



# Executive Summary

Taking stock: research and knowledge  
translation in Manitoba

## Background

Research Manitoba is mandated to promote and support, and coordinate the funding of research in the health, natural and social sciences, engineering and the humanities in the province. One of its tasks is to develop, coordinate, and implement a provincial research strategy and major funding programs. An integral part of strategic planning is an environmental scan, which was informed by the spectrum of Research Manitoba's mandate – providing support spanning knowledge generation to the translation of knowledge, from its uptake in professional/clinical practice, program development, and decision/policy making to commercialization activities.

Questions that the team wanted to answer in the environmental scan were:

- How does Manitoba compare with the rest of the Canadian provinces in terms of inputs into and the outputs of the research enterprise?
- What are Manitoba's areas of research strengths?
- What policies, events and changes in the environment influence Manitoba's research enterprise?

In each section, issues to think about – posed as questions – are included.

## Knowledge generation

### 1. Inputs of the research enterprise

#### Researchers<sup>1</sup>

Researchers are the drivers of the research enterprise. They develop different types of research, finding funding, mentor students and fellows, collaborate with colleagues within and outside Canada, produce discoveries that lead to health and socio- economic impacts, and contribute to the national and global knowledge pool.

Manitoba has five researchers per thousand population, the same as Quebec and Saskatchewan. Fifty percent of Manitoba researchers who are published are in the natural sciences and engineering, 40% in health, and the rest in the social sciences and humanities.

#### Funding

Funding from sources such as federal agencies, provincial funding organizations, and not-for-profit organizations and many others support the performance of research. It can also be used as a measure of research excellence.

Funding data from the Tri-Council agencies and CFI produces three groups among Canada's provinces: the big four (Ontario, Quebec, British Columbia, and Alberta), the middle three (Manitoba, Nova Scotia, and Saskatchewan), and the smaller provinces (Newfoundland & Labrador, New Brunswick, and Prince

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<sup>1</sup> This data is limited to published investigators. To find out the source of the data and other details, please read the complete report [here](#) .

Edward Island). Manitoba averaged \$27 per capita funding, ranking seventh after Saskatchewan, which had \$30. Of Manitoba's total funding, 61% is accounted by the Canadian Institutes of Health Research (CIHR).

Using 2012 data from the Canadian Association of University Business Officers (CAUBO), Manitoba's funding from federal sources compares well with the rest of Canada (46% versus 47%). From non-government sources, consisting of individuals, business enterprises, and not for profit organizations, Manitoba's funding is higher (34% as opposed to 25%); but lower for funding from other government (provincial, municipal, foreign) sources.

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*Are we supporting the research enterprise in the best way?  
Should the support to natural science, engineering, social sciences and humanities be strengthened? If so, how?  
How do we increase Manitoba's share of national funding?*

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### Postsecondary students

*"Universities...role in local development is... their ability to attract talent and, through that talent, disseminate leading-edge knowledge in the local economy. But to attract the best and brightest and properly train them, they need to conduct leading-edge research" (2013 State of the Industrial R&D of Canada).*

Manitoba had a total of 9,405 graduates from 2000 to 2012, averaging 723 graduates per year. The number of postsecondary graduates has averaged an overall annual 4% growth from 2000 to 2012. The rate of growth for each of the sectors has been 3-4% for the same period. Taking into account population, Manitoba ranks sixth in terms of the average number of total graduates per year and ninth in the average number of graduates per million population.

### Research infrastructure

The province of Manitoba is home to some world class R&D expertise and infrastructure. Research infrastructure, which includes facilities, equipment, and other key resources, plays an increasingly important role in the advancement of knowledge and technology. It helps attract the best and the brightest researchers, brings stakeholders together to facilitate collaborations, and enables the research community to conduct top-level research in their respective fields. Many of Manitoba's research infrastructure are in the life sciences; there are also critical research infrastructure in agriculture, information and communications technology, and industrial R&D.

### Collaborations

Collaborations – institutional, national or interprovincial, and international – bring in skills that complement existing expertise or provides the necessary expertise leading to a transfer in skills and

knowledge. They also bring in additional resources required by the research, and contribute to the faster movement of research findings to knowledge translation.

Manitoba's collaboration rates are in line with the other provinces: a positive trend in international collaboration, a relatively constant national collaboration, and a declining institutional collaboration. Manitoba averaged 36% for international collaboration between 2000 and 2014, which compares well with most of the provinces whose rates range from 37% to 39%. Its national collaboration averaged 18% over the same period. Manitoba's institutional collaboration rate of 34%, the average from 2000 to 2014, is the same as Ontario's and ranks behind Alberta (35%), Quebec (35%).

