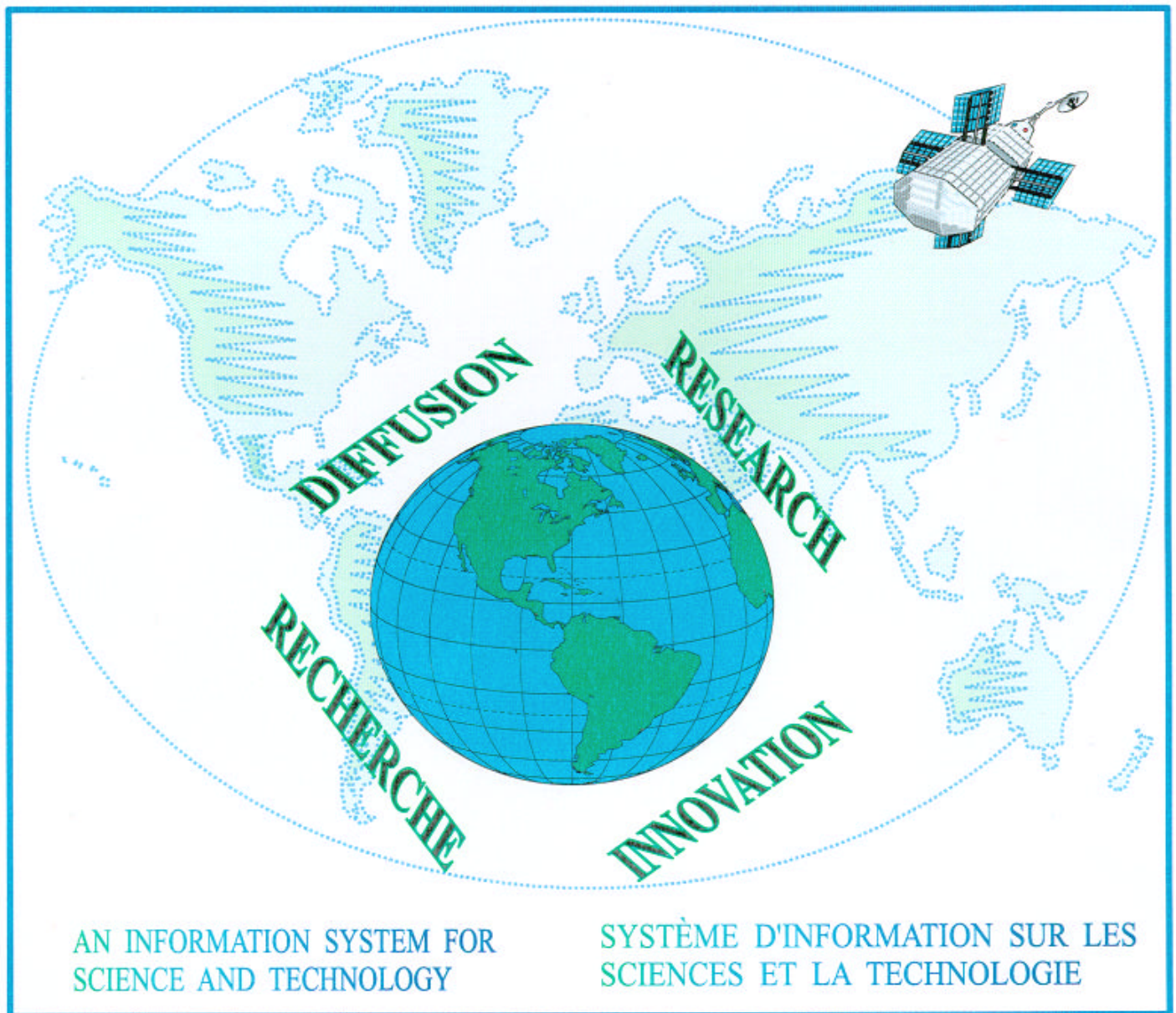


**SCIENCE AND
TECHNOLOGY**

**SCIENCES ET
TECHNOLOGIE**

**Survey of Intellectual Property Commercialization
in the Higher Education Sector, 1998**

ST-99-01



Statistics Canada
Statistique Canada

Canada

Survey of Intellectual Property Commercialization in the Higher Education Sector, 1998

By
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Science and Technology Redesign Project
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Symbols

The following standard symbols are used in Statistics Canada publications.

..	Figures not available
...	figures not appropriate or not applicable
-	nil or zero
--	amount too small to be expressed
e	estimated figures
P	preliminary figure
r	revised figure
x	confidential to meet secrecy requirements of the Statistics Act

NOTE:

Due to rounding, components may not add to totals.

THE INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY PROJECT

The purpose of this project is to develop useful indicators of activity and a framework to tie them together into a coherent picture of science and technology in Canada.

To achieve the purpose, statistical measurements are being developed in five key areas: innovation systems; innovation; government S&T activities; industry; and human resources, including employment and higher education. The work is being done at Statistics Canada, in collaboration with Industry Canada and with a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited and potentially misleading picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and more work has to be done to understand the characteristics of innovative and non-innovative firms, especially in the service sector, which dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology, in which it invests over five billion dollars each year. In the past, it was only possible to say how much the federal government spends and where it spends it. The current report, Federal Scientific Activities (Catalogue 88-204), released early in 1997, begins to show what the S&T money is spent on with the new Socio-Economic Objectives indicators. As well as offering a basis for public debate on the priorities of government spending, all of this information will provide a context for reports of individual departments and agencies on performance measures which focus on outcomes at the level of individual projects.

By the final year of the Project in 1998-99, there will be enough information in place to report on the Canadian system on innovation and show the role of the federal government in that system. As well, there will be new measures in place which will provide a more complete and realistic picture of science and technology activity in Canada.

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Working Papers

The Working Papers publish research related to science and technology issues. All papers are subject to internal review. The views expressed in the articles are those of the authors and do not necessarily reflect the views of Statistics Canada.

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Abstract

The linkages between university research and its contribution to national and regional economies are not well understood. Some of the contributions are direct and easy to measure. Research increases knowledge, development creates new products and the related activities create employment and wealth. Other contributions are less direct and the impacts are more diffuse. Scientists and technicians are trained for participation in the labour force, ideas are generated and published, and collaborative activities involve business, governments and international working groups. During the summer of 1998, Statistics Canada conducted a pilot survey of intellectual property (IP) commercialization in the higher education sector to begin to measure some of the contributions. The questionnaire was designed to obtain information that would help in understanding the overall process of IP management, from inception to commercialization. The voluntary questionnaire was sent to 81 universities and degree-granting colleges, of which 74 responded. The results show that most universities participate in a wide variety of activities including identifying, protecting, promoting and commercializing IP. About 62% of universities manage IP at the central administration level. Within the past five years, 43% have filed patent applications. One-third have licensed their technologies to generate \$15.6 million per year in royalties. Universities also hold over \$22.5 million in equity in their spin-off companies, which to date number 366.

1. Background

1.1. The role of IP management

The Canadian higher education sector, comprising universities and colleges, is a nationally and internationally important source of science and technology knowledge. Higher education accounts for 22% of Canada's Gross Expenditures on Research and Development¹ (GERD), 31% of Canada's R&D personnel², 65% of Canadian scientific publications³ and 4.4% of Canadian inventions patented in the US⁴ in 1996. In comparison with other countries, Canada ranks among those that depend most on the higher education sector to perform research and development.⁵

The focus on improving national performance and competitiveness in the "knowledge-based economy" has stimulated a new interest in the role of the higher education sector and its contribution to the future economy. The essential roles of universities are still the preparation of their students for the future and the pursuit of knowledge in the general interest of the community. Nevertheless, the institutions themselves have also taken on an important role as developers of new technologies with commercial applications.

One of the keys to exploiting the knowledge being generated in universities is the appropriate management of the institution's IP⁶. If inventions, ideas and creations are identified and protected, their benefits may be shared by the institution that originated them. Commercializing this IP further ensures that the inventors, creators and their institutions share the benefits of their work.

Lawyers are raising consciousness about IP management in the wake of major acquisitions of rights to texts, films, works of art and music by software, hardware and Internet companies. Harris⁷ calls IP the currency of the 21st century.

Canadian universities have developed their own unique approaches to IP management. This diversity poses challenges to measurement. It requires both an understanding of what the universities do and how they do it.

¹ Statistics Canada, 1998, *Estimates of Canadian Research and Development Expenditures (GERD) Canada, 1987 to 1998^e and by Province 1987 to 1996*, Service Bulletin. Cat. No. 88-001-XIB, Vol. 22, No. 5, Ottawa, Canada.

² Statistics Canada, 1998, *Estimates of Research and Development Personnel in Canada, 1979-1995*, Science and Technology Working Paper No. ST-97-14, Ottawa, Canada.

³ GODIN, Benoît, Yves GINGRAS and Louis DAVIGNON, 1998, *Knowledge Flows in Canada as Measured by Bibliometrics*. Working paper prepared for Statistics Canada, Cat. No. **88F0006XPB No. 10**

⁴ Godin, Benoit, 1998, special tabulation. The number of patents had doubled between 1990 and 1995.

⁵ In 1995, the most recent year for which internationally comparable statistics are available, Canada's higher education sector accounted for 22.7% of GERD. For the same year, the same sector in the United States accounted for 17.3%, Japan 20.7%, Germany 18.1% and Great Britain for 15.1%. Source: OECD, 1998, *Main Science and Technology Indicators*, Paris, France.

⁶ **Intellectual property**, for the purposes of this report, is defined as any creation of the human mind that can be protected by law. It includes inventions, works of literature, art, drama and music, computer software and databases, educational materials, industrial designs, integrated circuit topographies, and new plant varieties.

⁷ Harris, Lesley Ellen, 1998, *Digital Property: Currency of the 21st Century*, McGraw-Hill Ryerson, Toronto, Ontario.

1.2. Previous studies

Before this survey, the main source of statistical information on university commercialization activities has been the survey conducted by the Association of University Technology Managers (AUTM). This US-based organization has surveyed major Canadian and US institutions since 1991. Between 12 and 16 major Canadian universities have regularly responded. The survey focuses on licensing but also includes questions on technology transfer personnel and patents.

Several universities have produced studies on their economic impact. The University of Calgary released a study on its economic benefits⁸ in 1994 and another in 1995 on the influence of its faculty on policy⁹. Both of these were conducted using extensive interviews with university faculty and staff.

