TULI-program: A vehicle to generate academic innovations

Author:

Tuomo Pentikäinen (Finland)
Organisation: TEKEL, Finnish Science Park Association

TULI-program: A vehicle to generate academic innovations

Paper submitted for IASP 2006 world conference

Tuomo Pentikäinen
TEKEL, Finnish Science Park Association
mailto:Tuomo.Pentikainen@tekel.fi

Abstract

TULI programme is the biggest Finnish pre-seed initiative and it supports academic start-up companies and licensing. It is funded by government, whereas its management, coordination and implementation are done by Finnish Science Park Association and by regional science parks. Each year circa 600 academic business ideas are evaluated and some 200 of them are funded. TULI has supported foundation of more than 110 start-up companies and circa 80 TULI-backed inventions have led to licensing.

TULI is an example of public-private collaboration where science parks are used as a delivery channel and development platform for a public innovation policy initiative. This has required specific tools and strategy for network coordination and management. Moreover, specific information systems, decision support systems and follow-up procedures have been needed.

Experiences from the TULI programme support strongly the postulate of modern innovation theory – the chain-linked model of innovation. Universities and research institutes clearly do not only function as deal flow generators but they took actively part in different phases of innovation development also during and even after the TULI-activities.

1. Introduction: Is commercialisation of research results an issue for universities and research organisations?

In all OECD countries, commercialization of research results has become an increasingly important policy issue (Mustar, 2001; Rodriquez, 2003; EU Commission, 2005) and among scholars it has been seen as a central part of innovation systems (e.g. Lundvall 1992, Pavitt, ref). Much of these discussions and related actions originate from the USA, where the first experiments were made in the late 60s as Stanford Licensing Office was established and especially since the Bayh-Dole act came in force in the early 1980's. Since then licensing of intellectual property and spin-offs have gained increasing attention among university administrators and policymakers. Despite a growing number of patents issued to universities and public research institutions in the US, EU and Japan since the mid 1980s, licensing has not been very successful and especially not a very lucrative way of transferring IP from public research organizations to industry (OECD 2002). Despite of that, licensing is likely to offer other than direct financial benefits to public research organizations. Licensing functions as a strong incentive for researchers to take the commercial value of IPR in consideration in different stages

of research. Moreover, licensing works as a strong signaling vehicle of the quality of public research institution.

Public research institutions transfer their intellectual property to the market in many ways. Traditionally, collaborative and contract research projects have been the most common means to enhance technology transfer from public research sector to businesses. In contract research, a company pays the public research institution to undertake a specific piece of research on its behalf and receive the rights to exploit on any intellectual property created. In collaborative research, on the other hand, the research is co-funded by industry and the public research institution or a public funding agency. In this case, the rights to exploitation of intellectual property in principle belong to all members in consortia but typically the rights are negotiated.

However, licensing of research-based intellectual property is only one part of commercial exploitation of research results. Procurement and recently also start-up generation and incubation schemes have been analyzed and piloted. Several universities and research institutes have implemented different initiatives, schemes and programs that aim at management of academic IPR's and innovation development of them. However, majority of these practices are in their early stages and only fragmented information of the phenomenon per se let alone analysis made of the issue exist. A macro level study about European commercialisation practices was made by Callan in 2001, and it clearly revealed that the topic is emerging but understudied in Europe (Callan, 2001). Recently Lambert (2003), Ndzanzhou (2005) and Valovirta et al (2006) have listed current and recent initiatives of European universities and research authorities to commercialize results of publicly funded research.

Efforts to enhance commercialization of research results arise partly from the expectations by public stakeholders who want to improve the effectiveness of public R&D investment in order to get better value for resources invested in R&D. Research organizations themselves have also become more interested in developing innovation support activities and commercializing their research results.

Despite the growing interest in commercialization, there is a warranted fear that closer ties between science and industry create various risks by compromising the openness, objectivity, and independence of academic research (Feller 1991; Ziman 1994; Bok 2003; Tuunainen 2004). Yet, there is a considerable amount of scepticism on how commercial requirements may be harmonized with other functions of public research institutions (Delanty 2001; Tupasela 2000; Jacob 2003, Kutinlahti 2005).

