from the partners involved. And the total effort was just over 10,000 person-years.

By the mid 2000s, it was clear that software-intensive systems were an even more vital driver and growth engine for Europe's economy. So there was an obvious need to strengthen this leadership to maintain both the economy and jobs. ITEA 2 offered the crucial next phase to maintain the momentum established by ITEA and build solidly on the successes and lessons learnt.

The dramatic shift to software-intensive systems and services as the core challenge of ITEA 2 affects all aspects of our everyday lives. The ambition was to mobilise a total of 20,000 person-years – twice that of ITEA. This required a significant increase in investment to over €3 billion. Halfway through ITEA 2, the amount of effort is indeed close to 10,000 person-years – the same level of effort as for the whole of the ITEA programme, and in line with expectations.

Looking at the figures for both ITEA and ITEA 2, the number of partners and particularly SME involvement has grown consistently as shown in Figure 2. ITEA calls one to eight eventually involved 510 partners of which 237 were SMEs. ITEA 2 Calls one to four have already involved 672 partners of which 373 are SMEs. Overall, for the two programmes combined, to date there have some 1,035 partners of whole 568 have been or are SMEs.

Figure 3 provides an overview of how all this effort splits over the individual countries involved.

SME APPRECIATES STRONG MARKET ORIENTATION

Turkish SME Mobilera is a leading mobile software solutions provider, offering innovative community management, mobile marketing and content services. It was the first Turkish company to participate in an ITEA project when it joined the AMEC consortium in 2004 as the main technology provider. It appreciated being able to collaborate in a market-oriented project with a consortium of leading European industries and to demonstrate its knowhow.

"The market orientation is the definite value of EUREKA and ITEA."

ZEYNEP SARILAR AKALTAN
Mobilera

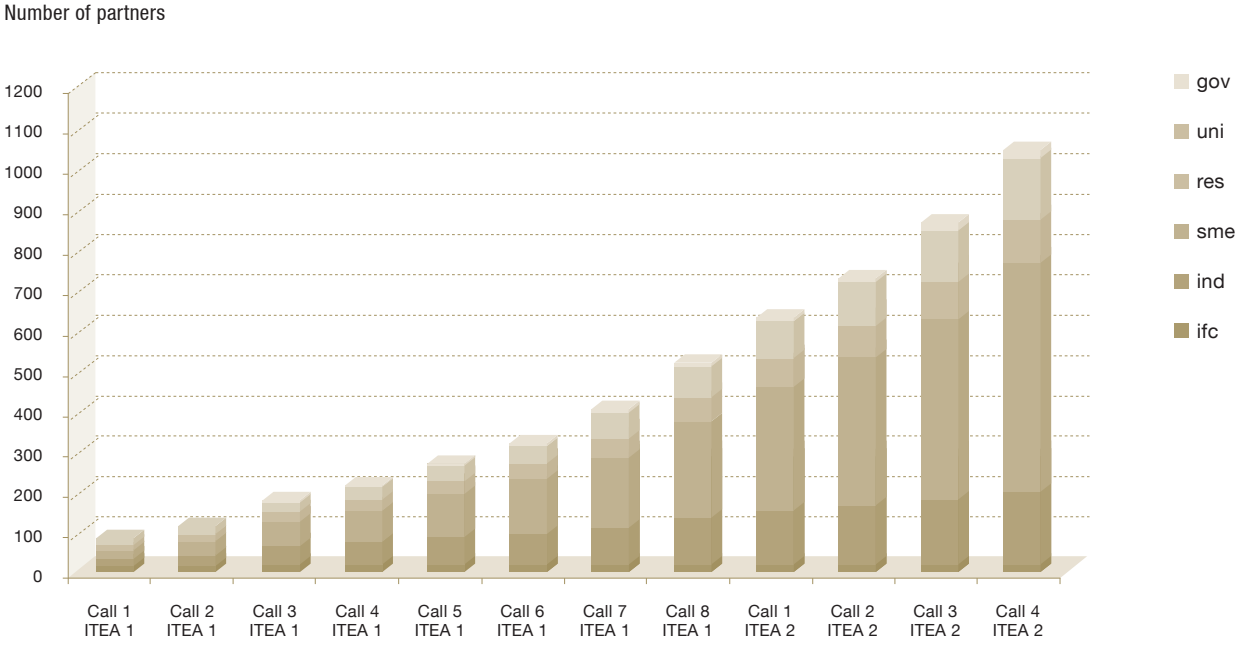

Figure 2 Cumulative number of ITEA & ITEA 2 partners

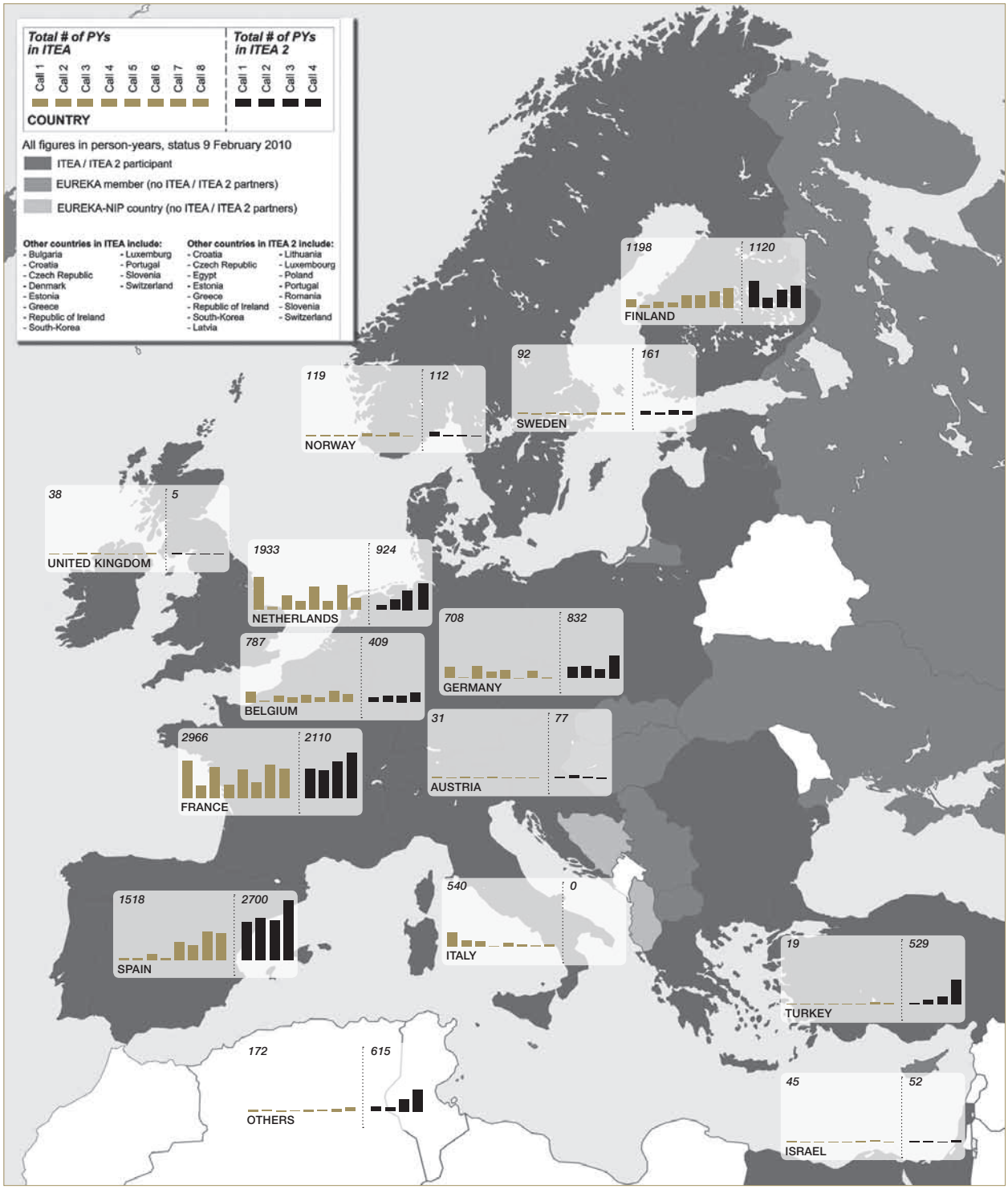

Figure 3 ITEA/ITEA 2 effort per country

CONSISTENT

AND EFFECTIVE RESULTS

The success of ITEA and ITEA 2 has come from the specific characteristics of the programmes and from the projects themselves. These involve both the software-intensive systems and services which are the target of ITEA and software-engineering projects which support the systems development.


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Establishing patterns of real success

Regular ITEA success patterns involve real innovations and, as importantly, their business impact. This can be in terms of:

- Crossing industry sectors and promoting open innovation between complementary competences and markets – such as in the development of algorithms for intelligent sensor networks for security and medical care;
- Creating ecosystems that support industry-wide application and standardisation of common approaches such as achieved through the ITEA Call 3 EAST-EAA project which drove the global Automotive Open System Architecture (AUTOSAR) standard;
- Gathering all the partners along a value chain for the introduction of a new consumer technology as found with the development of digital TV; and
- Development process and method evolution as found in the ITEA Call 5 Families, Call 6 Agile and Call 8 TWINS projects.

Three elements have always been seen as particularly important:

1. Fast exploitation of results – this is one of the best measures of success for an industry-oriented approach as illustrated by award-winning ITEA Call 8 near field communication (NFC) SmartTouch project, the ITEA 2 Call 1 high-performance computing ParMA project and the ITEA Call 8 networked services NUADU project;
2. Long–term exploitation – development of a step-change in technology which led to a complete solution for distribution and projection for digital cinema in the ITEA Call 3 Digital Cinema project that has become a jewel in the crown of Barco many years after; and
3. Standardisation – impacting the end-users targeted such as card-payment systems across the euro zone with the ITEA Call 8 EPAS project that helps Europe support large ecosystems and ensures that Europe can influences global standards.