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*Should the Manitoba post-secondary educational system produce more graduate students and postdoctoral fellows?*

*Do we have enough research capacity in Manitoba? Do we need to build capacity in certain areas?*

*Should we expand the number and type of research platforms?*

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## 2. Outputs of the research enterprise

### Publications

Publications, especially peer-reviewed ones, are a well-known output of research and an indicator of productivity. They also serve as an important mechanism for disseminating research results and discoveries.

Manitoba's publication per million inhabitants has risen from 1,000 in 2000 to 2,200 in 2012 and 2013 before dropping in 2014. Taking the average number of publications per million inhabitants between 2000 and 2014, Manitoba ranks seventh among the provinces.

### Patents

Patents, although not produced in a similar volume as publications, are also a measure of productivity. In general, counts of patent applications and issued patents based on inventor and assignee addresses measure the intellectual property (IP) and inventiveness of regions. Since important time lags exist between the filing date of applications and the issuance of the corresponding patents, data on applications provide more up-to-date information on the current (i.e. in recent years) inventiveness of regions (when based on the location of inventors).

Manitoba produced 13 biotechnology patents on average between 2001 and 2011, the same as Alberta and comparable to Ontario (15), Quebec (14), and British Columbia (14).

For health patents, Manitoba averaged 20 applications per year per million inhabitants, and showed an overall increasing trend despite the drop between 2010 and 2011. The rest of the provinces also had a positive trend in the growth of patent applications.

In addition to biotechnology and health patents, Manitoba produced one fifth of patents in agriculture, forestry, fishing, and hunting according to the 2013 State of Industrial R&D in Canada. This is on par with Quebec and second to Ontario's 55%.

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*How do we foster greater inventiveness and innovation?*

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### 3. Stakeholders

Stakeholders in knowledge creation involve researchers, research institutions, government agencies, the provincial government, non-profit organizations, industry, and the public. These can be broadly categorized into producers and users of knowledge, and supporters of knowledge creation, although this grouping is by no means fixed.

## Knowledge translation

Knowledge Translation (KT), is the umbrella term for all of the activities involved in moving research from the laboratory into the hands of people and organizations who can put it to practical use. KT describes a spectrum of activities which change according to the type of research, the timeframe, and the audience being targeted. Understanding and optimizing how research is translated is critical to identifying and improving research outputs. In the scan, two paths in KT are considered: a) health, social, environmental, and economic benefits and improvements, and b) commercialization activities.

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*Should we establish a set of provincial priority areas to guide research funding?*

*How did we support research strength and emerging opportunities?*

*How do we encourage the translation of research findings more quickly?*

*How are discoveries being shared? Are there more effective ways to share discoveries?*

*Should we require publications from funded research to be published in Open Access?*

*Are there gaps in the supports for activities related to the early stage commercialization of research?*

*Is there a consistent alignment between provincial and federal programs that fund research and pre-commercialization activities?*

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## Appendix 1. Environmental events/factors that affect the research enterprise

### 1. Provincial priorities

Manitoba has an Innovation Strategy with six priorities:

- Build on Manitoba's research excellence
- Support collaborative models for the commercialization of research
- Create a clear path for innovators and entrepreneurs in Manitoba
- Help our graduates and young entrepreneurs find the 'jobs of tomorrow' right here at home
- Enable our existing businesses to grow and prosper through innovation
- Create an environment that fosters private sector investment for entrepreneurs and innovators in Manitoba

### 2. Institutional research priorities and goals

- University of Manitoba's measures of success of its 2015-2020 Strategic Research Plan includes
  - Research capacity building through recruitment and retention of outstanding faculty, and
  - Recruiting top students and providing outstanding training opportunities.
- Brandon University's 2014-2017 Strategic Research Plan aims to, among others:
  - Continue to produce high quality research and creative activity building on existing strengths and partnerships,
  - Increase research capacity and to expand research partnerships and collaboration, and
  - Establish mechanisms to increase knowledge mobilization.
- One of the University of Winnipeg's strategic priorities is a continuing focus on teaching excellence and the expansion of research.
- Red River College's first strategic initiative includes a goal of increasing of applied research and innovation

### 3. Funding landscape

- Research Manitoba's funding for 2015-2016 is expected to remain at the same level
- Demand for funding for research projects and commercialization activities in Manitoba is strong as can be seen in the variety of projects and amount of funding being requested either as matching funds or direct support to research in the natural and social sciences, engineering, and humanities. In the health funding programs, the success rate of funding applications has gone down since 2007.
- The federal budget for 2015 does not include increases to the three federal granting agencies. However, new funds were announced starting in 2016-17:
  - \$15 million per year ongoing to CIHR (\$13 million for the expansion of SPOR and \$2 million for research on anti-microbial resistance).
  - \$15 million per year ongoing to NSERC (\$10 million for business innovation programs in areas such as natural resources and energy, advanced manufacturing, and environment and agriculture; and \$5 million to the College and Community Innovation Program).