This paper represents one case study about commercial utilization of research results: The Finnish TULI program. The next section describes briefly the structure and organization of the TULI program. The following section reports and analyzes the central results of the TULI program. The final section concludes.

2 The TULI program

Innovation support has been a focal policy objective in Finland since 1960's (Lemola, 2001). Especially the 90's witnessed active development of Finnish 'systems of innovations', that were partly inspired by Lundval's (1992) and Porter's (1990) original works. Finnish system of

innovations was manifested in mid 90's (Hernesniemi et al., 1996) and very soon it became the outspoken strategy of Finnish science and technology (Lemola, ibid). One part of this policy was improvement of commercial utilization of academic research.

In the early 90's, Finnish National Technology Agency, whose core activity is R&D project funding for Finnish industry and research organizations, established a new innovation development and funding instrument TULI, which after 8 years of piloting was scaled up to a national program in 2002. It has full-time commercialization experts who work mainly at science parks and in deep collaboration with local universities and research institutes to screen and evaluate new research-based business-ideas. TULI's annual financial volume has grown to over 2.5 M€, and it operates via 8 regional TULI-centers. TULI offers pre-seed funding, which can be up to 10 k€ for each project. (see Kuusisto et al. 2004, Valovirta et al (2006)).

Funding decisions concerning single research-based inventions are made by regional project groups, where the corresponding TULI-center's project manager works as a secretary and other representatives include central IPR and innovation related executives and managers from universities and research institutes, regional financiers and representatives from the region's business development companies. These project groups usually include up to ten members, and they follow common guidelines in project evaluation and decision making, and they use a national electronic database to document the decision process according to common rules.

The TULI-program as a whole is directed by a steering group, which includes 10 high-level representatives from research and financial institutes, public authorities and innovation development organizations. Steering group sets the investment criteria and accepts the tools and processes used at different stages of the investment or follow-up process, monitors the performance of regional TULI-centers and makes proposals for future budgets and resource allocation between TULI-centers.

Eligible for TULI are research-based business ideas that originate from publicly funded research from Finnish universities and research organizations, or from foreign research where there are substantial links to Finland. TULI is instrumented as a 100 % public grant. Central selection criteria concern the feasibility of the business plan and financial calculations. TULI funding is typically used to buy services from outside service providers e.g. for IPR or patenting surveys, market studies, partnering or competitor surveys or for legal advice. Usually TULI-projects originate from relatively mature research projects, where after some years of research potential business ideas are found and they are introduced to the TULI-program. However, as researchers have became more used to the TULI-programme, there is a tendency to start TULI-projects also in earlier stages of research. TULI-projects come from a large variety of research fields (see below figure 1)

