

Why research on Digital Ecosystems? Towards Innovation Ecosystems

Today the production and the delivery of products and services is formed through the dynamic integration of many different components and services, produced and provided by different organisations distributed around the world¹. ICT, new business processes, and progress in transport enabled a worldwide dynamic and distributed global network of producers, which reduces costs, but if not governed risks to expose Europe to loss of competitiveness and employment.

The response to this increased global competition is not only in lowering the production costs, through business networking and ICT adoption, but also in creating opportunities for participation within the economic process of those who are excluded, preserving the European social model and promoting local identity and culture.

The inclusion of traditional and new economic actors who become part of a regional and global business and social cooperation network makes the economy more competitive and also improves employment and socio-economic inclusion and cohesion, helping to reach these two Lisbon objectives.

The challenge is to transform European regions in Innovation Ecosystems, developing the ICT technologies, solutions, and models that are necessary to support distributed organisational models based on interaction and collaboration and the delivery of personalized high-margin products/services that leverage local identity and economic structure. **The aim** is to foster an inclusive and participative society, which supports economic inclusion, empowers the creativity and the participation of all potential actors of EU regions (public and private organizations, small and micro enterprises, communities, individuals) in open socio-economic processes.

FP7 research provides the enabling technology driving productivity, sustainability, quality and effectiveness in structured environments while boosting creativity, innovation and participation in unstructured organisational settings, developing new approaches, methods and tools taking advantage of diversity and multi-disciplinarity.

EU regions need to develop the capacity

- to master and to adopt the ICT technologies, new cooperative business models and democratic decision processes
- to enact common initiatives establishing a favourable environment for investment, innovation and growth, through democratic and participative decision processes

Innovation Ecosystems are emerging as a novel approach for the catalysis of sustainable development driven by networks of micro- and small enterprises, enabled by ICT services and intelligent cooperative solutions, linking multitudes of socio-economic actors and ICT solutions that are affordable, trustworthy, adaptive and evolutionary. Dynamic and remote collaboration and interaction in structured and unstructured environments are catalysed by new approaches and ICT technologies, which consider the knowledge, ICT solutions and services as “digital ecosystem entities” which exhibit the behaviour of natural organisms. Thus, the infrastructure and the services supporting organisational interaction and networking will form a “digital ecosystem” considered a pervasive common infrastructure carrying knowledge, models and services, where complex heterogeneous, human and digital entities and systems are themselves composed of simpler entities/subsystems.

¹ It is expected that the components which are more customised, and have more value added, are produced by smaller organisations, usually rooted in their regions and closer to the final users, whilst more generic common components – a digital commodity – are likely to be more standard and developed somewhere else.

The complexity of this challenge is related to the variety of structured and unstructured organisational settings composed of heterogeneous human and digital devices and systems. This requires building a theoretical foundation for the emerging area of Digital Ecosystems, which spans and integrates three different disciplinary domains: computer science, social science and natural science.

Computer Science research focuses on the seamless management of distributed, multi-centric and pervasive ICT networks carrying services and representations of knowledge, enabling the creation of a self-organising environment that supports the continuous evolution of business models and software services, by exploiting paradigms from biology and economics. It comprises:

- Research on robustness, reliability, sustainability, and scalability of distributed digital ecosystems and of their user communities
- Research on automatic code generation, autopoietic P2P networks, and distributed accountability, identity and trust
- Research on dynamic P2P architectures for distributed transactions, accountability, identity & trust
- Research on dynamic service composition and optimization
- Research on seamless interoperability with service oriented platforms
- Research on recursive, reflexive, and self-reinforcing knowledge creation
- Research on systems theory, biological, mathematical and formal models

Social science research focuses on the representation of socio-economic contexts that will drive productivity, quality and effectiveness in structured environments while boosting creativity, innovation and participation in unstructured settings. Research fields include linguistics, sociology, economics, and governance and represent the interactions between the human and digital dimensions in a context of dynamic self-organisation of socio-technical and economic systems. The research includes:

- Research aimed at underpinning the continuous creation, formalisation and sharing of knowledge in the form of micro-economic and macro-economic structures, processes and behaviour
- Research on how the modelling the knowledge related to socio-economic interactions, embedded in a pervasive digital ecosystem infrastructure, will play a fundamental role in the dynamics of sustainable socio-economic development, leading to the emergence of new societal and economic interaction paradigms.
- Collaborative development of ICT instruments that support dynamic distributed and participative open systems, fostering social constructivist processes and economic development.
- Research on semantics, natural language processing and modelling tools enabling to define business and service models, and generate context-dependent code from natural language models
- Research on formalisation of socio- and micro-economic aspects like reputation, social interactions, business objectives, legal relationships, and trust
- Social and ICT-network analysis and simulation mechanisms which generate knowledge bases providing training and skills resources to socio-economic communities and organizations,
- Research on dynamically self-organising business and social networks, integrating knowledge and skills, that adapt to local cultures and practices and that fit the needs of smaller organisations and of dynamic networks.

The expected high economic impact warrants addressing governance and regulatory issues to ensure transparency and participation.