# Valorisation of Academic R&D: The INTERVALUE Platform

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This paper presents an organizational framework and a methodology toolkit that tackles one of the major hurdles of economic development in South East Europe (SEE), the missing link of the innovation triple helix: the valorisation of research performed in the region's universities and research centres. SEE region is lagging behind in terms of innovation even though it includes many active research centres and university labs, producing results that cannot find their way to the market. The concept of a deficit in R&D expenditure has recently served as a crucial focusing device for research and innovation policy in the EU. Relevant studies assume that R&D support mechanisms must strengthen the R&D take-up by creating critical system links oriented to market-driven R&D efforts. Support actions for strengthening this interaction are limited by low-level accessibility of R&D results by enterprises, due to internalities of research effort; weak knowledge transfer mechanisms; communication barriers between academia and industry; failure to meet a critical mass of R&D results due to isolation and lack of cooperation. Based on the work performed within the INTERVALUE project (funded by the SEE Territorial Cooperation Program), a methodology and a web-based toolset has been developed that allows innovation intermediaries (such as knowledge transfer offices within Universities) to identify potentially marketable R&D and provide valorisation plans that could lead to market commercialisation of R&D. The toolset guides IP valorisation agreements based on detailed examination of each R&D result with regard to its technical feasibility, IP protection, market potential, and investment/ funding opportunities.

**Keywords**

Valorisation of R&D; academic technology transfer; web-based research valorisation.

## 1. Valorisation of academic R&D

Universities have become innovation ecosystems of major importance. The shift towards knowledge-based development, the increasing importance of science and technology in sustaining innovation and competitiveness, the limitless growth that knowledge can generate, make universities more sensitive to the valorisation of their intellectual capital and the generated intellectual property deriving from their research activity. The valorisation of academic R&D and the generated IP is the key process in the creation of university-based innovation ecosystems. Complementing learning, research and innovation gave birth to

university-based innovation ecosystems, which rely on institutions of research-industry intermediation, liaison offices and triple helix alliances, while the campuses host new research and science parks. University cities encourage strongly this orientation and contribute financially to the development of infrastructure that helps creating such university-based innovation ecosystems. Public policies in many regions provide support to universities for creating infrastructure and institutions that encourage the embrace of innovation, growth and job creation.

The commercialisation of university research outcomes (an equivalent term for academic R&D valorisation) has become an important issue in both literatures of university reform and innovation development. Especially in the literature of innovation, a strong interest on university R&D, which is considered as a major and unexploited deposit of innovation, is observed. EU statistics document also the shift of technology transfer towards academic research. This is due, on the one hand, to the fact that about 40% of the global R&D effort takes place within university labs and public R&D centres [1], and on the other hand, to the fact that university R&D is a source of radical innovations generated from breakthroughs in science and technology. Innovations in two major sectors of our time, information and communication and biotech industries have started and have been continuously fed by academic R&D and science-based novel products.

Arguments about the characteristics of the bond between academic R&D and innovation abound in the literature. The transition from a linear model towards systemic and open models [2, 3, 4] and triple-helix collaboration [5] are among the most known.

From an operational point of view however, it is important to underline the difference between contractual or formal procedures of valorisation, such as research contracts, patents license, «buy-sell» transactions between academic institutions and companies, and collaborative or emerging relationships between universities and firms [6]. In the former case, valorisation is seen as a process resulting from a contract between technology supply and demand, where suppliers and users of technology operate independently and the gap between them is bridged by a licensing contract. In the latter, valorisation of academic R&D relies on interdependences, interactions and interactive learning between different bodies, arising from collaboration networks and collective learning processes. This collective sharing and transfer of knowledge among the actors involved in the process constitutes the basis of territorial systems of innovation and localised interactive learning processes [7].

