

Intellectual Property Rights and Licensing: *Can Centralised Technology Transfer Save Public Research?*

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During the past decade numerous researchers have expressed the possibilities that commercial activities can bring to universities in terms of increased cooperation with the private sector as well as new sources of revenue for research. Some have noted that universities have lost their 'misgivings' (Grit, 1997: 4) about commercial activities and provide case studies of universities that have 'succeeded' in commercial activities (Gering, 1995: 72). All attempts to develop commercial services, such as patenting and licensing services, have not been as successful as others. Universities have different functions and are not all alike. One needs to ask whether studies of successful commercial activities represent a useful category for analysing the new role that commercial activities are playing in university administration and planning or whether it would be more instructive to identify problems in the commercialisation process.

Proponents of Entrepreneurial Sci-

ence (Johnston *et al.*, 1987), as well as Mode 2 (Gibbons *et al.*, 1994) have suggested that commercial activities offer an effective bridge between the industrial and academic sectors. Knowledge capitalisation, according to some (Etzkowitz *et al.*, 1998: 11), has led to increased production as a result of a division of labour in the physical and biological sciences as well as in the social sciences. Increased activity has also meant that more connections have developed with the private sector. An important component of these new cooperative networks have been the acquisition of rights to research results. Centralised patenting and licensing is seen as a way in which conflicts over intellectual property rights can be avoided before agreements are signed. In addition, however, patenting and licensing firms are seen as a conduit through which universities can gain new sources of income through the commercialisation of university research.

This article will use the case of Hel-

sinki University Licensing Ltd. (HUL), a technology transfer company owned by the University of Helsinki and the Finnish National Fund for Research and Development (Sitra), to identify problems that have emerged in the patenting and licensing of public university research during the 1990's in Finland. The goal of Sitra has been to develop "economic prosperity in Finland through venture capital investment in technology companies and funds as well as by developing new and successful business operations" (Sitra, 1998). Although patenting and licensing represents only a small portion of commercial activities that universities can take part in it is nonetheless seen as the most lucrative one. In particular, the paper asks whether patenting and licensing is able to provide a feasible source of new revenue for large traditional public universities such as the University of Helsinki. The critical approach towards entrepreneurial science must be placed into the context of the formation of HUL in 1992 when university administrators held high expectations in terms of the revenue that patenting and licensing activities would bring to the university.

The study is based on an analysis of strategy documents, science and technology programmes and interviews with 11 experts involved with patenting and licensing activities in Finland. Experts included university administrators, researchers, business entrepreneurs and scientists who were all involved or had been involved in the commercialisation process and the activities of HUL. This study has not been exhaustive in its coverage of all those involved, but rather has sought to identify some critical aspects of the process and reflect on the broader

possibility of further development at Finnish universities. The University of Helsinki is the largest university in Finland and the activities of HUL have been considered to be the most developed in patenting and licensing. HUL does, however, specialise in the patenting of biotechnology so it is impossible to make generalisations about other sectors, such as information technologies.

Many of the interview respondents indicated that networks were based on personal ties and contacts to industrial representatives and not formal channels developed through HUL. Indeed, HUL representatives have indicated that in many cases it was the researcher who had a partner in mind when looking to commercialise research results. Furthermore, HUL's own statistics indicate that it has had poor success in commercialising results that it has taken into its patent portfolio. Recently HUL has been fused with Finntech, also located in the capital region, to try and centralise expertise and minimise expenses. Experiences showed that patenting and licensing activities were too expensive and profits too small in order for the companies to operate separately.

Policies for Knowledge Production: Development Policies, Priorities and Diffusion

During the 1990's Sitra was involved in the setting up of five university technology transfer offices in Finland (HUL – University of Helsinki, Aboatech – University of Turku, Tamlink – University of Tampere, Oulutech – University of Oulu, and Finntech – Helsinki University of Technology) whose purpose was to assist university researchers in the com-

mercialisation of their research. The development of technology transfer offices during the 1990's in Finland can be explained in part by supranational and national policies that encouraged universities to play a more central role in the technology transfer process. It can also be explained by an increased interest on behalf of the university administration itself to play an active role in the transfer of university research to the commercial sector. Pelkonen (2000: 4) has noted that the establishment of intermediary organisations, such as HUL, is an indication of an increased interest in university-industry links.

University-industry links, however, are not new to Finland. Researchers and professors have always had contacts with the private sector and had an important influence on local economies (Hietala, 1992). What has emerged, as an important factor in the process is the development of a multitude of different administrative offices whose goal it is to assist university researchers in the technology transfer process, as well as to develop new sources of income for the university. By doing so the university administration has become increasingly interested in the way research produces patentable, and thus commercially viable research results. This in turn has placed increased pressure on academic scholars to "transfer academic knowledge into products" and then commercialise them (Häyrinen-Alestalo *et al.*, 2000: 166). Commercial interests have come alongside academic considerations in the evaluation of university research projects. These policies and interests, however, have a strong tendency to overlook variations and differences that exist in different types of universities as well as the

conditions that exist within them.