In 1997, the University of British Columbia¹⁰ released a study of its spin-off companies. The report lists 71 companies that account for 1,502 jobs.

1.3. Policy questions

University research, its funding and its commercialization involve several actors including the universities, federal government, funding agencies, and provincial governments.

The universities have been experiencing a general decrease in funding from federal and provincial sources. They are developing mechanisms for replacing that funding through increases in gifts, investments and commercialization. As new funding and new programs appear, universities need to demonstrate the social and commercial benefits of their work to be able to compete for resources.

The funding agencies are posed the task of equitably allocating their funds based on the merit of the applications and in accordance with national goals. It has been difficult to trace the outcomes of federal grants let alone measure their long-term benefits.

The federal government is currently undertaking discussions leading to the revision of the "Policy on Title to Intellectual Property (IP) Arising from Crown Procurement Contracts". One aspect of these discussions concerns how the federal government can better contribute to the creation and management of IP to which it contributes directly or indirectly. This affects universities in terms of the ownership of IP arising from research contracts and collaborative arrangements.

Provincial governments fund university research and development at about half the federal government level. They also act as research collaborators and promoters of university products and services. The regional policy issues (such as regional competitiveness, use of local resources, cultural and language issues) are unique and need to be taken into account as well.

⁸ Chrisman, James J., 1994, *Economic Benefits Provided to the Province of Alberta by the Faculty of the University of Calgary*, University of Calgary, Calgary, Alberta, Canada.

⁹ Unrau, Yvonne and Jack McDonald, 1995. *The Frequency, Nature, and Impact of Faculty Influence on Policy External to the University of Calgary*, University of Calgary, Calgary, Alberta, Canada.

¹⁰ Livingstone, Angus, 1997, *Report on UBC Spin-off Company Formation and Growth*, University of British Columbia, Vancouver.

1.4. Analytical questions

To support the analysis of conditions and trends relating to university IP commercialization, Statistics Canada set out to develop a comprehensive database consisting of:

- available Statistics Canada data,
- data held by other government departments and
- a survey of universities to supply important new information.

Statistics Canada's Science and Technology Redesign Project adheres to a conceptual framework¹¹ that concerns the generation, transmission and use of science and technology knowledge. Within each of these main components are activities, linkages and outcomes. The framework suggests that, to develop a set of useful indicators, the questions shown in Table 1 should be asked.

Table 1. Basic components and questions posed by the S&T framework

<p>Activities:</p> <ul style="list-style-type: none">• Who are the actors?• What is the nature of the activity?• Where is the activity taking place (geographical region, sector, etc.)?• What are the objectives? <p>Linkages:</p> <ul style="list-style-type: none">• What resources are committed? What are the resources and where do they come from?• What are the linkages between the actors? <p>Outcomes</p> <ul style="list-style-type: none">• What is the result?

In terms of IP commercialization in the higher education sector, some of the answers to these questions are known and others remain to be answered. Table 2 shows several potential indicators derived from this framework.

Some of the indicators listed in Table 2 are already available from other sources. For example, expenditures on university research and development are well accounted for by related Statistics Canada projects¹². Information on enrolment and staff by discipline are also available from other Statistics Canada sources¹³. Another project is investigating the impacts of the higher education sector by analyzing publications in the Science Citations Index as well as the US Patent Database¹⁴. The design of the questionnaire takes the availability of this information into account.

The indicators derived from the survey do not constitute a complete set of ideal indicators of the management of intellectual property. Rather, they provide information on outcomes linked to the activities of knowledge generation, transmission and use. It is not possible, using a survey of university administrators, to measure the quantity of IP created or to obtain a full accounting of the

¹¹ Statistics Canada, 1998, *Science and Technology Activities and Impacts: A Framework for a Statistical Information System*. Cat. No. 88-522-XPB, Ottawa, Canada.

¹² Statistics Canada, 1998, *Estimation of Research and Development Expenditures in the Higher Education Sector, 1996-1997*, Cat. No. 88-001-XIB, Ottawa, Canada.

¹³ Statistics Canada, 1998, *Education in Canada*, Cat. No. 81-228, Ottawa, Canada.

¹⁴ Godin, Benoît, personal communication.

outcomes of IP commercialization. As information on IP creation and outcomes accumulates, it will support our analysis of the impacts of these outcomes, but that is a longer-term objective.

Table 2. Potential indicators of university IP management

Component	Questions	Answer	Specific Indicators
Knowledge Generation	Who	<ul style="list-style-type: none"> • Researchers and creators in Canada's higher education sector 	<ul style="list-style-type: none"> • Number of researchers by major field
	What	<ul style="list-style-type: none"> • Inventing, discovering, creating works of literature, devising trademarks, developing software 	<ul style="list-style-type: none"> • R&D expenditures by field
	Where	<ul style="list-style-type: none"> • Universities and degree-granting colleges 	<ul style="list-style-type: none"> • Performing higher education institutions, number and size • Policies concerning IP ownership
	Why	<ul style="list-style-type: none"> • Pursuit of knowledge, community service, commercial applications, enhancement of education 	<ul style="list-style-type: none"> • Income and equity from commercialization; hours of consultation; status of graduates who participated on research projects
	Linkages	<ul style="list-style-type: none"> • What are the sources of funding? • What is the source of knowledge? 	<ul style="list-style-type: none"> • Proportion of income from gifts, investments and sales • Proportion of creations based on knowledge generated in-house
	Outcomes	<ul style="list-style-type: none"> • How much IP is generated? 	<ul style="list-style-type: none"> • Number of reports of inventions, creations, discoveries, etc.
Knowledge Transmission	Who	<ul style="list-style-type: none"> • Research administration • Technology transfer personnel 	<ul style="list-style-type: none"> • Number of research administration and technology transfer personnel; budgets
	What	<ul style="list-style-type: none"> • Policies on IP • Publishing • Reporting on IP generation • Protection of IP 	<ul style="list-style-type: none"> • Number of universities that retain some rights to IP created • Approaches to IP management • Number of reports of IP creation • Number of protection activities
	Where	<ul style="list-style-type: none"> • Universities and degree granting colleges • Business partners • Users of knowledge 	<ul style="list-style-type: none"> • Number of co-operative research activities; research contracts
	Why	<ul style="list-style-type: none"> • Application of knowledge • Commercialization 	<ul style="list-style-type: none"> • Number of research papers, patents, non-disclosure agreements
	Linkages	<ul style="list-style-type: none"> • What are the sources of funding for technology transfer? 	<ul style="list-style-type: none"> • Funding of technology transfer activities
	Outcomes	<ul style="list-style-type: none"> • How much IP is reported and protected? 	<ul style="list-style-type: none"> • Number of protection activities by type of IP
Knowledge Use	Who	<ul style="list-style-type: none"> • Users, purchasers, licensers of technology. • Spin-offs • Innovative enterprises 	<ul style="list-style-type: none"> • Number of spin-offs, licenses
	Where	<ul style="list-style-type: none"> • World 	<ul style="list-style-type: none"> • Location of spin-offs, licensees
	Why	<ul style="list-style-type: none"> • Innovate products or processes for market advantage, reduce costs or environmental impacts 	<ul style="list-style-type: none"> • Number of innovative companies
	Linkages	<ul style="list-style-type: none"> • Sources of knowledge for innovation 	<ul style="list-style-type: none"> • Number of innovations due to published information or new employees
	Outcomes	<ul style="list-style-type: none"> • Economic benefits • Social benefits 	<ul style="list-style-type: none"> • Royalties from licenses; equity in spin-offs

2. Approach

2.1. Questionnaire development

In early 1997, Statistics Canada commissioned a report by the Impact Group¹⁵ that recommended a set of 50 indicators to measure components of the commercialization process (Annex A). These indicators and the framework from which they were derived (IP creation, Identifying IP, Protecting and Managing IP, Exploiting IP, Faculty IP Transfer, Company Support and IP Transfer Impacts) served as the basis for the subsequent work at Statistics Canada and for consultations with universities.

The Association of Universities and Colleges of Canada (AUCC) recommended additional indicators and facilitated discussions with university representatives. Resulting recommendations were used to produce a draft questionnaire that was subsequently discussed with IP managers in eight universities. The feedback from this group was used in developing the final questionnaire and respondent handbook, provided in Annex B.

Following is a brief summary of the questionnaire components.

2.1.1. Section 1: General information

Questions 1.1 and 1.2. This section requests information about the respondent, including fiscal year and a list of the institutions covered in the report. Many of Canada's universities are groups of affiliated institutions with varying levels of autonomy. For example, a university and its teaching hospital may jointly manage their intellectual property and would therefore complete only one questionnaire. In other instances, the affiliate is more administratively independent and would complete its own questionnaire.

Question 1.3. This section requests information on the IP administrative structure, personnel and budget. Information on research parks and their tenants is requested since research parks provide an environment that stimulates the commercialization of the university's intellectual property.

Question 1.4. It is critical to understand each institution's policies covering IP disclosure, rights and ownership. If there is no requirement for researchers to disclose IP to the university, the responses will exclude some or all of the IP created at the university.

Question 1.5. Given the same discovery in two institutions, the pathway to commercialization will likely be different due to varying policies and preferred approaches. One institution may prefer to find an existing business to license its technology while another may be more willing to establish a spin-off company for this purpose.

Question 1.6. Faculty consulting is an important means of transferring knowledge from the institution to society but it is almost impossible to measure since it is rarely fully reported. This section asks whether or not consulting must be reported.

¹⁵ Statistics Canada, 1997, *Commercialization of Intellectual Property in the Higher Education Sector: a Feasibility Study*, Science and Technology Redesign Project Working Paper No. ST-97-11, Ottawa, Canada.

Question 1.7. Although universities are involved in many forms of collaborative research, this version of the questionnaire focuses on research contracts as the most evident one, and the simplest to measure.

Question 1.8. The question on barriers to IP commercialization is intended to determine whether the IP managers believe that, given different conditions or practices, their IP could be better exploited.

2.1.2. Section 2: Identifying intellectual property

Question 2.1. Since the respondents to this questionnaire are the university administration, we cannot measure the IP actually created. Given the varying reporting requirements, this question requests information on the number of reports made to the university.

2.1.3. Section 3: Protecting intellectual property

Question 3.1 requests information on the activities of the institution in protecting IP over the past five years. This question was intended to identify those small and medium-sized institutions, occasionally engaging in IP protection activities that may slip through an annual accounting period.

