

Reflexions on «Reflexions on the commercialization of academic genomic research in Canada»

by
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Notes prepared for presentation and discussion at the Points to consider:
Reflexions sur la commercialisation de la recherche génomique au Canada,
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Outline and key messages

1. Returns of commercialization... Suggest not to invest in academic research or else...
2. Therefore, yes to commercialization, but to be complemented by exploitation of academic genomic research
3. Protecting discoveries: patents need to be complemented by other IP protection mechanisms
4. In short, many complementary IP tools and value creation mechanisms are required to commercialize and exploit academic research



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The issue addressed in « Points to consider »

- Concerns raised by the commercialization of academic genomic research
- And, derived from these concerns: recommendations submitted for discussion
- I agree with most points considered in the paper and the recommendations developed to address the concerns discussed in the paper.
- **My major suggestion: to adopt a more « comprehensive » perspective on « exploitation » of academic genomic research**



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What are the returns resulting from the commercialization of academic research in Canada?

- Investments in academic research: 10.4 billion in 2007 (AUCC, 2008)
- Administrative costs related to the commercialization of academic research: 42.5 M in 2006 (Stat Can 2008)
- Returns in 2006: 59.7 M (Stat Can 2008)
- Total n. of patents granted as of 2006: 4784
- Total n. of licenses as of 2006: 1700
- Total n. of spin-off firms created in 2006: 43

Implications? Bad investments or non valid indicators of commercialization?

How does genomic research score with respect to commercialization?



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What does the word commercialization involve?

- In Points to consider, commercialization is associated with, as does Stat Can, the « process of extracting economic value out of new products, processes and knowledge through the use of intellectual property rights, the creation of spin-offs of both »
- I agree with this view of commercialization



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Commercialization: an incomplete concept?

- I contend that **commercialization is an incomplete concept** and I advocate the more comprehensive concept of exploitation.
- Exploitation includes:
 1. Commercialization of ...
 2. Implementation of... Which might be subdivided into :
 1. direct implementation of research knowledge into innovations, and
 2. indirect implementation of “useful” research knowledge



The direct implementation

- The direct implementation of knowledge into innovation arises when research knowledge-based opportunities are turned into tangible routine applications. This stage may be subdivided into three phases: trial, acceptance, and expansion:
 - **Trial**: the new product, policy, service or practice is adopted for trial evaluation. The adopters develop product demonstrators, prototypes, pilot plants, undertake pilot production tests or pilot implementation. The product, service or practice is adjusted to the particular requirements and competences of the receptor organization.
 - **Acceptance**: the new product, policy, service or practice becomes accepted and full scale production and implementation are launched. The product, service or practice is taken to the market for commercialization or implementation.
 - **Expansion**: the production and implementation of the new product, policy, service or practice are expanded and improved before replacement by another new product, service or practice that creates more value.



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The indirect implementation

- The indirect implementation of “useful” research knowledge arises when the knowledge transferred contributes to improve access to knowledge-based opportunities that are exploited or implemented below their potential value.
- The knowledge transferred through indirect implementation provides new insights, ideas and hypotheses that contribute to improve access to knowledge influencing future decisions regarding the development or improvement of existing products, services and practices.



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What are the effects of commercialization of genomic research?

- «... results do not suggest that commercialization has had an overwhelming negative impact... or created overt conflicts of interest » (page 2)
- More and more evidence in tech transfer shows that there are complementarities between commercialization (especially patents) and publications
- Publications, patents, spin-off creation, consulting and non-commercialized research transfer exhibit complementarities (Landry et al, Forthcoming in **Scientometrics** : « Managing the portfolio of academic activities: complementarities, substitution and independence »)



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Does commercialization contribute to an increase in secrecy? (page 3)

Yes: in the context of a cycle:

- initially, when the invention or discovery is not fully developed, you need to rely on secrecy to protect it from imitation by rivals
- Then, when the invention or discovery is fully developed, you should rely on patents to protect it from imitation, if it is easily imitable



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Prior studies have identified three categories of motives that justify patenting, especially (Landry et al, Forthcoming in IJIPM)

