



**Report: Intellectual Property in
Ontario's Innovation Ecosystem**
Expert Panel on Intellectual Property

Report to the Government of Ontario
February 2020



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MESSAGE FROM THE CHAIR OF THE EXPERT PANEL ON INTELLECTUAL PROPERTY

This report would not be possible without the countless hours of work by dedicated professionals who share a commitment to evidence-based public policy and a desire to see Ontario prosper in the 21st century economy of ideas. From the first online survey through province-wide in-person consultations, to the final analysis of data collected and the preparation of the final report, the talented staff of the Government of Ontario lent their expertise and resources so we could fulfill this Panel's mandate.

The Secretariat at the [Ministry of Colleges and Universities](#), and the [Ministry of Economic Development, Job Creation and Trade](#) provided critical administrative and strategic support and guidance. All Ontarians should be encouraged at the level of professionalism and enthusiasm that exist within these two ministries, especially for creating strategies that will make Ontario a prosperous province for decades to come.

I am also grateful that Premier Ford, and Ministers Romano and Fedeli recognized the transformative potential that the commercialization of Intellectual Property (IP) has on Ontario's current and future prosperity. IP is, by definition, a government-granted exclusive ownership right to an idea, and continued leadership from the Government of Ontario is critical to the success of these recommendations.

The **Expert Panel on IP** brought together recognized experts in IP law, innovation ecosystems, IP education and the commercialization of ideas. Their contributions to this project have advanced my own understanding of these topics and I am confident the readers of the report will be equally stimulated and enlightened.

On behalf of the **Expert Panel on IP**, I thank the Government of Ontario for giving us the opportunity to contribute to its prosperity strategy.

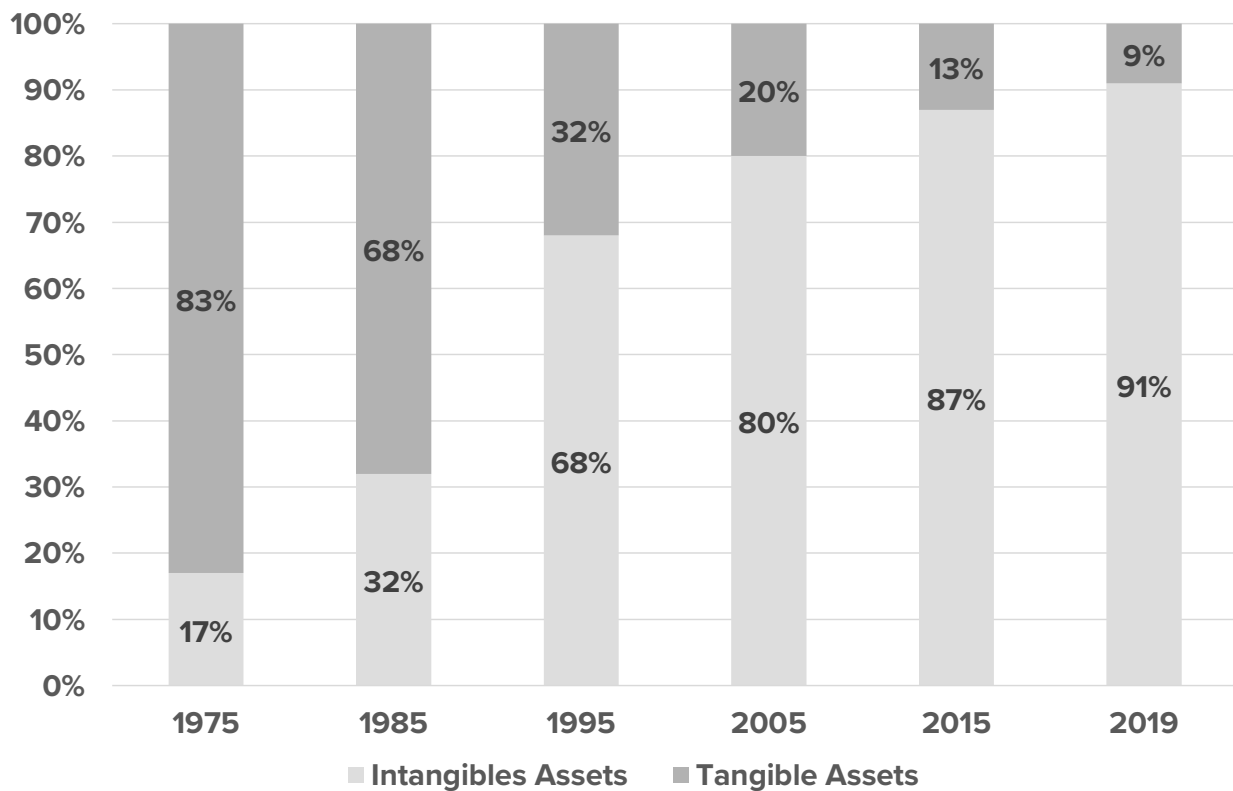
Sincerely,

Jim Balsillie
Chair – Expert Panel on Intellectual Property

INTRODUCTION

The digital transformation over the past thirty years has resulted in a new economic reality in which the basis of wealth and power is derived from the ownership of valuable intellectual property (IP), and more recently, the accumulation and control of data. IP and data are now the world's most valuable business and national security assets. This is best evidenced in the steady change of the Standard & Poors 500 Index (S&P500) over the last four decades. As shown in Figure 1, in 1975, about 17% of the value of the S&P500 was intangible assets, whereas today intangibles comprise over 91% of the S&P500 (Ocean Tomo, 2015) to the total of \$22 trillion total in value ([The Globe and Mail, 2019](#)), and tangible assets account for only 5% of the total value of the world's five most valuable companies.