Question 3.2 requests information on the number of protection activities initiated by the institution during the reference year.

Question 3.3 provides more detail on patent applications and patents issued by field of study. Note that the field of study classification was not originally intended as a patent classification. It was seen as a useful way for university administrators to link patents with the existing university departmental structure.

2.1.4. Section 4: Exploitation of intellectual property by the institution

This section covers activities and outcomes of IP exploitation: promotion and licensing.

Question 4.1 requests information on promotional activities including market studies, business plans, feasibility studies, scale-up projects, demonstrations, prototype development, licensing studies and other related activities. Some universities undertake these as part of the technology transfer program. Others expect the promotion of IP to be included in external agreements such as research contracts or license agreements.

Question 4.2 is concerned with new and active licenses. New licenses are those that are executed (i.e., signed) during the reference year. Some licenses are exclusive, that is, only the licensee has the right to use the technology for the license period. Exclusive licenses sometimes allow the institution itself to use the technology.

Question 4.3 requests information on royalties received from active licenses during the reference year. In cases where the institution has sold some or all of its equity in a spin-off company, this equity should be excluded. The rationale was to use the same definition as applied by the AUTM. Information from the disposition of equity in spin-off companies is included in Section 5.

Question 4.4 was included to identify other major sources of income related to IP commercialization.

2.1.5. Section 5: Impacts of intellectual property commercialization

This section covers spin-offs, one of the more measurable outcomes of university IP commercialization. The definition of spin-off, adopted from the University of British Columbia¹⁶, includes companies created to:

- **License the institution's technology:** This is the most common type of spin-off. A university researcher has developed a technology with commercial potential but it requires further development. No large investor is willing to risk developing or licensing the technology in its current form.
- **Fund research at the institution in order to develop technology that will be licensed by the company:** In this case, a company is formed to further develop a technology with a good commercial potential.
- **Provide a service that was originally offered through a department or unit of the institution:** University laboratories, for example, often engage in contract services. This category of spin-offs refers to such services that have broken away from the institution.

2.1.6. Section 6: Respondent feedback

This section requests the amount of effort required completing the questionnaire, which questions were most difficult and suggestions for improvements.

2.2. Survey execution and follow-up

The initial list of universities and contacts was derived from the AUCC University Directory, which lists senior personnel in the AUCC's 90 member universities. It was recognized that some of the institutions were affiliated with others but the questionnaire allowed institutions to report individually or together with their affiliates.

For universities with teaching hospitals, the respondent decided whether to include them. Only two universities explicitly included teaching hospitals.

Eighty-one questionnaires were mailed out in early May. About two weeks later, an electronic mail note was sent to all respondents notifying them that the questionnaires had been sent out.

At the end of June, only about 50% of the responses had been received. Non-respondents were telephoned to determine the status of the outstanding questionnaires. Responses continued to trickle in until mid-October.

Preliminary results, released in early October, were missing two medium-sized institutions that responded shortly after the release. Another release, focusing on spin-offs, was issued in late October.

¹⁶ Angus Livingstone, 1997, *op. cit.*

3. Results

3.1. Overview

The data were collected in accordance with the Statistics Act¹⁷. Therefore, any results that would divulge the response of any one institution cannot be reported. For this reason, only limited sub-national results can be provided (Tables 19 and 20).

In most cases, the number of institutions responding to each question is provided. The numbers will vary between questions since:

- not all institutions had something to report (for example, patents), and
- some institutions (including some larger ones) did have activities to report but did not have records to respond to the more detailed questions.

This combined with varying reporting policies means that some results are understated.

3.2. Infrastructure for IP management

3.2.1. Central offices for intellectual property (IP) management

Sixty-two percent (50/81) of universities are actively managing (identifying, protecting, promoting and/or commercializing) their IP, mostly through central offices within the institution. Some examples of central offices are:

- Office of Research and Graduate Studies,
- Business Development Office,
- Industry Liaison Office and
- Technology Transfer Office.

Some universities have more than one office involved in IP management. Table 3 shows that 50 universities manage their IP through a total of 67 central offices. The total number of staff dedicated to IP management for the 50 universities was 186.6 full-time equivalents (FTEs). The operational budget for IP management totalled 12.6 million dollars, 5 million of which was devoted

Table 3. Central IP management offices and resources allocated

	Universities with central IP management	Number of central offices	Full time equivalents (employees)	Operational expenditures	Patent budget (expenditures)
	number		FTEs	dollars	
Total	50	67	186.16	\$12,645,000	\$5,084,000

¹⁷ Department of Justice, 1985, *Statistics Act*. 1970-71-72, c. 15, s. 1, Revised Statutes of Canada, Chapter S19.

to patents.

A few universities (with or without central offices) indicated that they refer their technological IP to another university, either to the institution itself or to an affiliated technology transfer office. This is usually a larger or affiliated university within the same geographic area. This strategy enables smaller universities to participate in IP commercialization at minimum cost.

Some of the smaller universities not currently doing IP management indicated that they are beginning to investigate this area or are in the process of developing IP policies.

3.2.2. *Research parks and business incubators*

Fifteen Canadian universities currently operate 14 different research parks or business incubators, four of which were described as new. One park/incubator (not counted in the 14) was reported as having been recently shut down.

The survey also asked about the institutions' expenditures on park/incubator activities and the number of university employees devoted to such activities. A few universities reported zero for one or both of these questions because:

- the park/incubator is just being started up (and resources have not yet been allocated)
- no university resources are being used to operate the park/incubator.

These results are summarized in Tables 4 and 5. Note that two parks/incubators did not report tenants because they were new. Ten of the park/incubator tenants were also reported as spin-off companies later in the questionnaire.

Table 4. Research parks/business incubators

	Universities reporting	Number
Research parks/business incubators	15	14
Park/incubator tenants	13	172

Table 5. Resources for research park/business incubator activities

	Universities included	Total
Number of university employees devoted to park/incubator activities	13	33.5
University expenditures on park/ incubator activities	11	\$1,323,000

Regarding expenditures and number of employees, it should be noted that the information for one large park/incubator could not be provided and hence the totals are underestimated.

3.3. IP policies: reporting

The survey asked universities whether there is a requirement to report the creation of various forms of IP at the institution. Table 6 shows the number of universities that are always, some-

times or never required to report IP creation, by IP type. For example, in 26 out of a total of 81 universities in the survey, the researcher is always required to disclose inventions created at the university to the appropriate office within the institution.

There were four possible answers to the requirement to report IP question:

- IP type not applicable,
- researcher never required to report,
- researcher sometimes required to report and
- researcher always required to report.

3.3.1. IP type not applicable

The category "IP type not applicable" was added to the original question, as this was the response given by some universities. For example, some small, liberal arts colleges with virtually no science department or faculty could not answer the questions on policies concerning integrated circuit topographies and other technological IP types.

The questionnaire also gave respondents the option of indicating their policies for additional IP types (other than the first eight listed in Table 6). Only one university reported an additional IP type for this question - know-how, and indicated that it must always be reported to the institution. For the remaining 80/81 universities, this IP type is coded as "not applicable".

Note that literary works, educational materials and software/databases were found to be applicable to all universities, since most institutions produce written works and databases.

3.3.2. Researcher never required to report

For most IP types, the major response was "researcher never required to report". This can be explained as follows:

- In the case of "literary works" and to a lesser extent "educational materials", the standard policy in Canadian universities is give the rights to these types of IP to their faculty creators.

Table 6. Reporting requirements

Type of intellectual property	Researcher always required to report	Researcher sometimes required to report	Researcher never required to report	IP type not applicable	Total
	Number of universities				
Inventions	26	18	29	8	81
Software or databases	12	29	40	-	81
Literary, artistic works etc.	10	16	55	-	81
Educational materials	8	21	52	-	81
Industrial designs	13	11	45	12	81
Trademarks	12	10	47	12	81
Integrated circuit topographies	12	12	45	12	81
New plant varieties	13	12	38	18	81
Know-how	1	-	-	80	81

Table 7. Ownership policies

Type of intellectual property	Institution owns both IP and all royalties	Researcher owns both IP and all royalties	Research Contract Sponsor owns both IP and all royalties	Shared ownership and/or shared royalties	IP type not applicable	Total
Inventions	10	28	-	35	8	81
Software or databases	8	40	-	33	-	81
Literary, artistic works, etc.	1	70	-	10	-	81
Educational materials	5	60	-	16	-	81
Industrial designs	7	45	-	17	12	81
Trademarks	11	40	1	17	12	81
Integrated circuit topographies	8	46	-	15	12	81
New plant varieties	10	42	-	11	18	81
Know-how	-	-	-	1	80	81

- In the case of the industrial designs, trademarks, integrated circuit topographies and new plant varieties, many universities indicated that they had no policy on reporting or ownership. The copies of IP policies submitted by universities supported this. Many of the relevant policies were found in collective agreements between the Faculty Associations and the University. Some of the larger universities also post relevant research policies on their web sites.
- The intellectual property clauses in the collective agreements received mainly addressed inventions and copyrights (for written works, recordings, etc.). The agreements make no mention of industrial designs, trademarks, integrated circuit topographies and new plant varieties.

As a result, many respondents indicated that they had no policy and did not know how to complete the questions on requirement to report for these latter four IP types. This does not affect the results since these universities were usually not conducting research that would lead to the creation of these four IP types.

The final result was that the "no policy" responses were coded as "researcher never required to report". This explains why this is the most predominant category of response on IP policies.

Interestingly, a few collective agreements were found to describe IP very broadly, for example as any "invention, design or development". Universities that use this type of wording in their collective agreements help to clarify their ownership policies for any new types of IP created at the university.

3.3.3. *Researcher always or sometimes required to report*

Policies on invention ownership and requirement to report were present in most or all of the collective agreements received. For 43 percent of universities, inventions must always or sometimes be reported.

A few universities indicated that only patents (not inventions as such) must be reported to the university. This is true even if the inventor worked totally on his/her own time and off campus. This provides the university with a record of the IP being generated by its staff.

Regarding literary and related works, some universities require researchers to report these to the institution but have no rights to the IP. For example, faculty members must report literary and related works as part of the annual performance review or to be considered for promotion or tenure.

3.4. IP policies: ownership

In most university IP policies, the ownership of the IP and the resulting royalties are either shared or owned by the researcher (Table 7). In the case of inventions, in only 28 of the universities, do all rights remain with the researcher. There were problems with the interpretation of Question 1.4. Regarding ownership of IP by research contract sponsors, a number of universities indicated that they could not report their IP ownership policies for research contracts and those for IP created within the university in the same question.