FAST EXPLOITATION OF NFC APPLICATIONS

The ITEA Call 8 SmartTouch project designed and tested a near-field communication technology/service platform and developed the concepts for corresponding business chains. Aiming at a broad range of NFC applications, the project involved a wide combination of technology and service producers, researchers and companies in examining the role of NFC technology in city life, the home, wellness and health, technological building blocks, security and privacy, and business building blocks. In addition to demonstrating NFC services for payment and ticketing, the project piloted access control, infotainment and entertainment services. Gemalto – a world leader in digital security – used SmartTouch results to ensure fast nationwide deployment of NFC mobile payment in Taiwan. Alcatel-Lucent used the results to launch Touchatag, providing mobile payment and marketing solutions to telecommunications operators and enterprises.

EFFECTIVE USE OF HIGH-PERFORMANCE COMPUTING

Leading European high-performance computing (HPC) players, led by major French computer manufacturer Bull, joined forces in the ITEA 2 Call 1 ParMA project to allow the HPC community to benefit fully from the processor race while developing innovative, flexible and open technologies taking full advantage of multi-core architectures. The results of this project are already enabling the development of power-intensive innovative embedded applications and helping achieve new goals in modelling and simulation. This is speeding research in many domains as well as the design of better products in industry because it is now possible to explore many more parameter combinations in the form of virtual prototypes. Simulation software development partners have greatly enhanced the performance and scalability of their applications, providing their customers with much more powerful solutions. And Bull and the German supercomputing research centre FZJ Jülich have been able to deploy the largest European HPC machine and 10th largest HPC machine in the world; this HPC system is targeted on the nuclear fusion research community.

LONG-TERM EXPLOITATION IN DIGITAL CINEMA

While fast exploitation of results is a driving force in ITEA, long-term exploitation of results is equally important. The shift in the film industry to enable digital distribution was a major step change in a century-old industry that required a universal, long-term digital cinema standard meeting the needs of exhibitors, studios, equipment manufacturers and others involved in this effort. Digital distribution and display of feature films was driven in Europe by the results of the ITEA Call 3 Digital Cinema project, which designed a complete solution for digital cinema, including post-production, transmission, theatre system and projection. The results were integrated in the Barco product line and provided the basis for becoming the global number one supplier in that market segment in 2009, six years after the ITEA project finished.

"NFC offers very good business cases but we wanted it to become a global standard with everything in place for full exploitation."

TUOMO TUIKKA
VTT Technical Research Centre of Finland


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Speeding the design of safer and more comfortable vehicles

European car manufacturers are among the world leaders even if new competitors arise throughout the world.

Electronics are being used increasingly to improve safety and comfort in all areas of the car – from engine, steering and braking systems to communications, entertainment and man-machine interfaces. The problem is that, when a new component is introduced, not only must it be tested thoroughly but so must all existing components to ensure none has been adversely affected. As a result, introducing new electronics puts a strong upward pressure on development costs and cycle times.

Leading the way through global standards

ITEA projects have achieved success of indisputable value to the automotive industry in Europe and worldwide, and are continuing to lead the way through global standards.

More than 20 carmakers, component suppliers and academics collaborated in the ITEA Call 3 EAST-EEA project to develop a common software interface for electronic devices to ensure Europe a competitive edge in the automotive sector. This important advance has made vehicles quicker to design and cheaper to bring to market, while maintaining high quality standards.

EAST-EEA had three aims – to create the standard middleware, define a high-level language to make it accessible and develop specialist tools, including test tools and demonstrators. The result was a new software architecture that allows easier integration of new electronics – systems, subsystems, modules and components – delivered by different suppliers into the complete network of a vehicle system through ‘plug-and-play’ technology, dramatically reducing development time and costs to market.

Thanks to the EAST-EEA approach, vehicle manufacturers will be able to use an integrated framework for software and communications interfaces, tool environments and rules. Suppliers will benefit from standard solutions and reuse will become possible. New vehicle models will be developed faster and product quality will be improved.

The results of EAST-EEA were used as the basis for the EU Sixth Framework Programme EASIS project to develop a highly dependable in-vehicle electronic architecture and systems-engineering process for integrated safety systems.

"Continental's 'EMS 3', a new AUTOSAR-based platform for the development of engine-management systems, employs the TIMMO results for the specification and analysis of timing aspects in such systems."

FRIEDHELM STAPPERT
Continental Automotive GmbH

EAST-EEA also paved the way to a standardised platform for automotive applications – the Automotive Open Systems Architecture. AUTOSAR is now a global industrial initiative that currently is bringing together more than 100 original equipment manufacturers (OEMs) and their suppliers worldwide. The initial ITEA partners still form the majority of the current core group.

Mastering in–vehicle timing constraints

This partnership has been extended in the ITEA 2 Call 1 TIMMO project on mastering in-vehicle timing constraints which has contributed to real-time performance modelling and verification. The project results will be integrated into AUTOSAR.

TIMMO developed a standardised approach to analysing timing information in embedded system design to predict and master in-vehicle timing constraints. With so many of the functions in cars – such as braking and stability control, anti-collision systems, parking aids, clean-burn fuel injection, and exhaust and emission management systems – now handled electronically, timing synchronisation between electronic control units (ECUs) has become crucial – especially for safety-critical processes.

Until recently, timing constraints were detected by testing, measuring and simulation. As a result, problems were only picked up late in the design cycle when working on the finished units, sometimes meaning the whole design process had to be restarted. TIMMO has developed a more effective approach that enables analysis of the timing from the beginning of the design cycle, using a common standardised timing-augmented description language (TADL) as an input for tools.

This common language describes all the elements that can be used as an input for timing analysis tools and scheduling to make timing predictable. The results are applicable to car manufacturers and component suppliers as well as tool vendors – the companies offering the tools for timing analysis. TADL makes it easier to exchange requirements and specifications between manufacturers and their suppliers. And tool vendors benefit from a common input language for their tools.

The overall result is an easier development cycle, making the development of complex functions more reliable and faster. Consumers also benefit from more complex functionalities that lead to greater innovation in ever more reliable and safer cars.

Ensuring safety–critical quality of embedded systems

The goal of the ITEA 2 Call 1 ES_PASS project was to target the awareness, improvement, integration, deployment and dissemination of product-based static-analysis verification techniques for quality assurance in safety-critical embedded systems engineering. The range of industrial sectors particularly concerned included aerospace, automotive and rail transport.

A major advantage of static analysis compared with other dynamic verification and validation methods is the ability to give guarantees with respect to a given specification. Therefore, this technology is considered promising for the future development of safety-critical applications.

ES_PASS evaluated different analysis tools from commercial and non-commercial vendors for their potential application in industrial development processes. The results of these evaluations had a direct influence on tool development. Further co-operation is now possible between leading European technology institutes in this area and industrial end users. This will drive research to target end-user needs better and hence strengthen European industry and research in this sector.

As a major result, this ITEA project has led to improved engineering processes with a higher degree of integrated static analysis. Another prominent result was the commercialisation of the ASTRÉE static-analysis tool by AbsInt.

Facilitating complete vehicle system functional mock–up

The ITEA 2 Call 2 MODELISAR project is boosting collaboration and innovation across different disciplines of vehicle system development. Thanks to plug-and-play coupling of different existing models and embedded-software components from different domains, the integrated simulation and test of a complete mechatronic vehicle system – functional mock-up – can be achieved at lower costs and less time.

MODELISAR will propose an open standard, the so-called functional mock-up interface (FMI) specification. Simulation, modelling and embedded-software development tools which support this standard can exchange models and run an integrated simulation without additional efforts.

Moreover, simulation tools can be coupled directly, for instance over an intranet. An example would be simulation of the physics of a gas spring – such as a Modelica-based model – and an AUTOSAR software component with no additional software code. Furthermore, the models of the kinetics of a power-lift gate and non-AUTOSAR software components could also be coupled.

In addition, the coupling of testing tools is supported. In this way, FMI would facilitate running test scenarios for complete system behaviour. In addition, FMI for product lifecycle management (PLM) will be provided to store models, simulation and testing configurations and results.

Several tool vendors will develop FMI-compliant implementations. A series of proof-of-concept demonstrators will be realised – such as engine gearbox shifting, power lift gate and energy management. Furthermore, the Modelica language for systems modelling and simulation will benefit from the FMI results.

"The MODELISAR functional mock-up interface standards (FMI) will considerably ease the integrated simulation of models from different domains within the process of vehicle systems development."

NIKOLAUS KLEINER
Daimler AG

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Ensuring healthcare and wellbeing

Healthcare is a domain where Europe has two worldwide leaders in ITEA founding companies Philips and Siemens as well as many innovative SMEs.

Wellbeing and personal healthcare are becoming more and more important, as people are living longer while there are fewer people available to provide assistance and it is becoming more important to increase the added value of the people providing such help. Software and software-intensive systems and servicesare playing an ever greater role in medical diagnosis, patient monitoring and improved wellbeing – particularly in the follow up to medical interventions and helping enable the elderly and the handicapped maintain their independence.

Speeding life–saving decisions

The amount of digital video content now available makes automated interpretation essential to ensure optimal use of data in the shortest possible time. The ITEA Call 8 CANTATA project set out to make digital video processing systems content aware, making use of the advanced digital technologies and greater system power now available. This enabled the development of robust analytical algorithms for content interpretation.

Healthcare was an immediate beneficiary as an increasing amount of graphical information – for example from high resolution 3D scanners – is being used for diagnoses, putting a high stress on the medical experts involved.

