Technology Commercialization - The Choices Facing Researchers

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Abstract

Technology commercialization, the development of commercial products from research discoveries, is coming of age as an industry in North America. A number of avenues are available to the researcher who chooses to commercialize; and a number of informed business decisions must be made, on the part of the researcher and on the part of the commercializing organization even before the technology is offered commercially. Calgary-based University Technologies International Inc. has a unique approach to commercialization., heavily based on consultation with inventors and versatility of choices.

Sommaire

L'industrie de la commercialisation de la technologie, c'est-à-dire du développement de produits commerciaux à partir de découvertes scientifiques, approche la maturité en Amérique du Nord. Plusieurs choix sont offerts aux chercheurs qui décident de commercialiser, et un grand nombre de décisions d'affaire doivent être prises, autant du côté du chercheur que du côté de l'organisation en charge de la commercialisation et ce, bien avant que la technologie soit disponible commercialement. University Technologies International Inc. de Calgary propose une approche unique vers la commercialisation, basée en grande partie sur des consultations avec les inventeurs et une polyvalence des options considérées.

1.0 Introduction

Technology Transfer, as it is known to university-based researchers, is the movement of research knowledge to and from research facilities. As an example, this might involve an exchange, loan or sale of biological materials to assist a researcher in following a particular line of investigation. In other cases it might involve the purchase or licensing of the research discovery by a commercial end user. An engineering company, for example, might license the discovery of a new electrical component or controlling software to augment, develop or improve its business and give it a competitive edge in the market place. A significant industry has grown up in North America around the commercial aspects of technology transfer. To differentiate the commercial aspects from the non-commercial exchange of research materials and information, the former is referred to with growing acceptance as technology commercialization.

In most North American universities, the primary source of research discoveries, there is a particular office or department which handles both the commercial and non-commercial transfer of technology. Known as Technology Transfer Offices, Industry Liaison Offices or Research Services Offices, these departments may offer any or all of the spectrum of technology commercialization services - assessment, intellectual property protection, development, negotiation, sale, licensing, company creation or other commercialization options. Many also handle the non-commercial aspects such as product development contracts and materials transfer agreements. Operating under the institution's intellectual property policy, they can advise the inventor of the procedure, rights, responsibilities and rewards involved. Policies vary from institution to institution.

Through these offices, or through outside agencies approved by the intellectual property policy, a number of channels are open to a university inventor/researcher with a discovery to commercialize. Independent inventors, those not attached to a post-secondary institution, may prefer to go the commercialization route on their own, paying all costs and negotiating their own licenses or agreements. Others will engage a professional technology commercialization company to handle the process for a share of the revenue or a percentage of the resulting start-up company. Each route has its advantages and challenges and much will depend on the mindset of the inventor and his or her inclination toward involvement in the commercialization process.

Experience has shown that not all researcher/inventors have the interest in the process. Commercialization is a different world from the research laboratory and not all have a bent for it or even an interest in it. But involved in the process or not, the inventor is well advised to seek the advice of professionals in order to protect his discovery, and to obtain the maximum financial return. Commercialization professionals assist entrepreneurs through the tough business decisions to ensure successful commercialization which results in the maximum benefit of new products and services.

Whether or not the inventor seeks that assistance, the commercialization route available, the process and the stages involved are similar.

Technology transfer is the movement of scientific knowledge from one party to another. Technology commercialization is when that transfer involves the making or selling of a product with the aim of providing a financial return to the inventor. Often these terms are used interchangeably. In North America, technology commercialization is a $50 billion business, according to the Association of University Technology Managers which annually publishes figures on the direct and indirect financial impact of commercialization. This is the value that industry and government paid to support research and paid in license fees for the products of that research. The industry employs 280,000 people. In the United States, commercialization of government-sponsored research is mandated under the Bayh-Dole Act of 1980. Similar regulation has been hotly debated in Canada. Sponsored research in N. America totals about $34 billion; two-thirds of it from government sources. Canada accounts for about four per cent of each of these totals. That four per cent, translated into dollars, means technology commercialization in Canada has a direct economic impact of $20 million annually in licensing revenue and the creation of about 60 high technology companies a year.