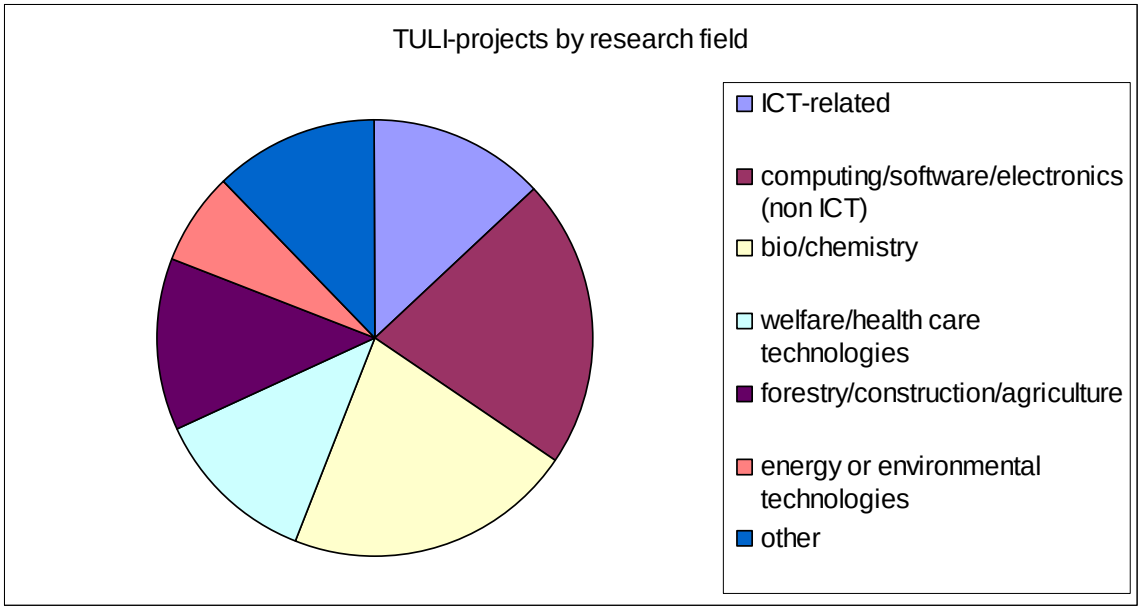

Fig 1: Distribution of funded TULI-projects (n 1100) by the main discipline of underlying research.

3: Central results of the TULI program: An innovation development platform for start-up –companies and technology transfer.

The goals of the TULI program were to improve commercial utilization of research results both in terms of academic spin-off companies and license sales and to offer a platform for development of research-based innovations. By the end of 2005 there have been circa 800 TULI-projects of which complete follow-up information is available. The follow-up is performed for all completed TULI-projects and it is conducted at four stages. First assessment is made immediately after completion of each TULI-project. At this stage, data concerning time before and during the TULI-activity is collected. Subsequently, three identical follow-ups are performed for all projects ½, 1 and 2 years after the completion of the TULI-project. TULI centers' project managers fill in background and follow-up questionnaires via an electronic web-based interface.

Below in Figure 2 it can be seen that TULI-projects have to major 'delivery channels'. Either they aim to establishment of a spin-off company (n=290) or they aim at a license contract (n=412). Hit-rate, i.e. whether these targets were received were 39 % for start-up companies and 18 % for licensing projects.

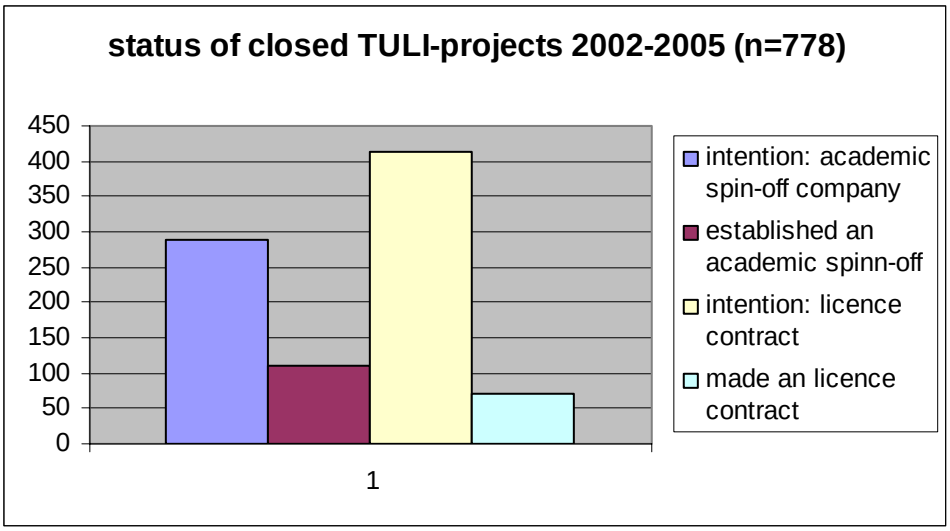

Fig 2: Commercialisation status of completed TULI-projects during 2002-2005

Second point of interest in TULI program concerns the status of intellectual property. TULI is targeted to very early stage innovations, and as a corollary in a majority of cases IPRs are owned either by researchers or university/research institute (Figure 3) The follow-up information reveals that at the one year follow-up there has been a clear shift in IPR ownership towards start-up companies and established bigger companies. However, a vast majority of IPRs still belong to universities, research institutes or researchers, which emphasize the importance of university collaboration: universities not only generate the deal flow for commercialization process but they remain owners of IPRs still during the commercialization process. (Figure 4)