Another meaningful distinction is made with respect to the policies that shape this relationship. Goldfarb and Henrekson [8] identify two central policy models, bottom-up vs. top-down policies of university intellectual property commercialisation, which are formed by incentives for universities to commercialise their research and by governments directly creating mechanisms that facilitate commercialisation. In the former case, which is common in US universities, intellectual property from R&D is awarded to universities. The Bayh-Dole Act adopted in 1980 allowed universities to appropriate the property rights resulting from university research that was funded by federal grants. This encouraged universities to create hundreds of technology transfer offices, which cover expenses associated with marketing, patenting, and license negotiation. The organised promotion of IP and the availability of funds for this purpose make commercialisation more likely when IP rights belong to universities.

In the second case, which is common in Sweden and many EU countries, IP rights stemming from R&D are awarded (fully or partly) to the inventor. A result of faculty ownership of property rights is that universities have little incentive in technology transfer, which discourages the systematic pursuit of research valorisation. This barrier, combined with constraints in the entrepreneurial activity of academics, leads to very low level of research commercialisation. “In a system that discourages faculty involvement with industry beyond consulting and where the property rights rest with the researcher, there is a lower likelihood that the commercial benefits of academic research will be reaped.” [8, page 647].

There are a few research valorisation / commercialisation mechanisms. At the end of a research project most usual commercialisation is (1) post-research contractual agreements to pursue research further, (2) consulting assignments during the product development phase, (3) technology licensing to allow use of research for commercial purpose, and (4) equity in spinoffs creation. However, barriers to the post-research commercialisation phase are numerous, due to many and diverse factors: low-level accessibility of R&D outcomes by enterprises due to internalities of research effort; weak knowledge transfer mechanisms; weak commercialisation incentives; communication barriers and language gaps between academia and industry; failure to meet a critical mass of R&D results due to isolation and lack of cooperation.

Most of them, however, are related to the existence or not of institutions that undertake valorisation systematically. Research on entrepreneurial universities indicates that most academics naively presume that a discovery will somehow automatically produce financial rewards [11]. On the contrary the existence of dedicated institutions, such as university technology transfer, liaison, and marketing offices can multiply substantially the level of research valorisation: “we are witnessing a phenomenon wherein universities that are reactive in technology transfer will respond to the rare entrepreneurs and faculty members who wish to “pull” inventions or technologies out of the institution. As these institutions become proactive, their mix of licenses becomes more balanced as more out-of-state deals appear with larger, established licensees” [12].

## 2. The INTERVALUE project concept

The “Inter-regional cooperation for valorisation of research results – INTERVALUE” project is based on the above consideration about academic R&D and its significant role to innovation. Furthermore, the project takes into account that the South East European region is lagging behind in terms of innovation even though it includes many active research centres, producing results that cannot find their way to the market. Recognizing the reality of the small market of each one of the national entities in the region, as well as the nature of scientific research that transcends borders, INTERVALUE is aiming to use the concepts of trans-national cooperation and networking in order to overcome the region’s innovation deficit by valorising the existing academic potential. INTERVALUE aims to bridge the gap between R&D creators, producers, financiers and marketers by creating a trans-national mechanism that facilitates the valorisation of research results. Trans-nationality is emphasized since the various stakeholders of R&D valorisation (researchers, financiers, producers and marketers) could come from one country and there will be interaction between researchers and transfer of experience between stakeholders in different countries. The overall objective of INTERVALUE is to set up a mechanism covering most of the SEE area, which allows sharing and dissemination of key technologies and helps to establish supply chains between the R&D institutions and the business sector. The project follows an integrated approach for

strengthening the linkages among university R&D, industries, and public or private funding schemes through the involvement of experts in the evaluation and valorisation of R&D results.

INTERVALUE adopts a bottom-up approach that allows interesting research to reach its market potential through a process of selection and promotion to relevant audiences. It creates a SEE-wide Repository of potentially exploitable R&D outcomes by building local research exploitation communities and by working with selected researchers and laboratories. An Experts' pool and database is created that utilises a four-way assessment toolset, to facilitate the valorisation of research results. The toolset is created to be used by innovation intermediaries (such as knowledge transfer offices within Universities) to identify potentially marketable R&D and to generate valorisation plans that could lead R&D outcomes to the market. The toolset allows the formulation of valorisation and promotions plan based on the detailed examination of each R&D result with regard to (1) technical feasibility, (2) IP protection, (3) market potential, and (4) investment and funding opportunities.