Supranational Policies

Science and technology policy has had an important influence during the 1990's on the intensification of the technology transfer process at universities. This trend can be traced to the early 1980's when organisations such as the Organisation for Economic Co-operation and Development (OECD) began to formulate arguments for the more efficient utilisation of university research results in industrial development. Later during the 1990's the European Union has emerged as an important facilitator and proponent of commercialising university research (Häyrinen-Alestalo, 1999: 45).

The role of risk and the costs that were involved in long-term research and development served as the backdrop for the identification of universities as sources of ideas and innovations. Public universities especially, became a focus for attention in that they consumed large amounts of public funding and were considered inefficient while their methods were thought to be 'aging'. "The economic health and future development of industrialised societies depend on their ability to exploit the possibilities opened through university research." (OECD, 1981: 66; see also OECD, 1978)

Elzinga and Jamison (1995: 592) note that the thrust of the 1981 OECD document was to emphasise the role of foresight and prediction as a methodology for policy making. Scientific research was no longer seen as an autonomous actor, but rather there emerged a new 'social contract' for science in which research was to become more responsive to the concerns of the state as well as the

private sector. The case of patenting and licensing at the University of Helsinki, however, indicates that researchers have already been working directly with industry. The introduction of a third party, such as HUL, to regulate these relations has raised important issues as to the conditions under which university research is transferred to the private sector, but it has also complicated certain processes. The idea of a new 'social contract' is misleading considering the presence of relations before formal technology transfer mechanisms.

The EU has also been trying to assert its influence on utilising university research to bolster economic development during the 1980's and 1990's. Such developments have been premised on the formation of effective networks between academia and industry. A central component of the EU strategy is an open economy in which dynamism and creativity are supported through competition. The process of competition in turn is supposed to foster decentralisation, which will give rise to a 'radical' reorganisation of society. Alongside information technology, biotechnology has been identified as having the greatest potential in terms of supporting economic growth and employment. "The important role of biotechnology in these sectors is likely to be to maintain employment by stimulating its productivity as well as to create highly skilled labour demand. (European Commission, 1993: 10)

The EU, however, has not considered well enough the relation between public funding of research and commercial application. Mackenzie *et al.* (1990) have noted how patenting activities in biotechnology have had a negative influence on scientific research. The authors

identify a realignment in the power relations between free scientific information and proprietary information in scientific research. Studies on intellectual property rights in the EU context have also indicated that an over-emphasis on patenting can have a counterproductive effect on research and development in the EU (ETAN Working Paper, 1999: x).

Despite this, EU documents in general contain the same discrepancy that OECD policies have. Namely that the information society that we are supposedly entering requires that information be disseminated and shared as broadly as possible while at the same time that very same information should be utilised as efficiently as possible. "The economy is becoming increasingly knowledge-based, manufacturing activities are being farmed out, services are taking the lion's share, and the possession and transmission of information is becoming crucial to success." (European Commission, 1993: 3) The increased prevalence of research cooperation between academia and industry has, however, raised problems in terms of the dissemination of knowledge as a result of intellectual property rights (IPR) issues. Nevertheless, the EU believes in "the relentless onward march of science and technology" and its ability to support economic progress (European Commission, 1995: 5).

The strategy of the University of Helsinki to patent and license university research has caused, however, some problems. In developing its business activities, HUL has caused uncertainty among researchers. Many indicated that they have tried to avoid HUL's services because of the reputation that it had in only beginning to learn how to commercial-

ise research. Many of these problems could be attributed to the fact that HUL had management problems and that the company had unrealistic goals. Specific incidents with researchers during the mid-1990's caused other researchers to avoid HUL's services. In addition the company was associated with the university administration, which placed constraints on it that other private companies do not have to deal with. HUL's ability to stay afloat is the result of a couple of successful licensing contracts early on that have produced income during later years. However, steady progress and success has been lacking over the past ten years of its operation. Economically it has had to be supported by its owners Sitra and the University of Helsinki.