2.0 Stakeholders

Most electronic and electrical engineers have experience with or have observed the technology commercialization process. How a researcher or inventor enters the process of commercialization depends largely on where he or she is working. Much of the research that is undertaken by engineers in post-secondary institutions and research labs tends to have a higher percentage of industry sponsorship, occasionally with a pre-determined path to commercialization or to ownership of the research results.

An inventor with a private company will be governed by that company's intellectual and research policies. Most retain all rights to their employees' inventions and compensate the employees in various other ways. In most cases the employee is under an obligation to reveal to their employer anything that they believe is a new invention. During the time of the discovery the researcher should keep detailed records of its development consistent with

the scientific method. In some cases, private companies or research labs have their commercialization done by a third party like UTI.

3.0 The Technology Commercialization Process

There are a number of important stages to the technology commercialization process.

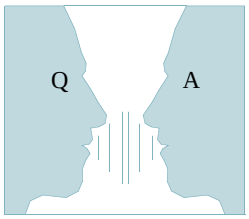
3.1 Disclosure and Assignment

The first step is for the technology commercialization company to gain an understanding of the technology. In order to do this the inventor must be willing to disclose the technology in a confidential written document. The technology or product has to be clearly described in terms of its function, stage of development, and advantages comparable to other similar products. The researcher should describe under what circumstances the invention was made, who else might have knowledge of the invention, and a listing of any publications or reports that may contain information related to the invention. A written description of the invention and supporting drawings is needed, perhaps with a description of alternative methods, materials, or construction which could accomplish the same result. The researcher must describe possible uses and applications for the invention and, possibly what companies would be interested in commercializing such an invention. Should a working prototype be available it could be examined. It is important that the researcher be very thorough in preparing this disclosure. An Assignment Agreement may be signed empowering the technology commercialization company to act as an agent for the inventor and make business deals on his or her behalf.

3.2 Technology Assessment

Following this disclosure and assignment, the next stage consists of a technical, business, and legal assessment. Using proprietary tools and years of experience, technology commercialization managers and their teams assess a technology's scientific and technical value, marketability and commercial potential, and intellectual protectability. Each year in North America, TC managers review about 12,000 disclosures. Only some are commercially viable and even fewer are protectable. Under patent legislation, something new but obvious is not protectable. Something new and not useful is not protectable. Something new that cannot be built is not protectable either. About 2,700 patents are issued annually to university researchers in North America; and when it comes to signing on the bottom line, about 3,700 legal licensing agreements or options are entered into annually.

To get to that stage, questions to be asked include:



- Is the discovery novel?
- Does it have merit?
- Does it have value?
- Is there a need for it?
- Could there be a desire for it?
- Is the technology patentable?
- Does a market exist?
- Could a market be created?
- Are there any barriers to commercialization?
- What is the strength of potential patents?

These questions and many more are addressed in the initial assessment of the technology. Questions about the inventor are also asked:

- Is the inventor enthusiastic about commercialization and willing to be part of the process?
- Does the inventor understand business principles?
- Are there more great ideas where this one came from?

Every day the professional commercialization manager sees brilliant ideas and inventions which he or she knows will never earn the first dollar. They have missed the market window; they're too far ahead of the market, they would be too expensive for the market to bear, they are no improvement on what already exists, they can't be protected, no one will pay for it. This is where due diligence enters the commercialization picture. Due diligence supplies the technical and market data managers require to make the necessary business decisions. Market data includes such business information as costs, competition, edge and potential. The manager will already have a good idea of intellectual property protection: patent, copyright, industrial design trademark or trade secret. There may also be existing third party interest - is there a company or financial backer who is interested in this product? The lower a technology is on the assessment scale, the riskier it is to commercialize and the considerations weighing on the decision are considerable. This expertise and experience can be of enormous benefit to the inventor.

3.3 Intellectual Property Protection

Evolving from the assessment is an intellectual property protection strategy. An item can be commercialized without Intellectual Property protection, but the window of opportunity is smaller and the risk of someone copying the technology is higher. In certain cases, it lessens the value of the technology on the market; protected technology is worth more. An idea is protected by a patent, an expression of an idea by copyright, and a mark identifying an idea by trademark.