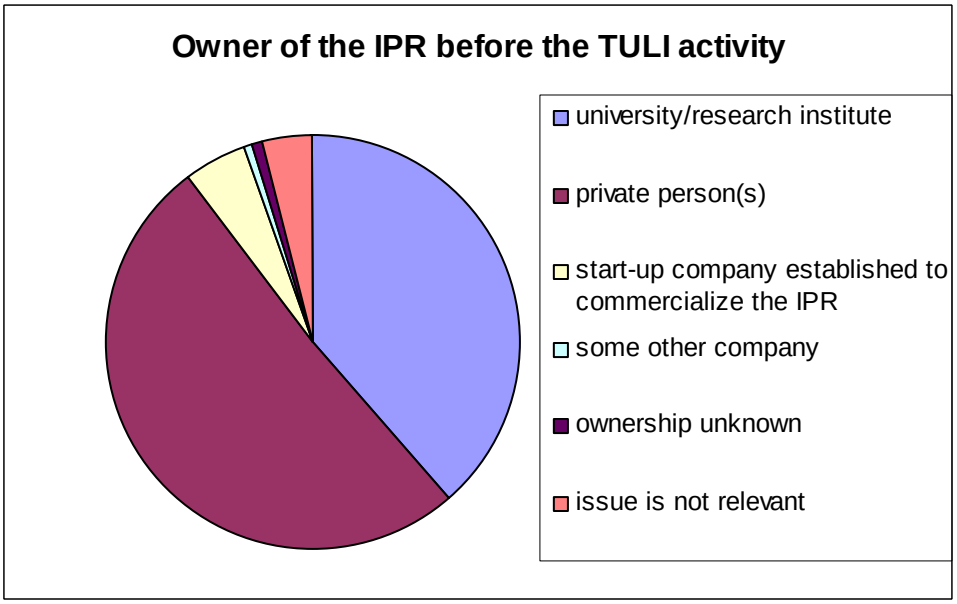

Figure 3: IPR ownership before TULI activity (2002-2005, n=852)

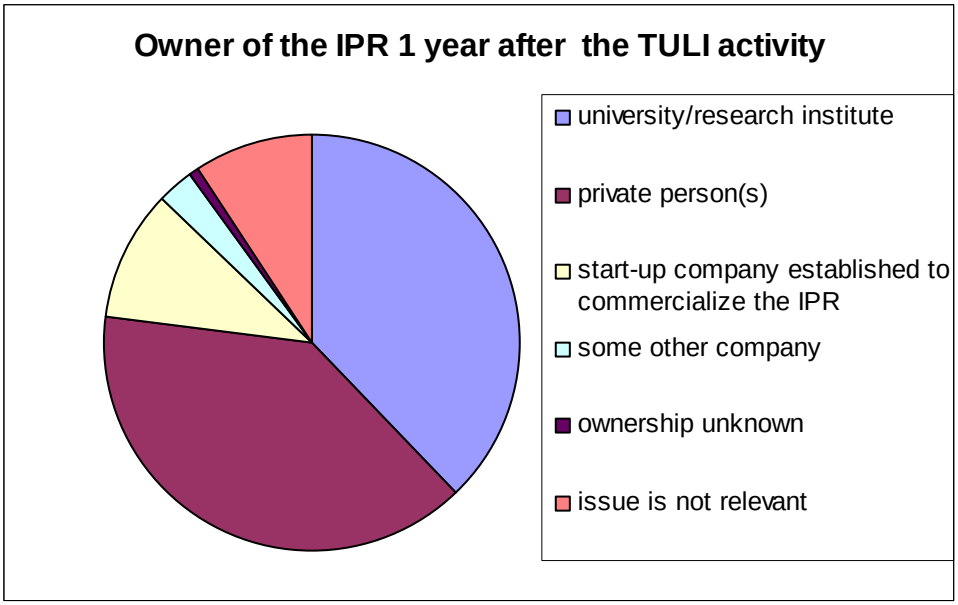

Figure 4: IPR ownership 1 year after the TULI activity (2002-2005, n=778)