National Strategies

For Finland, the role of biotechnology and universities became important during the 1990's because universities were one of the few places where advanced research was taking place. At the same time increased emphasis on formalised research cooperation with industry meant that IPR were becoming more relevant. IPR legislation in Finland, however, allowed university researchers the right to sign contracts and exploit the results themselves as opposed to the university. For companies this has meant that they have been able to work directly with researchers themselves. As a result companies have had an advantage in negotiating the terms of contracts with researchers. Although researchers might be experts in their field they are not necessarily competent to negotiate with large companies. In addition it has

been argued that information is 'leaking' out of the university because researchers are not patenting their results. These facts have been identified as reasons why a centralised patenting and licensing structure should be adopted in Finland. Indeed, HUL and its associated services has been able to develop better contracts for researchers and their industrial partners so that more funds are rechannelled back into research.

During the 1990's, despite economic recession, the role of knowledge and know-how became increasingly important in policies. National strategies to utilise and support university research were formulated in trying to support industry (Ministry for Trade and Industry, 1989: 35; Autio *et al.*, 1989). State actors began to see their role more in terms of predicting and investing in coming trends and needs of industry and in the coming information society (Ministry for Trade and Industry, 1996; Council of State, 1998: 2). The efficient utilisation of research results in the production of commercial innovations became even more important as companies began to search for ways in which research and development costs could be controlled and minimised. University research as a potential source began to gain attention as a source of information and technology that could be commercialised (Karnerva *et al.*, 1989). On the policy level, however, universities tend to be treated as an undifferentiated mass, when in fact there is a great deal of variation between technical and traditional universities, as well as between departments themselves (Häyrynen-Alestalo *et al.*, 2000).

In a 1996 Science and Technology Council Publication it was emphasised that knowledge and know-how were a

central component of Finnish science and technology policy during the 1990's and the coming millennium. This assertion was based upon the claim that national well-being and social prosperity was fundamentally tied to the effective utilisation of university research in finding solutions to current problems in a multitude of different fields. These innovations would have an effect only if they were applied broadly and effectively within society. "Knowledge and know-how are converted into economic growth, new jobs and well-being only once it has been broadly utilised and applied in society as new economic and social innovations" (Science and Technology Council, 1996: 39).

The utilisation of university research and information more generally was seen as an important component of promoting national well-being and furthering economic development. "The national innovation system is based on the effective cooperation between the public and private sectors." (Science and Technology Council, 1996: 63) The form and structure of these relations, however, is seen more in terms of a physical gap that needs to be bridged as opposed to a problem that entails other issues as well, such as the lack of trust between the private and public sectors. Krücken (2000: 14) has made a distinction between a 'cultural' and 'information' gap in identifying trust as a critical component of creating successful relations between academia and industry. Therefore the formation of networks between the two cannot be premised on structural components alone.

The activities of Sitra, to develop technology transfer structures during the 1990's, have to a great extent been unsuccessful.

Many universities in Finland lack any official policy on technology transfer despite efforts during the past decade to develop such mechanisms. In addition, successful innovation mechanisms are seen more in terms of technical and mechanical aspects as opposed to relations between people and organisations.

The case of Finland is not unlike other developed countries. The Canadian government, for example, is currently concerned that there is too much variation among Canadian universities concerning the commercialisation of innovations. Canadian studies argue therefore that this may in the future hamper the commercialisation of university research. (Gu & Whewell, 1999: 67) Similarly Finland has been concerned about the lack of mechanisms through which university research can be commercialised. No one, however, has asked whether these new mechanisms for commercialisation are more efficient than current practices at Finnish universities in which researchers have dealt directly with industrial partners and what kind of variation exists at Finnish universities.

University of Helsinki

With a student enrolment of over 34,000, 121 departments and research stations in 9 faculties, as well as 16 independent institutions, the University of Helsinki is by far the largest university in Finland. Founded in 1640, it can be characterised as a traditional university. Prioritisation among the disciplines has always been influenced by political interests (Häyriinen-Alestalo *et al.*, 2000: 174) and as such biotechnology has gained increasing attention recently in the potential that it

holds in terms of commercialisation.

The early 1990's mark a turning point in administrative attitudes towards commercial services at the University of Helsinki in that earlier attempts had been strongly opposed because commercial activities were not considered a part of the universities mission. The attitude of researchers at the university, however, was not as straight forward as that of the administration and as a result patenting and licensing activities by HUL have not been as successful as originally planned when the company was founded in 1992. Researchers, as well as representatives from the private sector, have noted that HUL did not possess the necessary professional experience to manage patenting and licensing processes. Several incidents during the 1990's were cited as giving the company a bad reputation and researchers considered going to HUL as a last option. Examples of researchers realising that their innovations would not be commercialised because HUL was not able to find partners caused tensions among the actors. In addition, many researchers have not been aware that such a service has been available and have never thought that their innovations could lead to commercial activities. Some researchers have also indicated that they are not interested in commercial activities and do not consider it to be a part of their research work.