Deep-vein thrombosis and its deadly complication pulmonary embolism affect 2.5 million people in the EU and the USA each year with fatal results in a third of cases. Timely diagnosis and appropriate therapy can reduce mortality to below 10% but a pulmonary embolism is particularly difficult to detect. Multi-detector computed tomography (MDCT) has radically improved diagnosis – not only directly by fast identification but also often by providing an alternative diagnosis when such embolisms have been ruled out.

MDCT is fast and patient friendly but involves the radiologist in checking hundreds of images – a time-consuming process subject to human failures. CANTATA offered computer assistance that makes quantification an acceptable part of the diagnostic routine. The system not only detects pulmonary embolisms automatically but also provides a quality-critical compressed image for transmission over bandwidth-limited network without affecting the quality of the medical content.

Clinical evaluation of such computer-aided diagnosis was carried out in several Dutch hospitals. The first computer-aided detection systems for pulmonary embolisms from Philips Healthcare are already entering the worldwide market.

The ITEA 2 Call 2 HiPiP project is making use of high-performance computing to speed use of medical image information. It aims to show the advantages these technologies offer in establishing a reliable diagnosis, applying radiotherapy or monitoring a treatment in real time, and even analysing biopsy tissue samples at cellular level.

Such an approach has a huge potential with numerous possible applications. Their common need is for precise 4D images – the three spatial dimensions over time – for different therapies, be it X-rays, positron emission tomography, magnetic resonance imaging or computed tomography. Because the imagery is so much more precise, a great deal more data has to be processed in the short time that the patient is actually present during a consultation or examination.

Possible applications include:

- Computer-aided surgical procedures;
- Computer-aided diagnosis;
- Real-time radiotherapy simulation; and
- Early detection of disease.

Prolonging independent living

Some 20% of the EU population is now over 65 – a figure set to increase up to 25% in the next 20 years. The prevalence of disability also grows significantly with age. All this affects individuals, families, communities and nations, and will inevitably have profound economic consequences for much of Europe – and all other developed countries around the globe.

Technology has an important role in enabling people to live fulfilling lives for longer. ICT can help the elderly overcome isolation in their own homes, and provide applications such as electronic alarm systems, tele-health monitoring and home automation to assist in everyday living, enabling them to stay as long as possible in their own homes. However, many older people face barriers – both physical and mental – in exploiting ICT products, services and applications to their full potential.

The ITEA Call 8 NUADU project investigated quality of life, healthcare and personal health needs. The objective was to find out what benefits could be provided by technology and how such technology would be accepted by users. It developed a series of solutions for elderly people at home, mobility for disabled people, health promotion for the young and obese, and chronic-disease management in cases of heart disease or diabetes.

The NUADU consortium co-operated with other projects both within ITEA and outside at European and national level. It also worked with the open industry Continua Health Alliance, which involves more than 200 healthcare and technology organisations in establishing a system of interoperable connected health devices.

An important impact was in contributing to standardisation in areas such as the type of data provided by personal sensors to the monitoring service. Data transfer currently involves proprietary formats, making it difficult to share between different systems. NUADU worked on new open software standards. The project also drew up guidelines to making sophisticated monitoring equipment easier to use.

A major element was a focus on pilot projects, bringing solutions directly to users for evaluation. Seven pilots were involved covering healthcare self-management in Finland and Spain, independent living for the handicapped, elderly and stroke victims in France and the Netherlands, and remote monitoring of heart patients in Spain. Results of NUADU have already led to the commercialisation of services such as a life-style coach being marketed by Philips. Nokia is working on its own platform to make it better enabled for healthcare applications. And Finnish research centre VTT, already strong in this area, is continuing work on tooling and applications. Moreover Philips and VTT are co-operating in the InnoHub innovation hub in Helsinki to continue such projects together.

"ITEA supports the interaction and benchmarking between our technical people and those of other companies. Improvements are taken up earlier, and people get a broader context of their work. This leads to their better functioning in the ecosystem of EU companies."

FRANK VAN DER LINDEN
Philips Healthcare

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Providing better entertainment and services

Pushing high–definition TV

Entertainment services are entering an era of dramatic innovation with a key convergence of TV, internet, and communications sectors. It is a challenge for Europe to remain in the driving seat of this industry.

ITEA has made high-definition television (HDTV) a reality in Europe and is driving the convergence of broadcast and Internet protocol (IP) technologies for its distribution. HDTV offers resolutions five times better than standard television with home image quality and format close to that of the cinema experience. It offers a new way of producing content and it requires fewer cameras. HDTV is already becoming a commercial reality in Europe and elsewhere. HD transmission of the 2008 world cup in Germany clearly demonstrated the benefits.

Both ITEA and ITEA 2 supported HDTV projects with success achieved in areas such as HD-ready products. The ITEA Call 6 MAGELLAN project carried out pioneering work in this sector, developing secured solutions for delivery and interactive access to multimedia services through heterogeneous broadband networks. It targeted digital broadcasting, IP streaming and digital storage as well as developing synergies between consumer electronics, telecommunications, software editing, content creation and engineering.

ITEA provided a major demonstration of HDTV during its 2006 symposium in Paris. This involved several national HDTV platforms – including Belgium, France, Germany, the Netherlands and the UK – showing commercial HDTV-format programmes produced in their countries. Broadcasters involved included the BBC and Sky from the UK, and Canal+ and TF1 from France. In addition, the ITEA Call 7 HD4U project demonstrated how it was reducing the resources needed to broadcast high definition content.

HD4U offered real breakthroughs with new video compression technology and transmission/reception equipment that ensured Europe was ready for the commercial deployment of multi-channel HDTV over terrestrial, satellite, cable and IPTV digital links. The objective was to fill in the technological gaps in the HDTV chain by creating a high-definition video encoder, improve picture quality and ensure interoperability of receivers.

The project set up an HDTV demonstrator on three types of distribution network: satellite, terrestrial and wired

broadband (ADSL2+). This showed the impressive improvements in quality available with new MPEG4-AVC video-encoding technology compared with traditional MPEG2.

HD4U also provided industrial partners with the opportunity to develop prototypes for encoding, modulation, IP encapsulation, set-top boxes and LCD screens and deploy commercial products a year after the end of the project. This includes a second-generation MPEG4-AVC encoder that targets a 50% gain in compression compared with MPEG2, making it possible to increase the number of channels transmitted over a digital terrestrial TV (DTT) network from three to four.

The ITEA 2 Call 2 HDTVNext project took the results of HD4U even further with the development of the next-generation HDTV platform and the means of deployment for full HD performance for both domestic and video-on-demand (VOD) applications. This involves the development and demonstration of a coherent HDTV 1080p 50 Hz end-to-end solution to synchronise the professional content creation, distribution and home user access areas – overcoming the independent evolution of the various segments caused by different approaches and levels of technical maturity.

In Europe, the professional area is taking advantage of multiplexing more signals in a given bandwidth to send HDTV programmes in place of standard-definition ones. In the middle of the chain, the distribution area is in the process of replacing analogue signal transmission by digital techniques. And at the consumer end of the chain, users are investing in new flat screens using progressive scan to replace cathode ray tube TVs.

Major results include:

- Increased picture resolution and overall quality;
- Optimisation of audio content rendering in the home;
- Facilitation of the consumption and production of 1080p 50 Hz HD content by ensuring a backward compatibility with the first HD generation and enabling management of self-produced contents from fixed, mobile and/or wirelessly-connected terminals;
- Integration of HD content into a multiple viewing, multiple-task home environment; and
- Compatibility between the different elements of the HD video end-to-end chain.

Commercial exploitation of many of the elements developed in HDTVNext is already starting, including the use of automatic content creation and the availability of the world's first Full HD professional TV camera. Much of the technology is also ready for the support of three-dimensional (3D) TV broadcasting.

Adapting media to family needs

Current set-top boxes and personal video recorders have limited intelligence. New consumer media products will be increasingly network-based. Such systems will be able to draw on a wide range of sources to offer greater personalisation, interactivity and group participation.

"Thanks to the HD4U project, Thomson/ Technicolor has been able to build its new HDTV head-end offer for deployment worldwide based on the MPEG-AVC encoding/decoding chipset designed and tested in the framework of this project."

PATRICK SCHWARTZ
Thomson Video Networks

The ITEA Call 7 PASSEPARTOUT project looked at how to bring tailored high-definition media content into the lives of the family. The project brought the needs of European society into the architectures and media standards designed for rich HD media in the home. It concentrated on the architecture and standards needed for European industry to participate in creating new consumer products and services.

PASSEPARTOUT focused on the convergence of digital systems architectures and applications in the home. This was achieved by coupling new devices from the consumer electronics industry to home networks for rendering scalable content for HDTV and interactivity in a seamless fashion. The goal was to achieve ambient intelligence through mass personalisation of reactive content. Project demonstrations stretched far beyond infrastructure and basic services for home networks, affecting also content and human-system interaction.

Results not only help to make sense of the input available but also to select, filter, scale and schedule HD content for presentation in the best possible way in the networked home on multiple large and small display devices. Work included seamless integration into home media centres and networks, with smart graphic displays controlling systems operation and interactive contents packaging.

Key project results include:

- Decoding of video streams for multiple sized displays using the scalable video codec (SVC);
- Exploitation of Blu-ray middleware technology for optical storage media used to distribute HD and interactive media;
- Use of new communications technologies for broadband communications in the home; and
- Development of the personalised iFanzy electronic programme guide (EPG) for cable and IPTV providers.

Personalising home multimedia viewing

The ITEA 2 Call 1 CAM4HOME project developed a 'create-once, deliver-anywhere' approach for ubiquitous access to any contents on any device through any type of network – be it broadcast TV, mobile networks and broadband Internet TV. It simplifies access to and sharing of all contents of specific personal interest. The main technical advance was the concept of collaborative aggregated multimedia (CAM) individual multimedia bundle that can be delivered as a semantically-coherent set of content over various communication channels.