The requirement to report and the ownership of IP are not always linked. Universities that required reporting of the creation of a certain type of IP did not always claim ownership of it. As shown in Table 8, eight of the ten institutions that required reporting of literary works yielded the rights to the researcher. On the opposite side of the coin, six of the 29 universities that never required reporting of inventions had policies for sharing the rights.

Furthermore, ownership of the IP itself is completely separate from the royalty-sharing agreement. In many cases, the university or researcher retains ownership of the IP but the royalties are shared. In a slightly different context, one university gave a good reason for this arrangement. The university indicated that in creating a university spin-off company, the technology would never be assigned to the spin-off because if it went bankrupt, the technology would be lost. Retaining university ownership of the IP and sharing royalties with the other parties involved is a risk minimization strategy in IP commercialization.

The question also asked when royalties are shared (e.g. between the institution and the researcher), what percentage of the revenue is retained by the institution. The actual percentages given varied. One finding was that it was usually the net proceeds (or net royalties) that were shared rather than the actual amount. Universities engaged in IP management often assume the patent costs but recover that amount if and when the royalties start coming in. Proceeds to the researcher are only paid out after the patenting costs have been recovered. Some universities indicated that this is done in an account separate from the university's main finances to ensure transparency. In terms of the university accounts, what appears to be happening is that the patent costs are expensed (written off) by the university.

On the revenue side, two universities listed "reimbursement of patenting costs" as an "other substantial source of income related to IP commercialization. The figures are shown in Table 9.

3.5. Identification of IP

The survey asked about approaches to IP identification. Table 10 shows that the predominant approach (60% of the respondents) is for the researcher to report the discovery to the university and request consideration for protection or commercialization.

Table 8. Reporting policies and ownership

Type of intellectual property	Ownership	Researcher is required to report IP created at the institution				
		Always	Sometimes	Never	Not applicable	Total
Inventions	Institution	7	3	-	-	10
	Researcher	1	4	23	-	28
	Sponsor	-	-	-	-	-
	Shared	18	11	6	-	35
	Not applicable	-	-	-	8	8
Total		26	18	29	8	81
Software and Databases	Institution	5	3	-	-	8
	Researcher	1	7	32	-	40
	Sponsor	-	-	-	-	-
	Shared	6	19	8	-	33
	Not applicable	-	-	-	-	-
Total		12	29	40	-	81
Literary, Artistic, Dramatic or Musical Works, Books, Papers	Institution	1	-	-	-	1
	Researcher	8	11	51	-	70
	Sponsor	-	-	-	-	-
	Shared	1	5	4	-	10
	Not applicable	-	-	-	-	-
Total		10	16	55	-	81
Educational Materials	Institution	3	2	-	-	5
	Researcher	3	12	45	-	60
	Sponsor	-	-	-	-	-
	Shared	2	7	7	-	16
	Not applicable	-	-	-	-	-
Total		8	21	52	-	81
Industrial Designs	Institution	5	2	-	-	7
	Researcher	1	3	41	-	45
	Sponsor	-	-	-	-	-
	Shared	7	6	4	-	17
	Not applicable	-	-	-	12	12
Total		13	11	45	12	81
Trademarks	Institution	8	1	2	-	11
	Researcher	-	1	39	-	40
	Sponsor	-	1	-	-	1
	Shared	4	7	6	-	17
	Not applicable	-	-	-	12	12
Total		12	10	47	12	81
Integrated Circuit Topographies	Institution	5	3	-	-	8
	Researcher	-	4	42	-	46
	Sponsor	-	-	-	-	-
	Shared	7	5	3	-	15
	Not applicable	-	-	-	12	12
Total		12	12	45	12	81
New Plant Varieties	Institution	6	4	-	-	10
	Researcher	-	6	36	-	42
	Sponsor	-	-	-	-	-
	Shared	7	2	2	-	11
	Not applicable	-	-	-	18	18
Total		13	12	38	18	81

Table 9. Substantial sources of income related to IP commercialization (other than licensing royalties)

	Universities reporting	Income
Reimbursement of patent costs	2	X
Sales of IP (e.g., books, databases)	3	X
Industry subsidies	1	X
Consulting	1	X
Total	7	\$731,000

Table 10. Identification of IP

	Number	%
1. The discoverer (researcher) reports the discovery to the institution and requests consideration for protection and/or commercialization	49	60
2. The institution monitors the activities of the researchers and notes which discoveries should be considered for protection and/or commercialization	1	2
3. Other approaches	4	5
4. No response/not applicable/no policy	27	33
Total	81	100

Table 11. Research funding summary

Item	Value
Total sponsored research (grants and contracts) ('96/7)	\$1.9 billion
Research contracts - value ('97/8)	\$289 million
Research contracts - number ('97/8)	5,081
Average value of research contract	\$57,000

The "other approaches" are as follows:

- a combination of 1 and 2
- copyright is automatically granted to the author, and
- IP activities occur in sponsored research and are predetermined in the contract.

3.6. Research contracts

A research contract is an arrangement under which a university, or an individual within the university, agrees to undertake a research project on a specified problem, using the institution's facilities and/or personnel, for a sponsor that provides funds to meet all or part of the costs of the project. Research contracts generally only constitute a small part of a university's total research funding. Most university research funding comes in the form of grants from governments and granting councils, such as the Social Sciences and Humanities Research Council (SSHRC), the Natural Sciences and Engineering Research Council (NSERC), etc. Table 11 gives the amount and number of university research contracts reported on the survey and the total research funding.

Research contracts result in knowledge flows between different public and private sector entities and often, in the creation of IP. The IP may be owned and/or licensed by one or more of the par-

Table 12. Number and value of research contracts by category of sponsor

Sponsor	Number	Value \$'000
Federal government	862	56,947
Provincial and other levels of government	786	70,610
Private business (Canadian)	2,072	91,801
Non-governmental organizations	291	7,607
Foreign companies	397	23,367
Foreign governments	56	5,456
International organizations	40	4,690
Other	50	8,050
Total research contracts¹	5,081	288,600

¹ The parts in this table do not equal the sum, as not all respondents were able to provide the breakdown by category of sponsor.

Table 13. University policy on ownership and first rights to license IP from research contracts

Code	Response	Number
0	No response	15
1	Sponsor (owns IP and has first rights to license)	8
2	University	3
2,1	University owns, sponsor has first rights	7
3	Researcher	10
3,1	Researcher owns, sponsor has first rights	1
4	Shared	3
4,2	University/researcher jointly own, university has first rights	1
5	Not applicable/no policy	8
6	Varies/negotiable/per contract	25
	Total	81

ties involved: the university, the researcher and the research contract sponsor. As shown in Table 12, the primary sponsors of research contracts were private business and provincial governments.

The survey asked, "What are your institution's policies concerning IP resulting from research contracts. That is, who owns the rights to the IP and who has the first rights to license it?" Note that there are two questions here. Some respondents gave one answer and others gave two answers, both of which have been coded. The responses are detailed in Table 13.

The 15 non-responses and the 8 universities responding "not applicable/no policy" (code 5) tend to be those universities not doing IP management and/or who have little experience with research contracts.

As might be expected, the predominant response (25/81 or 31%) was "Varies", "negotiable" or "per contract." As indicated previously, many universities emphasized that IP from research contracts is a completely separate matter from IP created from regular (e.g., grant funded) research. However, Table 13 indicates a variety of policies on the matter.

3.7. Faculty consulting activities

The survey looked at one other aspect of knowledge flows from the public to the private sector. This is the policy of universities regarding external consulting activities and the requirement to report such activities. The results are shown in Table 14.

For the 32 universities that "sometimes" require faculty members to report external consulting activities, Table 15 shows the pertinent conditions.

3.8. Barriers to IP commercialization

Thirty percent (24/81) of universities reported being aware of lost opportunities due to premature invention disclosure. In addition, thirty five percent (29/81) of universities reported knowing of instances where the institution failed to gain the maximum benefit from its IP. Regarding the second point, some of the reasons given are shown in Table 16.

Some specific responses of interest were as follows:

- "Lack of funds to defend against an opposition action to an "issued" patent. Lack of funds to do prototype development or field testing of the discovery to bring it to the point where industry could take it over."
- "A common problem is having only North American patent protection because inventors believe they have a year's grace period after public disclosure of their invention in which to file a patent application. They are unaware that Europe and Japan have no grace period. Lack of European and Japanese coverage is usually fatal for biomedical inventions."
- "Technology transferred via academic external consulting and commercialized without any return (financial, public relations) to the university. This is more common than previously thought."
- "Diminishing IP rights due to pressures exerted by individual partners. Failure of faculty to identify IP transferred to a research contract partner."

Table 14. Faculty requirement to report on external consulting activities

	Number	%
Always required to report	24	30
Sometimes required to report	32	40
Never required to report	11	13
Consulting not permitted	1	1
Unknown	13	16
Total	81	100

Table 15. Conditions under which faculty members are required to report external consulting activities

	Number	%
1 Significant amount of time involved	11	34
2 University facilities are used	2	6
3 Both 1 and 2	4	12
4 Conflict of interest	3	10
5 Report required annually or upon discretion of Dean, Director, etc.	6	19
6 Other or unknown	6	19
Total	32	100

3.9. Promotion activities

Twenty-one universities reported participating in the promotion of their technologies (Table 17), with an average promotion expenditure of \$4,200. A few universities indicated that they use the Internet to promote their IP. Others indicated that they do not promote IP since this is the responsibility of the researcher.

3.10. Identifying and protecting IP

For each type of intellectual property, more universities reported having engaged in the corresponding protection activity within the past five years than within the past year (Table 18). For example, 11 universities reported patent applications within the past five years but not within the past year. These are generally the small and medium-sized institutions.

The most active 12 universities (Table 19, defined as having greater than 50 million dollars in income from sponsored research in the 1996 CAUBO¹⁸ database) accounted for three-quarters of the invention reports, new licenses and active licenses. They also accounted for more than two-thirds of new patent applications. A majority of the activity in the remaining universities was among the medium-sized institutions, those having more than 10 million dollars in sponsored research income.

There are appreciable regional differences in IP management activities (Table 20). For example, British Columbia's nine universities reporting account for 30% of patents held. Similarly, the Prairies (Manitoba, Saskatchewan and Alberta) dominate in new licenses executed with 36% of the national total.

