Framework Programme VI

IST Priority

ICT for Enterprise Networking

December 2005

The presentation of the "Technologies for Digital Ecosystems" sector included therein has been prepared for inclusion in the 2005 report from Unit "ICT for Enterprise Networking" of DG Information Society and Media, due to be published in early 2006.

For copies of the 2005 annual report, please send us a fax at +32 2 296 83 87, or write to:

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3.3. Technologies for Digital Ecosystems Supporting Regional Growth and Innovation of Business Ecosystems

This Cluster is specifically focused on technologies for local growth and SMEs needs. A strong integration between R&D, ERA policy, and national/local growth policies is implemented.

The research work is multidisciplinary. Strong interaction between business and technological aspects, and co-ordination with national and regional research are key elements.

3.3.1 Aims

The objective of the Digital Ecosystem is to foster local economic growth through new forms of dynamic business interactions and global co-operation among organisations and business communities enabled by information and communication technologies. Research targets the basic enabling technologies which support the local implementation and deployment of a network of interconnected digital ecosystems.

More specifically, the work within the "Technologies for Digital Ecosystems" Cluster will contribute to identifying and developing the technologies as well as the scientific and economic models leading to distributed and co-operative bottom-up development and deployment of a pervasive network of digital ecosystems populated by a diversity of ICT-based services, components, knowledge, practices and business models adapted to local conditions.

This Cluster aims at addressing two strategic issues:

- re-boosting the software ICT service industry in Europe - by proposing a new paradigm of software production (through new forms of co-operation, developing reusable components Europe-wide, accessing multi-revenue-models);

- preventing the decline of Small and Medium Enterprises which are not able to adopt ICT to increase their productivity[1] - by making the case for an Industrial Policy Initiative (IPI) for the creation of regional economic business ecosystems – this IPI would represent the technological infrastructure enabling the evolution of the concept of business-ecosystems.

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[1] It has been estimated that 50% of the differential in increase of productivity between US and EU SMEs over the last 5 years was due to the adoption of ICT in their internal/external business processes.

3.3.2 Roadmap

During the last century we got used to the concept of *natural ecosystem*, defined as a biological community of interacting organisms plus their physical environment.

Over the last decade, the economic model of Business Ecosystem has emerged. The business network of buyers, suppliers and makers of related products or services plus the socio-economic environment, including the institutional and regulatory framework, is often regarded as a business ecosystem, due to its feature of "*dynamic open complex adaptive system, composed of interrelated parts, interacting with its environment, subject to resulting feedback effects, evolving over time adaptively to fit the pressure imposed on it, perhaps attaining a sustainable advantage, and in the process generating emergent phenomena*"[2].

J. Moore defines it as "*an economic community supported by a foundation of interacting organisations and individuals*" which "*enable them to move towards shared vision and to find mutually supportive roles*"[3].

The concept of digital ecosystem has recently emerged in Europe as the next step towards ICT adoption and a European model for the ICT-service infrastructure needed by local business ecosystems.

In September 2002, the e-Business unit of the Information Society Directorate-General published on the 'Go-Digital' website and widely disseminated the discussion paper "*Towards a network of digital business ecosystems fostering the local development*". The debate which followed within the scientific community confirmed that the digital ecosystem is a complex and ambitious multidisciplinary field of research, which is defining its identity, structure and exploitation potential, and whose outcomes provide the technological support for innovation in the local business with an impressive potential in generating positive economic impact.

Between and 2002 and 2003, workshops and on-line debates have explored:

- the interest of the European research community in improving and enriching the research area related to digital ecosystems;
- the views of incubators and main players from local and regional communities on whether and how local digital ecosystems could support the transition of SMEs towards the digital age.

As part of the 2003-04 implementation of the FP6 IST work programme, the development of the Digital Ecosystem concept aggregated a large multidisciplinary community and led to the presentation of several relevant proposals for Integrated Projects (IPs) considered above threshold, plus other large projects and specific targeted research projects (STREPs) in related areas.