Protection doesn't come cheap. An average Canadian patent costs $12,000. An international patent can cost $50,000. Will the technology return that cost? Are the patent claims valid? If the claims are challenged; the patent costs can skyrocket. It takes business acumen to make the right decisions on the correct and appropriate level of Intellectual Property protection. A patent attorney or agent can get a patent for you, but there has to be business decisions made on the correct level of protection. Spending $50,000 on a product with a potential market of $5,000 is obviously no way to succeed financially; but it is done with startling regularity. According to industry statistics, only two patents in one hundred makes back their patenting costs.

3.4 Commercialization Strategy

The initial assessment and due diligence will generally point to a commercialization strategy. A commercialization plan will be chosen which will best meet the unique needs of the invention. The usual commercialization routes are sale, license, joint venture/ partnership or company creation. The appropriate approach to commercialization depends upon factors such as competition, the marketplace, funding, and the nature of the technology.

If the Intellectual Property protection is not strong or the window of opportunity is short, selling the know-how may be the best option. Licensing which will be discussed in more detail later is the most common method and can be for a one-time payment as in software or an ongoing revenue stream. Joint venturing means finding a business partner who will take the technology into that company's business activity or develop a new activity in partnership with the inventor. Creation of a start-up company is probably the most exciting and dramatic, but does however offer significant financial, and organizational challenges.

3.5 Licensing

Licensing is often an appropriate commercialization strategy. Established companies often have the development, manufacturing, and marketing resources necessary for commercialization success. These companies can often be identified through searching databases. Selecting the best licensee from a group of interested candidates is a critical first step. Criteria include their proven ability to market and sell as well as manufacture the product. Confidentiality agreements must be signed before any information is provided to a potential licensee. Once a suitable licensee has been identified, a license contract is negotiated and signed by all parties involved. Basic elements of a license agreement include: the identity of the parties, the subject of the license, and the obligations of the licensor and licensee. Terms and conditions vary depending upon the particular licensing situation. The process does not end here however as the licensee must be monitored to ensure that all parties are fulfilling their responsibilities as outlined in the contract.

3.6 Company Creation

If certain circumstances and conditions exist, the technology manager may suggest the research discovery be commercialized through the formation of a company. This risky and rewarding route should only be taken if there are check marks beside a great number of boxes including:

- Is the technology actually a platform of technologies?
- Is the technology capable of supporting a company or a business division of a company?
- Is the researcher committed to becoming involved in the formation, operation and development of the company?
- Is there a place for the company in the market?
- Is there a place for the company in future markets?
- Can the company generate support among financial backers?
- Can the company be viable and contribute to the economy?
- Can the company attract the quality of management required?

If the answer to these and many other questions is yes, commercialization through company creation is one of the most effective methods of moving technology from the lab to the market. In terms of company creation, Canadian universities per capita outstrip their American counterparts. Of the more than 350 companies started annually from university technology, more than 15 per cent are started in Canada.

4.0 Tips for Inventors

- Success comes from the realization that the developer must be market driven.
- Do not underestimate the time and resources required.
- Get the best and most experienced people working with you.
- Determine your “window of opportunity.”
- Assess all options for commercialization.
- Take advantage of existing infrastructure services.
- Recognize that the inventor himself may not be the best person to commercialize.

The researcher has both legal and ethical responsibilities. The researcher must fully-disclose the discovery, must become knowledgeable about the commercialization process, be supportive and cooperative, be trusting and business-like with an ability and a desire to understand and work in a business environment. He or she must be patient. Commercialization is a time-consuming process. It can take two years to bring software to market, five years to market a circuit board, eight years to market a vaccine.

5.0 The Value of Dealing with Technology Transfer Professionals

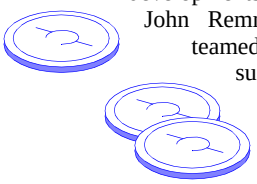
It is most important to recognize that the successful transfer of technology is a long-term process and does not follow a set timetable. The process is complex, highly interactive, and involves many stakeholders. It may be years before a suitable window of opportunity for commercial development opens. Experience has shown that it may take seven to12 years before significant returns on an invention are realized.

