Impacts of e-collaboration tools for development of rural areas

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Abstract

Information and communication technologies (ICT) are a powerful driver for economy-wide productivity, growth and jobs – and are arguably Europe's best-bet investment for the future. The ICT in innovation processes and acts play more and more important role in rural areas. The regional innovation performance is different in regions and lower in rural areas.The regional innovation performance is different in regions and lower in rural areas. The ICT acts play more and more important role in innovation processes in rural areas. The new requirements for developing new application and services is to increase the wireless and broadband services. Some EU supported RTD project served to develop the agri-food sector and rural areas. The National Development Strategies and Rural Development Strategies may help to grow the broadband penetration in rural areas. Collaborative Working Environment can be perceived as the tools, technologies, services and environments supporting individual persons in their working tasks to become more creative, innovative and productive involving the direct or indirect interaction (collaboration) with other individuals, groups or organizations. Collaborative platforms providing sophisticated upper middleware services required for environment and person-aware distributed collaboration. There were more EU projects focusing to collaborative tools and systems. The objective of the AMI@netfood project was to support the implementation of the IST Research Priority and Framework Programme, providing a long-term vision on future trends on Scientific and Technology Research oriented to the development and application of Ambient Intelligence technologies to the agri-food domain. The e-Learning and e-Training are more and more important domain where we can use collaborative tools, collaborative working environment. The European NODES project had a target group who are liniving in rural areas. For agriculture and rural areas the C@R project may contribute to design the European standard. C@R will design software tools to help people in rural areas to collaborate despite of the separation in space and in time. The Digital Business Ecosystem platform and tools may help for co-operation of SMS in rural areas.

Keywords: e-collaboration, rural development, wireless, broadband

1. Introduction - ICT in the innovation

Information and communication technologies (ICT) are a powerful driver for economy-wide productivity, growth and jobs – and are arguably Europe's best-bet investment for the future (RUSTEN – SKERRATT, 2007). A quarter of the EU's GDP growth and 40% of our productivity growth are due to ICT. The ICT industry generates 8% of Europe's GDP and employs 6% of its workforce. Widely deployed, ICTs have the potential to transform the way in which we work, live and interact. ICTs can give „voice" tor ural communities, thus permitting them to contribute to the development process, and empowerment peoples can be facilitated by and take advantage of ICT (GACEU, 2008). The digital convergence of media and information services, networks and devices provide unique opportunities: for firms, to modernize their business processes and deliver a wide range of services; for consumers, to experience a range of new media and content services, and for governments, to offer efficient, modern, interactive public services on line. The ICT in innovation processes and acts play important role. More innovation indicator have ICT relations. A few indicator are the following:

- Human Resources in Science and Technology – Core (% of population) Looking at the knowledgebased economy. It have seen mounting interest in the role and measurement of skills. Meeting the demands of the new economy is a fundamental policy issue and has a strong bearing on the social, environmental and economic well-being of the population. Data on Human Resources in Science and Technology (HRST) can improve our understanding of both the demand for, and supply of, science and technology personnel — an important facet of the new economy.
- Participation in life-long learning per 100 population (aged 25-64) economy is continual technical development and innovation. Individuals need to continually learn new ideas and skills or to participate in life-long learning. All types of learning of valuable, since it prepares people for "learning to learn". The ability to learn can then be applied to new tasks with social and economic benefits
- Business R&D expenditures (% of GDP). The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
- Employment in medium-high and high-tech manufacturing (% of total workforce). Number of employed persons in the medium-high and high-tech manufacturing sectors. These include chemicals, machinery, office equipment, electrical equipment, telecommunications and related equipment, precision instruments, automobiles and aerospace and other transport.
- Employment in high-tech services (% of total workforce). Number of employed persons in the high-tech services sectors. These include post and telecommunications, information technology including software development and R&D services.