The changes in university policy have been reflected in a multitude of university publications and speeches. In a recent speech to the City Council of Helsinki, the University of Helsinki Chancellor Risto Ihamuotila said that the role of the university had become an important factor as a driving force for economic

development in urban areas such as Helsinki. The main function of the university still remains the production of new information and models of thought of which only a fraction can be directly utilised by commercial markets. This is the result of the unpredictable nature of the research and the applications that might be developed from them. At the same time, however, the chancellor noted that the university is seen as a cornerstone for the enterprise sector and as such it should work harder to transfer university innovations and information more efficiently to the commercial sector. (Ihamuotila, 2000)

The commercialisation process, however, has been very uneven at the University of Helsinki during the past decade. Some researchers that have worked with HUL noted that they did not realise that the company was not interested and did not have the know-how that was necessary in finding commercial partners for that particular specialty of research despite the fact that it had commercial potential. As a result researchers became wary of working with the company. These nuances, however, are passed over in university, as well as other, strategies and policies.

In its strategy for 2001-2003, the University of Helsinki has brought forth several factors that reflect the changes that have occurred during the 1990's. On the one hand the university is concerned over its autonomy and ability to conduct critical research. At the same time it realises that it is operating in a global market where information has become a commodity that is produced and sold. Information is not only valuable in and of itself, but is a tool through which other goals can be attained as well.

Along with globalisation the power of large corporations grows in relation to traditional government structures. Funding for research and development by large multinational corporations is already more than that of the public sector's funding for universities. This provides new opportunities for cooperation between universities and the private sector. (University of Helsinki Strategy, 2000: 5)

At the same time the university exercises a policy in which it sees itself as an important part of society by conducting research that addresses social needs and problems.

Knowledge is valuable in and of itself as well as a tool in the realisation of other goals. By producing knowledge for the needs of society, the university serves society. Often there is a close relationship between scientific goals and the functions of social service. At times like this it is important to keep in mind the basic value of the university as a producer of knowledge. The growth of applied scientific research cannot be allowed to grow at the cost of basic research agendas that are independently developed. (University of Helsinki Strategy, 2000: 4)

Technology transfer offices, such as HUL, have not been effective in the dissemination of university research despite assisting in the legal aspects of patenting and licensing. A task that has proven to be costly in terms of image. As the University of Helsinki administration has become more active in the patenting of research results, the issue of ownership of property has become more important or at least more visible. Instead of perceiving the patenting office and its associated services as an important step in only the legal appropriation of research results, the University of Helsinki has also attached economic goals of de-

velopment and progress to the task. Although the former is quite easily attainable the ability of the university to accomplish the latter is less clear.

Helsinki University Licensing: A Dream Deferred?

In 1992 the University of Helsinki and the Finnish National Fund for Research and Development (Sitra) formed a partnership in which Helsinki University Licensing Ltd. was founded. The agreement between the University of Helsinki and Sitra to establish HUL was done with funding from the two institutions. Both partners had similar interests in terms of developing new sources of income. The University of Helsinki, however, was interested in providing a service for its researchers to help protect their inventions, while Sitra was more interested in developing new avenues for venture capital and the formation of technology transfer know-how in Finland. In forming HUL, the following points were made by university analysts concerning its operation and risks:

The business activities involved in the commercialisation of research results are exceptional and risky. The high risk is caused by the long time lag between the commencement of a project and the possible royalties that one might gain from it. [...] For the most part such business activities can be considered to be international in nature: the development of such activities cannot be considered to be profitable in terms of domestic markets only. The commercialisation of university research is risky for two reasons: the development of projects ties up large amounts of capital and there are no assurances that an innovation can be commercialised at the end of the development period. (Helsinki University Holding Ltd., 1992: 4)

While recognising the inherent and numerous risks and dangers that were involved in technology transfer through patenting and licensing, HUL also showed signs of overconfidence in the success and development of the company when it was first founded. Initially they estimated that they would enjoy broad acceptance and awareness in the researcher community within the first few years and that during that same period they would have received their first royalty payments that they would publicise visibly. No thought or planning was put into acquiring professional managers who knew how to operate such a business and instead the company was run and managed by a university administrator. Although HUL was a separate entity on paper it was still very much a part of the aspirations of university administrators to produce a new source of income for the university itself. There was a lack of understanding that if HUL wanted to operate successfully it would need more support and the ability to work more independently.

The operation of HUL has had numerous problems during the 1990's. Three main factors, however, have been poor management, an over-sized patent portfolio and patent legislation. Together these problems have resulted in the poor performance of HUL and the failure to gain profits during the past ten years.

