Accelerating innovation through partnerships: the role of universities

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Abstract

This paper discusses the role of universities in bringing innovation to society, in partnership with the ICT industry. Innovation is the application of knowledge to improve processes and products. In many countries, the vast majority of businesses are too small to successfully apply innovation and many of the public institutions do not have the skills or focus to drive high-potential innovation initiatives. In this scenario, universities have the opportunity to give high-value contributions, provided that strong partnerships can be put in place with leading technology companies and that there are strategic plans in place in the central and local Governments' agendas.

Innovation and the role of universities

Innovation is the buzzword of this decade. A famous article appeared in the Economist in 1999, referred to innovation as the "industrial revolution of the XX century"[2], stating that the innovation rhetoric has replaced the welfare economy of the post-war years.

For businesses, innovation indicates the set of activities that allow a company to produce and/or make possible new products or new operating processes. In today's small and medium enterprises in Europe, information technology penetration is often poor and process automation, knowledge sharing and collaboration technologies are still at their early stage of deployment. Therefore IT-driven innovation to keep businesses on the competitive edge is a priority in many countries.

In the consumer space, innovation means change in consumers' lives, habits, relationships made possible by technology. We see these "social innovations" in the ways how people access information, interact with one another, learn, produce and publish knowledge and entertain themselves. This *digital lifestyle* is the outcome of societal innovation and is gradually becoming reality.

When considering the role of universities, a number of things come to mind: first, the contribution given by universities to primary research, the backbone of market innovation. We recall the successful work done in Silicon Valley colleges to the flourishing of some of the information and communication technologies that have pivotal to the development of these last decades: operating systems, graphic interfaces and local area networking standards such as Ethernet, search engines, relational database management systems that have matured in the early '80s, or the effort around object oriented programming and later on the Internet standards. A contribution has also come from work done in some outstanding universities in Europe.

But innovation is the coupling of some of these fundamental advances with the ability to generate useful technologies, successful business models, new organizational processes and the proper mind share in society, all within a reasonable time frame and at affordable costs.

In this sense, innovation today is still mainly produced outside academia. Particularly in ICT, it is the private industry, or even the collaborative efforts in the consumer space, that have driven innovation in this last quarter of a century.

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[1] Citizenship Initiative Manager, Microsoft Italy

[2] *Fear of the unknown*, The Economist, Dec 2, 1999

Influencing the transformation

Innovation is a matter of speed. As we were watching the IT crisis of the post-2001 years, new amazing changes were emerging with the web 2.0[3], the advance in digital entertainment and the success of new Internet business models, based on viral marketing and online advertising.

Innovation is also a matter of recombination of technological and social advances that sometimes produce the big discontinuities that determine changes in the social and economic landscape. For example, the Internet boom of the beginning of this decade has been generated by at least three elements that occurred in the late '90s: the telecommunications deregulation in the USA and other countries, the Y2K *millennium bug* event and the dot-com business phenomenon.

Educational and research institutions can and should have a role in these transformations, but to do this often implies that their role needs to expand. In most of the European countries, much of the technological progress comes as adoption-expansion-application of things that have been invented elsewhere. But this is a strong reason for universities to have a stronger role. These institutions can leverage their know-how and exposure to the international environment and can contribute to knowledge transfer successfully, becoming a *driver* for accelerating innovation adoption and for making these countries contribute in an original way.

Here are areas that may be positively influenced by universities:

- Educating for the knowledge society
- Driving the information economy
- Piloting the strategic applications in the local environments
- Accelerating the know-how about process and organizational transformation in SMEs

In the following sections these aspects are explored in more detail.

Educating for the knowledge society

The primary role of higher education is to prepare the youth for the future. This means growing a new generation of people that besides the basic cultural and scientific background, can master the new elements that are changing society today.

But we should also not underestimate an additional value that is somehow paired to this: supporting the growth of society so that innovation can accelerate.

There is therefore a *pull* stage and a *push* stage. In the first one, universities get the advances that are occurring in the economy (for example, from the advanced technology leaders) and use them to educate the young people to the new paradigms. In the *push* stage, universities themselves help the local industry and the society overall to modernize and become more competitive. These two roles are both very important and the universities' long-term goal should in my opinion try to encompass them together.