Regional innovation performance as measured by the RRSII is shown in Figure 1. Countries are ranked according to their average innovation performance as measured by their RRSII. For each country Figure 1 shows the best and worst performing region. The Swedish region Stockholm is overall the best performing region, the Greek region Notio Aigaio is overall the worst performing region. Revealed Regional Summary Innovation Index (RRSII) -to locate *local* leaders by taking into account both the region's relative performance within the EU and the region's relative performance within the country3.

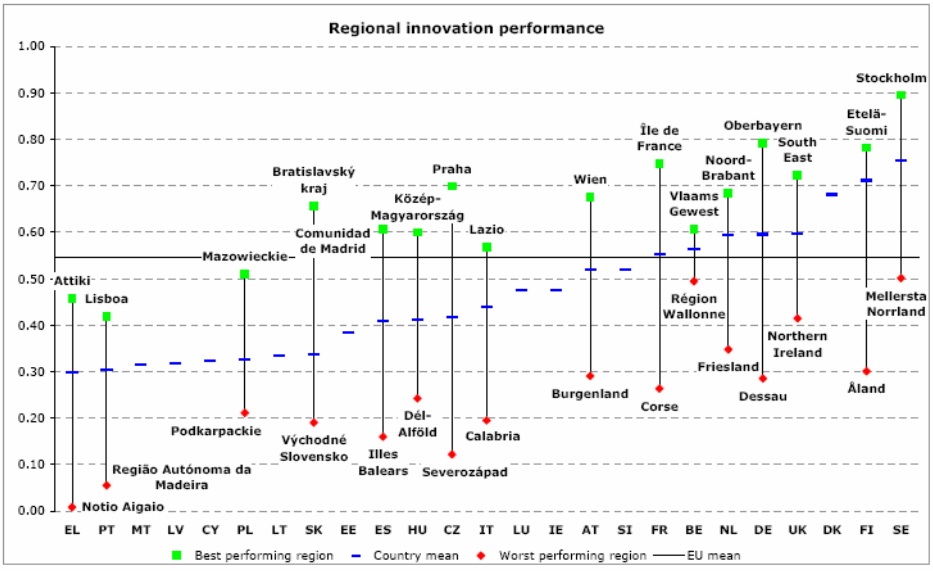

Figure 1. Regional innovation performance

Building upon the methodology used in the 2003 RIS, two indexes are calculated of which a weighted mean is taken for the Revealed Regional Summary Innovation Index (RRSII).

2. THE WIRELESS AND WIRED BROADBAND TECNHOLOGIES

The new requrements for developing new application and services is to increase the wireless and broadband services (HARTER, 2002). We can find many initiatives for developing service sin rural areas (GALLAGHER, 2005). Some wireless example from the USA are the following :

- Wi-Fi: Rural Oregon is home to the world's largest Wi-Fi hotspot → 700 miles2 Airgo Networks announced plans to sell Wi-Fi chips with data rates up to 240 Mbps by 4th quarter 2005 – 4x the speed of current Wi-Fi chips at 54 Mpbs.
- WiMAX: With a range of up to 40 miles, WiMAX may be a promising solution for delivering broadband to rural areas. Although WiMAX is still under development, the FCC and FEMA authorized deployment of a WiMAX network (15 mile range with 45 Mbps bandwidth – 30x faster than standard 1.5 Mbps DSL connections) to link Wi-Fi hotspots in an effort to restore communications damaged by hurricane Katrina.
- BPL: Manassas , VA -- a suburb of Washington, DC – recently deployed the nation's first citywide broadband-over-power-line (BPL) system and is available to about 10,000 of the city's 12,500 homes. Central VA Coop, a rural cooperative, also is developing a BPL network in that state.
- WISPs: Wireless Internet service providers, approximately 3,000 in the U.S., traditionally provide broadband connectivity in areas not reached by cable or DSL. Now WISPs are expanding into urban areas.
- Unlicensed Mesh Networking: By linking nodes on an ad hoc basis, mesh technology promises to deliver high bandwidth at an order of magnitude lower cost than existing licensed wireless technologies. Mesh architecture permits the extension of wireless coverage to areas that do not have wire infrastructure, and can link diverse devices or networks. Champaign-Urbana Community Wireless Network (CUWin) in Illinois has offered free 1.5 Mbps Internet access on a mesh network since 2002. The network can support 50-100 simultaneous users with three high-capacity T-1 wires that connect to the Internet. Speeds are comparable to $50/month ISP subscription.
- Satellite: Satellites have long held potential for communications coverage of large, sparsely populated areas. Hughes-owned DirecWay counts 250,000 subscribers; Denver-based WildBlue launched a similar service in June 2005.