Management and Know-how

The technology transfer companies that are associated with Finnish universities have in general had poor success in the patenting and licensing of university research. Although, most of these companies engage in a multitude of other ac-

tivities besides patenting, such as consultation and market research, there is none the less a lack of know-how in the commercialisation of university research in Finland through technology transfer companies. Of the five university-based technology transfer companies that Sitra has been involved with, HUL has by far the most amount of patents. As Table 1 shows, however, all of the companies have a long way to go before they are able to reach international standards (see Jääskeläinen & West, 1995). Low rates of patenting can also be explained by a high degree of direct cooperation between individual researchers and industry, thus hindering the entrance of a third player, such as HUL, into the equation.

In terms of US comparisons, centralised technology transfer in Finland lags far behind. In 1995 alone, the University of California System, MIT and Stanford University patented 122, 96 and 70 innovations respectively (Risteli, 1998: 41). Although it is unfair to make such comparisons due to differences in disclosure legislation between the US and Finland, there is a lack of comprehensive data on patent activity in Finland by individual university researchers against which to compare institutional patenting in the US. A quick comparison between individual patent activities at the Institute for Biotechnology indicates that in 1998 alone, members of the institute filed for 11 patents, while HUL took on only 4 new projects (Institute of Biotechnology, 2000). This seems to suggest that in some areas researchers are knowledgeable about IPR issues and file for patents before publishing. Even when compared to the patenting activities of countries that do not have common legislation con-

Table 1. Technology transfer in Finland, 1999.

Company	Domestic patents
HUL -University of Helsinki	21
Aboatech - Åbo University	6
Tamlink - University of Tampere	3
Oulutech -University of Oulu	1
Finntech -Helsinki University of Technology	0

Source: Finnish Board of Patents and Registration.

cerning disclosure practices at universities Finland still lags behind (see Gu & Whewell, 1999: 46). This would seem to indicate that Finnish universities have not been able to develop services that would attract researchers well enough. Changing legislation alone or forcing researchers to use these services would be the most detrimental move that Finland could take in trying to foster such processes and indeed changes can be seen in the direction that technology transfer processes are currently being developed.

Researchers as well as private enterprise actors involved with HUL have noted that the lack of know-how in the commercialisation of research results was an important factor in their decision *not* to work through HUL during the 1990's. Many noted instances of when they had signed their rights over to HUL expecting that they would commercialise their results only to discover that HUL was just learning how to operate its business. Interpersonal relationships and trust were an important factor that had a direct role in the problems that HUL encountered. Part of this problem was

with the fact that the University of Helsinki had not invested enough in HUL and there was no full time co-ordination of its activities. Furthermore, the commercialisation process is composed of several steps of which the patenting and licensing of innovations is only one. It was not until the late 1990's that the University of Helsinki formed the Office of Commercial Services whose goal it is to coordinate activities between different actors at the university. The most significant factor, however, remained that researchers did not trust HUL and its ability to commercialise the research results.

During the past seven years in working with industry, the University of Helsinki has not received any type of income from royalties, but rather income has been in the form of up-front payments for product development. The majority of the funding has been rechannelled into the research projects themselves, less HUL's operation fees. Table 2 shows HUL's income for the past seven years and its allocation between HUL and the research groups. Although it cannot be denied that patenting and licensing activities have opened up new and impor-

tant connections with the private sector, the degree to which such activities are taking place considering the size of the University of Helsinki, there remains a great deal of work to be done.

Given the fact that HUL must cover its costs from its share of the revenue, current patenting and licensing activities are far below what it would require if the company were to be considered successful. In addition, compared to the total amount of funding that the University of Helsinki receives both budget allocated and outside funding HUL's portion is quite small. If one considers the assertion that, when HUL was founded in 1992, the University of Helsinki planned reinvesting the profits made from patenting and licensing activities to other research areas, then the poor performance of the company during the past decade has been a disappointment for the university administration. Only in the past few years has the university administration began to pay more attention to the needs of patenting and licens-

ing activities due to the problems that they were having in attracting researchers to use their services. As a result both researchers and private enterprise have expressed a more open attitude towards HUL and its services. The fact still remains, however, that there is a lack of commitment to patenting and licensing activities in terms of such activities supporting and encouraging researchers themselves and not serving the interests of the university.