To reinforce the importance of getting the right skills among youth, we can consider that, rather surprisingly, in Europe the highest unemployment and underemployment is among the young. At the same time, the demand for skilled workers outstrips supply and in 2008 there may be a shortage of up to half a million people across Europe in advanced networking and software technology skills. Studies also confirm that e-skills are the key to employment and inclusion in Europe, and they are increasingly becoming the entry ticket to the job market and better jobs. Computer literacy is becoming the fourth key skill required by employers alongside, reading, writing and arithmetic.

[3] *What Is Web 2.0. Design Patterns and Business Models for the Next Generation of Software***,** Tim O'Reilly, http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

Supporting the information economy

Information economy is the theory and practices of the rules of business of digital goods. An increasing share of the world's economy is driven by bits and with time this will be probably the most strategic asset of many countries.

Information economy has its rules, and markets driven by information are somewhat different from traditional markets. Some of the peculiar aspects of this include[4]:

- It's the value, not the cost, that drive the price of information
- Competition rules are redesigned
- Intellectual property becomes paramount
- Network externalities generate *positive feedbacks* in the economic system
- Cooperation, compatibility and standards are key factors of differentiation and growth

Examples of information economy segments are mentioned in Table 1.

Information segment	Mid-term scenario
Electronic Gaming	Continues to be a key application in young generations.
Digital TV	IPTV deployment to be spread widely in next decade.
Digital movies	Rapidly taking place with high-end broadband adoption.
Electronic books	Adoption in education system expected to be slow in next 5 years.
Electronic newspapers	Selected major papers to go digital by 2012.
Smart phones	Will consume an increasing part of the digital contents.
Digital music	Now growing at high double digit rates, deemed to replace traditional music.
Web advertising	Could grow to approach 100 b$ by the new decade.
Online commerce	Entire industries (e.g. travel, banking, media, consumer electronics) heavily adopting the web.
Arts digitalization	May see strategic investments in selected countries, as new international audiences get exposure to arts.
Tourism applications	Also considered strategic in some countries for the development of integrated services.
Micro-payments	Driven by smart cellular phones, will be mainstream in 5 years.

Table 1: information-driven business areas

Universities can contribute to the information economy development in a variety of ways.

- Driving the new economic rules into the mainstream courseware and growing specialists in the various disciplines, which contribute to this social-economical scenario: economics, marketing, legal, organizational, sociological specialists of the new digital-based society.
- Increasing the knowledge of the rules and behaviors with fundamental research in many of the areas impacted by the digital economy.
- Piloting the strategic applications that will enable fast growth of the digital economy, especially in Europe.

[4] *Information rules*, C. Shapiro and H.R. Varian, 1999

Piloting the strategic applications

High-end education can have a role in scouting the new strategic applications needed for a firm take-off of the digital economy in many countries. I view this as a local effort, since it will take place at different speeds and in different areas in each of the European nations.

One of these application areas is **tourism**, which can be of interest in a number of countries. As we look into the tourist experience today, we see that there are several areas that can profitably be improved. The fundamental problem is that too often the various potential activities that the tourist can engage in, are isolated and the typical tourist has to hand-pick them as he goes. A different scenario is one that integrates the various views, taking advantage of the positioning technologies and the local information on arts, culture, cuisine, lodging, banking, sightseeing and the other features that usually attract or service the tourist. The tourist can have a substantially improved experience and can getting around much more productively, gaining knowledge and deep understanding of the territorial culture, tradition and habits.

Another potentially fast growth application area is the **digitalization of arts work**. This has been done with some success in few museums around the world, but is still developing slowly. Italy, where the availability of arts museums and other cultural institutions is incredibly high, is still moving slowly in this area, leaving potential growth opportunities still untapped. Arts digitization involves catalogue technique to store the arts information in a way that can be easily retrieved and put in relation with other information, and the actual digitalization and web publication.