Technology transfer professionals have forms, processes, sources, contacts, and knowledge in place. The wheel does not have to be reinvented each and every time. Technology Transfer professionals are non-biased and non-judgmental. Their focus is to maximize the value of and the return from the technology. Their experience and training makes them good at analyzing the potential of the technology. Their knowledge of markets and products and their contacts and networks assist them in placing it for maximum benefit. They have experience in negotiating and licensing.

The TC professional must do the best he or she can for the technology and the researcher to obtain the maximum benefit from the technology. The professional must be diligent, accountable, honest and straightforward.

6.0 Success Stories

It is through the efforts of services like this that the results of an invention can be brought to public use and benefit. In the Engineering field, UTI's primary success to date has been in commercializing the prolific and significant GPS-related technologies from the University of Calgary's Department of Geomatics. The satellite and receiver-controlling software from that department has given it a worldwide reputation. In mechanical engineering, Dr. William Shaw invented and patented a process of creating bonds through mechanical alloying of polymers. This process has been licensed to an industrial coating company and other developments will be coming from that technology. Dr. John Remmers of the University's Medical Faculty teamed with engineering to develop a line of very successful devices for combating sleep apnea. UTI has a number of very promising technologies from the engineering field which are in development including the gastric motility device of Dr. Martin Mintchev and the mammography imaging technology of Dr. Raj Rangayyan of the University of Calgary's Electrical and Computer Engineering Department



Two of the more significant success stories resulting from technology developed at the University of Calgary are:

- Dr. Michel Fattouche of Department of Computer and Electrical Engineering in the Faculty of Engineering working with communications engineer Hatim Zaghloul developed and patented high-speed wireless communications technology. With some licensing assistance from UTI, the two took their discoveries and formed Wi-LAN Inc. a leading innovator in the field of high-speed wireless communications products, offering unique, cost-effective wireless solutions based on its two patented wireless technologies - Wideband Orthogonal Frequency Division Multiplexing (W-OFDM) and Multi-Code Direct Sequence Spread Spectrum (MC-DSSS). These patented technologies are at the foundation of proposed international standards, and the technology that they protect is at the heart of Wi-LAN's wireless products. The company was listed on the Toronto Stock Exchange in March 1998 and achieved a market capitalization of more than $500,000,000. Wi-LAN's stock symbol is WIN and it can be tracked on the company's web site at http://www.wilan.com.
- At the same time, Dr. Fattouche was working with Dr. Gérard Lachapelle of the UofC's Department of Geomatics, Faculty of Engineering, and Richard Klukas the Faculty's Department of Mechanical Engineering to develop patented wireless location technology, a major thrust of which is a system of pinpointing the location of cellular telephones and similar devices using GPS-like technology. The result was the creation of a sister company to Wi-Lan. Cell-Loc Inc. went public in March 1997 and also raised more than $500,000,000 in the market. Its premier product, The Cellocate System™, was formally launched into the marketplace in February 1999 after three years of intensive field testing. It is a network-based Time Difference Of Arrival (TDOA) enabler of wireless location services such as fleet and asset management for dispatch and transportation businesses; tracking stolen phones and/or criminals; tracking children, patients, and pets; tracking stolen vehicles; location-sensitive billing; and location of cellular and PCS handset users in emergency situations. Cell-Loc's stock symbol on the Toronto Stock Exchange and the Canadian Venture Exchange is CLQ. Additional information on the company is available on its web site http://www.cell-loc.com. Additional information on the University of Calgary's Geomatics, Computer or Electrical Engineering programs can be found on the university's web site http://www.ucalgary.ca.

7.0 Additional Information

[1]. Association of University Technology Managers "Annual Licensing Survey", 60 Revere Drive, Suite 500, Northbrook, IL 60062, Phone: 847-559-0846, Fax: 847-480-9282, E-mail: autm@autm.net

[2]. Licensing Executives Society International Ronald "Making the Licensing Decision" LES (USA & Canada) Inc, 1800 Diagonal Road, Suite 280, Alexandria, VA 22314-2840, USA, Phone 703-836 3106; Fax 703-836 3107, E-mail leshq@aol.com, Web www.usa-canada.les.org

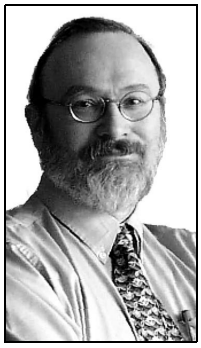
[3]. University Technologies International Inc. Suite 204, 609, 14th St. NW, Calgary, Alberta, Canada, T2N 2A1, Phone 403-270-7027, Fax 403-270-2384, E-Mail info@uti.ca, Web http://www.uti.ca.