Combining rich media services and multimedia deployment in the digital home opens up the possibility of developing personalised research and aggregation of contents on an overall range of related media according to the user profile and the user device. It also becomes possible to provide strong links and interaction with social networks.

CAM4HOME has simplified access to and sharing of all contents of specific personal interest with any terminal through any network. This involved enriching broadcast contents and providing links and interaction with such contents. The result has been a move from passive consumption to interactive community-based experience and finally the benefit of rich multimedia experiences.

Broadcast partners will benefit through an enrichment of broadcast contents from broadband connectivity At the same time, CAM4HOME provides users with easy access and interaction to a wide range of media contents.

This ITEA project marks a step forward with users moving from passive to active as producers and actors. The first trials are already running and the initial applications should be deployed in 2011. These include personalised on-line gaming , synchronised content aggregation for on-line business services, live sports events production, personalised VOD and EPGs, and sharing contents between fixed and mobile devices.

Innovating in live TV content creation

Ethernet/IP technology is beginning to move the TV studio from oriented on format and hardware towards a focus on networking and software to ensure it is ready for a future that will require more than video- and audio-signal processing. This involves the development of a unique link to convey multiple video and audio signals, control and programme-associated data, voice over IP (VoIP) and general computer communications.

The ITEA Call 7 PELOPS project made key innovations in content creation for TV production focused on networked studio and content-based analysis for live sports. Its software-based, network-oriented distribution approach enables content enrichment for immediate and later use. PELOPS also developed novel methods to display a large amount of video in combination with computer imaging to reduce cost and complexity of multi-viewpoint presentation. IP infrastructure technologies developed are now driving video and IT network convergence.

PELOPS resulted in an IP-based network/software-centred infrastructure for real-time video production, efficient equipment synchronisation for seamless mixing and switching of pictures, a studio software-management tool to ensure quality of service over the IP network; and a distributed monitoring platform using off-the-shelf personal computer (PC) display components and technology. Several sports applications were also developed, including live VOD.

SETTING THE STANDARDS IN MULTIMEDIA

Three ITEA projects – Call 3 RoboCop, Call 5 Space4U and Call 7 Trust4All – focused on component–based software engineering. One of the major results was the full MPEG–E – ISO/IEC FCD 23004 – standard on multimedia middleware. This standard was initiated and managed by the ITEA projects with the project partners as the main contributors. Another MPEG standard MPEG–V – ISO/IEC FCD 23005 – is defined by the ITEA 2 Call 2 Metaverse1 project, again with the project partners as the main contributors. Together with these standards, references implementations are developed and delivered to the standardisation body.

Project partner Barco used technologies developed in the project to offer a new solutions platform in networked visualisation, with a special focus on the network-management layer. This makes it possible to connect digital systems for archiving, editing and re-purposing of multi-format and high-definition media, increasing ease of live production as well as off-line editing.

Creating smart services on the web

Service innovation is a key are for the European economy. This has been addressed through a series of ITEA projects which provided open-source platforms for service orchestration and innovation. These software platforms were designed to incorporate new functionality and devices on the fly without impact in the availability for the users.

The ITEA Call 5 OSMOSE project contributed importantly to the success of the technology addressing these challenges through the launching of one of the worldwide leading open-source implementations. These modular and dynamic composition principles are currently adopted by all Java-based application servers, many developments in embedded devices and leading open source ecosystems. And the ITEA Call 7 OSIRIS project created an-open-source infrastructure for run-time integration of services. It provided the opportunity of extending the concept to a group of nodes validating project results in the public administration domain through a demonstrator led by the Tax Authorities of Norway.

" An Enterprise Service Bus, one of many references evolving from the OSMOSE and OSIRIS project results, has contributed to lowering Telvent´s costs for solutions in the health domain."

JESÚS BERMEJO
Telvent

Network operators are keen to serve the so-called 'long tail' of smaller service markets that they can manage and charge according to flexible models, while keeping operational expenditure targets within limits. At the same time, more and more businesses want to use Internet and Internet technologies to market their products and services, particularly to mobile users.

Various attempts have been made to offer simplified programming environments but technical knowledge is still required. The ITEA Call 7 LOMS project set out to combine service creativity with the rich, powerful features of a well-controlled service environment through new intermediaries in the value chain. These consist of enabling services on service platforms and service operators offering layers of service templates for specific application domains that can be used with no technical knowledge. As a result, local businesses can easily launch smarter services through more channels.

LOMS involved two key elements:

1. Local services tailored to the needs of a specific niche market, local culture or communities, or a geographical area with services typically location-based and often use of mobile devices; and
2. An ecosystem of such services combining the benefits of mass creativity and mass involvement, with the enabling functions of existing communications and media network deployments.

The service templates approach is built on general service-oriented architecture principles. These templates enable service operators to predefine the orchestration flow between underlying building blocks according to a software variability principle. As a result, service providers do not have to become involved in the basic design but can concentrate on their business, while the service and platform operators define how exactly the service is operated.

Demonstrations were carried out in:

- Local news publishing – a business-to-consumer application involving map-related news items with readers logging on to a map of their area and accessing news feeds of direct local interest; and
- Machinery field service – a business-to-business application that allowed automation of the field force network, combining electronic customer relationship management with specialised workflow control.

The concepts involved opened a broad set of opportunities in concrete solutions and concrete commercial exploitations of parts of the framework, the enabling services or elaborated service template examples. Some of the elements are already being exploited commercially. In Belgium, the LOMS approach makes it possible to offer niche digital TV services over an IPTV network, while in Germany, a newspaper in Stuttgart is offering a map-based local news service in co-operation with an Internet mapping provider.


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Improving security and safety

ITEA projects have tackled improving security and safety in many ways – from improving decision making, through developing intelligent software systems able to identify and tackle threats in real time, to avoiding a shear overload of information – whether in business, social or domestic applications.

Collaborative decision making

More and more enterprises and administrations have to collaborate to make appropriate business decisions or avert crises. The collapse of the 'new economy' has led to a renewed interest in software that can help companies to recover their business revenue streams and rapidly seek new opportunities.

Making a viable situation assessment or taking a common decision in a business or crisis-management context requires fast and secure access to a wide range of relevant information. It also needs a method of balancing the different elements available to support the decision-making process itself.

The ITEA Call 5 LASCOT project developed a distributed collaborative decision support middleware to provide companies and organisations, wherever they are located, with:

- Retrieval and sharing of information – for example from a private database management system or from the Internet;
- Security for information access and information exchange;
- Improvement of information appropriation; and
- Support for the decision-making process.

LASCOT contributed to a standards-based solution by defining and demonstrating a set of concepts and technologies for collaborative decision support in networks of large organisations. Demonstrators include a mock-up of an air traffic application and prototype dealing with oil spill pollution in the Mediterranean.

The decision-support technologies developed in LASCOT had wide application in large enterprises, public institutions and ministerial organisations involved in the management of risk, change and crisis. There was also potential in the healthcare domain, for the collection and sharing of patient data in special cases of sickness or emergency where speed is essential. Project partners such as Bull and Thales quickly used the technologies developed to enhance product offers as did several of the smaller companies involved And the technologies also attracted much interest from public authorities, particularly in France.

Intelligent surveillance

Concerns about terrorism have led to a growing desire for video surveillance to improve security for citizens and property and to allow back-tracking of events for criminal prosecution. Yet, with the trend to centralised surveillance operations, the shear mass of information can be totally overwhelming – especially with the growth in Internet-based security networks.

A series of ITEA projects have developed ever more powerful software-driven video processing chains to increase the intelligence of the cameras involved as well as combining data from a variety of sources to enable the system itself to recognise security risks and take action.

The first phase of video-content analysis (VCA) in the ITEA Call 5 CANDELA project located single objects based on specific features – such as identifying cars in a bus lane. The ITEA Call 8 CANTATA project concentrated on classifying the actions of a number of objects and/or scenes. An example is bank-robbery detection, where a number of persons and their interactions create a dangerous situation; these interactions determine the system's response.

CANTATA examined the economic feasibility of enabling systems to be aware of the content and to use this knowledge to establish an action or control the environment autonomously. Developments included algorithms to analyse content in different domains and a platform able run functions for all areas; attention was also given to user visualisation and interaction with the system.

Key results included: an intelligent surveillance camera with advanced VCA and robust software algorithms able to recognise the posture of human beings. Dutch SME VDG Security was able to launch an intelligent surveillance camera based on the technology. The project results have also been incorporated into VDG multi-camera and VCA channel video-surveillance systems used extensively for public transport and event surveillance. Applications include a system covering the entire metro network in Charleroi, Belgium and a 300-camera installation with 140 channels of VCA for the Dubai Formula One racetrack.

The ITEA 2 Call 3 ViCoMo project is now working on detecting behaviour of objects, persons and events in a 3D view taking the context into account by means of multi-camera video processing. It is combining 3D global localisation using multiple cameras with 3D presentation and navigation to provide security controllers with an orderly overview. This will improve the controllers' effectiveness and the quality of their decision making.

Enabling technologies developed in ViCoMo will open new opportunities within the surveillance market. These include: observation for surveillance and team training; 3D modelling of the real-world environment; observation of human behaviour for system control;

logistics control for traffic and transportation; and analysis of criminal events by public bodies such as the police and forensic institutes.

Avoiding information overload

Security of public infrastructures and for large cultural or sporting events traditionally relies on monolithic video-surveillance systems. However, security operators are quickly overloaded with information coming from multiple sources, displayed on multiple monitoring screens. In fact, it is totally impossible for operators to identify risk-prone situations in real time and to react accordingly before such situations degenerate. Video evidence is passive, used mainly for evidence in subsequent criminal prosecutions.