Figure 1: Shift from tangibles to intangibles. Components of S&P 500 Market Value



Source: Ocean Tomo: Intangibles Asset Market Value Study, 2015.

In parallel, forward-looking governments started crafting updated economic development strategies that focused on supporting the generation, accumulation, commercialization and protection of IP.

Over the past ten years, the global economy expanded to include data assets, and the strategic focus turned to generating, exploiting and controlling these data assets. This includes the application of machine learning to produce artificial intelligence as well as generating valuable IP developed on top of data assets, creating a new policy challenge of machine generated IP. This unprecedented generation of IP (and data) stock assets demands urgent but sophisticated policy approaches for every nation, state or jurisdiction that competes in the global economy. This certainly includes Ontario.

The Expert Panel on Intellectual Property was created by the Government of Ontario, in Spring 2019, as part of its efforts to review, update and implement policy objectives that advance the prosperity of Ontario in the contemporary economy. The Expert Panel was asked to develop an action plan for the development of a provincial intellectual property framework that fully exploits the potential benefits of Ontario's investments in research and development and maximizes the role that Ontario's innovation intermediaries can play in supporting this framework.

As Expert Panel members, we come from a wide range of backgrounds including postsecondary education, industry, technology and innovation, venture capital and investment, and intellectual property law:

- Jim Balsillie, businessman and philanthropist, retired Chairman and Co-CEO of Research In Motion (now BlackBerry), Chair of the Council of Canadian Innovators, and Chair of the Centre for International Governance Innovation
- Shiri M. Breznitz, PhD. Associate Professor, Munk School of Global Affairs and Public Policy, University of Toronto
- Myra Tawfik, B.C.L, LL.B., LL.M, Professor of Law and EPICentre Professor of Intellectual Property Commercialization and Strategy, University of Windsor
- Dan Herman, PhD, co-founder of MyJupiter Inc. and co-founder of The Centre for Digital Entrepreneurship & Economic Performance (DEEP)
- Natalie Raffoul, P.Eng. (Electrical Engineer), J.D. (Law), Registered Patent Agent, Managing Partner of Brion Raffoul Intellectual Property Law

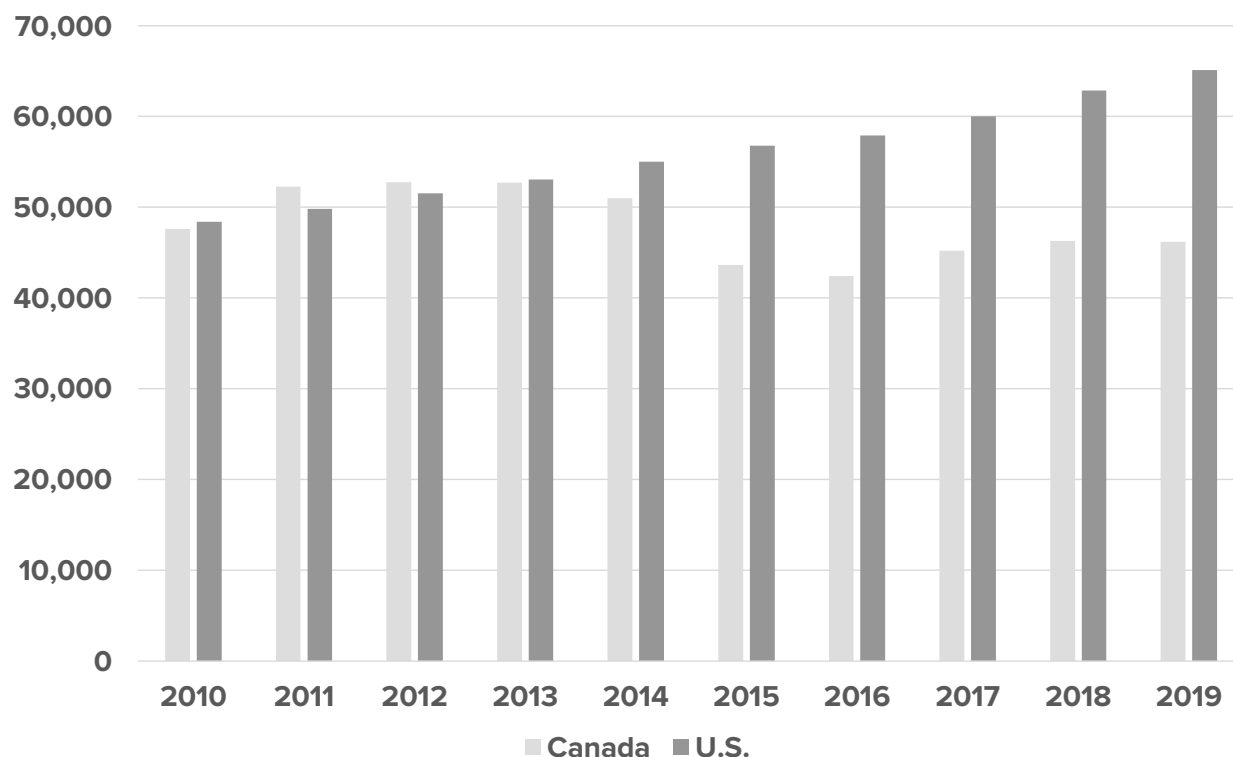
To arrive at our recommendations, we have reviewed research on the rise of the IP-driven economy, best practices from relevant jurisdictions around the world and conducted 14 in-person consultations, with participation from over 110 individuals and more than 80 organizations.