Some of these areas still need some work to be proven, and universities can contribute in significant ways:

- **Business models**. Work must be done to understand basic segmentation and targeting techniques in some of the new areas. For example, many museums are still reluctant to engage in digitalization and web initiatives because they aren't able to measure the risks vs. the benefits and have not yet identifying which is the proper market approach that they need to follow and how to go after it, what kind of partnerships to explore and how to identify the potential markets.
- **Implementation and standards**. Some of the mentioned potential areas of applications necessarily need large-scale projects and thus new methodologies in project management and implementation, plus work on the definition of the interfaces, protocols and procedures that guarantee duration, scalability and ultimately success to the project. Too often the public and private institutions that want to try do not have the skills of the resource span to even start on some of these projects.
- **Initial design and piloting**. Even when the resources can be identified, there is a clear lack of understanding on how to proceed in the initial scouting of the right solution. Incremental design and piloting technique are extremely useful but skills are usually lacking. This is where university project groups can contribute to the success of a specific project area, by doing the initial work and the proof of concept.

Contribution to transformation in SMEs

In some countries, smaller companies need help to implement innovation and increase their total competitive strength. For example, as shown in Fig. 1, the average online sales in small companies in EU is about 1% of total sales, which is quite low compared to the best-in-class, which is way above 3% (Norway).

Most of the time, the lack of presence on Internet is related to lack of business and technological know-how, which is itself linked to a number of factors, including the company size. For example, the average small company size in Italy is 4.2 people, low when compared to the 7.2 EU average.

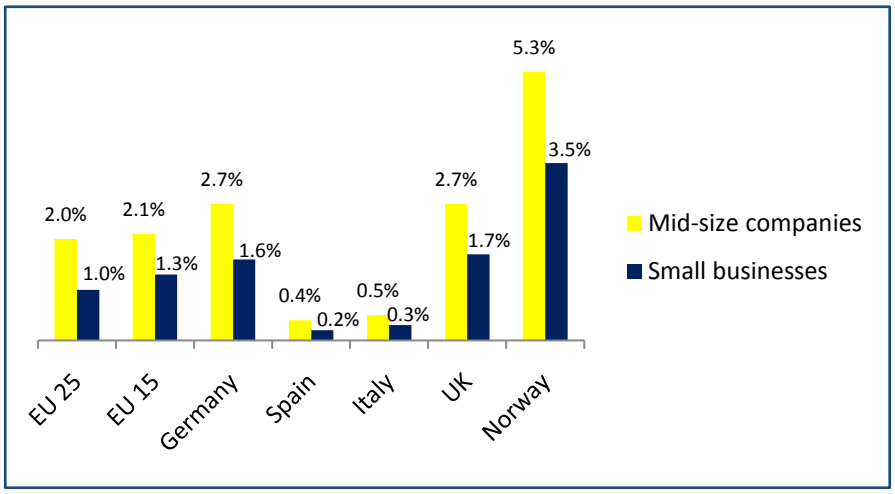

Fig. 1 – Internet commerce in SMEs in some EU countries as % of total revenues[5].

Universities can be of important help to the transformation of the small business environment in many areas. Table 2 reports some of the drivers of innovation in small businesses and the value that universities can bring in, which must be intended as the value that departmental researchers, senior or graduate students and the teaching staff can put to the table.

Business innovation driver	University potential added value
Customer management culture	Customer relationship management methodologies
Organizational culture	Organization models, best practices
Market intelligence	Business analysis methodologies and tools. Market research
Internet presence	Web sites design and implementation, content management
Electronic commerce	Market and target segmentation, web tools
Advanced marketing	The new rules of marketing in global and information age
Process automation	Business process analysis and optimization
Knowledge sharing	Knowledge management practices, Intranet and document management tools
Project management	Project management theories, methodologies, tools and software applications

Table 2: potential value delivered by universities in relation to businesses key innovation requirements

Innovative practices need to be identified to increase the contact perimeter between businesses and universities. These include more time spent by the research staff with local companies, opening courses to external participants from the industry, setting up formal partnerships between departments and business districts or associations, centers of innovation financed by the business but driven by university researchers and senior students.

