

Keynote Speech
The European Innovation Ecosystem Initiative
for SMEs and Regional Development

Francesco Nachira
European Commission ¹

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Ladies and gentlemen,

I am pleased to be here today, amid such an outstanding audience, to speak about innovation ecosystems.

I would like to use this opportunity to give some ideas about innovation that emerged from the digital business ecosystem constituency and to present them for further thinking.

CONVERGENCE

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I'll speak about the opportunities generated by convergence.

But I'll not speak about the "**Digital Media Convergence**", which brings together the separate worlds of **audio, video, data and voice communication services**.

This will allow the consumers to be "in control" of the benefits of their entertainment, i.e. to consume "what they want, where they want it, and when they want it".

I will speak, instead, about "**Ecosystem Convergence**", which brings together the digital and service economy and the material economy, considered as ecosystems. I will present an ecosystem of businesses, which interacts with a digital ecosystem of services, knowledge and ideas. Such interaction produces an environment favorable to innovation and sustainable development: an **innovation ecosystem**.

This opportunity is generated by the convergence between three emergent phenomena: **digital ecosystems, the semantic web and web 2.0**.

Thanks to this convergence, the SMEs and individuals who today are excluded or marginalized have the instruments to participate in the global economic processes and to contribute their talent, content, ideas, to produce economic value to the economy.


Indeed the integration of these technologies **will finally make it possible** to collectively build a digital representation of the economy. This representation can be used by humans and computers and is a unique opportunity of to access and share knowledge.

Some examples of the opportunities opened by the power of this representation, if accessible to all potential economic players, are:

- the access to knowledge, techniques, practices, **foster** effectiveness and competitiveness
- the knowledge of the market actors and opportunities **enables** business and social networks, synergies and systemic approach
- the global view **allows** greater freedom of choice and economic innovation

¹ This text is the basis of a keynote given at, ICEB + eBRF 2006 conference, Tampere, Finland.

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The icon  on the left defines the number of the slide associated to the text during the speech.

- diffused knowledge and skill, **enables** autonomy, and **enables** a transition from rents to synergies
- cultural diversity (services, ideas, business practices, models), **nurtures** creativity
- the exploitation of the diffused tacit unstructured knowledge, skills and infrastructure (in business clusters) diffused within regions **fosters** creativity, innovation and development

Let's see in more detail the three emerging phenomena that are converging:

Digital Business Ecosystems - Semantic Web – Web 2.0

and how this convergence fosters a new wave of innovation, based on ecosystems of innovation.

How and when the process, which elaborated this new notions of convergence, start? It started when it was asked, which contribution ICT could provide in contributing to achieve the Lisbon objectives.

ICT Adoption

Which requirements would the innovation ecosystem approach solve?

In 2000 the Council of Lisbon set the goal that Europe become the “most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”.

We do not need to elaborate further that ICT is the enabling technology for global access to the market **and that ICT adoption** has a dramatic effect on the productivity, and thus on employment.

In 2002 the European Commission activated a working group with the goal to identify how to foster the ICT adoption among SMEs.

The working group focused on the elements that are lagging behind: the **SMEs and the less developed regions**.

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For achieving the Lisbon objectives: activate SMEs

In Europe (EU-25) 99.7% of total enterprises are SMEs; 91.2% are micro enterprises (from 1 to 9 employees). Thus improving their competitiveness will have a huge impact on the economy.

Today we are facing exactly this problem: SMEs are not very competitive and they are lagging behind in ICT adoption.

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Difficulties of SMEs

The SMEs have difficulties to cope with the globalization process, to access to the global market, which **requires specialized resource and knowledge**.

They have also difficulties to know such markets, to identify possible partners and to establish cooperation. It requires specialized skill and knowledge: in ICT and technologies, but also in legal issues, marketing etc...

Today the production and the delivery of products and services is formed through the integration of many different components and services, produced and provided by organizations distributed around the world.

The new business processes, and the progresses in transport and in ICT, enabled a worldwide **dynamic and distributed global network of producers**.