Table 16. Reasons given by universities for not gaining the maximum benefit from their IP

	Number of universities
Premature disclosure/publication	6
Lack of policies and procedures	2
Faculty owns IP	4
Lack of resources	4
Lack of patent (or other IP protection)	3
Inadequate or no marketing (capability)	3

Table 17. IP Promotion activities and related expenditures

	Total (for all universities)	Number of universities reporting
Number of intellectual properties benefiting from promotion	298	21
Expenditures on IP promotion activities	\$1,226,000	19

¹⁸ Canadian Association of University Business Officers, 1997, *Financial statistics of universities and colleges 1996-97*. Ottawa, Canada.

Table 18. Reporting and protection activity summary

IP type	Applicable IP protection activity	Universities reporting this IP protection activity in the last 5 years		Universities that had disclosures (reports) of this IP type in 1997/8	Disclosures (reports) in 1997/8	Universities engaging in protection activities for this IP type in 1997/8	Protection activities in 1997/8
		number	%					Number
Inventions	Patent application	35	43	24	661	30	379
Computer software or databases	Copyright registration	23	28	18	66	4	6
Literary, artistic, dramatic or musical works, books, papers	Copyright registration	20	25	8	293	5	26
Educational materials	Copyright registration	19	23	3	X	3	X
Industrial designs	Registration	2	2	2	X	2	X
Trademarks	Registration	27	33	9	24	14	41
Integrated circuit topographies	Registration	1	1	-	-	-	-
New plant varieties	Registration (Canada)						
	Patent (US)	5	6	4	X	2	X
Various	Trade secret agreement	12	15	...	...	4	X
Other IP: Know-how		1	1	1	X	-	-
Other IP: Biological materials	Registration	1	1	-	-	-	-

Table 19. Activities of the 12 largest institutions¹

	Invention Reports		New patent applications		New licenses		Active licenses	
	number	percent	Number	percent	number	percent	number	percent
Largest 12	512	77	256	68	187	77	578	73
Other	149	23	123	32	56	23	210	27
Total	661	100	379	100	243	100	788	100

¹ The institutions with more than \$50 million in sponsored research income in 1996/97, as defined in the CAUBO database are: the University of Ottawa, Queen's University, the University of Guelph, the University of Calgary, Université Laval, the University of Western Ontario, McMaster University, McGill University, the University of Alberta, the University of British Columbia, Université de Montréal and the University of Toronto.

Table 20. Activities by region

Region	Universities reporting		Invention reports	New patent applications	Patents held	New licenses	Active licenses
	number	percent						percent of national total
Atlantic	16	20	9	9	2	2	2
Quebec	19	23	8	9	21	28	27
Ontario	22	27	44	31	20	23	17
Prairies	15	19	22	21	25	36	30
BC	9	11	17	30	32	10	24
Total	81	100	100	100	100	100	100

Note: The percentages have been intentionally rounded.

3.10.1. Inventions

The total number of invention reports or disclosures in 1997/8 was 661 (Table 18). Invention reports and disclosures were underreported in the survey due to question interpretation and general reporting problems. Many universities and affiliated technology transfer offices do not require researchers to report IP but have procedures in place to assist researchers who request commercialization assistance. The question only asked for the number of reports that had to be made to the university central administration. Some respondents gave all reports (whether or not reporting was required) and these values were retained.

In addition, some universities that always or sometimes require reporting could not provide the number of invention reports due to lack of records. The number of reports and disclosures for all types of IP was affected by the interpretation and reporting problems but the major impact was likely on inventions.

Some of the issues that arose in reporting patents were as follows:

- the patents reported do not generally include those applied for or held by faculty. The majority of universities do not seem to keep this information.
- one university inquired about whether patent renewals should be included
- "provisional" patents were reported by one university.

3.10.2. Copyright (general)

According to the CUIPG¹⁹, copyright is the exclusive right of a creator, or subsequent copyright holder, to reproduce a work. Copyright protection is granted automatically in Canada but copyrights can be formally registered to establish ownership. The survey intended to cover the number of copyright registrations only, not those granted automatically. Copyright extends to other countries by virtue of the Berne Convention and the Universal Copyright Convention. Therefore, registering one copyright in Canada appears to provide protection for all countries.

3.10.3. Literary, artistic, dramatic or musical works, book, papers and educational materials

One-quarter of the institutions responding reported having engaged in copyright registration for literary works within the past five years. Eight universities reported on the creation of 293 new literary works within the past year. Five engaged in 26 copyright registrations during the reference year.

Less than one quarter of the respondents reported having engaged in copyright registrations of educational materials.

The number of reports and the number of protection activities for these two IP types were underreported. As shown in the section on reporting requirements, (Section 3.3), only 10 universities required the reporting of literary works and eight required reporting of educational materials.

Many respondents indicated that different parts of the questionnaire had to be completed by many different persons within the university. In a number of the science-intensive universities, the

¹⁹ Canadian University Intellectual Property Group (CUIPG), 1998, *A Guide to Protecting Intellectual Property*, <http://www.utl2.library.utoronto.ca/www/techtran/cuipg.html>.

technology transfer office that was completing the questionnaire did not have a record of reports or protection activities for literary works or educational materials. Also, where separate but affiliated colleges were involved, some of these felt that it would be duplication for both themselves and the main institution to complete the questionnaire and did not respond. The result was under-reporting of the numbers on literary works and educational materials.

3.10.4. Trademarks

One third of the respondents reported having registered a trademark within the past five years. During the reference year, 14 institutions reported registering 41 new trademarks.

3.10.5. Software and database copyrights

Twenty-eight percent of the institutions reported having registered copyrights for software or databases within the past five years. During the reference year, four respondents initiated six new copyright registrations.

The issue of how to report software embedded in an invention arose in the survey. In one case, the software and the invention were both counted as "reports/disclosures" but only the invention was patented. According to the respondent, the software does not stand alone and hence no copyright was registered.

3.10.6. Integrated circuit topographies

According to the CUIPG, integrated circuit designs can be protected in Canada under the *Integrated Circuit Topography Act* and in the U.S., under the *Maskworks Protection Act*. Other countries are considering similar legislation.

Only one university registered an integrated circuit topography in the last 5 years and that there were none registered last year.

3.10.7. Trade secret agreements

Twelve respondents indicated that they had engaged in trade secret agreements within the past five years and four had initiated such an agreement during the reference year (Table 18).

Several of the larger universities indicated that they don't use or understand the term "Trade Secret Agreements". One university commented that any agreement that prohibits the university from publishing the results of its research could not be signed under university policy. Other universities gave numbers for what they termed "Confidentiality Agreements." Note that where reported, the survey included "Confidentiality Agreements" under the banner of "Trade Secret Agreements." Due to differences in interpretation, the number of agreements may be under-reported.

3.11. Patents

Canadian universities were issued a total of 143 new patents during the reference year (Table 21), bringing the total number of patents in force internationally to 1,252 (Table 22). Of the patents is-

Table 21. Patenting activities by field of study

Field of study	New patent applications	Patents issued in Canada	Patents issued in the US	Patents issued in other countries	Total patents issued
Educational, recreational and counselling services	X	X	-	-	X
Fine and applied arts	-	-	-	-	-
Humanities and related fields	-	-	-	-	-
Social sciences and related fields	-	-	-	-	-
Commerce, management and business administration	X	X	-	-	X
Agriculture and biological sciences /technologies	66	5	7	X	X
Engineering and applied sciences	40	8	10	X	X
Engineering and applied science technologies and trades	X	-	X	X	X
Health sciences and technologies	91	10	34	17	61
Mathematics and physical sciences	12	X	X	-	5
All other not elsewhere classified	-	X	X	X	X
Total	379	35	82	25	143

Note: Columns do not add to totals because (a) some values have been suppressed and (b) some respondents reported totals only.

Table 22. Total patents held by country of issue

Country of issue			
Canada	US	Other	
264	635	353	1,252

Table 23. New and active licenses

	New licenses			Total active licenses			
	Exclusive	Non-exclusive	Total	Exclusive	Non-exclusive	Unknown	Total
Nationality	82	62	144	254	164	60	478
Canadian	58	32	90	193	51	55	299
US and other	24	30	54	61	113	5	179
Multi-national or unknown	...	...	99	...	...	...	310
Total	...	...	243	...	...	...	788

sued during the year, 35 were in Canada, 82 in the United States and 25 in other countries. One university reported one new patent but not the country of filing.

3.12. Exploiting IP: licensing and spin-offs

Over the years, the universities have contributed to the establishment of many new businesses. The rationale for creating a new business rather than transferring the technology to an existing business is twofold. First, the technologies sometimes require further development or prototyping to demonstrate their commercial applicability. The spin-off is a way for the university to support the nurturing of these technologies to the commercial stage. Secondly, the spin-off is a way for the institution to invest in its own future. In many cases, the university will take equity in the business in lieu of licensing fees.

Table 24. Institutional linkage with spin-off companies

	Licensing	R&D	Service	Licensing and R&D	Licensing and Service	Unknown	Total
Number	177	43	6	24	1	115	366
%	48	12	2	6	-	32	100

Table 25. Equity held in spin-off companies

Spin-offs	With equity held by university	No equity held by university	Unknown	Total
Number	73	205	88	366
%	20	56	24	100

Table 26. Technological field of spin-off companies

	Technology field							Total
	Biotechnology/Biology	Health Sciences	Engineering/Applied Sciences	Information	Mathematics/Physical Sciences	Business/Management	Other/Unknown	
Number	90	66	58	55	73	5	19	366
%	25	18	16	15	20	1	5	100

Table 27. Year of incorporation of spin-off companies

	Incorporation year						Total
	Before 1980	1980 to 1984	1985 to 1989	1990 to 1994	1995 to 1998	Unknown	
Number	22	38	54	115	115	22	366
%	6	10	15	31	31	7	100

Table 28. Status of spin-off companies

	Conceptual stage	Early stage	Active	Merged	Inactive	Closed	Not known	Total
Number	7	44	253	6	17	23	16	366
%	2	12	69	2	5	6	4	100

Only those businesses that are started in a formal arrangement with the university are included in this definition of spin-off. The arrangement could be to license technology, to fund further research of a technology to be licensed, or to provide a service that was originally offered through the university.

The survey found that almost one-third (26/81) of universities have licensed their technologies. A total of 243 new licenses were executed with other organizations in 1997/8, bringing the total number of active licenses to 788 (Table 23).