The ITEA Call 7 SERKET project developed an innovative open software platform to handle and react in real time to diverse data coming from wide range of heterogeneous sensors, including video-surveillance cameras, microphones, human beings, badge readers and intrusion-detection barriers. The data is automatically processed, combined and analysed to provide security personnel with timely information to prevent risk-prone actions developing. This involved extensive work on intelligent signal processing, advanced information fusion and situational awareness rendering. Project co-ordinator Thales will use the results of this project to provide new functionality in its next generation of security-supervision solutions.

"Thanks to the SERKET partnership and its innovation achieved in information processing and correlation to decrease false alarms, the European industry is ready to deploy new capabilities."

OLIVIER SAGNES
Thales

“ ITEA has helped the EPAS project to deliver the very first ISO 20022 card-payment standard which will become the universal reference for the exchange of card-payment data between retailer and bank.”

WILLIAM VANOBBERGHEN
Groupement des Cartes Bancaires “CB”

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Supporting the Single European Payment Area

The European card-payment industry entered a period of dramatic changes following deregulation, leading ultimately to the creation of the single European payments area (SEPA). SEPA should make all electronic payments across the euro area by credit card, debit card, bank transfer or direct debit as easy as domestic payments are now. However this requires a full harmonisation of payment-card use – a necessary step to ensure the complete interoperability of national card-payment schemes.

The coexistence of national card-payment systems in Europe is characterised by a lack of interoperability caused by technical, commercial and legal barriers. Moreover, there is no harmonised regulatory framework favouring innovation and competition. The ITEA Call 8 EPAS project set out to overcome the obstacles to interoperability, delivering three major card-based protocols built on open and interoperable standards. And this valuable experience has been extended worldwide through an ISO 20022 universal standardisation process.

Harmonised development of electronic card payments in Europe should offer substantial savings in cash-management operations for retailers. And citizens will benefit from fast and secure transfers between bank accounts anywhere in the euro area, and use of their bank debit cards to make payments abroad in euro, just like at home.

EPAS has paved the way to standardised universal specifications free of royalty and/or charges. This is now enabling the key stakeholders in the European card-payment industry to benefit from a single, common solution available on various platforms provided by global key-terminal manufacturers and solutions providers.

Major players in the payment industry have now created EPAS Org, based in Brussels, to promote, develop and maintain common card-payment protocols and ensure the continuity of deployment after the end of the EPAS project.

A dedicated legal structure will ensure the further evolution and maintenance of the specifications and standards. The standardisation process is continuing in ISO 20022, where specifications were delivered and validated during 2009. Availability of an EPAS ISO 200222 standard will enable wider acceptance worldwide and proper convergence with payment standards already developed for credit transfers and direct debits. This will allow banks and users to reduce the gap progressively between card and non-card payment processes.

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Driving the web of objects

Ever higher levels of integration in electronic components now make it possible to embed intelligence even in low-cost devices such as sensors and actuators. The so-called 'web of objects' involves networking such devices using web communication protocols such as the Internet protocol to provide intelligent control and support to our everyday lives. The concept was adopted globally by OASIS as the Devices Profile for Web Services (DPWS) standard in mid 2009, driven by Europe as a result of the ITEA Call 8 SODA project.

Service–oriented ecosystem

SODA created a service-oriented ecosystem for high-level communications between computer systems and smart embedded software components in even low-cost devices costing less than €5 using the web of objects. All types of device can now communicate using the same language and can interact. Direct communication is possible from high level applications – such as an enterprise application server – to any low-cost component, like a temperature sensor, with full plug-and-play connectability and interoperability between sensors/ actuators and the IT system.

While much of this was possible before, the new technology makes it very simple and easy to do. All devices, from the temperature sensor in the home to the PC or IT system will speak exactly the same language – the Web Services language. The original proof of concept of embedding web services in low-cost devices was developed in the earlier ITEA Call 5 SIRENA project.

SODA developed the overall ecosystem to manage applications based on service-oriented architecture (SOA). SOA provides a way of integrating different software modules offering services by enabling them to work together even if they are substantially different in concept. For example, in a home, it is possible to have air-conditioning or home-automation systems controlling temperatures, lights, etc. that can be easily interconnected using this technology and be connected to an operator over the Internet. It is also possible for users to control their home heating and cooling systems remotely over the Internet.

" Schneider Electric is using the results of the SIRENA and SODA projects as the basic integration technology for its company programme EcoStruxure – Active energy-management architecture from Plant to Plug."

FRANÇOIS JAMMES
Schneider-Electric

This technological innovation is already finding a wide range of applications in industrial automation, automotive electronics, home and building automation, telecommunications and medical instrumentation. For example, Schneider Electric exploits such interoperability to help integrate and interconnect systems from different businesses acquired over the past ten years. And EADS Secure Networks is using it in its professional mobile radio solutions for emergency services communications systems.

Success in SODA has enabled Europe to become a driving force in the web-services domain. The DPWS standard allows any type of device to be plugged into a PC, offers dynamic discovery and is fully aligned with web services technology. This allows for the seamless integration of device-provided services in enterprise-wide applications, that lies at the heart of the "web of objects" concept.

Building application–oriented wireless sensor networks

The ITEA Call 8 ESNA project enabled the development of business-oriented wireless sensor network applications based on standard open-source architecture, technology and application-development guidelines, and proof-of-concept implementations. The ESNA architecture supports off-the-shelf sensor network nodes based on documented interoperability specifications. Guidelines cover network dimensioning and the type of nodes to use for different application domains.

Wireless sensor networks involve the interconnection of low cost matchbox-sized devices using radio communications. Battery power offers high flexibility as no power cabling is needed. And devices are multifunctional – nodes can be equipped with many different sensor capabilities, such as temperature, humidity, movement, radiation, gases and light, opening up a broad spectrum of applications. Dynamic network establishment adds robustness.

ESNA avoided being over-innovative. It worked on a generic platform – corresponding to the operating system in a computer – based on the emerging IPV6 Internet standard, developing the world's smallest implementation of IPV6 in terms of lines of code. And it made a particular effort to reduce energy use. The result was new software-controlled technology for very low power use to enable the devices to operate as long as possible on one set of batteries.

Overall, ESNA developed a strong European lead in wireless sensor networks as this field is still emerging globally. The highly efficient basic software operating system is already being used by commercial actors for small devices. And, on the applications side, a sensor node has been launched in Spain for precision agriculture while a Spanish spin-off is targeting energy monitoring and management in the construction industry. In addition, several industrial components have been developed based on work in the project.

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Meeting crucial challenges through software engineering

The rapid increase in software in embedded devices is a major challenge for European industry. Moore's law has seen a doubling of processing power every 18 months, doubling the shear amount of software required, simultaneously with a huge pressure on development costs, development time and quality levels. Software-engineering progress is crucial to manage this ever-increasing system complexity. Therefore, software engineering has been a key element of ITEA – from product families to agile methodologies.

An ITEA Board task force carried out a profound analysis of the software-engineering field early on in the programme. The results have been used to benchmark relevant ITEA project deliveries in terms of measurable and quantified objectives and business impact.

European research on software engineering is world class, although many major tool vendors are US based. However this sector creates high added-value employment in Europe. Key is the strategic exploitation of advanced research in software engineering by large European industrial companies themselves. Software is so predominant in all the different industries – including telecommunications, automotive and aeronautics – that software-engineering capabilities are essential in maintaining leadership in these markets.

While software engineering depends largely on the way work is organised and how employee competences are developed, it is important for Europe to ensure independence from only a few tool vendors as well as interoperability and long-term support for the tools – creating an opportunity for an ambitious open-source strategy in ITEA projects. Moreover, as European leaders are systems oriented, software systems and services engineering are becoming the new frontier – involving software/hardware co-design, complexity and interoperability.

Invention of product–line–engineering methodology

A key achievement within ITEA has been the invention of the product-line engineering methodology. While software-engineering technology long focused on creating one system at a time, product-line engineering involves processes, methods, platforms, components and tools making it possible to meet the demand for fully-fledged families of systems, which is the new demand of our European industrial leaders. Important projects for this have been ESAPS, CAFÉ and Families.

Structuring of systems into families spreads development costs and counters the impact of ever-growing complexity, making it possible to sustain a rapid rate of product innovation, while guaranteeing overall system performance and quality. This is one of the best ways to exploit business opportunities in rapidly-changing markets. The result is a substantial reduction in development costs, product lead times and maintenance.

The fundamental concept in the ITEA Call 1 ESAPS project was a domain-specific product architecture based on a layered set of platforms, supported by software engineering with a focus on pervasive reuse. ESAPS combined the most promising technologies of its partner companies in analysing, defining and evolving systems families.

ESAPS results were immediately applied by project partners such as Nokia in its supply chains for mobile phones, Thales for air-traffic control systems, Alcatel-Lucent for network management, Philips and Siemens for medical systems and Telvent in utility network management. Effective dissemination to industries across Europe has also been a key focus.

The ITEA Call 3 CAFÉ project extended the results of ESAPS by producing new methods and processes to support the whole life cycle of systems-family development. It introduced the business, architecture, process and organisation (BAPO) model to show that software development is influenced by concerns arising from a range of sources.

CAFÉ brought the first concepts for product-family engineering to maturity so that they could be used to develop methods and procedures in real-world, concrete projects, including communications, air-traffic control, healthcare, utilities control, supervision and management, financial services and the automotive industry. At the project's conclusion, Philips and Nokia demonstrated how the concepts of CAFÉ were applied to their current product lines.

The ITEA Call 5 FAMILIES project consolidated work in ESAPS and CAFÉ in practical businesses, architectures, processes and organisations connected to family development. FAMILIES resulted in a defined methodology, supported by models and prototype tools, all aimed at improving software architecture. In addition, it led to an improved insight into the separated processes and inter-process collaboration in software family engineering.