We were encouraged by the enthusiastic participation and bold ideas shared at these consultations and a clear desire by many Ontarians to help the government get a robust picture of Ontario's IP ecosystem and help it perform better for everyone involved in it. Consequently, our recommendations reflect the province's challenge in optimizing such an ecosystem but also the opportunities it can advance, often with no additional funding, simply with better coordination among stakeholders.

Ontario's challenge in today's economy

In a recent speech delivered by Ontario's Minister of Finance, Rod Phillips said this about Ontario's GDP per capita performance: "When we talk about Ontario, some of us will recall when we were a top 10 North American jurisdiction, on par with our neighbours to the south like New York, who today is number five...people are often surprised to find out we're ranked 45th, one place ahead of Montana. We should be doing better, and we can do better" ([Toronto Star, October 10, 2019](#)).

Figure 2: Canada – U.S. Comparative GDP Per Capita Performance



Source: www.IMF.org

Ontario's prosperity challenge is shared with the rest of the country. Data comparing Canada's GDP per capita with that of the U.S. over the past decade demonstrates trends that have only very recently started to create a sense of alarm, and only by a select few monetary and fiscal policymakers. According to the International Monetary Fund (IMF), Canada's GDP per capita is 3% lower than our 2010 levels, while the US has experienced a 35% increase over the same period ([International Monetary Fund, 2019](#)), due in part to the alignment of their economic policy infrastructure with knowledge-based and data-driven economic realities that, according to the U.S. Department of Commerce, contribute nearly \$8 trillion annually to the U.S. economy. These outcomes correlate directly with individual citizens' ability to consume products and services.

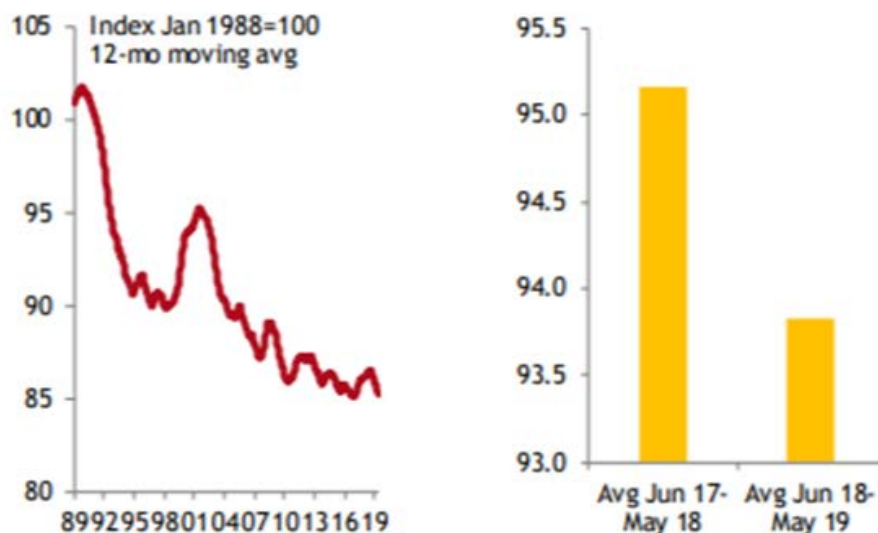
An additional consideration that isn't captured when looking at GDP per capita data, especially when employment rates see an increase, is the job quality index. In a recent study comparing the labour-market performance in Canadian provinces with U.S. states from 2015 to 2017, Canadian provinces significantly underperformed relative to U.S. states, with every Canadian province ranked in the bottom half of the 60 jurisdictions, (Fraser Institute, 2019).

Canadian workers were also much more likely to be stuck in involuntary part-time work, when they would otherwise want full-time work. On this indicator of under-employment, every Canadian province ranked in the bottom half.

In the late 1980s, when the economy was not as IP-intensive as it is today and our measure of employment quality was 15% higher, a 1% increase in employment generated, on average, a 4.4% increase in real labour income. Today, it generates less than 3%, (CIBC Economics, Tal Benjamin 2019).

Top performers in these indexes come from jurisdictions that have evolved their prosperity strategies to generate stronger outcomes in this changed global economy.

Figure 3: Canada Job Quality Index (Chart provided by CIBC)