5 How did the Digital Ecosystem Concept Originate?

The working group observed that in some SMEs communities “*The actual slowly changing network of organizations will be replaced by more fluid, amorphous and often transitory structures based in alliances, partnership and collaborations ... building a [dynamic] community that share business, knowledge and infrastructure, develop creativity*”²

6 Recent empirical observations suggest that new unexpected phenomena are emerging (see slide).

Emergent phenomena:

- **Increased interaction, dynamism, global dynamic business networks**
- **Key role of ICT infrastructure for SMEs inclusion**
- **Key role of knowledge (and its representation and diffusion)**

7 How can we leverage these emergent phenomena?

How to activate the process: **capacity-building -> empowerment -> participation -> new-economic-activities -> innovation -> employment ?**

How to foster the creativity, the undisclosed potentialities, to exploit the talent, the ideas of dispersed SMEs? How to discover, connect and develop?³

How to activate an environment favorable to innovation, growth, employment and social cohesion?

How to sustain the process of continuous creation and economic production and creation alive and dynamic?

Which ICT infrastructure / enabling-technology is required?

8 Stages in ICT adoption: Co-evolution between ICT-adoption and organizational structures

We know the CISCO ICT-adoption stairs, and how the ICT adoption and organizational structures co-evolve⁴.

*For supporting the innovation ecosystem **it is required a further stage in ITC technology adoption**. An infrastructure which exploits [the creativity, the potentialities and] the dynamic interactions (cooperation and competition) of several players in order to produce:*

- *systemic results,*
- *innovation and economic development.”⁵*

² Towards a Network of digital business ecosystems fostering the local development – EC Discussion paper, 2002

³ Connect and Develop, inside Procter & Gamble's New model of innovation, Larry Huston and Nabil Sakkab, Harvard Business Review, March 2006

⁴ We also know how in the same area different level of ICT-adoption co-exist

⁵ Towards a Network of digital business ecosystems fostering the local development – EC Discussion paper, 2002

Principles

The ICT platform, which implements this further stage in adoption, should respect **a set of initial principles**, which have emerged from the public consultations⁶.

- Capability to enable global solutions which adapt to a local or sector needs
- Ability to constantly evolve, differentiate and self-organize
- Scalability and robustness, no single point of failure or control
- Not be dependent upon any single instance or actor.
- Equal opportunity of access for all

A pure technological approach would not address the issue.

Due to the complexity and the different interests at stake, a classic plan was not adequate.

A new paradigm would be necessary⁷.

ECOSYSTEMS

The modeling of complex dynamic systems using the metaphor of the ecosystems is becoming quite common, abandoning the mechanic approach.

We can recognize all the principle mentioned above holds in an ecosystem.

Today economy is not perceived as a mechanic system, but as an ecosystem.

Business Ecosystem

In 1993, James Moore, introduced the idea of a business ecosystem. A business ecosystem is a group of vendor organizations and consumers who function as an economic community. Each member of a business ecosystem shoulders the responsibility, contributes to, and shares in the fate of the community and its ability to deliver value. The early conceptualization of ecosystem as metaphor of business transactions saw a large industrial player at the centre surrounded by many small providers; this has become known as the Keystone model of the ecosystem, which is prevalent in US publications and conceptualizations⁸

Service Ecosystem

Today it seems to be the latest fashion. "Five years from now, the concept of an application will be obsolete"⁹ "They will all be services, combined, mixed, matched and reused as needed."

Service publishing and aggregation of all forms is where the greatest opportunity lies.

All the large software and hardware companies consider their technology the keystone of an ecosystem (HP, SAP, IBM, Apple, ...).

It is quite bizarre, considering the concept of ecosystem:

Natural Ecosystem

A biological ecosystem is an environment, where there is a dynamic equilibrium between distinct but interdependent organisms, functioning as a biological community. The survival of the ecosystem depends on the diversity and the abundance of the organisms. It relies on mechanisms, like evolution, adaptation, composition of structural elements forming more complex organizations.