The *Technical Feasibility* aspect of the toolset focuses on the technical maturity of the research result in relation to its deployment as a product or a service that can be commercially exploited. The expert team is asked to cooperate with the research team in order to explore the following features of the research result: Has the result being tested and at which level? Is it tested as a Prototype, a Pilot Application or an Alpha/BETA testing? What were the results of this testing and based on them what further testing is needed to be done? What would be a realistic time frame for these further tests and what are the costs associated with them? To what extent does the research team have technical resources for supporting the production of a new product (in terms of human resources, knowledge, hardware, etc.)? What are the technical issues that need to be tackled for full deployment of the product or service? What additional technical resources are needed for the production of this new product? What are the materials, tools, technologies and staff effort that are necessary for full deployment (full scale production) of the product or service? At the end of the Technical Feasibility assessment exercise, the assessment team is able to produce a clear picture of the technical issues that need to be tackled in order to be able to bring the research result to the market.

The *Scientific Relevance* aspect of the toolset is concerned with the scientific and Intellectual Property futures of the research result. Here the expert team attempts to position the research result in terms of trends in contemporary and future research and to define possible ways to further expand this research. The following issues are being examined: How does the result fit with the state of the art in its scientific field? What is the problem/ need/ knowledge gap that the research result is responding to? How was it addressed before and what is the approach that makes the result unique and valuable? What is the potential for further research? What is the potential of the research result for synergy with other research areas either in the same or in a different discipline? What is the proposed method of IPR-protection (patent, license, trademark etc.)? What are the steps that need to be taken in order to secure the IPR-protection and what are the associated costs? What is the expected impact of the research results exploitation? Based on the above, the expert team is able to assess the scientific maturity of the research result, the optimum way to secure its IPR and the potential for further research either on the same direction that was followed up till now or in pursue of other relevant research objectives.

The *Market Potential* aspect of the toolset explores the market (existing or potential) of the new product or service that can be developed based on a research result. This part of the toolset will utilize input from the Technical Feasibility and Scientific Relevance parts and use

market analysis techniques in order to determine: What is the Unique Sales Proposition of the potential product? Is this a Technology-driven innovation or a Market-driven innovation? What would be the added value for end-users? Would this added value be based on higher quality or better technical characteristics? What is the target market for the product? Can this market go beyond the national level to a European or even global market? Will the product or service address existing demand or future/ hidden (latent) demand? Are there any existing or potential strategic partnerships that can be used for the marketing of the new product/ service? What is the current level of competition within the target market and what competitive advantages will the introduction of the new product ensue? Will the potential products be marketed to regulated or open markets? And finally what is the estimation of the cost of the new product, the expected sales volume and the expected market share? By answering these questions the expert team formulates the seed of a market analysis that could yield in the future a market plan for the product/ service.

The *Investment and Funding Potential* draws on the suggestions of all the previous parts of the toolset (Technical Feasibility, Scientific Relevance, Market Potential) in order to develop a summary version of a cost/ benefit analysis that includes reference to projected Costs (fixed costs, personnel costs, other running costs, marketing costs), expected Sales Volume and Revenues for a 3-5 years period. It also includes an evaluation of the financial Risks associated with further investment in the research result's exploitation. Finally, the expert team having assessed the level of investment required to develop the research result, is providing an assessment of suitable funding sources i.e. EU finding, national/ regional funding, private funding (VC, banks, sponsors) etc. The end result of the investment analysis is a basic version of a business plan for a new product/ service.

The four-way assessment based on the toolset provides different insights to different stakeholders in the exercise. For the research team: Regardless of the decision to proceed with potential exploitation of the research result (either through licensing, patenting, creation of a spin-off etc), the research team will have at its disposal a valuable road map that defines the basic parameters of commercial exploitation and provides expert insight that could be used for further development. For potential financiers: The exercise provides a clear picture of the potential for commercial exploitation and an initial estimation of the costs, risks and revenues that are to be expected.