Documented case studies emphasised the benefits of the systems-family approach to embedded-software development. The resulting Family Evaluation Framework can be used to assess the performance of a department in software-product family engineering.

Specific gains reported include:

- Product cost reductions of 60 to 70%;
- Productivity improvements by a factor of two to six times higher output;
- Investment reduction by an average of 50%, and up to 90%;
- Product lead times reduced by an average of 50%, and by up to 95%;
- Portfolio complexity reduction;
- Training time reduction;
- Better product planning and use of roadmaps;
- Product defect density 50% or less; and
- Reuse of test cases from 40 to 60%

The pioneering work on software product lines has been widely recognised. Philips Healthcare considered implementation of product-family engineering as the only way forward. The company typically designed one machine every three years; now market pressure leads to 6 variants of 12 machines a year. It is crucial to adapt the engineering methodologies and tools continuously to cope with this burden and high complexity.

Ensuring efficiency in software/systems development

Cost efficiency drives embedded software development. The ITEA Call 6 AGILE project involved 19 companies in 8 countries and showed that application of agile-development methods and processes can offer an up to 70% reduction in lead times and costs, increase quality and improve customer satisfaction for embedded software in a wide range of industries from aeronautics and mobile communications to consumer electronics.

Agile development offers a significantly different approach to software engineering that welcomes changes even late in a project to meet the latest market demands. This makes it possible to add new features at any time, even a few days before product launch. Moreover the approach focuses on business rather than technical issues when developing software.

As most consumers use only some 5% of the software-based features offered by a system, the development process focuses on critical features and puts the effort into getting them to market first. The methodology covers the whole development cycle but concentrates on the processes, techniques and tools used to get the systems out.

" VTT gained a lot of positive elements from participation in the well-built AGILE and FLEXI consortia which have developed over six years and can continue to work together on new projects in this area successfully. Such community building is a major benefit of ITEA."

PEKKA ABRAHAMSSON
Formerly of VTT Technical Research Centre of Finland, now University of Helsinki

Moreover, AGILE demonstrated that agile methodology can adapt to meet the demands of highly regulated industries such as aeronautics-systems developments that are subject to a wide range of tough standards.

Some 70 pilot case studies involving 1,800 software engineers in short and long projects clearly demonstrated a massive improvement in efficiency, reducing development costs and increasing flexibility. By the end of the project, Nokia Siemens Networks had already moved 25% of its software developers to agile methodology and showed important productivity gains with a three-times reduction in lead times, eight-times faster design and with up to four-times cost savings, as well as improved quality and customer satisfaction. Moreover, it claims integration time has been reduced from three weeks to 96 minutes.

The impressive results motivated many of the partners – including also Barco, BT, Engisud, F-Secure and Philips – to include agile aspects in their standard development processes. The project also provided an opportunity for participating SMEs – such Exoftware in Ireland – to build a consulting services offer to the industry players. AGILE project members are seeking to establish an Embedded Agile Institute in Europe to foster adoption of agile processes in software-intensive companies. In addition, the European Agile community is leading the way in global standardisation of the agile process through IEEE 1648.

Work on agile processes continued in the ITEA 2 Call 1 FLEXI project which developed the methodology for much wider use. FLEXI set out to scale-up agile approaches and develop solutions applicable directly in industrial use for large and very large software developments involving multicultural, multitechnology and globally distributed partners. This project applied agile methodology in a global value chain involving multiple technologies and partners not all within a single organisation.

FLEXI combined three components:

1. Market-shaping innovation – getting everyone in an organisation involved;
2. Flexible global portfolio management to provide long term but flexible planning; and
3. Specific R&D issues – how to scale-up project management, integration and sharing of engineering information requirements.

A major outcome of the project was an 'agile positioning system' – a strategic and practical tool enabling a company to assess and analyse how agile it is and what it can do about. The result is 'hyper-performing' organisation which offers a high level of agility in decision-making processes and also in its ability to respond to market needs. This should encourage the whole industry to change gradually to an agile form of working.

The ITEA Call 8 TWINS project developed techniques to improve the co-design of products in which hardware and software are tightly integrated. Co-design practice areas help pinpointing bottlenecks, waste and quality problems, and together with the TWINS knowledge website assist in the choice and tailoring of industry-verified software/hardware co-design solutions to specific domains and situations.

TWINS focused on four domains: mechatronics; balanced hardware/software- firmware; information driven; and electronic hardware modelling. A sample co-design flow was proposed and tested for each domain. This offered an integrated flow of solutions for the complete co-design process.

The new approaches are already being used by project partners such as Barco which developed its internal methodologies based


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on TWINS results. Applications are numerous in industries as diverse as automotive, avionics, copiers and printers, electrical-distribution systems and communications networks.

TWINS results will enrich individual product offerings from tool and service vendors, help develop new advisory services for software-intensive product manufacturers and improve overall software-intensive product development in Europe.

Enabling more effective and efficient testing

While the key to future European success lies in cost-effective and efficient development of complex software systems, 40 to 60% of overall costs lie in testing. More effective testing provides a better and faster indication of product quality. And, as product quality is directly related to economic success in many industrial domains, increasing test efficiency is a major goal in today's systems development.

The ITEA Call 5 TT-Medal project achieved a major breakthrough by developing a generic standardised solution for software-systems testing based on testing and test-control notation (TTCN-3). TTCN-3 offers great potential for European industry to reduce test development and execution time while at the same time meeting demands for high quality.

Key to TT-Medal was the development of methodologies, tools and industrial experience to enable European industry to test more effectively and more efficiently, and specifically to drive the deployment of TTCN-3 testing technology in Europe. TTCN-3 combines the advantages of increased productivity with expressive power. It also brings together a sufficient level of formalism with a component model to enable the reuse of testware between different phases of a product's life cycle.

TT-Medal significantly extended both the usability and awareness of TTCN-3. It developed the technology for industrial use particularly in the telecommunications and automotive sectors, demonstrated its applicability and advantages, and disseminated this information to large parts of European industry. Its case studies played a vital role in disseminating TTCN-3 far beyond the conventional TTCN-3 community.

Through the active participation and leadership of the TT-Medal partners, a number of major industrial standardisation activities have moved to TTCN-3 technology. It has been chosen as the language of choice in the telecommunications-standardisation area with 3rd Generation Partnership Project (3GPP), the Open Mobile Alliance (OMA) and Wimax moving to this technology.

In addition, the recent movement in AUTOSAR and Media Oriented System Transport (MOST) testing – MOST is a networking standard intended for optically interconnecting multimedia components in cars – shows an increasing awareness of TTCN-3 within the automotive domain.

Taking a model–based approach

The ITEA 2 Call 1 D-MINT project set out to develop more efficient and effective testing of complex software systems using a model-based approach. It turned this academic discipline into an industrial reality. Demonstrators showed how this method can close the productivity gap in the cost-effective development of quality software. The resulting techniques are already being exploited in product development by several major European industries.

In the classical approach, product and testing software are written in parallel – involving the same level of complexity on both sides. And the degree of reuse is virtually zero as the two sets of software are completely separate. By working at higher levels of abstraction and with models rather than actual code, it is possible to reuse some of those models as the specification in more general terms. Moreover, the modelling paradigm makes developers think more about what is being specified at the beginning.

The new methodologies in D-MINT offer many advantages at an industrial scale and with industrial quality. A key innovation was the ability to extract the information from various different levels and various different abstractions of models and put that together into a single model-based testing framework.

Model-based testing was demonstrated successfully across a very wide range of domains in eight separate industrial sectors. Applications ranged from street-lighting control to video-conference units, from telecommunications to automotive control systems and from industrial engineering to machine tools. Moreover, these techniques were used in real product development and genuine advantages were obtained in all the applications.

Analysis of time and investments costs across all the consortium members showed that not only could test costs be reduced by 15%, but that test coverage could be improved by 10%. This results in an overall improvement of some 20 to 25% in test costs. Moreover, these figures can be backed up in real industrial cases with actual figures.

One result is that three tool vendors – iXtronics Toolbox, Testing Tech TTmodeler and Conformiq Qtronic – have already marketed products. Even more convincingly, several of the industrial partners are using D-MINT techniques in their product development. ABB is using D-MINT results for the next version of its Softstarter control products as this approach proved significantly better than its current technology. And Daimler is planning to use D-MINT technology for testing electronic control unit software in the future.

CONTINUING EFFORT ESSENTIAL

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-ata) : = *i. bone*

Innovate (i

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make new, f. *m*

10

ICT provides the essential infrastructure and tools for knowledge creation, sharing and diffusion in Europe and worldwide. It boosts the innovation capacity of all sectors and contributes to overall productivity growth. However, to carry on competing successfully on a global scale, Europe has to continuously reinforce its solid knowledge base in ICT, shape ICT developments and make the best use of ICT innovations at the earliest stage. Continuing investment in Europe is also essential as ICT is the basis for competitiveness in a wide range of industries where Europe is in a leadership position globally.

It is commonly acknowledged that the USA, Japan, Taiwan and Korea are investing significantly more in ICT R&D than the EU in terms of ICT R&D to gross domestic product (GDP) ratios. For example, according to a recent European Commission Joint Research Centre report [1], Europe's ICT sector accounts for 4.8% of GDP, and leads the way in private R&D in the EU, with 25% of total investment and 32% of researchers working in the private sector in 2007. However, the EU is still lagging behind global competitors in terms of both private and public ICT R&D investment.

Corporate R&D investment in the ICT sector in the EU is much lower than in its main competitors in the USA, Canada, Japan and South Korea. R&D business investment in the USA is 2.5 times greater than in the EU. Moreover, 50% of R&D patents submitted by US-based inventors are in ICT technologies compared with 20% by European researchers. Individual EU ICT companies do not necessarily invest less in R&D than their international competitors; the disparity is largely due to the smaller size and slower growth rate of European ICT companies.