Source: CIBC tabulations based on Statistics Canada's tabulation

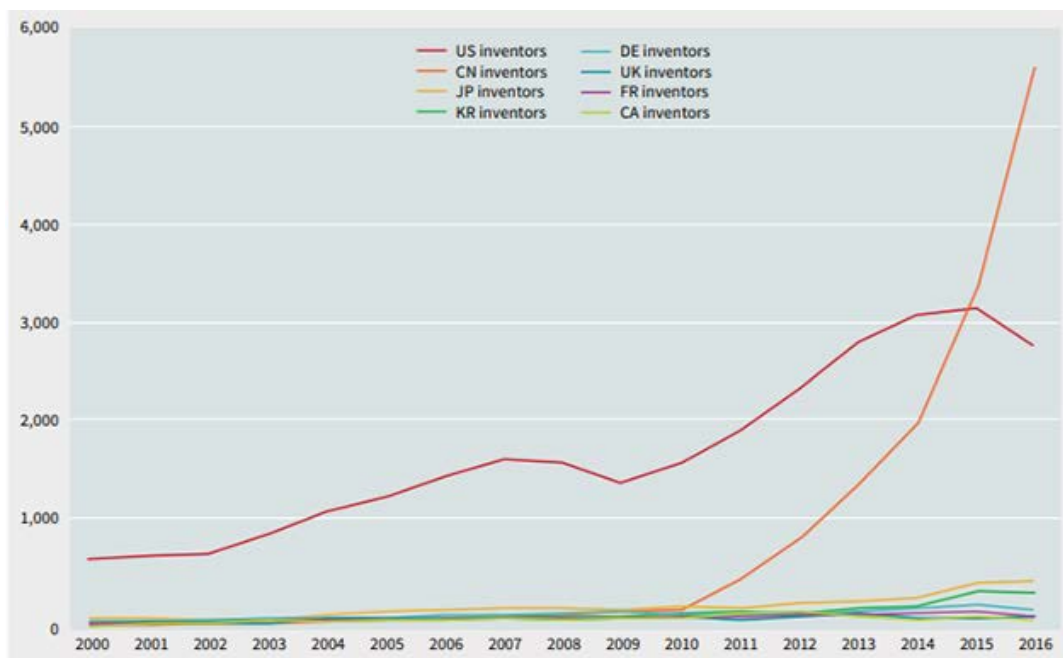
A number of Ontario stakeholders can play a meaningful role in reversing these prosperity trends. These include small and medium size enterprises (SMEs), Ontario's postsecondary education sector, incubators, accelerators and Regional Innovation Centres (RICs) that receive public funds to improve innovation outcomes. Equally, the government has a critical role in guiding the creation and implementation of policy strategies that help these stakeholders achieve desired prosperity outcomes.

THE ROLE OF IP IN A PROSPERITY AGENDA

The pace of the intangible economy is accelerating, as evidenced by a rapid rise in Patent Cooperation Treaty (PCT) patent filings in the past two decades. This is most evident in the race for AI patents and in the amount of data generated through the rapid adoption of connected devices.

We are witnessing the global race by large firms and advanced nation-states to own critical IP, especially patents, particularly for areas that have both economic and non-economic impacts, such as blockchain, AI and machine learning. These developments are particularly relevant for Ontario as its researchers, along with their peers in Montreal and Edmonton, are widely recognized to be at the forefront of the development of AI. Further, Ethereum's blockchain currency was created in Ontario. (CBC Radio, December 12, 2017)

Figure 4: AI-related patent volume by inventor nationality



Source: IAM Magazine; Cowan and Hinton. Intellectual property and artificial intelligence: what does the future hold?

Instead of traditional supply chains, the economy of IP and data features intangible value chains where companies compete on staking positions based on their IP and data assets and use those assets to expand their 'freedom-to-operate' while limiting competitors.

Successful companies now principally compete on staking positions in value chains of intangibles rather than by only lowering costs in production supply chains. Additional product enhancements and services based on IP and data have low or even zero marginal production costs, which results in “winner take all” economics. Those that want to prosper in the intangible economy are accumulating valuable IP assets because it’s a precondition to commercialization.

CATEGORIES OF INTELLECTUAL PROPERTY

When looking at what constitutes an IP intangible stock asset, the most frequently referenced and easily measured are “patents”. But this is not the full picture. It is critical to understand that there many categories of IP that when shrewdly developed and used together, create a valuable economic asset:

1. Contracts
2. Copyright including Moral Rights and Neighbouring Rights
3. Domain Names
4. Geographical Indications
5. Industrials Designs or Design Patents
6. Integrated Circuit Topography
7. Patents
8. Plant Breeders’ Rights
9. Personality Rights
10. Trademarks
11. Tradenames
12. Trade Secrets
13. Utility Models

In the knowledge-based economy, you cannot commercialize an idea if you don’t own it. A recent US National Bureau of Economic Research report states: “Patents are the most concrete and comparable measure of innovative output over countries and time.” ([The IT Revolution and the Globalization of R&D. National Bureau of Economic Research, Branstetter et al, 2018](#)).

Intangible assets – such as IP and data – have a direct impact on wealth and power at both the company level and nationally. This is why companies are amassing ever larger IP portfolios. Countries looking to advance their innovation outputs are focusing on encouraging ownership and then protection of these assets, most notably in the new global economic partnerships that are replacing traditional, production economy “free-trade” agreements.

See [Appendix C](#) for a description of IP assets.

THE EXPERT PANEL'S MANDATE AND PROCESS

As an independent Expert Panel, we were mandated to provide recommendations on:

1. Emerging policy issues relating to intellectual property and commercialization capacity inside Ontario's postsecondary education sector to improve innovation outcomes, including research commercialization, monetizing and protecting intellectual property, and supporting commercialization including start-ups and scale-ups for the benefit of Ontario's economy.
2. How intellectual property assets developed in postsecondary education institutions can be commercialized to support the government in achieving its mandate of creating sustainable, competitive and long-term economy in Ontario.
3. How to strengthen the relationship between the government and Ontario's postsecondary education, start-up and technology sectors in order to promote the generation of intangible assets that can be commercialized for the long-term economic benefit of Ontario.

Our work was also supported by a secretariat composed of public servants from the [Ministry of Colleges and Universities \(MCU\)](#) and the [Ministry of Economic Development, Job Creation and Trade \(MEDJCT\)](#). The secretariat provided administrative and coordination support for the related in-person consultation sessions, as well as research support and other assistance as required by the Expert Panel.