Patent Portfolio

The second factor that has influenced the poor performance of HUL during the past decade is not unrelated to inexperience and poor management. Technology transfer companies often maintain a patent portfolio through which the level of performance and success is often measured. Hsu and Bernstein (1997: 2) have suggested that technology licensing offices determine where they place themselves along a "commitment

Table 2. HUL revenue allocation in FIM, 1993-1999 (million)

Year	Net Income	HUL	Research
1993	2,50	0,25	2,25
1994	3,00	0,40	2,60
1995	1,00	0,15	0,85
1996	2,00	0,50	1,50
1997	1,50	0,35	1,15
1998	3,50	1,20	2,30
1999	7,00	1,50	5,50
Total	20,50	4,35	16,15

Source: Helsinki University Licensing Ltd. 2000.

spectrum” when developing a patent portfolio. This placement determines the amount of investment and effort that is required if sufficient returns are to be made. If a company’s patent portfolio is large then it is expected that it be able to commercialise a large number of innovations. If the portfolio is large and the number of successful agreements remains low, expenses will be larger than profits. HUL’s patent portfolio has for the most part been made up innovations in the biotechnology sector. This is in part due to interests within HUL and the university to develop expertise in the area and support biotechnology at the university. It has, however, caused problems because of the lack of know-how in the commercialisation of innovations that HUL has taken on as projects.

For the total amount of innovations that HUL has sought to commercialise, the number of successful projects has been quite low. Table 3 shows that the 15 new projects in 1994 have weighed heavily on the company when compared to the low success rate during the following years. The termination of three projects in 1993 indicates a misjudgment of the potential of new projects right in the beginning. These projects were, however, terminated very early on, whereas the new projects in 1994 have remained as expenses in the company’s portfolio. It was not until 1999 that the company’s new managing director terminated 20 projects that had not been successfully commercialised.

Promising new innovations will usually find prospective buyers and developers within a few years, after which it does not make sense to protect them any longer, due to increasing costs. Quite often the researchers themselves already

have in mind a prospective buyer. The buyers and developers come mostly from the bio-industry sector, such as pharmaceutical and agricultural companies. Given the small size of the bio-industry in Finland, prospective buyers must also be sought from overseas. Domestic markets remain far too small for successful licensing. Foreign competition by large companies further complicates the effort to develop domestic industries. Given the small size of the majority of companies in Finland it remains unclear how they are supposed to be able to compete with global or even domestic giants.

Gibbons *et al.* (1994) have argued that academic research is becoming increasingly produced in-context. This characteristic is one of the central tenets of Mode 2 knowledge production that is supposedly more efficient and reflexive. This implies that even before research projects are begun the application of the results is already known. HUL’s commercialisation track record raises important questions as to the degree to which university research has become, on the one hand based on commercial possibilities, and on the other more in-context knowledge production. It also raises issues concerning the degree to which university researchers are already working with private enterprise without the assistance of a patenting and licensing firm.

Intellectual Property Rights

The third factor that has played a role in the formation of a centralised technology transfer office at the University of Helsinki has been the role of intellectual property rights in Finland. The contrasts in activity between the US and Finland,

Table 3. HUL project development, 1992-1999.

	Projects		
	New	Commercialised	Terminated
1992	4	1	0
1993	1	0	3
1994	15	2	1
1995	7	2	1
1996	3	1	0
1997	5	0	2
1998	4	6	4
1999	3	3	20
Total	42	15	31

Source: Helsinki University Licensing Ltd. 2000.

for example, can in part be explained in differences in university research disclosure legislation. The US has been strongly influenced by the Bayh-Dole Act (Public Law 98-462) whereby the responsibility of commercialisation of federally funded research projects was turned over to universities themselves during the early 1980's. This dispersion of authority brought about a boom in the patenting of university research results and formed a network of university technology transfer managers.

Finland, however, operates under IPR legislation that dates back to the 1960's (Patent Act 550/1967) in which university researchers are afforded special status in terms of intellectual property rights and research. The main reason for the legislation was to afford university research its autonomy. The rights of the employer and the worker were a basic premise in determining who had rights to inventions. However, universities were given differential treatment due to need for researchers to have full access

to their own work. (Bruun *et al.*, 1988;) "Scientific freedom requires that individuals in higher education institutions be able to utilise freely those innovations and inventions that they produce through their research" (Committee Report, 1965: 17).

The belief that scientific activities should be afforded freedom from commercial interests has been changing. Knowledge as such no longer serves only as a general civilising function, but rather has become a means through which wealth can be generated for the university itself. "The transformation of scientific knowledge into economic activity is a fundamental social innovation, even as the worldwide spread of such activities presages a common form of economic development superseding traditional models of capitalism and socialism. The first step in capitalisation of science is to secure knowledge as private property." (Etzkowitz & Webster, 1995: 482) In developing commercial activities university administrators have found

that intellectual property rights are an effective way through which rights to knowledge can be secured. It is not clear, however, that given Finland's differing structures and practices that such activities can provide a significant supplement to public funding or research.