If consider the broadband services the result is impressive genarally. The number of broadband subscribers in the OECD increased 33% from 136 million in June 2005 to 181 million in June 2006. This growth increased broadband penetration rates in the OECD from 11.7 in June 2005 to 15.5 subscriptions per 100 inhabitants one year later. The main highlights for the first half of 2006 are:

- Northern European countries have continued their advance with high broadband penetration rates. In June 2006, six countries (Denmark, the Netherlands, Iceland, Korea, Switzerland and Finland) led the OECD in broadband penetration, each with at least 25 subscribers per 100 inhabitants.
- The strongest per-capita subscriber growth comes from Denmark, Australia, Norway, the Netherlands, Finland, Luxembourg, Sweden and the United Kingdom. Each country added more than 6 subscribers per 100 inhabitants during the past year.
- DSL continues to be the leading platform in 28 OECD countries. Cable modem subscribers outnumber DSL in Canada and the United States.

- The breakdown of broadband technologies in June 2006 is as follows:
  - DSL: 63%
  - Cable modem: 29%
  - Other technologies (e.g.satellite, fibre and fixed wireless) : 8%

3. COLLABORATIVE tools

CWE (Collaborative Working Environment) can be perceived as the tools, technologies, services and environments supporting individual persons in their working tasks to become more creative, innovative and productive involving the direct or indirect interaction (collaboration) with other individuals, groups or organizations (COLLABORATION@WORK, 2005). Collaborative platforms providing sophisticated upper middleware services required for environment and person-aware distributed collaboration. It is based on system integration of Web Services, Semantic Web, CSCW, utility-like computing and connectivity (grid or alike), sensor and wireless technologies (beyond 3G), advanced networks services (e.g. IPv6), knowledge and content management, and WFMS based on peer-to-peer design principles to enable radically new collaborative environments. They can provide the support and operations required for complex virtualised working environments. Works include development of tools for sharing resources, knowledge/resources discovery, service composition, CSCW tools (including multi-conferencing) to ensure stable, dependable collaborative applications.

In the future, developing and successfully commercializing new agricultural products and services, including those associated with site-specific agriculture, will require organizing increasingly complex partnerships. In the last decade a lot of different virtual systems and applications have been developed. We can find Virtual country, Virtual libraries, Virtual conference, Virtual market, Virtual field trips, virtual meeting, Virtual farm, Virtual agriculture tours, Virtual show rooms, Virtual lab.

Partners in the complex value-added partnerships of the future, including the partners with responsibility for research and technology transfer, will have to function as one; hence the term "virtual" agriculture. Virtual agriculture will depend heavily on networked computers. The information infrastructure must play a new role, enabling frequent, easy, powerful, and inexpensive communication and coordination within and among agricultural partnerships. To serve the diverse needs and desires of individual consumers and consumer groups and compete in highly competitive agricultural markets, specialized participants in the industry of agriculture, including consumers, must communicate with each other and coordinate their activities much more than their predecessors.