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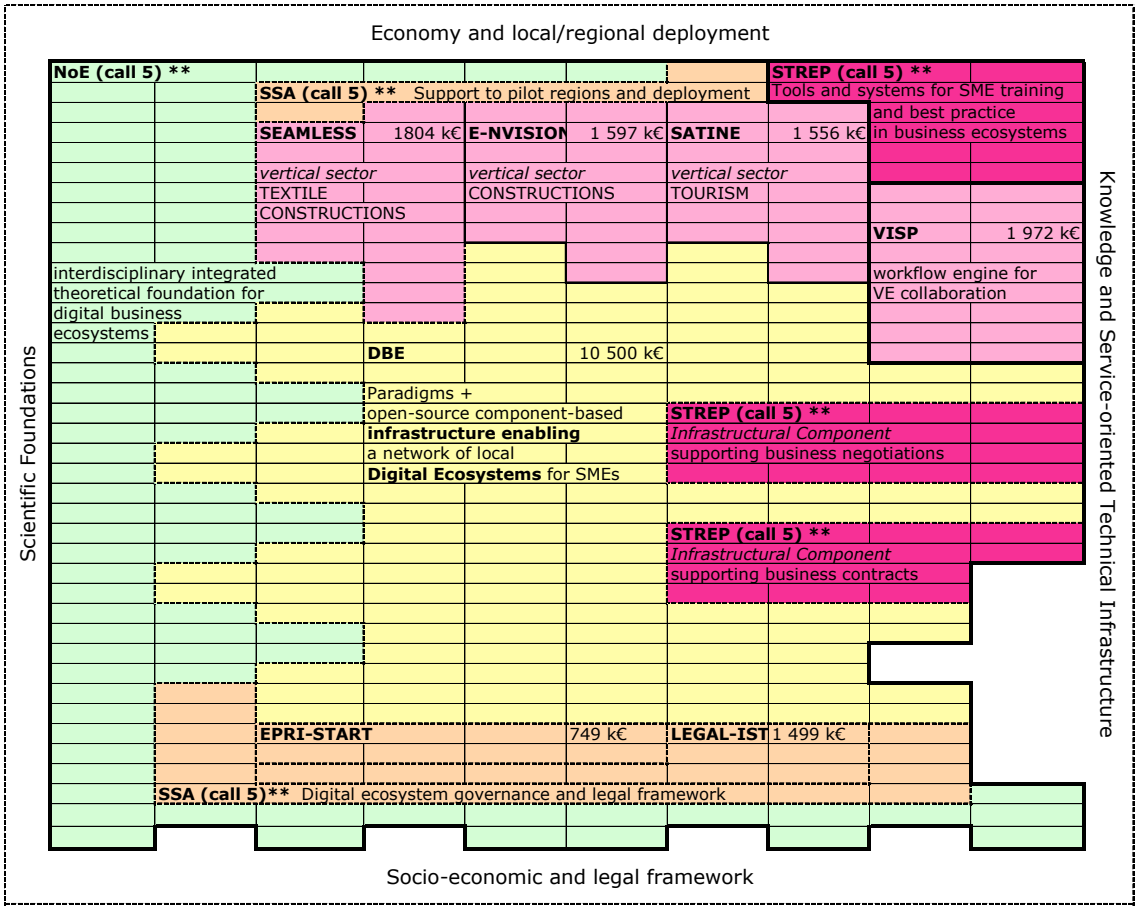
2 http://www.amsreview.org/articles/holbrook06-2003.pdf

3 J. Moore, *The Death of Competition*, Harper Business, 1996.

In 2004, owing to the growing interest in digital ecosystems, DG Information Society and Media created a new sector, "*Technologies for Business Ecosystems*", within the "ICT for Business" unit – which was since renamed "ICT for Enterprise Networking".

A Cluster on Technologies for Digital Ecosystems was defined, with three projects initially, including one large Integrated Project (DBE).
This cluster has since grown with the addition of a set of new projects, and is expected to reach the following configuration in 2006 (following the evaluation of the 4th and 5th IST calls for proposals which took place in 2005).