In terms of public support, EU governments fund a smaller share of ICT R&D in relation to total public funding for R&D compared with the USA. In 2007, 6% of total public funding for R&D in the EU (€5.3 billion) went to the ICT sector, while it was close to 9% in the US (€10.4 billion).

According to the Digital Agenda of the European Commission, Europe needs to double its public spending on ICT R&D at EU and member state level by 2020 and also create the best conditions for the private sector to do the same.

Identifying the key challenges

Service innovation is one of the great challenges in the global economy, which must be taken up actively up by the European ICT research community, together with the sheer speed of innovation. Other key challenges include: the ever-greater dependence of society on ICT systems – and thus the ever-increasing pressure on quality and security; the expansion in social networking that is revamping the demand on networks; and the need to provide more and more help with everyday living in an ageing society.

Regardless of the global economic crisis there are some significant societal and economic trends[1] that require the involvement of the ICT sector with a range of communities:

- An ageing society
  People live longer and better, demanding more efficiency, flexibility and connectivity from the healthcare system. Advances in the standard of living and innovations in healthcare enable more people to participate more fully in society. Furthermore, there is a need for better physical and mental wellbeing to allow people to work longer – in addition to better health care systems and assisted living for elderly people. It is also necessary to overcome the digital divide to allow the elderly to take advantage of the continuous stream of innovation offered by ICT.

- Sustainability
  The planet is faced with diminishing natural resources and biodiversity, and severe climate changes. Long-term sustainability requires control of the use and exploitation of natural resources, reduced pollution and carbon emissions, and efficient soil and water management. ICT can help in two ways:
  1. By supporting more energy-efficient performance of other sectors across the economy. For example: ICT can help increase the energy efficiency of various products and services through better control, monitoring and planning – smart grids, smart buildings, manufacturing and transport; and enhanced communications services can alleviate energy and carbon-hungry physical displacements.
  2. By reducing its own high energy consumption through the development of ICT systems, services and products with optimal energy consumption.

[1] *The following trends and challenges have been summarized on the basis of multiple sources ([2] to [5]) listed in the References for chapter 10 on page 58.*

- Mobility
  Strongly increasing traffic volumes demand a sustainable approach to mobility. Important aspects are safety and environmental friendliness. Information exchange, logistic processes and social activity patterns will intensify and need to be monitored and controlled more efficiently.

- Security and safety
  There is a greater demand for public security and safety in society, in terms of:
  - Protection to threats from outside, such as criminal threats, terrorism, privacy/ identity issues and protecting information; and
  - The safety and wellbeing of people in society – accident prevention and safety monitoring systems.

- Knowledge–based society
  In recent years the sheer amount of information and knowledge available has changed society. Information becomes more valuable and meaningful because of its context. Timely, easy and reliable access to knowledge can facilitate people in their lives as well as speeding the evolution of existing knowledge and creation of new knowledge.

- Virtualisation of communities/societies
  Individuals are increasingly part of networks and entities. Web-based social and business networks serve as virtual communities where individuals adopt a virtual identity. There is a strong demand from the new generation to remain connected to their communities in any circumstance. This will lead to a revision of all applications to integrate this collaborative way of living with concerns about privacy and identity theft.

- Urbanisation
  The growth of urban areas globally will remain an important factor in society's development – already four out of five Europeans live in towns and cities. Important issues are quality of live, efficient use of materials and resources and environmental and health impact. The 'digital divide' is an important risk between urban and rural areas but also between the different social categories in the cities themselves.

- Globalisation
  People and businesses are more interconnected than ever. Countless communications channels and travel possibilities make society, industry and commerce increasingly internationalised. There is no local market for technologies anymore. The supply chain is becoming the supply web with players not only becoming more flexible themselves, but also forming more flexible relationships with each other.

- Service economy
  There is a strong trend from a product-based to a service-based society. This does not mean products will disappear but that the offer is becoming more complex, mixing products, content and services. Industry needs to provide the market with end-to-end solutions including both products and services. The emergence of web-based services also plays a role in this service evolution, as they become tradable goods.

Seizing new opportunities

It is essential that Europe seizes the opportunities in web-based services: this is a 'crown jewel' that must not be lost. While competition is tough in the battle for consumer services, there are tremendous new opportunities available for Europe in business services. Web-based services markets are still open for established and new players. And ITEA has already demonstrated its success in achieving extremely fast exploitation of technology and on business models stimulating professional usage of the services.

At the same time, ITEA can help Europe make the best use of new technological trends. For example, cloud computing, software as a service, and their expansion to federated/ aggregated on-demand service provision is a trend that might transform not only the software industry but also the service industry in general. As a consequence of the crisis and the need of businesses to save money, it will come now even faster.

However, the expansion of the cloud-computing business will depend to a large extent on technology progress mainly in the areas of security and privacy. ITEA therefore will pay increased attention to these aspects.

Above all, ICT R&D must respond to new trends and emerging challenges in society, business and technology. ITEA has produced consistent and effective results, yet the speed of change in the business environment keeps increasing. Software is crucial in nearly all aspects of the European economy and society. It will play an ever-increasing role globally as the world moves from a product- to a service-oriented economy.

Rapid exploitation of results

The ITEA programme is always ready to address new challenges and to strengthen its economic impact – particularly by encouraging rapid exploitation of research results. Moreover, the ITEA organisation itself has proved to be very flexible and adaptable to market needs and evolution. It has the opportunity to reinvent itself towards future challenges due to its industrial roots which ensure the continuous market connection.

ITEA 2 is already committed over the next decade to:

- Paving the way towards societal computing by addressing key societal issues such as health, wellbeing, energy, transport, knowledge and education;

- Responding to the generalisation of connectivity by addressing the challenge of massive scalability – such as cloud computing, the web of objects and mobile phone deployment in the developing world;
- Supporting European industry in providing the market with end-to-end solutions including both products and services;
- Contributing ICT-based innovations to ensure the competitiveness of jobs and businesses; and
- Addressing greater sustainability and efficient use of scarce resources such as energy, water and radio frequencies.

Strong case for ITEA 3

To keep Europe ahead in the global market, the establishment of ecosystems involving large companies, SMEs and academia is essential. Funded co-operative R&D projects, by their neutrality, offer the environment to create confidence and build such alliances. Public investment in research is an important instrument to support this.

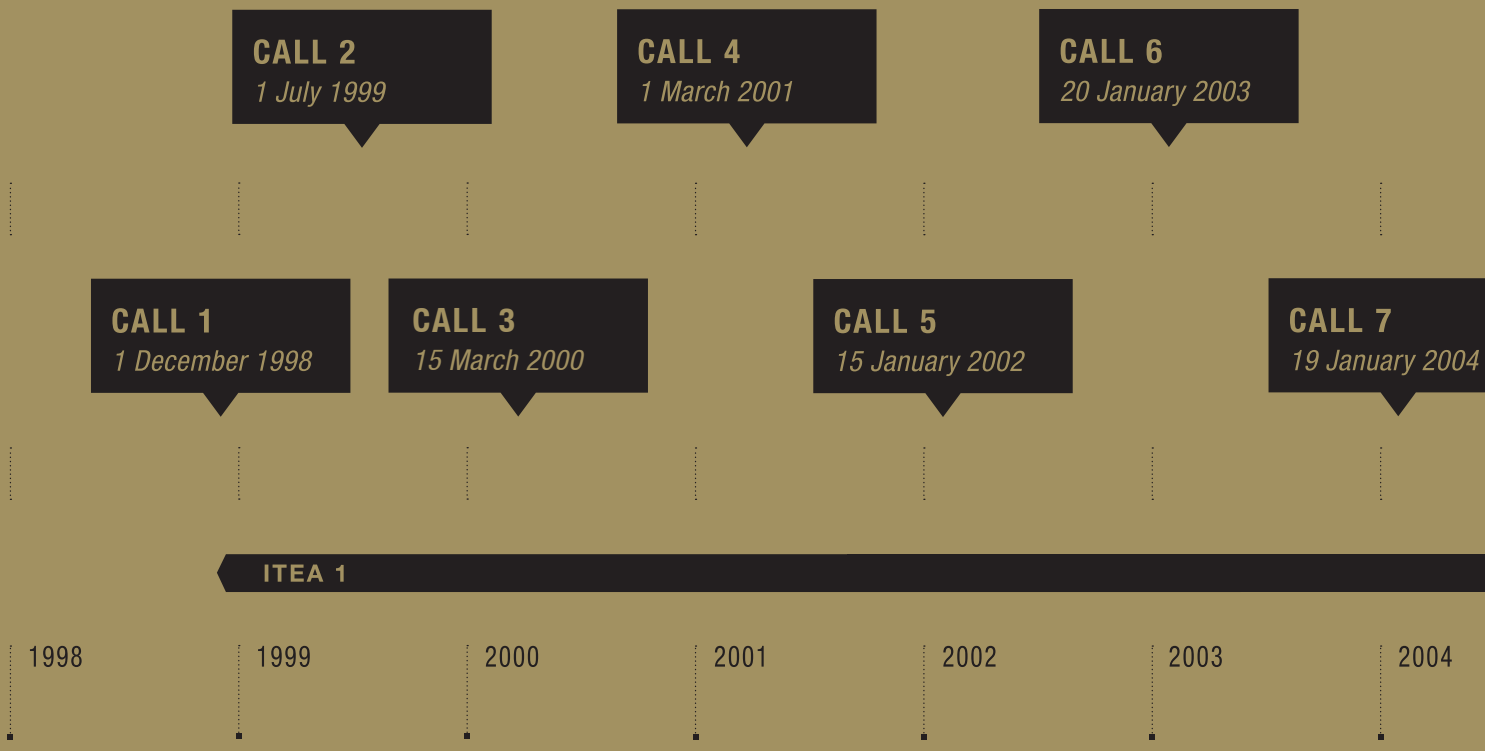
EUREKA Clusters play an indispensable role in European ICT research as they are very flexible. Moreover, EUREKA's intergovernmental bottom-up approach allows a good project idea to attract funding from participating countries, even if it is not a priority for other countries. It is the only instrument in the software sector to enable this.