The key components of virtual agriculture and virtual R&D are the partnerships, that is, the teams or task forces that conduct the R&D and implement the resulting information and technology. The question is: how to organize and manage them, and how best to exploit their collective capabilities, is emerging as another specialty, a subdiscipline of management. Because value-added opportunities are created at the primary production level, farmers will be important partners in virtual agriculture.

The success of agricultural initiatives will depend on the capability of the specialists and the degree to which their activities are coordinated, integrated, and focused. Research and development (R&D) efforts enabling and supporting complex commercial initiatives in agriculture also will be organizationally complex. They will require unusually close relationships in which public institutions, local and regional development agencies are full partners in commercialization efforts.

Application Sharing is an element of remote access, falling under the collaborative software umbrella, which enables two or more users to access a shared application or document from their respective computers simultaneously in real time. Generally, the shared application or document will be running on a host computer, and remote access to the shared content will be provided to other users by the host user. A videoconference is a set of interactive telecommunication technologies, which allow two or more locations to interact via two-way video and audio transmissions simultaneously. It has also been called as visual collaboration and it is a type of groupware.

Modern collaborative working environments are utilizing:

- innovative technologies and media,
- human resources,
- ways of organising work
- and creating value chains in order to reach maximum, yet sustainable, productivity.

Enabling platforms providing sophisticated upper middleware services required for environment and person-aware distributed collaboration. It will be based on system integration of Web Services, Semantic Web, CSCW, utility-like computing and connectivity (grid or alike), sensor and wireless technologies (beyond 3G), advanced networks services (e.g. IPv6), knowledge and content management, and WfMS based on peer-to-peer design principles to enable radically new collaborative environments. It should reflect an open interoperable service oriented reference architecture built on top of lower layer middleware and offer sophisticated services such as discovery and allocation of resources (human, peers, content, knowledge, computing capacity and services); identity, security, privacy and trust; community management and sharing support; and environment awareness, including mobility.

- They will provide the support and operations required for complex virtualised working environments. Works include development of tools for sharing resources, knowledge/resources discovery, service composition, CSCW tools (including multi-conferencing) to ensure stable, dependable collaborative applications.
- These applications will benefit from sharing and accessibility of knowledge gain from cross-domain fertilisation and, when appropriate, leveraging on the experience on collaborative games. In particular, it is expected applications in the areas of collaborative design and engineering (fast prototyping), virtual manufacturing, maintenance, media/content production, e-Professionals, e-Scientist, and knowledge workers and information workers in remote and rural settings.

It is expected that work on enabling platforms and tools for collaboration would crystallize around Integrated Projects which will also demonstrate and validate those results on challenging application scenarios. These Integrated Projects are expected to create critical mass by covering: basic research (e.g.: methods, models, languages), component-based research (e.g. new generation tools) and system integration. Projects must stimulate systemic innovation in business and industrial systems by incorporating leading-edge users with visionary application problems and also mid-term issues and SMEs to ensure a wider take-up. Iterative testbeds and large demonstration should also be part of the IPs.

The number of research challenges to develop the enabling “upper layer” collaboration @ work middleware for distributed environments is so high that it is required a multidisciplinary research. The outcome will be enabling technologies that will support e-activities. The research challenges related to the following 9 issues will have to be tackled with:

- Reference architecture for collaboration at work,

- Ontologies for collaboration at work,
- Plug&Play interoperable service oriented architecture (SOA) for collaboration at work,
- Smooth "upper layer" middleware interaction with the underlying layers,
- Interaction among peers (workers, systems, robots),
- Utility-like computing capacity and connectivity,
- Contextualization and content,
- Group-level security, privacy and trust,

4. MOTIVATION FOR DEVELOPING COLLABORATIVE SYSTEMS

Research for agri-food and related sectors is one of several industry-focused clusters within the IST Programme. Under FP5, projects here explored innovative business models for eBusiness for the food, agriculture and fisheries sectors that aid value creation. In FP6, relevant work was undertaken in the Strategic Objective on Collaborative Working Environments. This aimed to develop next generation collaborative working environments that increase creativity and boost innovation and productivity (ERIS, 2006, ETC, 2006).