Government officials and university administrators have become increasingly concerned over the 'leakage' of university research to the private sector without any compensation. In addition, Kankaala and Lampola (1998: 90) have noted that the rate of conflict of interest has risen due to increased cooperation with industry. As a result, a 1998 report by the Ministry of Education noted that if universities in Finland wanted to play an effective role in the transfer of technology from researchers to industry then they would have to pay more attention to intellectual property rights and technology transfer issues. In its conclusion the committee recommended that Finnish intellectual property rights legislation should be changed so that university researchers would have to disclose their innovations to the university administration and that the university would own the rights to those innovations. In order for university innovations to be fully exploited it was necessary, according to the committee, to bring university inventors into the same legal framework as other inventors working for different institutions, such as the Academy of Finland. (Committee Report on Researchers and IPR, 1998)

The ability of universities in Finland to successfully commercialise the number of innovations that are produced every year is highly unclear. Indeed there is no empirical data on the number of patents that are filed for by individual re-

searchers. University administrators and government officials, however, have been interested on gaining access to these rights. Recently, however, university administrations have begun to adopt more conservative approaches to commercialisation. An example of this has been the shifting of patenting responsibility to companies themselves, leaving technology transfer offices to look after the legal aspects only.

The committee's recommendations were prompted by practices in other countries, especially the US, where legislation affords universities the rights to the intellectual property rights of its researchers. As opposed to the decentralising nature that the Bayh-Dole Act implied in the US, the change in Finnish legislation would have the opposite effect, in that the technology transfer process would become centralised. The context for change in Finland has also been prompted by the fact that patenting and licensing activities require expertise in legal matters. As a result, patenting and licensing services would be important in avoiding conflicts of interest and later problems in terms of ownership of property. The transfer of ownership to the rights of the research to the university in this process, however, is not clear.

High-Tech Hopes

The strong influence of national and supranational policies is reflected in the expectations that new research areas will produce jobs and wealth. Biobusiness has shown signs of strong potential in the stock market and holds a great deal of expectations in terms of its capacity to produce profit and employment opportunities both nationally and interna-

tionally. Sitra alone has invested over FIM 200 million since 1995 into small biotechnology companies in the hopes that it will help national economic development and between 1997-1999, 37 companies were formed in the sector. Indeed one of the premises for government intervention has always been that the markets have failed to accommodate current changes. A lingering problem, however, is the high volatility and uncertainty that marks research and development. Recent studies have also begun to indicate that government-led programs have been a failure in fostering competition, increasing innovativeness and developing cooperation between partners (Pentikäinen, 2000). In addition there is a lack of evidence to support that biotechnology is able to provide a large number of new jobs despite the large sums of public funding that have gone into it (Kivinen & Varelius, 2000).

As an industrial sector, biotechnology is reliant on highly skilled labour and advanced technologies. The development of new job opportunities remains quite small in relation to overall unemployment numbers in Finland. Aronowitz and DiFazio (1994: 15) have noted that a gap is emerging in the labour market between a relatively small skilled and large deskilled work force.

The Finnish bio-industry sector is made up of a relatively small number of SME's and a few large corporations. In terms of providing employment opportunities and growth potential as a result of synergy the capacity of the field remains still quite small. Nonetheless, government officials maintain that university research must be utilised more effectively in developing commercial products in order to compete globally (Sasi,

2000: 2). It has not been demonstrated, however, that technology transfer offices, such as HUL, are able to increase the efficiency with which technology is transferred to the technological sector.

Taking a closer look at basic statistics in the biotechnology industry is helpful in placing current strategies into perspective. Given the strong financing that has gone into the biosciences, the effects on the industry in terms of employment have been quite small. In 1998 the bio-industry employed 5610 personnel. However, if the three largest corporations are removed from the statistics, the figure is reduced by almost half. These companies have existed for over ten years and as such do not represent the new wave of start up's that the government wants to support and develop. Current policies would have one believe that the potential of this area of research and development is unlimited. However, Table 4 indicates that the levels of output and employment are quite small when compared to the broader national employment needs of Finland.

The role of patenting and licensing of university research is important in such equations due to the high level of public expenditure on research and development in biotechnology as well as other sectors. The intense investment and concentration of capital in one sector has been the result of high expectations of the role of scientific development as a universal problem solver, especially biotechnology. Biotechnology, however, represents only one component of the research that is conducted at the University of Helsinki as well as many other universities.