Starting in Spring 2019, we designed a broad and extensive engagement strategy to receive ideas, perspectives and general inputs from across Ontario's innovation system. The engagement with stakeholders began with the launch of an online survey, open to the general public, which solicited feedback on three questions related to the generation, commercialization and protection of IP in Ontario postsecondary institutions and across Ontario's innovation network. From May 17th until July 15th, 2019, the online survey received 90 responses.

A second part of the stakeholder engagement process involved the design and dissemination of an in-depth questionnaire distributed to two distinct sets of Ontario IP stakeholders:

- Ontario postsecondary technology transfer offices (TTOs) and/or college-based business and industry liaison offices. This stakeholder group included 21 universities and 24 colleges. This questionnaire focused on the development of a deep understanding of organizational mandates, capacity and expertise with respect to intellectual property.
- 17 provincially funded Regional Innovation Centres (RICs), 65 campus-linked accelerators and associated On-Campus Entrepreneurship Activity (OCEA) centres, 18 medical-research organizations and 12 research institutes / sector-specific organizations. This questionnaire focused on the development of a deep understanding of organizational mandates, capacity and expertise, and programming for start-ups and SMEs with respect to intellectual property.

Respondents were provided three weeks to provide their responses to us; a total of 90 official responses were received.

The final phase of our engagement strategy took the form of in-person consultations, undertaken on a regional and stakeholder-type basis, from August 27, 2019 to October 2, 2019.

We hosted 14 in-person consultations in the following cities (noted in chronological order): Toronto, London, Windsor, Ottawa, Thunder Bay, Sudbury and Sault Ste. Marie. The following lists the full schedule of consultations by region and stakeholder type:

Date and location	Participating organizations
August 27, 2019 (AM), Toronto	University TTOs (GTA, Southern Ontario)
August 27, 2019 (PM), Toronto	College TTO/industrial liaison offices
August 28, 2019 (AM), Toronto	RICs, CLAs, OCE
August 28, 2019 (PM), Toronto	Medical Research Organizations
September 16, 2019 (AM), London	University TTOs (Southwestern Ontario)
September 16, 2019 (PM), London	College TTO/industrial liaison offices
September 20, 2019 (PM), Windsor	RICs, CLAs, MITACs, other stakeholders
September 23, 2019 (AM), Ottawa	University TTOs, RICs and Medical Research
September 23, 2019 (PM), Ottawa	College TTO/industrial liaison offices
September 24, 2019 (AM), Ottawa	RICs, CLAs and Medical Research
September 30, 2019 (AM), Thunder Bay	All stakeholders
October 1, 2019 (AM) Sudbury	University TTOs, RICs, CLAs and Medical Research
October 1, 2019 (PM) Sudbury	College TTO/industrial liaison offices
October 2, 2019 (PM) Sault Ste. Marie	All stakeholders

The in-person consultations consisted of:

1. A brief introductory presentation about our mandate and the findings to date including the results of the online survey and questionnaires.
2. A plenary discussion catalyzed by the question: **“How can we govern IP protection and the commercialization of IP in Ontario to maximize the benefit to all Ontarians (community, economy and jobs)?”**.
3. An open discussion with session participants about challenges and gaps within the current environment in relation to IP generation, commercialization and protection.
4. An open discussion about potential solutions.

During the course of our work, we undertook research and analysis to arrive at our understanding of the IP landscape and to inform our recommendations. A total of 87 institutions and organizations participated in the in-person consultations. (See [Appendix B](#) for a list of participating institutions and organizations.)

BACKGROUND ON OUR APPROACH AND RECOMMENDATIONS

Data and information sources

In our deliberations, we relied heavily on the findings of the various in-person consultations described in the previous section. We also referenced past provincial and federal reports as well as more recent studies that provide an assessment of the current IP landscape in Canada.

The Strategic Mandate Agreements (SMA) with Ontario universities and colleges were discussed during the consultations. While the SMA does not fall under this Expert Panel's mandate, we were nevertheless mindful of ensuring that our recommendations for innovation metrics are aligned with the direction of these agreements.

We also considered relevant initiatives of the federal government such as the National IP Strategy including the Patent Collective Pilot Project (which some of the members of the Expert Panel are directly involved in). This pilot project is designed to provide a multitude of IP services but is limited to clean tech companies. While we are of the view that innovation strategies and IP commercialization must involve and be supported by both provincial and federal levels of government and that duplication and overlap should be reduced, our mandate is focused on Ontario and our recommendations are reflective of the needs of this province.

We appreciated the candour of the in-person consultations which produced discussion on a broad range of important issues of concern. For example, we heard about constraints at the level of federal funding such as the Natural Science and Engineering Research Council of Canada programs. While the scope of our mandate does not permit us to specifically address all the issues and insights that arose during our consultations, we hope that the provincial representatives who were present throughout have noted these concerns and will direct them to the appropriate individuals or agencies.

Issue identification

Drawing from our research and the in-person consultations it was clear that the most significant recurring themes revolved around questions of capacity-building in IP education and access to specialized IP legal services as well as the structure and governance of the various “public sector” entities within the ecosystem. Our recommendations are therefore organized under these headings.

While we recognize the importance of all forms of IP, there is no question that patents remain the most significant—not only in terms of their economic value but also in terms of their complexity and costs.

Opinions about the importance of patents varied among those consulted with some expressing skepticism that patents may be overvalued as economic drivers in the knowledge-based economy. We are not indifferent to these views. However, patents remain important strategic assets in today's global marketplace and their commercialization yields significant economic returns to their owners. While incomplete data currently exists to show the IP generation of Ontario, the Patent Cooperation Treaty (PCT) provides a useful overview of nation-wide performance in IP generation and suggests that Canada's patenting performance is woefully inadequate (see [Appendix A](#)).