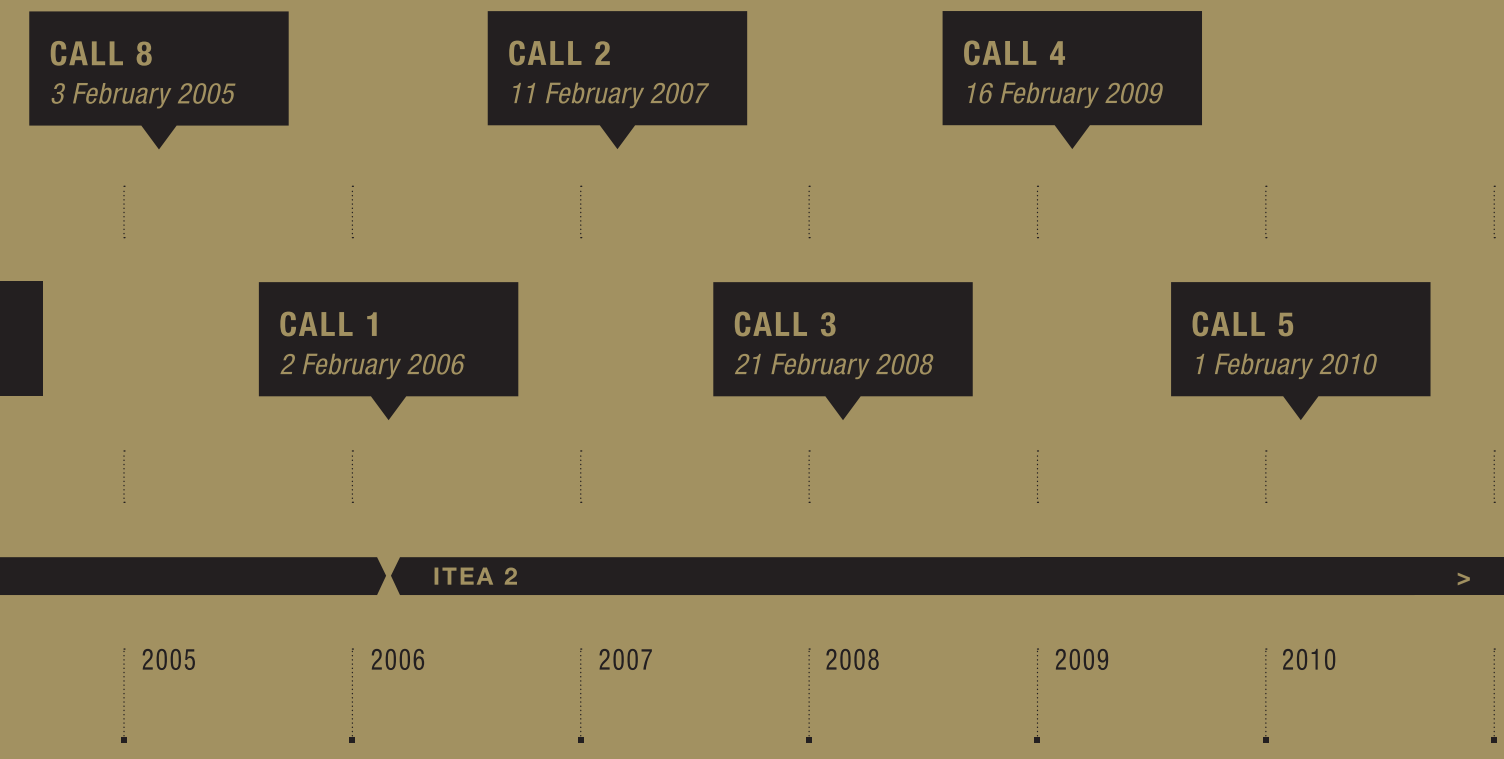
As industry representatives, the ITEA Board members therefore regard the ITEA instrument as indispensable. Their conclusion is that European industry needs ITEA 3. This would enable ITEA to continue to work closely with public authorities and the ITEA community to help enlarge the necessary innovation instruments.

It would also strengthen the economic impact of the European ICT industry by more support to deploy ITEA results in the market. This could include full scale trials, experimentation, end-user involvement, supporting the creation of ecosystems on open innovation, addressing the positioning of the actors in multiple dynamic value chains and business-driven expansion of geographic scope.

Moreover, ITEA 3 would reinforce standardisation efforts by adding a strong European dimension to the results and the projects achieved and, through such innovation and co-operative programmes, boost education and training for young engineers to reinforce employment capabilities in European high-tech industries.

ANNEX 1: ITEA and ITEA 2 Call timeline




CALL 8
3 February 2005
CALL 2
11 February 2007
CALL 4
16 February 2009
CALL 1
2 February 2006
CALL 3
21 February 2008
CALL 5
1 February 2010
ITEA 2
>
2005
2006
2007
2008
2009
2010

ANNEX 2: Award-winning projects list

The annual ITEA Achievement Awards honour high-level technical contributions based on real European collaboration that provide significant results while promoting the programme and its goals. These prestigious awards highlight highly successful projects that represent best practice. Major factors include innovation, exploitation and dissemination.

The 2001 ITEA Achievement Award
Members of the core team which developed the *ITEA Technology Roadmap on Software–Intensive Systems.*

The 2002 ITEA Achievement Award
PEPiTA (Platform for Enhanced Provisioning of Terminal Independent Applications)

The 2003 ITEA Achievement Award
AMBIENCE (Context Aware Environment for Ambient Services).

The 2004 ITEA Achievement Award
EAST-EEA project (Electronics Architecture and Software Technology - Embedded Electronic Architecture)

The 2005 ITEA Achievement Award
TT-Medal (Test & testing methodologies for advanced languages)

The 2006 ITEA Achievement Award
SIRENA (Service Infrastructure for Real-time Embedded Networked Applications)

The 2007 ITEA Achievement Award
Gold AMEC (Ambient Ecologies)
Silver AGILE (Agile software development of embedded systems)
Bronze HD4U (High definition TV for Europe)

The 2008 ITEA Achievement Award
Gold LOMS (Local mobile services)
Silver MARTES (Model-driven approach to real-time embedded system development)
Bronze Trust4All (Trustworthiness in embedded software)

The 2009 ITEA Achievement Award
Gold SmartTouch (Browsing through smart objects around you)
Silver EPAS (Electronic Protocols Application Software)
Bronze SODA (Service-Oriented Device & Delivery Architectures)

The 2010 ITEA Achievement Award candidates
CAM4HOME (Collaborative Aggregated Multimedia for Digital Home)
ESNA (European Sensor Network Architecture)
ParMA: (Parallel Programming for Multi-core Architectures)

REFERENCES FOR CHAPTER 10

[1] The 2010 report on R&D in ICT in the European Union; May 2010
(http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=3239)

[2] Revising Europe's ICT Strategy; Report from the Information Society Technologies Advisory Group (ISTAG), Final version – February 2009
(ftp://ftp.cordis.europa.eu/pub/ist/docs/istag–revising–europes–ict–strategy–final–version_en.pdf)

[3] Orientations for Work programme 2011-2013; Report from the Information Society Technologies Advisory Group (ISTAG), Final version - November 2009
(ftp://ftp.cordis.europa.eu/pub/ist/docs/istag/wp–rep–nov09_en.pdf)

[4] National Roadmap Embedded Systems; ZVEI, Zentralverband Elektrotechnik- und Elektronikindustrie e.V., December 2009
(http://www.zvei.org/de/publikationen_veranstaltungen/publikationen_downloads/publikationen_zu_themen/forschung/?no_cache=1&tx_ZVEIpubFachverbaende_pi1%5Bdownload%5D=1057&type=98)

[5] ICT2030.nl, ICT-agenda voor de toekomst van Nederland; ICTRegie, May 2009
(http://ict2030.nl/ICT2030nl.html)

GLOSSARY

3GPP	3rd Generation Partnership Project
AUTOSAR	Automotive Open System Architecture standard
BAPO	Business, architecture, process and organisation
DPWS	Devices Profile for Web Services
DTT	Digital terrestrial television
ECU	Electronic control unit
EPG	Electronic programme guide
FMI	Functional mock-up interface
FPP	Full Project Proposal
GDP	Gross domestic product
HDTV	High-definition television
HPC	High-performance computing
ICT	Information and communications technology
IFCCs	ITEA founding companies and countries
IFCs	ITEA founding companies
IP	Internet protocol
ITAC	ITEA 2 Authorities Committee
MPEG	Moving Picture Experts Group
MOST	Media Oriented System Transport vehicle bus standard
NFC	Near field communication
NIP	EUREKA national information point
NPC	EUREKA national project co-ordinator
OEMs	Original equipment manufacturers

OMA	Open Mobile Alliance
PC	Personal computer
R&D	Research and development
SEPA	Single European payment area
SME	Small and medium-sized enterprise
SOA	Service-oriented architecture
TADL	Timing-augmented description language
TTCN	Testing and test-control notation
VCA	Video-content analysis
VOD	Video on demand
VoIP	Voice over IP

12 YEARS *of* ITEA

Achievements & results of the EUREKA programmes ITEA & ITEA 2

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EUREKA

ITEA 2
INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

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