Technology Transfer at TRIUMF

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Abstract

TRIUMF is Canada's major national research centre for sub-atomic physics. For the past five or six years, there has been an increasing emphasis on commercializing the technology that has emanated from the scientific research at the facility. This emphasis on technology transfer reflects a national policy trend of the Canadian federal government, which is the funding source for the majority of the research performed at TRIUMF. In TRIUMF's case, however, the initiative and funding for the commercialization office came from the provincial, or local government.

This paper will describe the evolution of technology transfer at the TRIUMF facility, identifying the theory, policies and practical procedures that have been developed and followed. It will also include TRIUMF's experiences in finding exploitable technologies, protecting those technologies, and locating and linking with suitable industry partners to commercialize the technologies. There will be a discussion of resource allocation, and how TRIUMF has endeavoured to establish a portfolio of projects of assorted risks and expected returns.

1 INTRODUCTION

Situated on the west coast of Canada, on the endowment lands of the University of British Columbia, TRIUMF is the major sub-atomic research facility in Canada. About five years ago, TRIUMF, reacting to current pressures from Canadian industry and the government funding agencies, embarked on a strategy to transfer some of the innovative scientific knowledge that is developed at the facility, out into the commercial world. This emphasis on technology transfer reflected a movement common to many industrialized countries[1,2] that were recognizing, and trying to benefit from, the untapped resources of science and technology that were being developed, and yet largely left dormant or underutilized, in government-funded research centres.

This paper describes lessons learned during the past five years in the evolution of technology transfer at the TRIUMF facility, identifying theories, policies and procedures that have been developed. Overall, the experiment has been fairly successful, despite the unavoidable failures and disappointments, and has resulted in TRIUMF currently receiving a significant increment of its annual revenue from its aggregated commercial activities.

2 TRIUMF

TRIUMF has a primary mandate for pure research, funded predominantly through an annual contribution from the federal government of Canada. The TRIUMF facility is based around the 18-metre diameter cyclotron, which accelerates H^- ions up to 500 MeV. Experimentation at the facility is open to all international researchers, with experimental time at individual research stations being allocated on the competitive basis of independently evaluated experiment proposals.

The nascence of TRIUMF was a collaborative effort between three universities in British Columbia, University of Victoria, Simon Fraser University and the University of British Columbia, with the Tri-University Meson Facility being built on the endowment lands of the latter university in the late 1960's and early 1970's. The first beam at TRIUMF was delivered in December 1974, and by then, the University of Alberta had joined the consortium of the other three. TRIUMF is utilized by Canadian universities from across Canada, and now has as Associate Members of the TRIUMF consortium, the University of Manitoba, the University of Montreal, the University of Regina and the University of Toronto.

International participation is a key component of the research at TRIUMF, with the Users' Group, outside of Canada, comprised of representatives from over twenty-five countries.[4] As with any research institution, TRIUMF is measured by quality of the research performed at the facility and the member and quality of papers and citations[5] that emanate from the work that is performed.

The total staff complement of about 375 persons at TRIUMF is comprised of scientists - experimentalists and theoreticians -, facilities operators and an administrative group. The annual TRIUMF budget totalled about $35 million Canadian in 1993, with about 90% of that coming directly and indirectly from federal funding, and over half of the budget being required for the operation of the cyclotron and the administration of the facility.

3 TECHNOLOGY TRANSFER AND COMMERCIALIZATION AT TRIUMF

Following some successful initial commercial agreements with an established vendor of medical radioisotopes, in 1989 TRIUMF initiated a detailed formal review into the prospects for technology transfer at the facility.[6] This review was funded by the government of the Province of British Columbia, and resulted in May 1990 in TRIUMF formally establishing an office of technology transfer, called the "Ventures Office," which continues to be funded by a grant from the provincial government of British Columbia. The mandates of the Ventures Office is to vigorously pursue all financially and technically viable opportunities for commercializing the technologies that evolve from the research and operations of the TRIUMF facility.

The objective of the technology transfer program at TRIUMF is twofold:

1. To disseminate technology opportunities to industry for the long-term enhancement of the Canadian economy.

2. To provide additional revenues to TRIUMF that can be utilized to fund research activities peripheral to the central mandate of the facility.

In commercializing TRIUMF's technology, preference is given to Canadian industry. However, when there is no suitable receptor company within Canada; the commercialization activity becomes international in scope.

In common with other research facilities, TRIUMF has found that while the concept of technology transfer is readily identifiable, and even legislated,[7,8,9] the practice of technology transfer requires careful planning to avoid and overcome the many pitfalls that are inherent in the process.[10] Potentially-commercial technology opportunities have to be recognized and identified as worth protecting for exploitation, and then an informed one time decision made as to whether the technology should be kept confidential for commercialization,[11] or published in the accepted academic practice of public disclosure. This decision must obviously involve the inventor(s), and provide them with appropriate compensation, if publication is foregone.

On an implicit level, knowledge is irrevocably carried by individuals from one place to another, in the ongoing movement of staff and students, while on the explicit level, intellectual property is identified and transferred deliberately to selected commercial receptor vehicles for appropriate exploitation of the technology. TRIUMF recognizes and utilizes six fundamental approaches to transferring technology from the research facility to the industrial economy.