Royalties to universities from licensing totalled \$15.6 million or \$20,000 per active license. Where survey respondents were able to provide the breakdown, approximately one-third of revenues were from "Canadian" sources and two-thirds were from "foreign" sources. However, this distinction is difficult to make with respect to multinational companies.

Canadian universities have created a total of 366 spin-off companies to commercialize their technology. Almost one-half of spin-off companies were created solely to license university technology, as shown in Table 24.

As indicated in Table 25, universities reported holding equity in 73 (20%) of the 366 spin-off companies at the time of the survey.

In 1997/8, five universities disposed of \$861,000 in spin-off equity. There remained a total of \$22.5 million in spin-off equity held by ten universities.

Much of today's research at Canadian universities is in the areas of biotechnology, medicine and engineering and related fields. This is reflected in the technological fields of the spin-off companies created, as shown in Table 26.

The rate of spin-off company creation is increasing over time (Table 27). During the 1980s, about nine spin-off companies were incorporated per year. This rate more than doubled in the 1990s to 23 per year.

Whether these companies are still in business is of primary interest. Table 28 shows that only 13 percent of the companies are known to be inactive, closed or merged with other companies. Over two-thirds of companies are in active status, while a further 14 percent are in the conceptual or early stages. The status of the remaining four percent is not known.

4. Conclusions

It is recognized that commercialization itself is a narrow indicator of the outcomes of university research. However, there are few other measurable indicators that demonstrate the higher education sector's direct contribution to the economy and society.

Improved reporting of the creation of all forms of intellectual property would contribute to a broader assessment of the impacts. Until more is understood about the quantity and nature of the intellectual property generated, it will be difficult to assess whether enhancements to IP management would result in a parallel increase in commercialization.

The survey has provided unique and useful insights into one of the linkages between knowledge creation, transfer, use and impacts. Further refinement of the questionnaire will be required to provide stable long-term indicators.

Annex A: Indicators recommended by the Impact Group (Statistics Canada, 1997)

Innovation Theme	Sample Indicator
Creating IP	
Nature and extent of university research*	Volume of research (\$, # of projects, fields, etc.) Distribution among universities Type of research (grant, contribution, contract, etc.) Research quality (bibliometric data)
Training/re-training of HQP and managers*	Enrolment, graduation and employment data (FT/PT)
Identifying IP	
Identifying inventions	# of invention discoveries reported # of invention discoveries reviewed by university or agent # of invention discoveries declined for investment
Protecting and Managing IP	
Identifying & evaluating intellectual property	# of invention discoveries accepted for investment # of technology transfer personnel \$ of technology transfer expenditures Field of discovery (cf. NSERC/MRC categories) Field of application (cf. SIC code)
Protecting intellectual property	# of discoveries with patent applications # of patent applications per discovery # of patents granted # of software copyrights registered \$ invested to protect new IP \$ invested to protect old IP
IP Exploitation by Institution	
Demonstrating/developing intellectual property	# of prototype, demonstration or scale-up projects \$ investment in prototypes, demonstration or scale-up # of market studies \$ investment in market studies
Exploiting intellectual property	# of university-owned commercialization companies \$ spent to market inventions # of technologies licensed # of licenses/options awarded \$ of royalty income \$ from licensing fees \$ from equity investments Type of company licensing IP (e.g. SME, Canadian, etc.) Country in which IP is being commercialized
IP Transfer by Faculty	
Transferring intellectual property	# of faculty engaged in consulting # of consulting projects completed \$ of faculty consulting income \$ of research contracted back to institution Impact of faculty consulting (sales, exports, jobs, etc.) Biological material exchanges
Support of Technology-based Companies	
Research parks and business incubators	Presence of a research park or business incubator \$ spent on park or incubator activities # employees devoted to park or incubator activities # of tenant companies # of employees/employee growth at tenant companies \$ sales/sales growth at tenant companies
Impacts of IP Commercialization	
New company formation	# of start-up companies created (from IP) # of university spin-off companies created (from IP) \$ of outside investment leveraged into new companies New company growth (sales, employment, exports, etc.)
Returns from equity investments	# of companies with university equity investment Type of equity investment (IP, cash, etc.) Type of equity received (shares, warrants, debentures, etc.) \$ returns from dividends \$ returns from equity disposition
Job creation	# of jobs created through IP commercialization
Exports	\$ of export revenues earned through IP commercialization

* Not recommended for an IP commercialization study

Annex B: Survey questionnaire and respondent handbook



Science and Technology Redesign Project

Survey of Intellectual Property Commercialization in the Higher Education Sector, 1998

Confidential when completed.

Collected under the authority of the Statistics Act, Revised Statutes of Canada, 1985, Chapter S19.

Si vous préférez ce questionnaire en français, veuillez nous appeler au (613) 951-2199.

In all correspondence concerning this questionnaire, please quote this three-digit reference number.

Please correct name and address, if necessary.



Purpose

The information you provide is essential to assure the availability of pertinent information to monitor science and technology related activities and to support the development of science and technology policy. Statistics Canada will create a database combining survey responses with other Statistics Canada records concerning your institution.

Confidentiality

While participation in this survey is voluntary, your cooperation is important to ensure that the information collected is as accurate and as comprehensive as possible. Statistics Canada is prohibited by law from publishing or releasing, in any manner, any statistics that would divulge information obtained from this survey relating to any identifiable business, institution or person, without the previous written consent of that business, institution or person. The data reported on this questionnaire will be treated in strict confidence, used for statistical purposes and published in aggregated form only. The confidentiality provisions of the Statistics Act are not affected by either the Access to Information Act or by any other legislation.

Questions?

If you require assistance in completing this questionnaire or have any questions regarding this survey, please call the sponsoring division collect: Statistics Canada, Science and Technology Redesign Project, 613-951-2199 (Call collect).

Survey Contact

Please indicate the name of the person completing this form so that we know who to contact should we have any questions.

Name	
Title	
Telephone Number () -	Fax Number () -
E-mail	

1. General Information

1.1 Please report your fiscal year (normal business year) ending at any time between April 1, 1997 and March 31, 1998.

This report covers months
(number)

From: | | 1 | 9 | 9 |
day month year

To: | | 1 | 9 | 9 |
day month year

5-4900-483.1: 1998-04-08 STC/SAT-465-75141

1.2 If your records do not permit separate reporting, list the names of all institutions (the main institution, affiliated colleges, related research institutes, teaching hospitals, etc.) included in your figures. Also, indicate whether or not they are engaged in intellectual property management (identification, protection, promotion or commercialization) by selecting YES or NO in the second column.

Name of Institution	Intellectual property management		Indicate type of affiliation with reporting institution (i.e., affiliated college, research institute, or other).
	Yes	No	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	
	1 <input type="radio"/>	2 <input type="radio"/>	

1.3 Infrastructure for intellectual property management

a. Does your institution have one or more central offices engaged in intellectual property management, including identification, protection, promotion or commercialization?

1 Yes 2 No



b. Please note the names, number of employees, and budget for patent applications during the reference year for all offices within the institution that are engaged in intellectual property management. If the employment has changed during the year, please indicate the number at the end of the year. *If there are more than three offices, list the additional ones on a separate sheet.*

Name of office engaged in intellectual property management	Number of full-time equivalents (persons)	Operational expenditures (\$ thousands)	Budget for patent applications (\$ thousands)
		\$	\$
		\$	\$
		\$	\$

c. If intellectual property is not managed centrally, please provide an explanation of how it is managed. *Use an additional sheet of paper, if necessary.*

d. Does the institution own and operate a research park or business incubator?

¹ Yes ² No



If so, please provide the following information about the research park or business incubator:

Name	Your institution's expenditures on park or incubator activities <i>(\$ thousands)</i>	Number of employees (full-time equivalents) devoted to park or incubator activities <i>(persons)</i>
	\$	

Please list the legal names of the tenant companies below. *Attach a separate sheet, if required.*

1.4 Intellectual property policies

a. Is there a requirement to report the creation of the following types of intellectual property at your institution? *Please refer to the definitions in the accompanying handbook.*

b. To whom do these reports need to be made (for example, to a central office, to the Dean of the Faculty, to the Department Head)?

	<u>always</u>	<u>sometimes</u>	<u>never</u>		<u>Whom these reports need to be made to:</u>
Inventions	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Computer software or databases	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Literary, artistic, dramatic or musical works, books, papers	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Educational materials	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Industrial designs	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Trademarks	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Integrated circuit topographies	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
New plant varieties	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	
Other (<i>please specify</i>)					
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	➔	

c. Who normally owns the rights to each of the following types of intellectual property created at the institution: the institution, the researcher, the research contract sponsor? If the rights are shared, note this in the space provided.

d. If the royalties from licensing are **shared**, what percentage of the revenue is retained by the institution? If the percentage varies, please indicate the range and explain the conditions in the space provided.

	<u>institution</u>	<u>researcher</u>	<u>sponsor</u>	<u>shared</u>	<u>Percentage</u>	<u>notes</u>
Inventions	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Computer software or databases	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Literary, artistic, dramatic or musical works, books, papers	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Educational materials	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Industrial designs	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Trademarks	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Integrated circuit topographies	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
New plant varieties	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%
Other (<i>please specify</i>)						
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	➔	%

e. Please list any other policies in effect that influence the management of intellectual property created at the institution. *List the policies on an additional sheet of paper if necessary, or provide paper copies.*

1.5 Approaches to intellectual property management

a. How are intellectual property management activities most often initiated for new intellectual property?

check one

The discoverer (researcher) reports the discovery to the institution and requests consideration for protection and/or commercialization.

1

The institution monitors the activities of the researchers and notes which discoveries should be considered for protection and/or commercialization.

2

Other (*please specify*)

3

b. What are the main approaches to developing and commercializing the institution's intellectual property? For example, patenting and licensing could be managed by the technical transfer office or alternatively by a commercialization company. *Provide the response on a separate sheet of paper, if necessary.*

c. Please describe a typical case of intellectual property management at your institution. This description should include who took what action and at what time. *Provide your response on a separate sheet of paper, if necessary.*

1.6 Faculty consulting activities

Faculty consulting is an important means of transferring the institution's intellectual property to groups outside the institution.

a. Are the institution's faculty members required to report on external consulting activities?

1 **always**

2 **sometimes** → What are those conditions?