- Improvement in the management of knowledge:
 - Increase in R&D, innovation and improvements in the management of R&D (Kortum and Lerner, 1998; 2003; Hall, 2005);
 - Improved ability of firms to enforce their patent rights in the United States (Arundel, 2001; Hall, 2005; Cohen, 2005);
 - SMEs use patents to signal expertise in order to attract research partners or investments (Mazzoleni and Nelson, 1998; Penin, 2005);
- Securing value and capital:
 - Use of patents to secure the financing to start new ventures (Hall and Ham Ziedonis, 2001; Hall, 2005);
 - Use of patents to increase firm value (Hussinger, 2005);
 - Use of patents to secure revenue from licensing (Hussinger, 2005);
 - Use of patents to secure licensing revenue from their patented inventions (Arundel, 2001);
- Changes in the competitive environment:
 - Increase in the economic importance of proprietary knowledge due to an increase toward competition based on technological innovations (Arundel, 2001);
 - In the United States: legislative changes that expanded patentability to software and artificially engineered genetic organisms (Hall, 2005; Cohen, 2005);
- Strategic motives:
 - Patenting may also be used to block rival firms from patenting related inventions (Cohen et al., 2000; Macdonald, 2004; Cohen, 2005);
 - Patenting may secure protection against infringement suits (Cohen et al., 2000; Macdonald, 2004; Cohen, 2005);
 - Patenting may finally be used to build a portfolio of patents securing a stronger position in negotiations over technology rights (Levin et al., 1987; Cohen et al., 2000; Macdonald, 2004; Cohen, 2005; Penin, 2005);
 - Use of patents as a tool in merger and acquisition negotiations (Hussinger, 2005);
 - Patents help technology trading (Penin, 2005).



Secrecy may be preferred to patenting when:

- It is difficult to demonstrate the novelty of an invention (Cohen et al., 2000; Arundel, 2001)
- Early patenting carries high risk of imitation because a perfectible technology is involved (Duguet and Kabla, 1998);
- The amount of information disclosed in a patent application is considered risky (Duguet and Kabla, 1998; Cohen et al., 2000; Arundel, 2001; Hussinger 2005)
- The cost of applying for patents is considered too high (Cohen et al., 2000);
- The cost of defending a patent in court disproportionately dissuades SMEs (Lerner, 1995; Cohen et al., 2000);
- The ease of legally inventing around a patent is considered too easy (Cohen et al., 2000; Arundel, 2001).



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Firms use combinations of IP mechanisms (What about researchers?) Page 4-6)

- The results of a study on manufacturing firms conducted by Landry et al (forthcoming in **International Journal of Intellectual Property Management**) show that firms devise IP protection strategies that are based on various mixes of mechanisms in order to protect their inventions and innovations.
- More specifically, the results show that firms devise four distinct categories of appropriation strategies to protect their inventions and innovations from imitation by rivals:
 - pure legal (patents, copyrights, trademarks, confidentiality agreements)
 - legal supported by secrecy
 - pure informal and
 - Pure informal strategies (secrecy, lead time, complexity) supported by trademarks.



IP protection mechanisms used by manufacturing firms

(Landry et al, 2009 Forthcoming in IJIPM)

- Informal mechanisms:
 - lead-time advantages over competitors: 51.3%,
 - Secrecy: 39.3%
 - Design complexity: 24.5%
- Legal mechanisms:
 - Trademarks: 20.3%
 - Patents: 14.5%
 - Design registration: 8.9%



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Conclusion: « Universities, research sponsors and industry representatives should actively work towards coherent approaches to commercialization » (page 7)

- Yes, we need coherent approaches and, I would add more comprehensive approaches.
- The lenses of commercialization, when associated to patenting and spin-off creation, will always be incomplete.
- **What we actually want to do is to create value from the use of knowledge.**



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When is value created?