Digital Ecosystem Cluster, hypothetical scenario 2006



Existing projects
- IP
- SSA
- STREPs calls 1 & 4 (vertical sectorial projects)

Hypotical scenario, projects of call 5 **
- NoE call 5
- SSA call 5
- CA call 5
- STREPs call 5 (infrastructural and generic components)

** not based on actual proposals or projects

EU-funded research in digital ecosystems is largely complemented by ERA national and regional initiatives together with local policies, which activate a virtuous cycle based on research innovation, deployment, adoption and growth.

In addition to the three initial EU-funded pilot areas (Tampere, West Midlands, Aragon), three further regions have already joined in the DBE project initiative (Piedmont, Extremadura and Trentino).

In subsequent months, pilots in Europe and in developing countries have also expressed their interest in joining in. A large international conference, targeted to both the open source development community and regional decision-makers, took place in May 2005 to present the preliminary results of these developments.

The ecosystem paradigm is now also applied to the ICT infrastructure of services and formalised knowledge used to support our business and economic activities in general. This digital ecosystem is an "evolutionary self-organising system aimed at creating a software environment for networked organisations" that supports the Cluster development of open and adaptive technologies and evolutionary business models. The key enabling technologies developed within digital ecosystem research aim to provide a service-oriented infrastructure that supports the spontaneous composition, distribution, evolution and adaptation of ICT-based services. This platform should allow:

- the European SME software industry to develop co-operatively – and to launch on the network – services and software components that are composed together to form complex solutions
- SMEs to find affordable ICT services which support their business networking needs, enabling them to co-operate within and among business ecosystems.

A DIGITAL ECOSYSTEM	A DIGITAL COMPONENT
is a pervasive "digital environment" which supports the business ecosystems which is populated by "digital components" which evolves and adapts to local conditions with the evolution of the components	could be: software components, applications, services, knowledge, business processes and models, training modules, contractual frameworks and laws... .... and hopefully a mixture of these.

3.3.3 Challenges

In the increased complexity of today's global knowledge intensive businesses, based on dynamic business networking, SMEs need to share resources and rely on a support network that provides the knowledge and resources which are not available internally[4]. The knowledge-based global business leads to the emergence of dynamic and more amorphous worldwide alliances and inter-connections among enterprises and clusters.

[4] This represents the key for success for traditional clusters such as industrial districts and innovation areas.

This requires an intensive use of ICT applications together with new models of co-operation through novel support networks, which promote the emergence and sustainability of "territories of excellence" or "knowledge areas" throughout Europe. Such territories are geographical or virtual areas, where innovation and productivity, as well as social inclusion, are promoted through the combined use of local assets empowered by the networking and knowledge sharing capacities provided by digital ecosystem information technologies.

European SMEs lag behind US organisations in ICT adoption and in business value chain integration. Digital ecosystem enabling technologies provide the framework which allows SMEs to collaborate in developing affordable services, able to evolve and adapt to local needs, promoting local and global co-operation in such territories of excellence. These areas will not only benefit from innovation and economic growth, but it is deemed that they will at the same time be able to sustain a more harmonised development preserving European traditions and culture.

A co-ordinated strategy, with a long-term perspective but delivering intermediate results, is required for the implementation of such radical change: the scientific advances on basic theories and advanced software technologies should be developed thanks to a focused European interdisciplinary research in both FP6 and complementary ERA initiatives.

The transposition of behaviours and architectures from natural to digital and to economic systems requires focusing and integrating R&D from several disciplines, ranging from fundamental research to computer science and to social sciences. Research should develop the basic theories and technologies needed for structuring and for the bottom-up spontaneous deployment and evolution of digital ecosystems, able to implement a structural coupling with their local business ecosystems, to adapt and to co-evolve with their social values and economic needs. Key research issues need to be addressed in fundamental science, network architectures, as well as in socio-economic and organisational models.

3.3.4 Main Achievements

Although pursuing long-term visionary goals and developing long-term research, the paradigms of the digital ecosystem, which are based on evolutionary principles, have enabled to deliver quickly initial usable results.

3.3.4.1 Science

The digital ecosystem community recently produced a vision paper entitled "The Digital Ecosystems Research Vision: 2010 and Beyond" which raised huge interest (already more than a thousand web downloads).