Overall, INTERVALUE is building a transnational innovation supply chain in the SEE region based on academic research, which combines a *Repository* of promising R&D, a pool of *Valorisation* plans, and follow-up processes for research dissemination, promotion, *exploitation agreements*, and funding.

## *3. The INTERVALUE platform*

The above described processes of collection, elaboration of detailed valorisation plans, and commercialisation of research are guided and supported by a digital space, the INTERVALUE Platform. It is a meta-repository of R&D results and a collaborative web-space facilitating the interaction between researchers, companies and experts, and supporting innovation by academic research.

The Platform has three principal components (Figure 1):

- The Repository space: Research teams and technology providers from universities and research and technological institutions submit research outcomes that can lead to new products, production processes and services.
- The Valorisation space: A network of experts helps researchers to create valorisation plans for their R&D results covering technical feasibility, IP protection, market potential and funding potential, along the perspectives discussed in the previous section.
- The IP Agreements space: Research outcomes and valorisation plans are promoted to selected markets and brokerage events in view of achieving different forms of commercialisation agreement: new contracts, licenses, or equity. Online learning roadmaps, newsletters, models of IP agreements, and pilot applications create a learning environment guiding IP commercialisation.


**Figure 1. INTERVALUE Platform: Repository – Valorisation – IP Agreements**

The Platform was developed along Web 2.0 principles in view of facilitating the creation of content by multiple users. The WordPress MU or multi-user (http://mu.wordpress.org) was used as basic content management system, which was customised according to the needs of the project concept. The multi-user WordPress is ideal for cases that run multiple content applications or in cases of multiple users hosting services. The development of the Platform followed also the principles of the service-oriented architecture (SOA), in terms of reuse, granularity, modularity, composability, componentization and interoperability, and services identification categorization, delivery, and monitoring and tracking.

Each component of the Platform was organised along a three-tier architecture: (1) The presentation tier, which is the topmost level of the application and displays information related to such services as browsing merchandise, purchasing, and shopping cart contents. (2) The applications tier, which controls an application's functionality by performing detailed processing. (3) The data tier, which consists of databases in which information is stored and

retrieved. This tier keeps data neutral and independent from application servers or business logic. Giving data its own tier also improves scalability and performance.