3 **never**

1.7 Research contracts

Research contracts often result in intellectual property being created in the form of inventions, computer software, databases, published papers, etc. This section requests information on the role of research contracts at your institution.

- a. What are your institution's policies concerning intellectual property resulting from research contracts? That is, who owns the rights to the intellectual property and who has the first rights to license it?

- b. During the reference year, how many research contracts were initiated, and what was the total value of the research contracts? *If the information is available by field of study, report the number and value of research contracts according to the Field of Study Classification detailed in the survey handbook, on a separate sheet of paper.*

Number of research contracts	Value of research contracts (\$ thousands)
	\$

- c. Who were the sponsors of the research contracts initiated during the reference year?

Research contracts initiated with:	Number of research contracts	Value of research contracts (\$ thousands)
Federal government		\$
Provincial and other levels of government		\$
Private business		\$
Non-governmental organizations		\$
Foreign companies		\$
Foreign governments		\$
International organizations		\$
Other (please specify) |		\$

1.8 Barriers to intellectual property commercialization

- a. Are you aware of any instances where the rights to intellectual property (for example, patent rights) have been lost due to the invention having been publicly disclosed (published or otherwise made public) before the rights had been secured?

1 Yes 2 No

- b. Have there been any instances of the institution not gaining the maximum benefit from its intellectual property?

1 Yes → What were some of the reasons for this? _____

2 No _____

2. Identifying Intellectual Property

2.1 Each form of intellectual property (see the handbook for full definitions), if reporting is required, may require a different reporting procedure. Inventions, for example, normally have a formal disclosure procedure.

Indicate the number of new reports or disclosures, during the reference year, for all forms of intellectual property that require reporting to the institution central administration.

	Number of reports
Inventions	
Computer software or databases	
Literary, artistic, dramatic or musical works, books, papers	
Educational materials	
Industrial designs	
Trademarks	
Integrated circuit topographies	
New plant varieties	
Other (please specify): _____	

3. Protecting Intellectual Property

3.1 Has the institution engaged in any of the following forms of intellectual property protection over the past 5 years?

Indicate YES in the column provided, whether or not the action was completed. These are more fully defined in the handbook.

	Yes	No	Do not know
Patent applications	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Copyrighting of computer software or databases	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Copyrighting of literary, artistic, dramatic or musical works, book, papers	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Copyrighting of educational materials	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Industrial design registrations	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Registrations of trademarks	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Integrated circuit topography registrations	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Applications for plant breeder's rights	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Trade secret agreements	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Other (please specify): _____	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>

3.2 Protecting intellectual property requires effort, and often expenditures, by the institution. Not all reports of intellectual property creation detailed in Question 2.1 above require or merit further action by the institution. In some cases, the institution may not be able to afford the time or money to engage in protection.

During the reference year, how many protection activities were initiated? Note that this is independent of the number reported in Question 2.1 since there is often a time lag between reporting and initiating the protection activity. Furthermore, one intellectual property (such as a computer program) could be protected using several forms such as patents, copyrights, trademarks and trade secret agreements. This should not include continuations of processes initiated in previous years.

	Number of activities
Patent applications	
Copyrighting of computer software or databases	
Copyrighting of literary, artistic, dramatic or musical works, book, papers	
Copyrighting of educational materials	
Industrial design registrations	
Registrations of trademarks	
Integrated circuit topography registrations	
Applications for plant breeder's rights	
Trade secret agreements	
Other (please specify):	

3.3 Patent applications and patents issued

During the reference year, how many patents were applied for and issued with the support of the institution, whether or not the institution retains the rights. *Wherever possible, the information should be provided by field of study (see the handbook for full definitions). If details are not available by field of study, please report the total number for the institution.*

	New patent applications	Patents issued in:			TOTAL
		Canada	US	other	
1. Educational, Recreational and Counselling Services					
2. Fine and Applied Arts					
3. Humanities and Related Fields					
4. Social Sciences and Related Fields					
5. Commerce, Management and Business Administration					
6. Agriculture and Biological Sciences/Technologies					
7. Engineering and Applied Sciences					
8. Engineering and Applied Science Technologies and Trades					
9. Health Professions, Sciences and Technologies					
10. Mathematics and Physical Sciences					
11. All other not elsewhere classified					
TOTAL					

	Patents held in:			TOTAL
	Canada	US	other	
Total patents held including patents issued this year				

4. Exploitation of Intellectual Property by the Institution

4.1 Intellectual property promotion activities

a. Under what conditions does the institution engage in activities that are intended to promote its intellectual property? This refers to market studies, business plans, feasibility studies, scale-up projects, demonstrations, prototype developments, licensing studies and other related activities.

b. Number of intellectual properties benefiting from promotion activities initiated during the reference year (number)

c. Total expenditures on promotion activities during the reference year \$ (\$ thousands)

4.2 Licenses

Most commercialization activities result in a license being executed with another organization, whether this is for licensing a patented invention, computer software or a logo. In this section, please report the number of new licenses executed during the reference year and the total number of active licenses at the end of the reference year. If detailed figures are not available, please report totals in the appropriate cells.

	Exclusive (number)	Non-exclusive (number)	TOTAL (number)
a. New licenses executed with Canadian companies during the reference year:			
- That are sponsors of research contracts			
- That are not sponsors of research contracts			
- Total			
b. Total active licenses with Canadian companies at the end of the reference year:			
- That are sponsors of research contracts			
- That are not sponsors of research contracts			
- Total			
c. New licenses executed with companies in the United States and other foreign countries during the reference year			
d. Total active licenses with companies in the United States and other foreign countries at the end of the reference year			

4.3 Royalties received

During the reference year, what was the total amount of royalties received from active licenses? Include license issue fees, running royalties, software and database end-user license fees, and any other royalties. Exclude cashed-in equity from spin-off companies.

	FROM:		
	Canadian sources (\$ thousands)	foreign sources (\$ thousands)	TOTAL (\$ thousands)
Royalties received during the reference year	\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

4.4 If there were other substantial sources of income related to intellectual property commercialization, indicate the source of the income and the total amount.

Other sources of income not covered by royalties (specify)	FROM:		
	Canadian sources (\$ thousands)	foreign sources (\$ thousands)	TOTAL (\$ thousands)
	\$	\$	\$
	\$	\$	\$

5. Impacts of Intellectual Property Commercialization

- 5.1 New companies may be established to either:
- (1) license the institution's technology,
 - (2) fund research at the institution in order to develop technology that will be licensed by the company,
or
 - (3) provide a service which was originally offered through an institution's department or unit.

These companies are often called **spin-offs**. A subset of these, those dependent on licensing the institution's intellectual property, are called **start-ups**.

In the space provided below (and on additional pages, if required), list the legal names of all spin-off companies, the year of their incorporation, the company status, technology sector, institutional link, and the percentage of the company owned by your institution.

Legal name	Year Incorporated	Company Status (conceptual stage, early stage, active, merged, inactive, closed)	Technology sector (information, medicine, engineering, physical sciences, etc.)	Institutional link (licensing or R & D)	% of company owned
					%
					%
					%
					%
					%
					%
					%
					%

5.2 During the reference year, what was the total value of dividends received from these spin-off companies (not including disposition of equity)?

\$ (\$ thousands)

5.3 During the reference year, what was the amount received from disposition of equity holdings in spin-off companies?

\$ (\$ thousands)

5.4 What was the value of remaining equity in spin-off companies at the end of the reference year?

\$ (\$ thousands)

6. Respondent Feedback

6.1 We are committed to minimizing the burden placed on our respondents while obtaining quality statistics. Please answer the following questions to help us fine-tune the survey.

a. How much effort was required to complete the survey?

person-hours

b. In your opinion, which was the most difficult question to answer?

question number

c. Did you find the questions and classifications used in the survey compatible with your own accounting systems?

1 **Yes**

2 **No** → If not, please comment on how the concepts and classifications could be changed to be more compatible.

6.2 Other comments

Thank you for your cooperation !



Science and Technology Redesign Project

Survey of Intellectual Property Commercialization in the Higher Education Sector, 1998

Respondent Handbook



5-4900-483.3: 1998-04-08 STC/SAT-465-75141



Statistics Statistique
Canada Canada

Canada



Science and Technology Redesign Project
Survey of Intellectual Property
Commercialization in the
Higher Education Sector, 1998

Instructions and definitions

If exact numbers are not readily available, please provide estimates with a note indicating this.

Please do not leave any question blank. Enter zero responses with the digit "0" if the value is known to be zero. If the data are not available, enter "N/A". In cases where the question is not applicable, please indicate this.

Report all dollar amounts in Canadian dollars.

Section 1. General Information

- 1.1 Please provide information for fiscal year 1997-1998. If the information provided on this form does not refer to 1997-1998, please note the year to which the data do refer.

If information is available for other years, as well as for 1997-1998, please provide it on a separate form. Please photocopy one questionnaire for each fiscal year reported.

- 1.2 Include all related institutions that were affiliated for research purposes with the main institution during fiscal year 1997-98. This would cover the main institution, affiliated colleges and universities, institutes and teaching hospitals only if information for these institutions is included in your responses.

Intellectual property management includes intellectual property identification (reporting, patent disclosures), protection (patenting, registration of industrial designs, etc.), promotion (market studies, business plans, prototypes, etc.) or commercialization (licensing, research contracts, consulting, spin-off investment).

- 1.3 a. "Intellectual property management" is to be interpreted in the broadest sense. It refers to the activities of an institution's University-Industry Liaison Office, Office of Research, Technical Transfer Office, Software Licensing Office, etc.

c. Some institutions may manage intellectual property in a de-centralized manner. For example, faculties or departments that engage in research may have their own offices for intellectual property management.

d. Research parks and business incubators may house companies other than spin-offs. Please list all tenant companies whether or not they are spin-offs.

The legal name is the name used to refer to the company on official documentation such as incorporation papers or tax forms.

- 1.4 Intellectual property includes:

Inventions: Any patentable product, process, machine, manufacture or composition of matter, or any new and useful improvement of any of these, such as new uses of known compounds (Canadian University Intellectual Property Group, 1998). Some inventions

are patentable in some jurisdictions but not in others: these include novel genetically-engineered life forms, new microbial life forms, methods of medical treatment and computer software. In the event of multiple possibilities (for example, computer software that is patented and copyrighted), count the item only once and preferably in the category most appropriate for Canadian intellectual property legislation.

Computer software or databases: As noted above, computer software can be patented but normally it is protected by copyright. Databases may also be copyrighted.