- \$7 million ongoing to SSHRC for Partnership Grants
- This year's investments in research focuses on infrastructure, with support to the Canada Foundation for Innovation, TRIUMF and the international Thirty Meter Telescope project.
- In health, CIHR, the major source of funding, has overhauled its funding delivery system
- A recent report indicates pushback to CIHR's direction towards "health knowledge along the innovation pipeline and into health and economic benefits." Scientists fear that there will be less money for discovery science as a result. CIHR for its part has stated that 50% of CIHR funding has, and still goes to idea that's of top quality and in the area of health.
- Greater requirements for matching funds
- Non-expanding funding universe

#### 4. Barriers to translation of science and technology knowledge

Although the following were identified for Canada as a whole by the 2013 State of Industrial R&D in Canada report, the validity of these factors in the Manitoba setting should be considered.

- Technology transfer. Investments in university research and technology transfer personnel have seen a marked increase since 2000 but the number of patents and licensing agreements has not shown a corresponding rise. The Organization for Economic Co-operation and Development (OECD) and other reports have suggested that this may suggest low and declining productivity of technology transfer or a weak commercialization culture at universities, driven in part by an overly bureaucratic mindset across TTOs.
- Dearth of management expertise and business acumen. This conclusion is derived from lower levels of educational attainment of Canadian managers as opposed to US counterparts, and the likelihood of managers to leave post-secondary education without obtaining a degree. Canada's low managerial skill set does not enable competing in fast-paced knowledge economies and in adequately meeting the needs of dynamic markets.
- Business support. The total venture capital (VC) investment and the number of firms receiving VC investment showed a decline since the early 2000s.
- Public procurement. The 2011 Jenkins report suggest using public procurement as a lever to create demand, especially in public-good properties and high innovation propensity (e.g. health, education environment) since there are very few demand-side policies that encourage innovation.
- Business culture. Canadian business culture is highly risk averse. Ideas produced by universities are frequently further away from the market and inherently more risky, making Canadian businesses less willing to develop these ideas for markets.

Particular to Manitoba, there is no lead organization that provides early stage commercialization services, and current programming and services of organizations and agencies overlap.

## Appendix 2. SWOT analysis (preliminary)

<b>Strengths</b>	<b>Weaknesses</b>
New mandate; fresh starting point	Outside of research not enough collaboration between stakeholders (maybe no data about it?)
As a smaller province, the research enterprise has a better sense of its abilities and expertise, and investigators can connect with each other easily (the Manitoba advantage)	Weak link between research and post research innovation programs
Able to leverage more research income from non-government sources compared to other provinces	Research budget too small for system wide requirements
There are many organizations to draw from	No adequate pre-commercialization programs
Research strengths in: arctic research; functional foods; agriculture; aerospace; immunity, inflammation and infectious disease research; and, population and global health	Coordination and advising role not clearly defined functions
Patents applications and issued patents compare well with bigger provinces	Fixed funding for Research Manitoba in context of broad mandate
	Below average provincial research funding
<b>Opportunities</b>	<b>Threats</b>
Create or develop a role for CHI-KT planning for other areas of research	Matching funds requirements, e.g. from national funding agencies
Support to e-health industry(?) which is a huge trend going forward	Funding sources (national, provincial, not for profit) have fixed research budgets
Develop additional clusters in agriculture, health, proteomics, composites, aerospace	Escalating indirect costs
Expand research connections/invest in pre-commercialization activities	Overlapping mandates, lack of coordination and cooperation among facilitator-organizations in Manitoba
Work more with industry – coordinating activities/\$	Strong competition for federal dollars
Invest in natural sciences and engineering, and social sciences and humanities	
Invest in social innovation	
Targeted research calls based on issues of particular importance to Manitoba	
Partner with different organizations to find solutions	
Encourage a greater multidisciplinary approach, e.g. the work around composites where research institutions have worked with other sectors to identify and realize practical applications of discoveries in materials research	
Consolidate major innovation and commercialization supports into a single facility, which could co-locate relevant services from all levels of government and integrate the service offerings of many existing programs and facilitator organizations	