The digital ecosystem constituency, formed by the original working group, a set of projects funded by the European commission and Regions, collectively defined the primordial concept of digital ecosystem. In contrast to the Keystone model, the European ecosystem model is

⁶ We could say a Bill of Right or a Constitution, More information on the consultation phase on <http://www.digital-ecosystems.org>

⁷ This means a body of theory, combined with research methodologies and communities of practices, which take in account the interdependence between the socio-economic and the technical system

⁸ E.g. M. Iansiti and R. Levien, The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation and Sustainability, Harvard Business School Press, Boston Massachusetts, 2004.

⁹ Sawhney, blogs.

based on a large number of diverse enterprises in a given sector or geographical region, with no dominant player.

Digital Ecosystem (of services and ideas)

We could define as a pervasive digital platform designed to represent and to diffuse the semantics of the micro-economy of the regions including the associated services, enabling collaboration and innovation and which embeds the functional principles of a natural ecosystems, including the capacity to evolve, of self-organization and composition of its elements.



Shift of paradigm

This progression shows how we are transitioning from a context-free scientific and engineering tradition based on models and machines, to a systemic point of view, to arrive finally to an **interdisciplinary integration between technical infrastructures and socio-economic processes**.



An Ecosystem-Oriented Architecture can support and facilitate the emergent business phenomena

How are the ecosystem principles developed and preserved in an evolving self-organizing ecosystem without a planned design ?

The range of possible behaviors of a system is determined by its structure. This structure specifies its realms of interaction.[H.Maturana, F.Varela]¹⁰

The cyberspace [or a digital ecosystem] has an architecture, its code - the software and hardware that defines how it is — is its architecture.

That architecture embeds certain principles; defines what's possible in a digital ecosystem. And these terms and possibilities affect innovation in the cyberspace. **Some architectures invite innovation, others chill it.** [L.Lessig]

The digital ecosystem embeds mechanisms enabling its evolution. It exploits the principles of the natural ecosystems

1. The species living in a natural ecosystem are the result of a selection based on the pressure of the environment. The applications / services of a digital ecosystem are the result of a selection of the most adapted to the economic habitat. The ones which survive provide a value added.
2. The biological diversity makes the ecosystem more robust. A robust digital ecosystem has an high "conceptual diversity": a richness of business models, services, ideas, talents capabilities.
3. Species migrate between different ecosystems, and adapt to the new environment. In the same way the ecosystem embeds mechanisms for the migration of services, business models and practices to environments.

The same mechanisms hold for the components of the digital ecosystem infrastructure, to render the infrastructure evolutionary, generating local ecosystems adapted to local conditions.

It is worthwhile to note, that whilst the ecosystem infrastructure for reasons of governance and trust is necessarily open source and it is considered a "digital commons", the digital organisms (e.g. ICT services) could follow any business or licensing model.

¹⁰ Maturana, H and Varela F., The Tree of Knowledge: The Biological Roots of Human Understanding, 1987

13 **The Digital Ecosystem: a collective brain for the formalization and distribution of knowledge**

We could consider a digital ecosystem analogous to a collective brain that builds a representation of the world. Therefore it has to represent/formalize, store and retrieve such information.

14 **[A] Represent / Encode**

The ecosystem is populated by “digital organisms” that evolve and adapt to local conditions with the evolution of the components. The digital organisms that populate the ecosystem could be: software components, applications, services, (like in a service-oriented architecture), also representations of business processes and models, laws, trust relationships, reputation, skills, talents, competences, ideas, ...

In short, **ANY USEFUL REPRESENTATION, EXPRESSED IN A LANGUAGE (formal or natural), DIGITISED AND LAUNCHED ON THE NET, WHICH CAN BE PROCESSED (by computers and/or humans).**

15 **[B] Store**

According to the principle to avoid a single point of control or failure and to guarantee the autonomy, the information is fully distributed, like the “holographic” distributed memory of the brain. Distributed persistent storage technologies have been developed in FP5, FP6 projects, and are free, open source and available

16 **[C] Retrieval vs. Migration**

Exploiting the concepts of natural science, like habitat, migration, evolution, digital species, the information instead of being searched and retrieved, spontaneously migrates towards the most relevant clusters of users, thereby enabling spontaneous networking and self-organisation

17 **Language Processes**

The representation of the world is an old dream, and we are faced with obstacles:

- which formalisms, languages?
- an interpretation of the reality is subjective, how we can have a consensual representation?
- which are the resources for populating the ecosystem?