Our experience is that university researchers, when confronted with the option to do more work with the local environment, appear very open and available, but they lament a lack of proper organizational processes

[5] *Community survey on ICT usage and electronic commerce in enterprises*, Eurostat, 2005

that facilitate this linkage, an unfriendly internal attitude t in universities and the lack of time left after the research and teaching duties. This is an unfortunate situation, given that in many local and regional areas universities have plenty of talents, sometimes underutilized, while businesses lack even the basic innovation skills.

Software business models

One area of debate is strong in many educational institutions and relates to the development, distribution and marketing of software, usually referred to as the *open source* vs. the *commercial* business models. The positioning of each model is quite well understood, so is the value of both. The open source movement has facilitated the growth of a strong collaboration community around the world and is often adopted in pilot studies and projects; the commercial software industry has brought industrial quality and strength to the software and has helped bring volume economies to this business, accelerating adoption and modernization.

University need not fight a battle of principles around this issue and will probably find useful to use both models. Open source can help bring quick new ideas to researchers around the world and share information, but intellectual protection is a must when ideas are to become market realities, and the incentive of economic success often drives innovation penetration in business and society.

For the development of the strategic applications, or for much of the work that universities do with the local businesses and public administrations, hybrid models can be adopted. The initial piloting can be done with source sharing to increase the probability to get quantity ideas and to ensure common understanding, while the actual project can be done with the classic industrial-scale techniques to ensure focalization, timing and quality. The distribution and licensing schemes can be negotiated on a project basis, considering the benefits and risks of each model. Intellectual property rights may be relevant for many of the university projects, since this ensures funding for further projects or for larger-scale initiatives.

Corporate experiences: Microsoft initiatives

Microsoft has engaged in the recent years in an increasing number of "citizenship" initiatives aimed at supporting innovation through the growth of the digital society, in partnership with local Governments and public and private institutions. These programs concentrate mainly on IT skills, a primary vehicle of technological growth. In 2006 an alliance was established with a number of other business leaders and public institutions, denominated *European Alliance on Skills for Employability*[6]. Through the Alliance, Microsoft has pledged to provide 20 million people in Europe with access to technology, content, certification training opportunities in computer technology and other skills by 2010. 8 million people have been reached to date, among them over 3 million students.

Other Microsoft programs have a broader scope and involve the IT ecosystem, fostering development and growth. Microsoft Research is also active to accelerate development of basic research in breakthrough areas in partnership with leading institutions in Europe.

Microsoft Innovation Centers

Microsoft Innovation Centers have been created as means to foster innovation and growth in local software economies. The Centers are focused on planning, researching, and developing of innovative software solutions with industry, academic, and government players. Today the network consists of more than 110 Centers in 60 nations, that offer students, professional developers, architects, IT professionals, and researchers access to world-class facilities, consultants, and resources. In many cases, Microsoft and government, universities, and industry organizations jointly operate these facilities.

[6] European Alliance on Skills for Employability: http://www.e-scc.org/alliance/

Microsoft Innovation Center program offerings are grouped into the following three areas:

- **Skills and Intellectual Capital accelerator:** software development courses, business skills and market development training, employment programs for students. Intellectual capital programs are designed to help develop both business and technical skills.
- **Industry partnerships accelerator:** they include software industry clusters, software quality certification programs, and support for select student-led research projects industry clusters. Proof-of-concept projects and workshops for software companies are also offered.
- **Innovation accelerator.** The centers help foster innovation through hands-on experiences and the use of custom courses.

European Science Initiative

In 2005, Microsoft launched a new strategic research initiative – the European Science Initiative (ESI)[7] – focused on enabling and accelerating new 'kinds' of science and computing – important new fields now emerging at the intersection of both.

The initiative aims to play a key role in the development emerging at the intersection of computer science and the sciences, a development set to underpin a new era of science-based innovation. It is also critical to understanding and addressing some of the most important foreseen future challenges, from environmental change to the understanding of biology and deeper diagnosis of diseases.

The European Science Initiative is now well underway, rapidly implementing an ambitious scientific and technical vision and agenda through collaborations with leading scientists in Europe and around the world in the areas of Computational Biology and Computational Ecology and Environmental Science.