A comprehensive perspective

Incentives and accountabilities must be matched by a commitment on the part of all stakeholders within the ecosystem to work together and ensure that the commercialization of the most valuable intangible assets results in Ontarians receiving economic benefits for their investment. Radical solutions are not needed but it is incumbent on the government and participating stakeholders to determine the best ways to add or embed greater attention to IP within the province's existing entrepreneurial and innovation environment.

We are also mindful of the diversity within the entire ecosystem itself. Universities come in all forms and sizes, as do colleges, with different disciplinary specializations and expertise including those with particular demographic expertise like entities serving Franco-Ontarians or Indigenous peoples. They also come with different levels of access to resources and expertise. This diversity can be leveraged for strength. Collectively, the ecosystem needs to do better at achieving IP commercialization goals but always in step with individual disciplinary and contextual strengths.

Some stakeholders stood out as requiring further study or review. The colleges offer interesting pathways to commercialization that are currently underdeveloped and should be the subject of more focussed attention. We encourage the province to consider the opportunities for colleges to more directly support IP education for industry, their students and their faculty and to determine how to resolve some of the structural obstacles that have limited their ability to enhance their IP commercialization skills and services.

The medical research institutions involved in pharmaceutical research are also a specific group with challenges that we cannot fully address in our report. Much of their work is basic research and requires years of development. Finding the correct partners and collaborators is crucial to allow hospitals and medical researchers to negotiate more beneficial IP arrangements for publicly-funded research. In this respect, assistance with the costs of clinical trials and with strategies for de-risking IP commercialization efforts were issues of concern.

IP AND PUBLICLY SUPPORTED RESEARCH

“Canada is the world’s open source factory for ideas. We create it, but let others commercialize it”

Expert Panel consultation participant

Ontario is Canada’s most patent-intensive province and has a strong publicly-assisted postsecondary education sector. In 2014, 66% of Ontario adults had a postsecondary degree or diploma, more than any member country of the Organization for Economic Co-operation and Development (OECD). The province produces one of the most educated workforces in the world, as well as internationally respected research and ideas. The gross domestic expenditure on research and development in the higher education sector has been increasing in Canada since 2007 and it is close to the OECD average. ([Gross domestic expenditures on R&D by performing sector, OECD, 2019](#))

Although university-private sector partnerships have increased over the past five years, Canada continues to lag in moving university-developed technologies to outside licensors. ([Montreal: Institute for Research on Public Policy, Gallini and Hollis, 2019](#))

Moreover, the latest [Association of University Technology Managers \(AUTM\) report](#), indicates that Canadian academic Institutions filed 687 patents, down from 790 in 2016 and the fewest since 2008. While the AUTM data on its own is not conclusive it provides some basis for concern. We heard suggestions that the decline in filing rates is mitigated by better quality patents. Taking that into account, we would still have expected to see an overall increase in patent filings or to learn that universities are successfully utilizing other forms of IP, such as trade secrets, as preferred alternatives.

There may be some contributing factors that might explain this decrease in patent filings, which would warrant more investigation: in Canada, IP policies differ from university to university and their rules regarding IP ownership vary considerably, with some universities owning the IP but granting a nonexclusive licence to creators (for example, University of British Columbia), while others provide for joint ownership (for example, University of Toronto, McGill University) or creator-owned IP (for example, University of Waterloo). It is not clear whether these variations affect patent filing rates, but the question might be worth further study.

Moreover, a [Council of Canadian Academies 2018 report](#) finds that the areas of comparative advantage in academic research do not always align with those in industry in Canada. Whether this circumstance has a negative impact on patent filings may also be a useful area for further study, as would the question of whether better alignment should be encouraged between academic research and industry needs.

According to a recent study, [Maicher et al](#), have identified the five fundamental pillars for the prosperity of a Tech Transfer Office (TTO):

1. IP Policy and its official support by high-level management.
2. The university [or college] and its environment including its prestige as well as its entrepreneurial spirit.
3. The TTO internal organization necessitating well-trained professionals that are both integrated within the institution as well as networked with other institutions and industry.
4. The involvement of researchers, since their ideas are the first stage of innovations and only they know how an idea may become reality in the first place.
5. Industry and their financing providing both the resources for covering costs at the early stages of product development and the power for successful commercialization.