Literary, artistic, dramatic or musical works, books, papers: This category includes any copyrightable works other than computer software and databases and special educational materials as noted below.

Educational materials: This category includes special materials that may be copyrighted but are not necessarily in the form of printed books. This could include broadcast lessons, Internet pages, booklets, posters or computer files, among others.

Industrial designs: These are original shapes, patterns or ornamentations applied to a manufactured article. Industrial designs are protected by registration with the Canadian Intellectual Property Office.

Trademarks: These are words, symbols, designs, or combinations thereof used to distinguish your wares or services from someone else's. Trademarks are registered with the Canadian Intellectual Property Office.

Integrated circuit topographies: This is a three-dimensional configuration of the electronic circuits used in microchips and semiconductor chips. Integrated circuit topographies can be protected by registration with the Canadian Intellectual Property Office.

New plant varieties: Certain plant varieties that are new, different, uniform and stable may be protected by registration with the Canadian Intellectual Property Office.

If your institution deals with intellectual property of a form other than those listed, please write the type in the space provided under "Other".

c. The owner of intellectual property rights refers to the assignee of an invention, or holder of the copyright or registration of other intellectual property. Ownership may be categorized by means of protection (i.e., patents, copyrights) rather than by the form of intellectual property. If this is the case at this institution, include the information on a separate sheet.

d. Many institutions have a standard split for sharing revenues. In some cases, the percentage depends on who manages the protection, promotion and commercialization. Sometimes, the percentage is negotiated. Please note either a single percentage or a range with conditions.

e. List the names of any other policies of the institution that may have an impact on intellectual property ownership, protection, promotion or commercialization. This could include policies on research contracts, spin-off companies and others. If available, please provide paper copies of these policies.

1.5 a. "New intellectual property" in this case refers to the list of forms of intellectual property defined under Section 1.4.

b. For this question, please be as specific as possible about the names of the offices and companies involved. If there are several different approaches, please list the most common ones.

c. A typical case need not be the most common approach. Your response will be more useful if it does contain a complete description of the process from inception to licensing.

1.6 “Consulting activities” refers to paid or unpaid professional activities, beyond normal academic and collegial duties, for the benefit of clients outside the institution. Unpaid consulting could include advising a non-governmental organization.

1.7 Research contracts are arrangements under which the institution, or an individual within the institution, agrees to undertake a research project on a specified problem, using the institution's facilities and/or personnel, for a sponsor that provides funds to meet all or part of the costs of the project.

b. The initiation of a research contract refers to the commencement of work as stated in the contract itself. A contract may be signed specifying that the work is to commence upon signing or may set some future date for commencement of the work.

If reporting by field of study, please use the Statistics Canada Census Field of Study classification. In this classification, 123 detailed fields are grouped into 11 general classes:

1. Educational, Recreational and Counselling Services
2. Fine and Applied Arts
3. Humanities and Related Fields
4. Social Sciences and Related Fields
5. Commerce, Management and Business Administration
6. Agricultural and Biological Sciences/Technologies
7. Engineering and Applied Sciences
8. Engineering and Applied Science Technologies and Trades
9. Health Professions, Sciences and Technologies
10. Mathematics and Physical Sciences
11. All other not elsewhere classified.

The detailed fields and their relationship to the 11 general classes are shown in the Annex. Note that this is a unified classification system intended to classify fields of study at technical colleges as well as universities.

c. In the case of multiple sponsors, count a contract under the classification of the sponsor with the greatest contribution. The total number and value of contracts should add to the totals provided in 1.7b.

1.8 a. This refers to the loss of any potential intellectual property rights including patents, copyrights, industrial design registrations, trademark registrations, integrated circuit topography registrations, plant breeder's rights, etc.

Section 2. Identifying Intellectual Property

2.1 The types of intellectual property are defined under Section 1.4. If reporting of these forms of intellectual property is never required, answer "not applicable".

Section 3. Protecting Intellectual Property

3.1 The mechanisms for protecting intellectual property do not exactly parallel the forms of intellectual property. One invention, for example, may result in several patents, copyrights, trademarks and trade secret agreements. The mechanisms for protection are:

Patent: A patentable invention (see description under Section 1.4 above) to be protected, requires a patent application with the government of the countries in which protection is sought. A patent application may be preceded by an invention disclosure to the institution.

Copyright: The kinds of works covered include: books, maps, lyrics, musical scores, sculptures, paintings, photographs, films, tapes, computer programs and databases. A copyright means that the owner is the only person who may copy his or her work or permit someone else to do so. You obtain copyright automatically in Canada when you create an original work. It is not necessary to register copyrights with the federal Copyright Office but doing so can be a proof of ownership.

Trademark registration gives the owner exclusive rights to words, symbols and designs, or combinations of these, that distinguish one's wares or services from those of someone else. Trademarks are registered through Canada's Trade-Marks Office. Normally, trademarks do not need to be registered, however, doing so gives the owner exclusive rights throughout Canada.

Industrial design registration gives the owner exclusive rights to use the design. The design must be an original shape, pattern or ornamentation applied to a manufactured article.

Registering an integrated circuit topography gives the owner exclusive rights to use the design. Protection can extend to the layout design as well as to the finished product.

Plant Breeder's Rights give the holder exclusive rights to new varieties of some plant species. To be protected, the varieties must be new, different, uniform and stable. A claim for protection is preceded by publication of a description of the plant variety in the Plant Varieties Journal.

Trade secret agreements. Trade secrecy is an alternative to patenting. A trade secret agreement does not constitute a property right although the trade secret can be protected by contract. Parties to a trade secret agree not to divulge valuable technical knowledge and can be prohibited from so.

- 3.2 Count the number of protection activities (see definitions in Section 3.1 above) initiated during the reference year. In this case "initiated" refers to the first formal action completed by the institution and conveyed to someone outside the institution. In the case of a patent application, count applications that have been completed and sent to a patent office. Do not count an incomplete patent application.

In the case of multiple applications (such as copyright registrations in several countries), count each one as a separate protection activity.

- 3.3 If the information is not available by field of study, please report the total only. Refer to Section 1.7b and the Annex.

“New patent applications” refers to all patent applications completed during the reference year, regardless of country of application. The total figure for this item should match the number of patent applications provided in the first line of Question 3.2.

“Patents issued” refers to new patents issued during the reference year.

“Total patents held including patents issued this year” refers to all patents in effect in Canada, the United States and other countries.

Section 4. Exploitation of Intellectual Property by the Institution

- 4.1 “Intellectual property promotion activities” include market studies, business plans, feasibility studies, scale-up plans, demonstrations and prototype development. Count those activities to which the institution made a significant contribution financially or in kind.
- 4.2 “New licenses executed” refers to the completion of an agreement with a client to use the institution’s intellectual property for a fee or other consideration (such as equity in the company).
“New licenses executed with sponsors of research contracts” refers to clients that have funded research at the institution and are now licensing the intellectual property generated during that research contract.
“Exclusive licenses” are agreements allowing only one client the right to use the intellectual property.
- 4.3 In this case, “royalties” refers to income generated from licensing. The total figure should not include reimbursement for legal or patent fees. In some instances, the revenues received from disposition of equity in a spin-off company may be interpreted as a royalty. If possible, please exclude these values from the total and report them under Question 5.3. If this is not possible, please note that the value includes revenues from disposition of equity.
- 4.4 The purpose of this question is to identify other sources of income related to intellectual property management not covered in other questions. For example, if a potential licensee contributes the funds to apply for the patent, this could be considered another source of income. Please list the items whether or not figures are available.

Section 5. Impacts of Intellectual Property Commercialization

- 5.1 “Legal name” is defined under Question 1.3d.
“Institutional link” refers to the nature of the relationship between the institution and the company.
“Licensing” means that the company has licensed the institution’s intellectual property.
“R&D” means that the company funds research and development at the institution in order to develop intellectual property that will be licensed by the company.
If there are other institutional links, please note them.
“Technology sector” refers to the field or industry of the main business of the company.
- 5.2 For spin-off companies in which the institution holds equity, please report the dividends paid, if any, during the reference year.
- 5.3 In cases where the equity in spin-off companies has been sold, please report the amount received for these sales.
- 5.4 “Remaining equity” refers to the market value of the shares in the company at the end of the fiscal year reported.

Annex: Detailed Field of Study Classification

1. Educational, Recreational and Counselling Services
 - Education - General
 - Elementary - Primary Education
 - Secondary Education (Basic)
 - Secondary Education (Specialized)
 - Special Education
 - Non-teaching Educational Fields
 - Physical Education, Health and Recreation
 - Counselling Services and Personal Development
 - Other Education
2. Fine and Applied Arts
 - Fine Arts
 - Music
 - Other Performing Arts
 - Commercial and Promotional Arts
 - Graphic and Audio-visual Arts
 - Creative and Design Arts
 - Other Applied Arts
3. Humanities and Related Fields
 - Classics, Classical and Dead Languages
 - History
 - Library and Records Science
 - Mass Media Studies
 - English Language and Literature
 - French Language and Literature
 - Other Languages and Literature
 - Philosophy
 - Religious Studies
 - Other Humanities and Related Fields
4. Social Sciences and Related Fields
 - Anthropology
 - Archaeology
 - Area Studies (Non-languages or Literature)
 - Economics
 - Geography
 - Law and Jurisprudence
 - Human/Environment Studies
 - Political Science
 - Psychology
 - Sociology
 - Social Work and Social Services
 - War and Military Studies
 - Other Social Sciences and Related Fields
5. Commerce, Management and Business Administration
 - Business and Commerce
 - Financial Management
 - Industrial Management and Administration
 - Institutional Management and Administration
 - Marketing, Merchandising, Retailing and Sales
 - Secretarial Science - General Fields
6. Agricultural and Biological Sciences/Technologies
 - Agricultural Science
 - Agricultural Technology
 - Animal Science Technologies
 - Biochemistry
 - Biology
 - Biophysics
 - Botany
 - Household Science and Related Fields
 - Veterinary Medicine/Science
7. Engineering and Applied Sciences
 - Architecture and Architectural Engineering
 - Aeronautical and Aerospace Engineering
 - Biological and Chemical Engineering
 - Civil Engineering
 - Design/Systems Engineering
 - Electrical/Electronic Engineering
 - Industrial Engineering
 - Mechanical Engineering
 - Mining, Metallurgical and Petroleum Engineering
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