The convergence with Semantic Web findings and with the Web2.0 emerging phenomena open the possibility to gradually face these problems.

SEMANTIC WEB

The semantic web is a project leaded by W3C World Wide Web Consortium. It has the objective to realize “a Web [in which computers] become capable of analyzing all the data on the Web – the content, links, and transactions between people and computers”.

For reaching this goal, the community of researchers, coordinated by the World Wide Web Consortium is gradually defining a set of standard formalisms, used for marking and describing several aspects of information, like the Web Ontology Language (OWL) is used to publish and share sets of ontologies, supporting advanced Web search, software agents and knowledge management. In 2004 released the Resource Description Framework (RDF) is used to represent information and to exchange knowledge in the Web.

Unfortunately, these formalisms did not become popular, because of the lack of human-friendliness.

WEB2.0 and Social Web

Web 2.0, coined by O'Reilly Media in 2004, refers to a second generation of Internet-based services and tools, based on social networking: wikis, communication tools, and folksonomies, that emphasize online collaboration and the content is built collectively by the users.

The web 2.0 applications:

- * foster the users to participate collectively to the construction of the content
- * exploit the network effects created by an architecture of participation
- * are based on lightweight business models enabled by content and service syndication

When there is a large participation of users, the user-generated content, results of high accuracy

A famous example is the result of the analysis made by Nature, which found that the article of Wikipedia and Encyclopedia Britannica had similar accuracy¹¹.

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TAXONOMIES vs. FOLKSONOMIES

The Web 2.0 approach, where the content is collectively generated by the users, has been extended to the generation of taxonomies.

Several 2.0 applications started to allow the user to associate a simple label to information. These labels, called tags, initially were a simple word or mark.

Then the tags generated by the users could be used to create classifications and for information retrieval. This practice, known as folksonomy: i.e. a taxonomy collectively generated, or generated by the folks.

Example: Last.fm

Es. The tag cloud, applied to the music, the size of the fonts reflects the popularity of the tags.

In contrast to professionally developed taxonomies with controlled vocabularies, like in semantic web, folksonomies are unsystematic and open-ended.

This approach allows to afford this work of systematization, which would not be affordable with other means. In a way solving the problem of the unpopularity of semantic web formalization.

But there is something more. The folksonomies provide a shared interpretation of the world. It represents the reality how is perceived by the users.

Example: The Cranberries, presented as rock band. It is also strongly perceived by the users as alternative music, as female vocalist, as Irish.

Another example, applied to tourism, is the star classification system for hotels. This is based on a number of criteria and classification committees. But the stars fit only partially with the user perception. All of you prefer to book a 3 star hotel suggested by a traveler rather than in a unknown 4 star hotel. The tourism industry is aware of the potentialities of user-created content: indeed the European Tourism Forum 2006 recommended to:

1. To support the technology for managing user generated content and exploit it
 - for enhancing information and the assessment of existing products
 - for improving the quality of the offer based on user feedback

Also it provides a further recommendation,

2. to enable personalized dynamic packaging, based on user profiles

¹¹ <http://www.nature.com/news/2005/051212/full/438900a.html>

This semantic added to the information, allows to group and classify the information, but also to profile the users which provided such information, to group them in user communities, and to identify the similar needs/view. It allows to identify which are their interests:

Example: the recommendation provided by Amazon when you buy something, the system inform you that: “who bought this item also bought”

Essentially, the Web is shifting from a global library of interlinked pages to an information ecosystem, where data circulate like nutrients in a rain forest.
The digital ecosystem marks the evolution from the semantic of the web to the semantic of economy

The convergence between Digital Ecosystems – Semantic Web – Web 2.0

provides the possibility to associate and generate semantics and ontologies, based on an introspection of the content and networks generated by the users. The evolutionary approach allows the first generated representations to be rudimentary, but to increase in expressive power gradually over time.