Characteristic for early stage innovation development - and for the TULI-program also – is that it is done by a complex set of instruments and organizations taking part in development of innovations in their early stages. This is the very reason why early stages of innovation development are often poorly documented and why early stage innovation management is difficult. Below is a simplified network presentation of immediate partners of the TULI-program. Connected with white arrows are organizations that were responsible for innovation development before the TULI activity, organizations that collaborated with the TULI center during the TULI activity are connected with grey arrows, whereas organizations that had a major innovation development responsibility after the TULI activity are connected with white and grey arrows. Innovators themselves are not presented in the figure, but excluding some atypical licensing cases they participated actively in most cases both before, during and after the TULI activity.

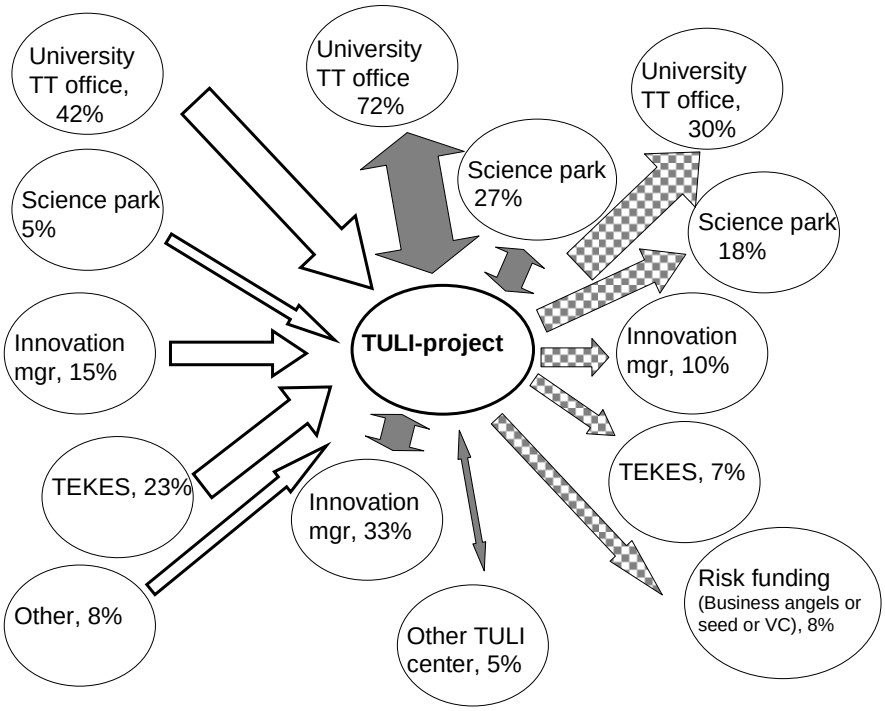

Figure 5: Network map of organizations taking part in innovation development before (white arrows), **during** (grey arrows) **and after** (grey and white arrows) **the TULI activity. Percentages describe the share of respondents that belonged to each category. (n=778)** (Abbreviations, TT-office=technology transfer office, Innovation mgr=university's officer responsible for invention disclosure and IPR management, TEKES=the leading Finnish public R&D financier)

A central outcome of the TULI programme has been to collect regional practices of local innovation development settings and practices, and – as a participatory process, where all project managers and central personnel of collaborating organizations have taken part – to build a common TULI-process (Figure 6), which is now utilized by all TULI-centres. The TULI-process itself contains three phases. The first is *the Input phase*, which includes the methods, practices and interfaces that are used at universities and research institutions and which lead eligible cases to TULI get TULI funding. Second phase is *the TULI development phase*, which includes processes, tools and practices used in TULI funding, decision-making and documentation. The last is *the output phase*, which includes processes and documentation used in handing over the TULI-case to the following process owner. Follow-up is also a part of the exit phase. Each of these phases are major elements of the TULI process, all TULI-projects go via these phases and each phase and each project has a documented process owner.

Moreover, there are four support processes that may be utilized by each of the three sequential TULI-phases. *Financial process* and *competence process* are resource processes and databases that support TULI-centers to facilitate the funding and competence building and management of projects that go through TULI process.