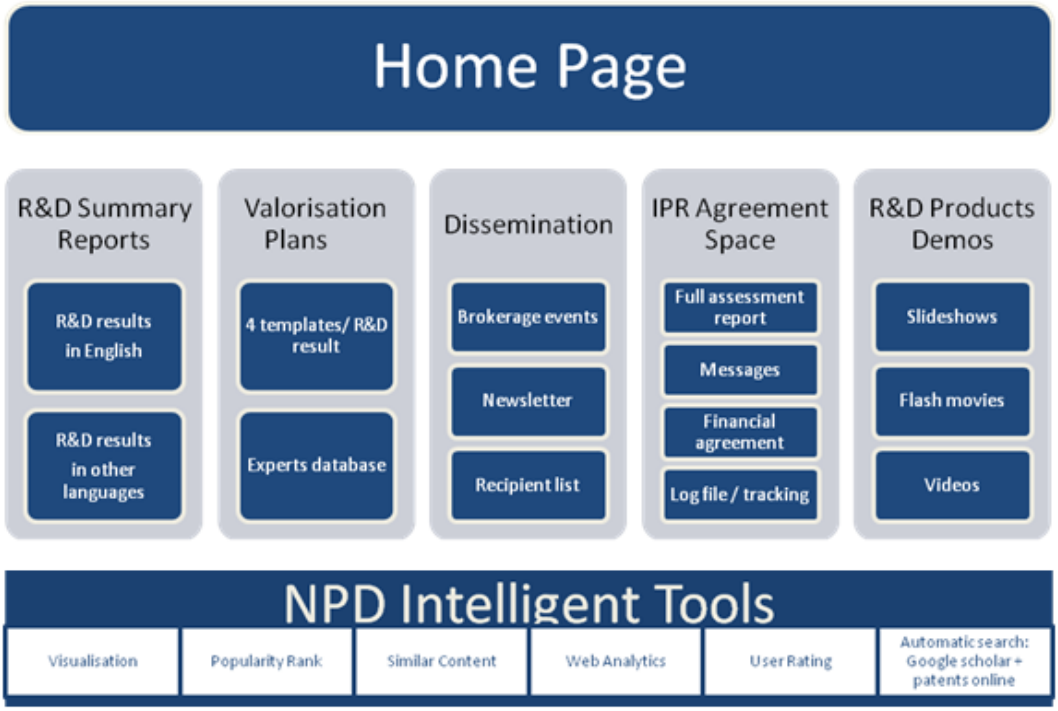


**Figure 2. Architecture of the Platform**

The components of the INTERVALUE Platform, presented on Figure 2, together with the work of experts and the participation of users create an intelligent space for efficient R&D valorisation.

- The collective action of users, in the first place, uploads content on the Platform along a predefined template (T0) for R&D description. At the beginning of the project, universities from the SEE region feed with R&D data, but as the Platform is open, it is expected that other universities will follow in the collective gathering and upload of research.
- Then, individual experts create the valorisation plans along four other predefined templates (T1, T2, T3, and T4). Four methodologies and a learning roadmap assist these reports on technical feasibility, IP protection, potential market analysis, and funding opportunities investigation. The cooperative work of experts is disseminated in brokerage events and communicated via newsletters.
- The Platform assists all these procedures: the repository of R&D in the beginning, the drafting of valorisation plans according to the four templates, the dissemination of information. An IPR agreement space facilitates different forms of commercialisation agreements, from new research contracts to equity in new business creation. A series of intelligent tools and collective intelligence algorithms bring additional content to users, in terms of visualisation, popularity of entries, similar content, and web analytics. Thus the Platform offers an organisational and methodological framework for the valorisation and commercialisation of IP.

Users, experts, and the Platform set in motion a collaborative system, which combines the individual capabilities of experts in drafting valorisation plans, the collaborative work of a large number of users for content creation, and the data storing, retrieval, and analysis of the

web applications. It is a system having all the fundamental characteristics of an intelligent community [12].

## 4. ***Barriers in the valorisation of academic R&D***

Academic R&D is often regarded as a "world of its own" impenetrable by society and most importantly by the people that could make use of it at a commercial level: the financiers, the marketers etc. This is particularly true in the European context. According to an EC communication: *"Compared to North America, the average university in Europe generates far fewer inventions and patents. This is largely due to a less systematic and professional management of knowledge and intellectual property by European universities. Moreover, efficient knowledge transfer in European research institutions is hindered by a range of factors, including: cultural differences between the business and science communities; lack of incentives; legal barriers; and fragmented markets for knowledge and technology*" [9]

The process of transforming academic research into marketable products or services, involves three kinds of actors:

- Researchers themselves (usually a research team that has some kind of strong or loose affiliation with a University or research institution.)
- Funds and capital providers (banks, VCs, or plain businessmen)
- Intermediaries (academia – industry liaison offices, consultants, lawyers, technology brokers, technology transfer specialists, innovation professionals)

For each of the above actors, certain obstacles are identified and need to be dealt with.

At the level of the researchers the main obstacles are: Lack of understanding of the business environment; a tendency to either overestimate or underestimate the commercial potential of research; a sense of insecurity regarding relations with capital providers; a tendency to focus on a single set of questions and interests that does not allow crossovers to other disciplines and exploitation of knowledge in non-conventional ways; isolation that leads to failure to meet a critical mass of R&D results; lack of an IPR policy at the institutional level that would set clear rules and incentives. [10]

At the level of the capital providers, the obstacles include: too much focusing on numbers leading to systematically underestimating potential investments coming from research ideas; lack of technical and scientific skills are not regarded as problems, so they are not tackled at an appropriate level; focusing on short term results and quick yields of investments; inability to access small innovative start-ups and spin-offs.