As mentioned earlier, all of the above categories represent separate depart-

Table 4. Finnish Biotechnology in FIM (1998)

Sector	Number of companies	Turnover (mmk)	Employees
Pharmaceuticals:			
SME's	14	50	140
Large corporations	3	4260	2500
Diagnosics	28	1220	1390
Biomaterials	8	45	60
Food stuffs and feed	10	1410	1060
Industrial enzymes	3	325	290
Agricultural	7	10	30
Services	16	70	110
Other	3	35	30
Total	92	7425	5610

Source: Finnish Bio-industries 1999.

ments in various faculties. Different faculties, such as medicine, have developed vastly different methods of technology transfer and cooperation with industrial partners over the years. Individual researchers as well have formed their own contacts with industry through which innovations are transferred. HUL expertise has not been in medical technologies or agricultural products and as such these areas of research have not been properly represented. This has created disparities even among those departments that are able to commercialise their research through patenting. Departments such as computer science have also been totally neglected in terms of developing centralised services. This raises concerns over the goals and aspirations of university administrators to equally represent the rights of university researchers. Has university technology transfer become interested in only those areas that it perceives to be profitable

and is the university administration the right actor in evaluating these factors?

In a recent initiative by the Canadian government it was suggested that an additional 5% funding be added to university budgets to support the commercialisation of university research. The purpose of this added funding would not be to create new revenue streams for universities, but rather create new wealth for Canada. The study argues that public expenditure on research and development in universities should have a *direct* influence on national economic development. (Advisory Council on Science and Technology, 1999: 2-5) Visions of investment driven development tend to be teleological. I am not questioning the fact that universities should play an important role in local and national development, but rather whether centralised models are the most efficient method through which research is converted into marketable

innovations. Furthermore it is questionable if certain research areas, such as biotechnology, provide the best return for the amount of public investments.

In politics, biotechnology is compared to information technology in providing incredible economic benefits for countries in the near future (Juurus, 1999) and replacing old and inefficient industries with new 'success story' like businesses (Backman, 2000). Yet the ability of biotechnology to provide new job opportunities and create wealth is still limited and uncertain. The strategy of the University of Helsinki to cater to such a narrow interest group is problematic given the amount of public funding that it receives. There is no doubt that university research has an important impact on economic development and social well-being. However it is not as clear what kinds of mechanisms and systems should be developed to support such ventures and on what basis are different areas supported over others.

Conclusion

When the University of Helsinki and Sitra first founded HUL in the early 1990's they believed that patenting and licensing activities would prove to be a highly profitable business for the university. The funds gained from licensing activities were to be redistributed to those research areas that needed extra support for further development.

Technology transfer models in the US have proven to work well in the transfer of academic research to the commercial sector. The adoption of such models in Finland, however, has proved more difficult than originally believed. A decade later, university administrators are more

hesitant about pursuing such changes without the necessary know-how that would be required. Despite the problems that the University of Helsinki and HUL have had in terms of the commercialisation of research, there remain strong under currents that suggest that legislation should be changed in the future, once the universities have been able to organise their activities. Such plans, however, have failed to account for the fact that technology transfer in Finland has been operating for the past thirty years under different conditions. To date there is no evidence, except for a few cases, to show that university research is being squandered or wasted as a result of patenting by university researchers. University administrators, however, have used such allegations as a basis for their arguments for changing legislation. Nonetheless, it remains unclear if the university would be able to accomplish such a task itself.

University administrators must also address the issues of competence and professionalisation. Researchers must be convinced that HUL and related university services are able to provide a quality service without obstacles to research if the university wants to attract business. Forcing researchers to work with an organisation that hinders and restricts researchers would be detrimental and cause long-term problems. It is therefore imperative that the university invest time and effort into the development of HUL if it wants to gain the trust of its researchers. A recent study (Jansen & Dillon, 1999) of licensing activities in the US indicated that the majority of leads for prospective licensing contracts come from researchers themselves. This being so university administrators in Finland

might consider placing less emphasis on developing the commercialisation aspect of their services and focus more on nurturing effective contacts and other support mechanisms with researchers themselves, leaving the commercialisation to companies themselves.

Science and technology policies seem to avoid addressing the broader perspective of employment and the capacity of new technology areas, such as biotechnology, to employ large numbers of people. Ellul (1990: 35) has discussed the role of technology in producing both good and bad effects and thus being ambivalent. The role of centralising patenting and licensing in Finland would certainly have positive effects, however, such changes would also bring negative effects as well, which are not understood well enough and need further probing. Current conditions seem to indicate that university licensing offices are not ready to take on the burden of commercialisation in addition to patenting if legislation were to be changed.

The assertion that centralised technology transfer will bring with it new sources of revenue for university research remains a tenuous one. Certainly we can see that patenting and licensing has brought about new sources of income for researchers at the University of Helsinki and this is something that needs to be nurtured. It has not been shown, however, that centralised patenting and licensing activities can be used to effectively bolster research activities at a large publicly funded traditional university. Instead, other alternatives should be considered and developed as well. Furthermore, the push to develop commercial activities should not be limited only to those departments

that the university administration considers lucrative, but should be offered to all those that have realistic possibilities at developing commercial applications.

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