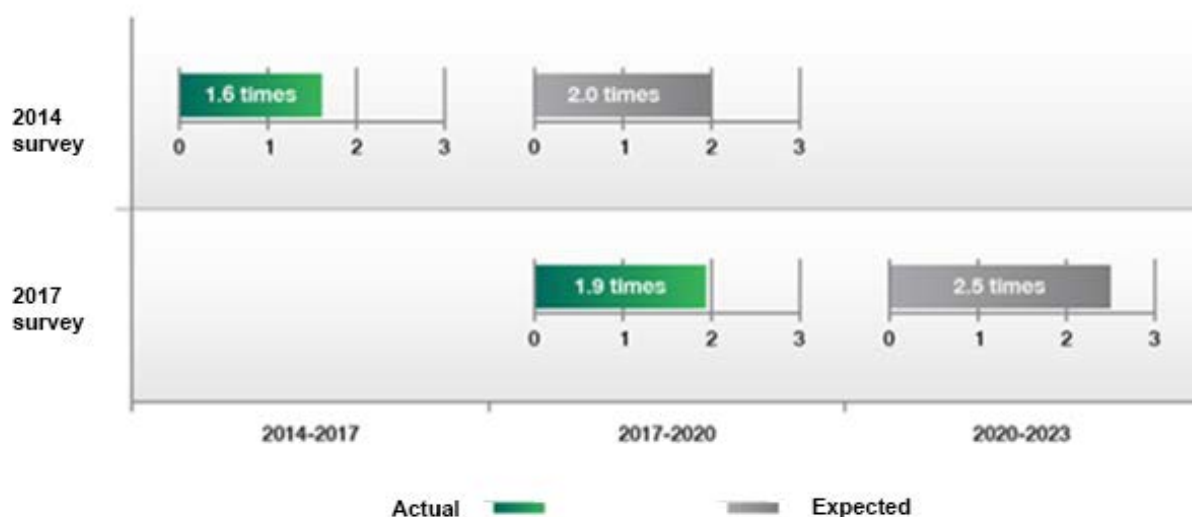
Source: Maicher L, Mjos KD, Tonisson L (2019). Intervention Opportunities for Capacity Building in Technology Transfer. In: Granieri M, Basso A (eds), Capacity Building in Technology Transfer. The European Experience. Springer, Cham, pages 29-46.

The success of TTOs depends on ensuring all these pillars are in place and it may take more than a decade until they have realized the full potential of the academic institution. For more information on Technology Transfer and Intellectual Policy at Universities please refer to [Appendix F](#).

IP AND SMALL AND MEDIUM ENTERPRISES

According to a recently [published report by the Canadian Intellectual Property Office \(CIPO\)](#), Canadian small and medium enterprises (SMEs) aware of or holding registered IP rights are more likely to have expanded, or intend to expand, to domestic and international markets. Specifically, Canadian SMEs holding registered IP rights are 3 times more likely to have expanded domestically and 4.3 times more likely to have expanded internationally. Those that are aware of IP are 1.9 times more likely to have expanded domestically and 2.4 times more likely to have expanded internationally. The expectations are even more impressive: 3.8 times more likely to intend to expand domestically, and 5.4 times more likely to intend to export.

Figure 5: Likelihood of Expected Growth by SMEs Holding IP



Source: Canadian Intellectual Property Office (CIPO)

Of particular concern is the survey result noting that while 59% of SMEs are at least slightly aware of patents; only 2% of SMEs hold at least one. That percentage needs to grow dramatically for Canada’s productivity and prosperity to grow in this economic era of intangibles.

Several recent reports show that a significant portion of IP created in Canada is eventually owned by foreign companies. For example, a [study from the Institute for Research on Public Policy \(IRPP\)](#) found that the majority of patents filed by research teams with at least one Canadian inventor are assigned to firms outside Canada or to foreign subsidiaries in Canada, and of the patents that are assigned to Canadian residents, a significant proportion are subsequently sold to foreign entities.

“As noted here and in other studies, while Canada appears to have the human capital and infrastructure to support innovation, it falls short relative to other countries in investment in R&D, patent grants and incentives to advance to the commercialization and sustainable operation stages of the innovation process. Rather, patents on a large share of inventions developed with Canadian input are assigned to foreign companies. These observations suggest that Canada faces challenges not so much in invention, but rather in IP development and commercial exploitation.”

IRPP Report, 2019

WHAT WE HEARD

Our engagement strategy yielded over 250 responses and in-person contributions related to the topic of IP generation, protection and commercialization in Ontario. This dialogue, both online and in-person, has proven to be an exceptional asset for our work and for the development of concrete recommendations toward an IP framework for Ontario.

The process yielded a series of key themes presented by respondent type, and where appropriate, by region.

Respondent Group: University Technology Transfer Offices

Issue: IP ownership

Ontario's postsecondary IP environment is contextualized by the diversity of approaches that universities take with respect to the ownership of IP. These approaches range from strict institution-owned models to inventor-owned models, and hybrid models where ownership of IP is shared between stakeholders. We heard that the absence of a standardized model creates obstacles for industry engagement, where some industry partners may come to the table with different expectations based on engagement with other institutions. This potential benefit of a standardized approach was, however, near-unanimously seen by universities as outweighed by the need for flexibility with respect to faculty collective agreements and institution and departmental talent attraction and talent retention needs.

Issue: IP expertise and capacity

As is the case with varied IP ownership policies, the issue of access to IP related expertise and capacity differed greatly amongst institutions. Larger, more science and technology focused institutions, and generally those in the Greater Toronto Area (GTA), voiced a general satisfaction with their internal resources and capabilities related to intellectual property. In smaller institutions, particularly universities outside of the GTA, we heard significant concerns related to their access to IP expertise, both in-house and through third party IP legal experts. This concern was most prominent amongst northern universities where external IP expertise in the community is limited or unavailable. This gap in access is a barrier that creates significant challenges for both the TTO and the inventor it seeks to support.

Issue: Funding

We heard repeatedly the impact of reduced budgets for TTOs and often limited, or unavailable, funding for IP commercialization and patenting. While some participants believe that this forces an increase in the quality of patents applied for, most argued that without adequate funding, significant potential for commercialization remains on university shelves or ends up licensed to industry partners at a pre-development stage and thus with limited negotiating leverage.

Issue: Education

No single issue received as much universal support as the topic of increased education for IP and commercialization on Ontario campuses. While many participating universities noted existing programs for IP knowledge for both faculty and students, we heard a continuous demand for standardized IP related education, an idea that was underscored across the university stakeholder set. Such education would include IP literacy for faculty, researchers, graduate students and undergraduate students.