*Stakeholder process*es differ between different TULI-centers, and they include contracts, interfaces and dissemination, which are needed to manage the network of TULI's stakeholders (for a simple example see network map in Figure 5 above). Finally, there is an *IPR process*, which is utilized by personnel responsible for IPR management. All TULI-cases do not necessarily utilize all support processes.

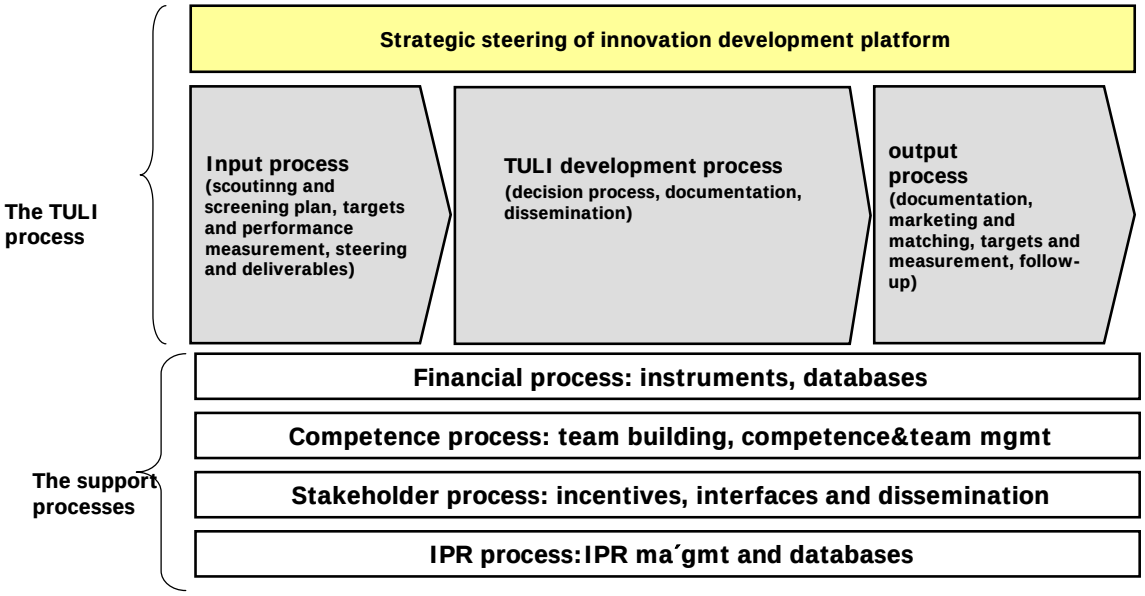

Figure 6: The TULI process

4: Conclusions

Valovirta et al. (2006) studied TULI-alike international initiatives from Sweden, the UK, Israel, Ireland and the USA. Even though completely comparable figures due to different data gathering practices are difficult or impossible to achieve, some comparisons could be drawn. First, TULI's deal flow and amount of academic spin-off companies are big and at or above best international practices. So is also the success rate as far as generation of start-up companies is considered. On the other hand, success rate of licensing was far below the success rate of best international peers, especially that in the USA (AUTM, 2005).

These findings underline the existence of market failures in early stage innovation development. Market failures inherent with start-up generation seem to be rather well corrected with catalytic public funding, when private business development companies like science parks have a major role in actual business development. The findings from the TULI data base do not tell much about the performance of the established companies, but there are of course well known market failures in latter phases of start-up companies development, especially as far as risky R&D projects or high risk venture capital funding are considered. However, when talking about licensing market failures seem to be even deeper and market failures seem to require much more extensive public support than just catalytic innovation development funding.