- Value is created or increased when the use of research knowledge in the development or improvement of products, services or practices carries impacts, like the following, for the customers of research knowledge:
 - increased the quality of products, services or practices,
 - improved the flexibility of service provision,
 - increased the speed of supplying and delivering goods or services, improved productivity,
 - increased profitability,
 - improved the facility of maintenance and repair,
 - improved ease of use,
 - met more closely customers' needs and requirements,
 - improved health and safety,
 - reduced the use of materials or energy,
 - reduced environmental impacts,
 - reduced the cost of use of products, services or practices.

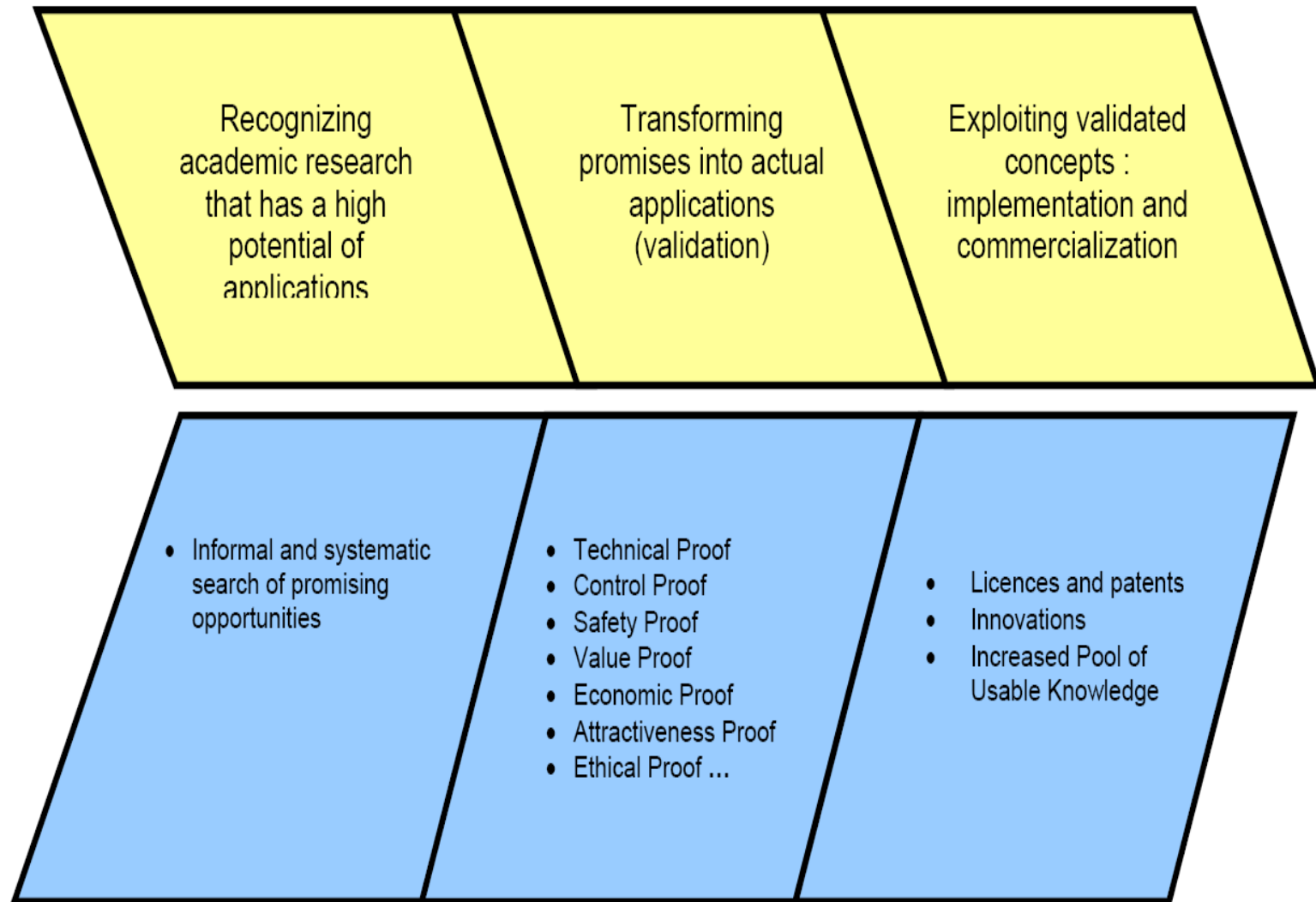


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Figure 1

KNOWLEDGE VALUE CHAIN*



Identification of knowledge-based opportunities

- Studies on knowledge transfer tend to implicitly assume the existence of knowledge-based opportunities
- However, highly promising knowledge-based opportunities may suffer from two shortcomings.
 - First, knowledge-based opportunities focus the search on highly promising research knowledge, while studies on the development of new products and services show that the development of such innovations usually requires the mobilization of research knowledge in combination with other forms of knowledge (Amara and Landry, 2005).
 - A second shortcoming is related to the lack of attention to the applicability of knowledge, more specifically on the transformations that are required to convert promising knowledge into new or improved products, services and practices.
- By comparison, the literature on knowledge management tends to explicitly assume that **knowledge-based opportunities need to be recognized** through identification of possibilities of combining, in new ways, existing knowledge with new scientific knowledge, internal knowledge with external knowledge, knowledge resources with other resources.
- **Challenge**: the size of the knowledge pool: ex: 2 millions of new scientific articles/year published in biomedical research



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Conversion of knowledge-based opportunities into new or improved products and practices

- The KT and KM approaches differ sharply with respect to their assumptions on the applicability of research knowledge.
 - On the one hand, organizations promoting KT assumes that in order to increase transfer, one needs to forge more efficient interactions with users, and to more effectively adapt and communicate research knowledge to users.
 - On the other hand, the literature on knowledge management assumes that the knowledge transfer assumption is counterproductive because the research knowledge is not ready for applications. Many studies confirm this second assumption.
- Hence, a study regarding the translation of highly promising basic research into clinical applications that screened 101 articles published in top basic science journals between 1979-1983 found that:
 - “Two decades later, only 5 of these promises were in licensed clinical use and only one of them had a major impact on current medical practices. Three quarters of the basic science promises had not yet been tested in a randomized trial” (Ioannidis, 2004).



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Proof of concept

- At this stage, individuals or organizations that have identified knowledge opportunities need to convince others to invest resources that will contribute to demonstrate that the opportunity can be translated into actual value (Lundquist, 2003).
- The value creation stage can be subdivided into many complementary levels.
- Gaining support and investment for the application of research knowledge requires proof at many complementary levels (Lundquist, 2003):



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POC at different levels

1. **Technical proof:** demonstration that a concept (for a new good, new policy, new service, new practice) is technically feasible at each stage, from theory through production and delivery to customers?
2. **Control proof:** demonstration of legal right of use of the intellectual property of the proven concept?
3. **Safety proof:** demonstration that the proven concept is safe and that you minimizes liabilities?
4. **Value proof:** demonstration that enough customers exist and can be served to clearly generate a private or public profit from the proven concept over time?
5. **Economic proof:** demonstration that a finished product, service... based on the proven concept will deliver benefits in excess of their costs?
6. **Attractiveness proof:** demonstration that the proven concept fits the mission, goals, and strategy of the organization to which it is transferred?
7. **Ethical proof:** demonstration that the proven concept meets the organization's ethical criteria?



Appropriation of the value of the validated knowledge through implementation or commercialization

- The third stage of the knowledge transfer process involves the possibility to appropriate at least part of the created value.
- There appears to be at least two major mechanisms that actors can rely on to appropriate value from knowledge-based opportunities:
 - direct implementation of knowledge into innovations, and
 - indirect implementation of “useful” knowledge.



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Appropriation of the value of the communicated knowledge through implementation or commercialization: **the challenge of implementation**

- Researchers from the USA and the Netherlands have estimated that:
 - 30-45% of patients are not receiving care according to scientific evidence and that
 - 20-25% of the care provided is not needed or is potentially harmful
- (Schuster et al., 1998; Grol 1999; McGlynn et al., 2003).



Thank you for your attention
Questions?
Comments?



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