The representations of the digital ecosystem are socially constructed. (Interpretation as social process)

In a social context we interact through a shared interpretation of the facts and the world. Our representation is the result of a consensual collective construction of meaning.

The same holds for the representations of the economy and the socio-economic relationships expressed in the digital ecosystems. The representations expressed in the ecosystems are the connotative meaning developed during the consensual process and the social interaction which produced the content.

The capacity to manage the user generated content, emerged within the web 2.0 movement; the ability to express it with formal languages generated by semantic web researches; and the multidisciplinary vision of the digital ecosystem paradigm would allow to build a radical new approach to innovation.

Example: Reputation in eBay

eBay built a rudimental mechanism for scoring the reputation of the sellers. The buyers have a measure of the reliability of the seller

Further studies on languages and in social science are providing the ability to define formalisms and languages which have the expressive power to model several aspects of both economy and the social/economic relations. Further studies would allow extraction from the multiple narrative descriptions generated by the participation and to express in formal languages.

Autopoiesis and structural coupling

We own a lot from ideas and concepts, like autopoiesis and structural coupling, originally developed long time long ago, in Chile, during a period of massive popular and somewhat chaotic participation, which fostered the creation of new ideas and new economic models. Probably the creative impetus of the massive willingness to collectively participate to the creative process is similar to the one recently emerged within the in the social web or web 2.0 communities.

The application of autopoietic theory as a conceptual description of living systems beyond the borders of traditional biology, extending autopoietic theory into the analysis of social systems.

The most promising and visionary researches in the ecosystem area are represented by the NoE OPAALS "Open Philosophies for Associative Autopoietic Digital Ecosystems", which also studies the dynamic process of self-creation and self-organization, made by a network of processes of production of its components, dynamic processes which are the basis of the evolution and of the innovation.

19 Business Ecosystem + Digital Ecosystem = Innovation ecosystem

The digital ecosystem provides a - collectively built - representation of the business ecosystem. The business ecosystems, on the basis of these representations, have the power to reconfigure the value chains, the business networks, etc...

Example: The digital ecosystem would recommend new services, potential collaborations, The digital ecosystem would allow new models of dynamic and distributed organization, (e.g. crowdsourcing)

The digital ecosystem and the business ecosystem are structurally coupled and co-evolve forming an innovation ecosystem.

The digital ecosystem influence (or even recommends), who is the business partner with whom to cooperate, which business networks to use.

I would mention that the transparency of the architecture (which determines the structure, the rules and the behavior), together with democratic governance are key issue, for building the trust on such digital ecosystems. Therefore the digital ecosystem platform have to be open source, and the control properly defined as result of an open and democratic consultation process.

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21 Conclusions

We are facing an unexpected convergence.

After the effects of the media convergence, we start to perceive the opportunities generated by the convergence of the outcomes generated by the work of different communities: service architectures, semantic web, web 2.0 and digital ecosystem.

The structural coupling between the material world and the digital world, generates a new wave of radical innovation.

Now a large range of possibilities and evolutionary paths still exist. We can't figure out what will be the result of this convergence, who will take advantage of it, which work organizations and structures will emerge.

Will it allow a greater participation to the democratic and economic process?

We will see more opportunities of expression and social networking, like in Web 2.0, but also more opportunities to participate to the global market and of business networking?

An equal access to a [consensual] description of the economy has the potential to reduce the digital divide.

Shall we see the emergence of a plurality of ideas, platforms, business models ?

Shall we see the emergence of keystone models, ecosystem of services and ideas organized around few platforms controlled by a single organization or by a cartel?

Probably, like it is now for the operating systems, we will see the co-existence of proprietary and open models: proprietary platform will co-exist with open source digital ecosystems platforms considered as common goods.

We can just conclude that we live interesting times, which will shape not only the future of business, but also will determine our ways of working and who will control the knowledge and the immaterial means of production.

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It will determine how the new generations will communicate, interact, create, learn and if a more equal and participative society would emerge.

More information on <http://www.digital-ecosystems.org>