Computational Biology: enabling fundamental advances in biology through fundamentally new kinds of computational tools and methods. It is in the natural sciences where many of the greatest scientific, social and global challenges are to be found. It is in these areas where the greatest impact of computer science is likely to be felt. Conceptual and technological tools developed within computer science are starting to have wide-ranging applications outside the subject in which they originated, especially in sciences investigating complex systems, most notably in biology and chemistry. The underlying vision is that computer science is poised to become as fundamental to biology as mathematics has become to physics. In fact, there is a growing awareness among biologists that to understand cells and cellular systems requires viewing them as information processing systems. Many believe this is a potential starting point for fundamental new developments in biology, biotechnology and medicine.

Computational Ecology and Environmental Science. Developing novel computational tools and methods to predict and mitigate the rapid changes occurring in the earth's life support systems. Understanding the earth's life support systems, and predicting and mitigating the rapid changes that are occurring in these systems because of human activities is one of the great global scientific challenges humanity is currently facing. The programme in ecological and environmental sciences aims to contribute to meeting this challenge by working with the scientific community to identify critical problems and develop novel computational methods and tools for addressing these problems.

Two major joint Research Centers have been established in Europe.

Centre for Computational and Systems Biology. Launched in February 2005, the Microsoft Research-University of Trento Centre for Computational and Systems Biology[8], is a joint venture between Microsoft, the Italian central and local governments, and the University of Trento in Italy.

[7] European Science Initiative: http://research.microsoft.com/ero/
[8] Microsoft Research-University of Trento Centre for Computational and Systems Biology: http://www.cosbi.eu/

The Centre is operating in the convergence of life sciences and computer science to develop new conceptual and computational tools to enhance our understanding of dynamic evolution of biological systems. In the meanwhile, the aim is to better understand how biological entities process information, reverse-engineer them and try to develop the next-generation of new powerful and reliable languages and frameworks for software development.

Researchers' focus now is to create a new generation of computational tools for the life sciences, in order to better understand and predict complex processes in biological systems. In the long-term, this could revolutionize our understanding of disease, and lead to new therapies and vaccines. The centre is also establishing close cooperation with experimental scientists at both the domestic and international level to maintain a close relationship with real biological data.

Microsoft Research-INRIA Joint Centre[9]. In April 2005, the French Ministry of Research, Microsoft and INRIA, the French national institute for research in computer science and control, agreed to create a new joint laboratory in the Paris region. Research at the Centre will investigate two key areas of computing and science: the first is the application of mathematics to improve software and systems security; the second area is the development of new software tools for effective management and analysis of increasingly highly complex scientific data.

Microsoft IT Academy

The Microsoft IT Academy Program[10] is an initiative designed for two goals: first to help students master technology skills that prepare them for today's workplace, second to give workers an opportunity to improve technology skills. Achieving technological proficiency broadens career choices for individuals, and provides employers with a workforce better equipped for the work needs.The program is open to accredited academic institutions, including primary, secondary, post-secondary, trade or technical institutions, and sources of continuing education.

The IT Academy uses a curriculum, online learning resources, faculty training, courseware, Microsoft certification, job and internship support for students.

The program is available in more than 100 countries. In Italy alone, the participating educational institutions are above 160.

Students to Business Program to Develop Skills for Europe

The Microsoft's Students to Business (S2B)[11] program was launched in November 2006 with the objective of allowing graduating technical students to accelerate their entry in the job market. The students are offered internship positions in innovative software companies that will provide them with often valuable experience and allow them to expand their skills. The program is a Microsoft community initiative, connecting Microsoft partners with universities.

The objective of the S2B program is to inspire local businesses to communicate the competency requirements for new talent, leveraging Microsoft and universities to provide the needed skills, and create opportunities for local students to work on real projects. In Italy alone, about 400 students have joined the program in the last 12 months.

[9] Microsoft Research-INRIA Joint Centre: http://www.msr-inria.inria.fr/
[10] Microsoft IT Academy: http://www.microsoft.com/education/msitacademy/
[11] S2B program: http://www.s2bprogram.com/