[4]. Wi-LAN Inc. 300, 801 Manning Road N.E. , Calgary, Alberta, Canada, T2E 8J5, Phone: 403-273-9133, Toll Free: 1-800-258-6876, Fax: 403-273-5100, Email: info@wilan.com, Web http://www.wilan.com.

[5]. Cell-Loc Inc. 220 Franklin Atrium, 3015 Fifth Ave. NE, Calgary, Alberta, Canada, T2A 6T8, Phone 403-569-5700, Toll Free 1-877-569-5700, Fax 403-569-5701, E-mail info@call-loc.com, Web http://www.cell-loc.com.

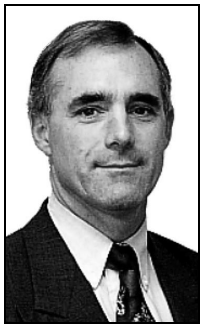
[6]. University of Calgary, 2500 University Drive NW, Calgary, Alberta, Canada, T2N 1N4, Phone 403-220-5110, Fax 403-282-7298, Web http://www.ucalgary.ca.

About the Authors



Don Morberg, Communications Manager at University Technologies International Inc. joined the company in November, 1995. As Communications Manager, he is responsible for all of UTI's internal and external communications as well as communications support to the senior management. He is responsible for UTI's corporate communications including writing, editing, media relations, brochures, documentation, the quarterly newsletter UTI Ink and UTI's Internet site www.uti.ca.

Don holds a diploma in journalism from Vancouver City College and has a wide range of experience as a journalist, writer, editor, photographer and webmaster in the media and in corporate and government communications.



Geoff Moon is Manager, Technology Transfer, at University Technologies International Inc. He joined UTI in March 1996 in his present capacity. He is responsible for evaluating, developing and marketing identified technologies in the areas of engineering and the physical sciences. He is also responsible for the protection and patenting of intellectual properties assigned to his portfolio as well as negotiating and administering licenses relating to these properties.

Geoff holds a Computer Science Diploma from Red River Community College; an Advanced Systems Design Diploma from Herzing Institute and an MBA For Working Professionals Certificate from The University of Western Ontario. For 16 years prior to joining UTI, Geoff worked in various senior technical/sales and technical marketing positions within 3M Canada Inc. and Kodak Canada Inc.

About University Technologies International Inc.

University Technologies International Inc., a for-profit technology commercialization company based in Calgary and wholly-owned by the University of Calgary, is uniquely placed to supply technology commercialization services to researchers not only at the University of Calgary, but at any other education or research facility which requests its expertise. About to enter its eleventh year of operation, UTI has made its professional services available to researchers and inventors at the University of Calgary, University of Lethbridge, Defence Research Establishment Suffield, Agriculture and Agri-food Canada, other post-secondary institutions, hospitals, research laboratories and garages and basements.

At its inception in 1989, UTI Inc. represented a unique approach to technology commercialization. It was the first private, for-profit institution to handle technology commercialization for a University in Canada and has become a model for other such institutions world-wide. As a company, UTI became profitable in its fourth year of operation. Now employing 14, UTI Inc. has, in its 11 year history, returned close to $15,000,000 to the University of Calgary and its researchers in the form of royalty payments, support, donations and contributions including three annual fellowships of $15,000 each to promising post-graduate or post-doctoral researchers. The company continues to expand its business outside the realm of the university, dealing with a growing number of independent inventors and researchers.

During its operation, the company has entered into more than 350 legal agreements to commercialize technologies and been involved in the creation of 15 companies. Additionally it has used it expertise to assist in the business development of ten other companies. More information on UTI Inc. is available at http://www.uti.ca.

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Thought for the Day

How come being in a pickle means the same thing as being in a jam?