3.3.4.2 Digital Ecosystem infrastructure

In 2005, the DBE Execution Environment was released on open source, under the code name Swallow [http://swallow.sourceforge.net/].

In October 2005, the first open source public release of the primordial open-source integrated DBE development environment for the Digital Business Ecosystems (DBE

Studio, based on the OMG's MOF-compliant metamodel) was released as Eclipse plug-in on Sourceforge, under the code name Merlin [http://dbestudio.sourceforge.net/]. DBE Studio is an evolving collection of editors, tools and wizards that together will allow business services to be analysed, and corresponding software services to be defined, developed and deployed onto the DBE Execution Environment.

3.3.4.3 Formal Languages and Standards

SBVR (Semantics of Business Vocabulary and Business Rules) was adopted by DBE as its Business Modelling Language. In future evolutions, a synergy with the OMG's ODM approach will be implemented. The DBE goal is to enable small and medium sized enterprises to register their business and product offerings and conduct business over the Internet. SBVR is expected to allow SMEs to express their business in natural language, making a significant contribution to the interaction capability of the digital ecosystems.

On 12 September 2005, the OMG Business Enterprise Integration Domain Task Force and Architecture Board approved for SBVR to become a final adopted specification of the OMG.

The first prototype of the SBVR Editor for the Business Semantics of Business Rules (BSBR) is running.

3.3.4.4 Community Building and Training

The three initial pilot regions (Tampere, West Midland, Aragon) launched the first regional call for proposals towards software development SMEs, for the development of software applications targeted to SMEs, as a first step in the capacity building strategy of the digital ecosystems local communities.

In October 2005, "Code camps" for software training for SME developers took place in these three regions: the first real-world test for DBE studio. In November 2005, the first open source DBE service was developed.

DBE is one of the projects selected to represent the IST research activities at the WSIS exhibition in Tunis.

A new, user-friendly DBE website was finalised in October 2005 to act as portal towards digital ecosystem communities.

3.3.5 Open workshops and Concertation meetings

Two open workshops were organised in April and May 2005, the first to help identify the needs of regions and SMEs, the second to review future technology and research activity needs. These led to the production of a vision paper, in July 2005, entitled “The Digital Ecosystems Research Vision: 2010 and Beyond” (see http://www.digital-ecosystems.org/events/2005.05/de_position_paper_vf.pdf).

Following the first concertation meeting of the four clusters of Unit ICT for Enterprise Networking, meetings also took place bilaterally between projects in 2005, to establish cooperation on both legal issues and trust and security issues.

3.3.6 Awareness-raising and Dissemination

3.3.6.1 Major Events

July 2005 – The advanced International eBusiness Management Summer School took place, addressing: " The emergence of novel organisational forms in the globalising planet: Toward the business ecosystem?"

November 2005 - Tunis World Summit on Information Society. The DBE project was selected among ten FP5 and FP6 flagship projects to publicise the results of EU-funded research activities at the European Union booth of the Its4all exhibition in Tunis. The project will be also exhibit at the booth of Sun Microsystems and INTEL.

December 2005 – Cambridge eBusiness Conference.
The Cambridge conference on “eBusiness: The Way Forward” of 5-6 December 2005 (organised by DG Enterprise and Industry, in collaboration with DG Information Society and Media), devoted its 5th panel to “Digital Ecosystems for SMEs: roots, multiplier effects and regional growth stakes” (see programme and conclusions on http://europa.eu.int/comm/enterprise/ict/conferences/cambridge.htm).

3.3.6.2 On-line dissemination

The website on Digital Ecosystems [http://www.digital-ecosystems.org] is ranked first on Google, when searching for “digital” “ecosystems”, showing the European leadership in the field.

The new interactive DBE website acting as portal towards digital ecosystem communities [http://www.digital-ecosystem.org] is ranked first on Google, when searching for “digital” “ecosystem”.

The activity related to the first release of the digital ecosystem implementation on the Sourceforge open source portal has already been ranked among the major 900 open source projects worldwide, after only one month of activity.