The above obstacles demonstrate the necessity for the existence of appropriate mechanisms that could bridge the "distance" between the two worlds of academia and finance. The role is usually being covered by organizations like the knowledge transfer offices of the Universities or local/ regional innovation support entities. Still, according to the EC: *"The personnel working on knowledge transfer must possess a wide range of skills in order to carry out their tasks effectively. However, relatively inexperienced staff is often appointed to such positions. Continuous professional development exists in a limited number of countries but it is often inadequate in terms of cost and/or delivery"* [10]. Intermediary mechanisms tend to be either attached to academia (i.e. industrial liaison offices) or to a financial institution (i.e. the VCs that are being established by banks). In this sense they are not truly intermediaries and they are not able to perform their basic function which is to facilitate the flow of knowledge between the world of academic research and the world of the "market". Often they do not have the necessary capacity and incentives to produce success stories while they

experience lack of specialization of their staff who are either too broad (generalist) or too narrow (overspecialization). Building an appropriate intermediary mechanism is one of the main challenges for any local/regional innovation system.
The last observation highlights the importance of the existence of innovation/ knowledge transfer policy. So a fourth type of actor at play should be also considered: The policy maker (either at a national or local/regional level). The basic obstacle that inhibits the role of the policy maker is the fact that their policies are often fragmented.. Policies that address the academia are indeed designed and implemented but they quite so often neglect the needs and drivers of the business world. And the reverse is true regarding policies that are addressing primarily the business world.

A really successful national/ regional research and innovation system will have to find a "fine balance" between the "scientific/ technological" perspective which only an extrovert, flexible and innovative academic community can offer with the "business" perspective that a risk prone, entrepreneurial and global-minded finance community can contribute. Putting together researchers and business people to achieve this fine balance is the challenge of any policy and requires the employment of able, sustainable intermediary mechanisms.

## References


[1] Jaruzelski, B. and Dehoff, K. (2008), "Beyond Borders: The global innovation 1000", *Strategy and Business*, No 53, Winter.

*[2] Chesbrough, H. (2003)* Open Innovation: The new imperative for creating and profiting from technology*, Boston MA: Harvard Business School Press*

*[3] Chiesa, V., Manzini, R. and Pizzurno, E. (2004) "The externalisation of R&D activities and the growing market of product development services"* R&D Management*, Vol. 34, No 1, 65-75.*

[4] Godin, B. (2006) "The Linear Model of Innovation: The Historical Construction of an Analytical Framework", *Science, Technology & Human Values*, Vol. 31, No. 6, 639-667

[5] Etzkowitz H. (2002) "The Triple Helix of University - Industry – Government Implications for Policy and Evaluation", Working paper 2002 - 11, Science Policy Institute.

*[6] Harmon, B., Ardishvili, A., Cardoso, R., Elder, T., Leuthold, J., Parshall, J., Raghian, and M., Smith, D. (1997) "Mapping the university technology transfer process",* Journal of Business Venturing*, No. 12, 423-434.*

*[7] Kyrgiafini, L. and Sefertzi, E. (2003) "Changing regional systems of innovation in Greece: The impact of regional innovation strategy initiatives in peripheral areas of Europe",* European Planning Studies*, Vol. 11, No. 8, 885-910.*

*[8] Goldfarb, B. and Henrekson, M. (2003) "Bottom-up versus top-down policies towards the commercialization of university intellectual property"* Research Policy*, No 32, 639-658.*

[9] European Commission COM(2007)182 final: "Improving knowledge transfer between research institutions and industry across Europe: embracing open innovation – Implementing the Lisbon agenda" (April 2007)

[10] European Commission Recommendation COM(2008)1329 "On the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organizations" (April 2008)

[11] Etzkowitz, H., Asplund, P., Nordman, N., (2000) "The university and regional renewal: emergence of an entrepreneurial paradigm in the US and Sweden", cited by Goldfarb and Henrekson (2003).

[12] Waugaman, P. G. and Tornatzky, L.G. (2001) "Benchmarking University-Industry Technology Transfer in the South and the EPSCoR States" Southern Technology Council.

[13] Komninos N. (2008) *Intelligent Cities and Globalisation of Innovation Networks*, London and New York, Routledge (pp. 121-124).