High-speed - or 'broadband' - internet access is essential to the prosperity and future development of Europe's rural regions. Broadband services are a prerequisite for eBusiness, and for the growth and jobs on which regional economies depend. Broadband allows individuals and organisations to communicate and access services regardless of their geographical location. By its very nature, broadband bridges distances and is particularly beneficial to the development and attractiveness of remote and rural areas. At the end of 2005 an estimated 13% of the EU population, or about 25% of households, had broadband access. In the EU-15 this increased to 90% of the urban population, but only around 60% of businesses and house- holds in remote and rural areas.

A number of EU-funded research projects have addressed the technical and economic obstacles involved in rural broadband access, such as:

- Roadmap for ICT Solutions for Rural Areas and Maritime Regions (RURAL WINS, www.ruralwins.org),
- Analysing Broadband Access for Rural Development (A-BARD, www.a-bard.org),
- The Potential Socio-Economic Impact of Broadband Access and Use on New Form (BEACON, www.ovum.com/beacons),
- Communications from Aerial Platform Networks Delivering Broadband Communications for All (CAPANINA, www.capanina.org).

ICT brings rural communities new solutions to economic, social and environmental challenges [6, 9]. eBusiness can do much to strengthen the vitality and sustainability of agricultural and related industries. New ICT approaches, however, offer solutions that will be as applicable to the small business as to the large. Important supported projects connecting the Agri-Food Rural Value Chain are the following:

- Agri-Food Roadmap:A Vision and Work Plan to Implement Future RTD Trends for the Transformation of Agri-Food Industries into Digital Companies (AFORO, www.aforo.net),
- Food Safety and Quality Monitoring with Microsystems (GOODFOOD, www.goodfood-project.org),
- Development of Long-term Shared Vision on AMI Technologies for a Networked Agri-food Sector (AMI@NETFOOD, www.ami-netfood.com),

- A Collaborative Platform for Working and Living in Rural Areas (C@R, www.c-rural.eu)

ICT is helping to improve food quality and safety through efficient and cost-effective tracking from farm to fork (HERDON and FÜZESI, 2006). Food safety is vitally important and work to improve it is going on all the time. There has been a major overhaul of EU food safety laws in recent years, partly as a response to the food safety scares of the late 1990s. Projects connecting to food quality and safety are the following:

- Trial of the Eurovet Animal Identification and Veterinary Surveillance System (EUROVET, www.viatrace.com),

Cold Chain Monitoring and Traceability Services (COLD-TRACE, www.cold-trace.com), Energy Efficient Sensor Networks (EYES, www.eyes.eu.org).

AMI@Netfood project objective is to provide valuable contributions to progress towards the achievement of the objectives of a European Research Area in the IST field, with a view to its application into agrifood and rural domain. AMI@Netfood, by generating consensus on a Strategic Research Agenda, contributes to prepare the ground for further RTD activities beyond FP6 by investigating future research challenges, RTD roadmaps and associated implementation models in the target domain. The key outcome achieved by AMI@Netfood project is related to first identify and reach EU consensus on medium to long term Research ICT priorities and second provide means to support the implementation of several of the identified priorities by means of a proposal for joint activities.

Once major feedback was received from AMI@Netfood constituency and sectoral stakeholders, the objective of the project has been focused to four specific RTD domains as follows (see also Figure 2)

- ICT applications for the complete traceability of products and services throughout a networked value chain.
- Collaborative environments in agri-food and rural areas.
- ICT as key enabler to support innovation and development in rural areas creating value for citizens and businesses.
- Innovative ICT applications in rural areas using broadband infrastructure