TULI, like most initiatives targeted to academic innovations in their early phases, is delivered via a relatively complex network. Moreover, innovation development is a long-lasting process, which is likely to have several different process owners in its various phases. Typically cases remain within universities even for several years before they are targeted to various development platforms. In the next phase business development companies, science parks, licensing offices or other intermediary organizations are likely to participate in innovation development, very often with various publicly funded instruments. Finally cases come to truly profit-oriented markets like to venture capitals or license markets. Even there, numerous publicly funded activities, instruments and programs exist. This complexity generates three major shortcomings. First, as the process is complex it is often difficult to define a committed process-owner – or put it simply – a named professional committed to a sufficiently long time to the development of the innovation. Second, complex processes are difficult to steer by innovation policy makers or by public financiers, especially as far as there are no well-defined process owners or well-planned interfaces. Third, as far as the complex system is made of separate single processes there is likely to be a lot of unnecessary or overlapping pre-investement analysis, due siligence, reporting and follow-up. Moreover, lead-times are the longer the poorer are interfaces between different phases of the complex system. In the TULI program one generic system was piloted (see Figure 6 above) where the aim was to somewhat reduce this complexity.

TULI faces challenges common to most pre-seed or early-stage financiers: Prospective investments are highly uncertain, and moreover, appropriate risk assessment, due diligence and other evaluations and investment calculations are complicated by the fact that virtually all cases are lagging measurable quantitative history. Furthermore, investments are typically small, which makes costly pre-investment evaluations inappropriate. In order to tackle these challenges, managers of early stage innovation programs usually use simple qualitative and partly subjective evaluation criteria to select eligible cases from the deal-flow. However, there would be much room for further studies concerning this selection and management process. For instance modern tools of multi-criteria decision making ought to be implemented to these decision problems, too. Moreover, existing data about early stage innovation development is currently scattered (partly due to the complexity of the innovation process). All emphasis to combine these stand-alone data sets and to make analyses and meta analyses of the phenomenon would be highly welcome.

▪ References

Bok, Derek (2003), Universities in the Marketplace. The Commercialization of Higher Education. Princeton University Press. Princeton, New Jersey.

Callan B. : Generating spin-offs: Evidence from across the OECD, OECD STI Review 26: 13-55 (2001).

Delanty, G. (2001), Challenging Knowledge. Open University Press. Buckingham.

EU Commission (2005) Lisbon action plan incorporating EU Lisbon programme and recommendations for actions to member states for inclusion in their national Lisbon programmes. EU Commission, Brussels

Feller, Ian (1990), ‘Universities as Engines of R&D Based Economic Growth: They Think They Can’, *Research Policy* 19, 335–348.

Jacob, Merle, Mats Lundqvist and Hans Hellsmark (2003), ‘Entrepreneurial transformations in the Swedish University system: the case of Chalmers University of Technolog’, *Research Policy*, 32, 1555–1568.

Lambert, Richard (2003). Lambert Review of Business-University Collaboration.Final Report. HMSO Licencing Division.

Lundvall, B.-Å. (ed) :*National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, Pinter, London, 1992

Mustar P. : Spin-offs from public research: Trends and outlooks, OECD STI Review 26: 165-172 (2001).

Ndzandzhou (2005) add ref

Nieminen, Mika and Erkki Kaukonen (2004), ‘Universities and science-industry relationships: Making a virtue out of necessity? In Gerd Schienstock (ed), Embracing the Knowledge Economy. The Dynamic Transformation of the Finnish Innovation System. Cheltenham and Northampton, Edward Elgar.

Niskanen, Pirjo (2001), Finnish universities and the EU Framework Programme – Towards a new phase. VTT Publications 440. Espoo: VTT.

OECD, (2002). Benchmarking Industry-Science Relationships, Paris.

Pavitt K add ref

Rodrigues MJ (2003), *European Policies for a Knowledge Economy*, Edward Elgar

Salo A and Liesiö J (2005) A case study in participatory prority-setting for a scandinavian research programme. Forthcoming in *International Journal of Information Technology and Decision Making.*

Tupasela, Aaro (2000), “Intellectual Property Rights and Licensing: Can Centralised Technology Transfer Save Public Research?” *Science Studies* 13(2):3-22

Tuunainen, Juha (2004). *Hybrid Practices: The Dynamics of University Research and Emergence of a Biotechnology Company*, Research Reports no 244, Department of Sociology, University of Helsinki.

Ziman, John (1994), *Prometheus Bound: Science in a Dynamic Steady State*, Cambridge, Cambridge University Press.