- Staff secondment
- Consulting for industry
- Spin-off companies
- Joint ventures
- License agreements
- Facilities usage

For the process of technology transfer to start, the first step is to encourage inventors to bring forward disclosures of potentially-commercial technology. Given the cultural differences between pure research and commercial exploitation, encouraging disclosures is a non-trivial task. Inventors frequently are convinced that their valuable invention will only be stolen if it is revealed to the commercial world, and such views definitely have precedents. The difficulties tend to be compounded by the relatively low rate of successful disclosures. TRIUMF has been fortunate to have about a 25–30% of its disclosures that are currently projecting some commercial activity.

The first hurdle that the inventors have to face is that a significant scientific or technological achievement does not necessarily translate into a significant commercial success. This is traditionally characterized by the "technology push" and "demand pull" dichotomy, and it is a sad truth to many inventors that commercial success is more often achieved by an indifferent technology that is sought out by the marketplace, than by great innovative technologies that have to look for an application.[11] TRIUMF has had its share of exciting technologies that have been received with indifference in the commercial marketplace, and it has been difficult, but imperative to explain to the inventor(s) that their great invention does not project attractive returns to investors.

The second lesson that we have learned is that for a technology to be successfully commercialized, it must have a champion who will push it through all of the customary setbacks with undying optimism and determination. Of course, here it becomes very judgemental as to when the champion is simply pursuing an impossible dream. This is a very difficult area in our experience at TRIUMF, since we have had a few technologies that have gone on to success when the consensus of the champion's colleagues has been that it had already failed. Commercialization of technology is not a trivial exercise for the inventor, and invariably incurs a significant amount of time and stress.[12]

The third factor that can become crucial to the successful commercialization of a new technology is the timing of the search for an industry partner or licensee. The standard concerns are that the technology will "go stale," or "miss the window of opportunity," and such concerns are very valid. If a technology is offered around prospective partners for too long, and too publicly, there will be the assumption that "if it were any good someone would have snapped it up already." We have endeavoured to minimize such overexposure by being as discrete as possible, and requiring potential industry partners to sign non-disclosure agreements, when searching for a suitable commercialization vehicle.

However, we have also encountered one or two instances where a good technology has been developed, but attracts no interest from industry for a number of years because it simply precedes the market demand. TRIUMF's most conspicuous experience with this latter timing issue was with a technology for pollution control that was first developed about ten years ago, and despite major efforts, only became commercially acceptable in late 1993, when the social climate was conducive to major expenditures on such facilities.

The fourth major hurdle that TRIUMF has experienced in endeavouring to commercialize its technologies, has been to find an appropriate "receptor" in the commercial world, - whether that be an industrial licensee, a partner or some other commercial entity. We have encountered some very discouraging situations with commercial associates who have been quite enthusiastic about carrying TRIUMF technology out to the marketplace, but simply lack the total resources necessary to do the job. In addition, an "expectation gap" frequently exists between what TRIUMF regards as a technology ready for commercialization, and what industry expects as a market-ready technology.

4 TRIUMF PROCEDURES

Once TRIUMF receives a disclosure, it embarks on a fairly formal review process to evaluate the commercial potential, and whether it is worth spending significant funds on patent protection and a commercial search. It must be recognized by all participants from the beginning that transferring technology from a research facility is an economic venture for all of the parties:

- the inventor must be able to anticipate a return for his/her efforts, not only for inventing, but also for the considerable efforts in pursuing the invention through patenting, with prospective licensees and financial investors as well as the technical review by peers. Frequently, a simple publication looks much more attractive.
- the prospective commercial associate must have a reasonable prospect of making an appropriate return on the investment.
- the research institution, TRIUMF, must not experience a long term financial and/or personnel drain from the commercialization activity. Costs must be minimized.
- the technology must appear technically viable to a review panel of technical peers, including at least one representative from outside TRIUMF, and preferably from industry. At this early stage the technical review can reasonably only focus on the negative question - "Is there any reason to reject the proposal?"

The first significant costs occur with the filing of a patent. At that stage there should have been an informal exploration of commercial interest that would support the initial expenditures on patenting. Patent searching is done effectively and efficiently through the University of British Columbia Patscan office, that has computer access to Canadian and International patent listings.

The TRIUMF approach is to have the inventor(s) assign the patent rights to TRIUMF in return for an equal split on future royalty income, after expenses, such as patenting, that TRIUMF will incur. In this way the inventor and TRIUMF become de facto partners with a joint interest in the success of the commercialization venture.

5 CONCLUSION

The factors at TRIUMF that have emerged as being the most significant for the institution to achieve success in developing potentially commercial technologies are:

(i) Excellence in the scientific research - despite intuitive perceptions to the contrary, this should not be sacrificed for, or confused with, expanded applied research effort.

(ii) A research culture that recognizes the benefits of technology commercialization to the broader society - commercial success is given similar recognition to scientific success and publications.

(iii) The research facility seminar management is supportive of technology commercialization efforts, albeit keeps them appropriately financially constrained. Technology transfer must be an integral part of the facility's strategic long-term plan.

(iv) A formal system is established that provides impartial evaluation and rewards for potentially-commercial disclosures.

(v) Every commercial opportunity, no matter how good, requires an absolutely committed champion (usually the inventor) to achieve success.

A research facility does not have to be focussed solely on commercial applications to achieve success with commercial technologies. The most outstanding example of that is probably CERN, where, as Barbalet has shown,[13] the physics of accelerators has led to many commercial advances.

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