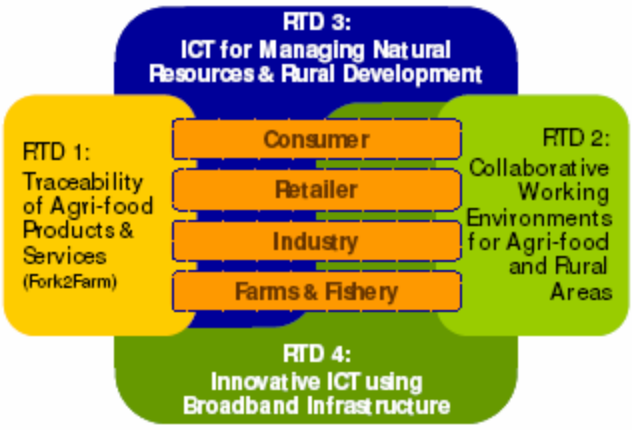

Figure 2: Identified RTD domains

Project key objective has been to provide valuable contributions to progress towards the achievement of the objectives of a European Research Area in the IST field, with a view to its application into agrifood and rural domain. To achieve the stated objective AMI@Netfood has selected as main tool the design of a Strategic Research Agenda containing a set of societal challenges and a number of RTD areas to be further developed with a view to prepare

the ground for further RTD activities beyond FP6. The key outcome achieved by AMI@Netfood project is related to build consensus on medium to long term Research ICT priorities and also to provide means to support the implementation of several of the identified priorities by means a set of potential joint activities. Specifically, AMI@Netfood has set up specific cooperation links with one very much related ETP in "Life Sciences" such as Food for Life. It has to be highlighted here the excellent welcome received from several partners responsible for different working groups under ETP Food for Life with whom possible co-operation channels have been identified for the future. In addition to close cooperation with ETPs, active cooperation with other EU finded projects has been pursued during the whole project.

References

Collaboration@Work. (2005): The 2005 Report on new working environments and practices. Luxembourg: Office for Official Publications of the European Communities, 2005 ISBN 92-894-9283-X. 2005

ERIS - European Regional Innovation Scoreboard (2006 RIS): (2007): This report was prepared by Hugo Hollanders (MERIT – Maastricht Economic and social Research and training centre on Innovation and Technology).2007. http://trendchart.cordis.europa.eu/

ETC - European Trend Chart on Innovation Annual Innovation Policy Trends and Appraisal Report Hungary. 2004-2005. (2006): European Commission. Enterprise Directorate-General A publication from the Innovation/SMEs Programme

European Commison. (2006): Information Society and Agriculture & Rural Development Linking European Policies.. Luxembourg: Office for Official Publications of the European Communities. 2006. 15 pp ISBN 92-79-02621-6

Gaceu L. (2008): Consideration Regarding ICT Development in Rumanian Rural Area. Journal of EcoAgriTourism. Proceedings of BIOATLAS 2008 Conference, Vol 2. pp. 323-326. ISSN: 1841-642X.

Gallagher M. D. (2005): "Promoting Broadband Deployment Across America" Promising Technology Solutions to the Rural Challenge. National Telecommunications and Information Administration. U.S. Department of Commerce. www.ntia.doc.gov. Phoenix, Arizona. November 7, 2005

Harter B. (2002): Microwave in Maryland. Rural America Goes Broadband. Wireless Broadband www.WBT2.com pp 42-45.

Herdon M. – Füzesi I. (2006): Quality control and product tracing in ERP systems, Computers in Agriculture and Natural Resources, Proceedings of the 4th World Congress, Orlando Florida, ISBN: 1-892769-55-7. pp.518-521.

Rural Development Programme for Scotland 2007-2013 (2006): The Strategic Plan. Crown copyright 2006 ISBN 0 7559 4968 4 Published by Scottish Executive St Andrew's House Edinburgh Produced for the Scottish Executive by Astron B45142 2/06

Rusten G. - Skerratt S. (2007): Information and Communication Technologies in Rural Society, Beeing Rural in a Digital Age. Publisher: Routledge