Issue: Industry receptors

Of the most passionate conversations amongst participants was the issue of industry engagement in the commercialization of intellectual property. Two views emerged strongly from the in-person consultations: we heard from many participants about the lack of domestic industry receptors for postsecondary knowledge while other participants argued that more could be done to engage local SMEs and start-ups in their knowledge-creation processes and in matching the needs of industry with the work of university researchers and knowledge creators.

While available data supports the view that colleges have a well-established local or regional industry network, the same cannot be said across universities. Here, the sophistication of larger, often multinational companies, allows these parties easier access to university-created IP. We heard strong positive views in support of developing stronger local or regional partnerships amongst universities and local start-ups and SMEs.* But, the issue of funding was again raised as a potential barrier to transactions between universities and local/regional partners.

*For the purposes of consistency, we have answered the question of what an Ontario or Canadian company is and, our working definition is a company whose corporate headquarters are in Ontario or Canada.

Respondent Group: College Technology Transfer / Industry Liaison Offices**Issue: IP ownership**

In contrast to the diversity of approaches to IP on university campuses, colleges are near-unanimous in their hands-off approach to intellectual property. We heard from participants that their interaction with IP is generally through relationships and contracted research with industry partners. The standardized approach for Ontario colleges is for all IP either created or improved upon through the college-partner relationship to rest with the industry partner. As one participant noted:

“[the] main reason colleges do applied research is to contribute to community economic development, not for patenting/IP ownership... We have a dedicated business development role; whose role is to be out there in the community.”

We heard several colleges note the potential risk to those community economic development efforts should they attempt to negotiate partial IP rights.

Issue: IP expertise and capacity

Both the questionnaire responses from the colleges and the in-person consultations surfaced a generalized lack of IP related expertise and capacity on campus. This was not a surprise given the aforementioned treatment of IP with industry partners. However, several college participants noted that as student and sometimes faculty entrepreneurship become more sophisticated, the need for internal resources related to IP has increased. Similarly, given the strong engagement colleges have with industry partners, a role for colleges in the transmission of IP knowledge to these partners was raised as a potential evolution of their roles. Doing so, however, requires either on-campus – or networked – access to IP expertise.

Issue: Education

While college participants noted a third-party status when it comes to the generation and treatment of IP, we heard in the in-person consultations of the strong opportunities to improve access to IP-related education for both on-campus students and faculty, as well as local and regional industry partners. Given the volume of college-industry partnerships present across the province, there exists a significant opportunity to leverage these interactions to help build the capacity of local industry partners through the transmission of IP-related education. Stakeholders from participating colleges expressed interest in exploring this role.

Respondent Group: Regional Innovation Centres (RICs) and related innovation intermediaries**Issue: IP expertise and capacity**

Both in-person consultations and questionnaire responses received from participating organizations, identified the significant lack of IP relevant expertise in the management ranks at Ontario Regional Innovation Centres and related support intermediaries. Across this stakeholder group, this gap in expertise is mitigated through referral to third-party legal services. While participants noted that this model allows for an adequate level of support to be provided, the IP needs of growing firms very quickly exhaust what is provided at subsidized levels.

Issue: Education

While the majority of this stakeholder group noted that they offer educational seminars on IP-related topics, usually held in partnership with legal firms, responses also indicated a significant lack of both internal and external IP resources in the form of operational staff, mentors and advisors to properly support the commercialization needs of emerging firms. These unmet needs include overall IP strategy, managing IP in contracts, managing confidentiality, and engaging external experts.

As with colleges, while a referral model works in certain cases, the lack of in-house expertise significantly restricts the amount of both formal and informal IP-related education that can be conveyed to participating companies.

In addition, we heard from participants from the broader innovation ecosystem who noted that this lack of dedicated IP resources lends itself to support intermediaries discouraging patenting for ventures they are engaged with. Several support intermediaries suggested that if a start-up asked them whether they should spend their money on marketing or filing a US provisional patent application for \$10,000, they would always recommend the former. Here, the decision to pursue speedy access to market or customer acquisition versus IP strategy is too often seen as binary as opposed to complementary.

Issue: Ecosystem accountability

Less than half of the RICs and support intermediaries who participated in the questionnaire portion of our engagement had an explicit mandate related to generating intellectual property. This finding is supported by comments we heard from the in-person consultations related to the peripheral as opposed to core nature of IP in their operations. While it is true that the original mandates for this organizational type do not include an explicit focus on IP, the evolution of the intangible economy and its importance in start-up growth, makes this continued omission more glaring.

As it relates to performance measurement, while all participants in this stakeholder group had existing data collection efforts related to IP, a lack of standardization as it relates to definitions and required metrics raised concerns about the comparability of existing approaches and the resources required to collect and administer these efforts.

Respondent Group: Medical and other research organizations

Issue: IP ownership

While medical and other research organizations own the IP developed in their institutions, complications arise when faculty researchers are cross-appointed to universities that have distinct approaches to IP.

Issue: IP funding

Participants in this category noted that the development and commercialization of IP in the life sciences and broader medical field requires significant capital for clinical trials, testing and evaluation that is in short-supply in Ontario and across Canada. We heard that the result of this is a tendency toward the early transfer of IP developed in these institutions to private partners, albeit at depressed values, owing to the early stage of development of this IP. We heard from one organization who was able to receive a 10x multiple on the original license value of one of its healthcare assets thanks to the seed capital received to further develop this asset.

Issue: IP expertise and capacity

There is significant diversity in the levels of expertise and capacity related to IP across this stakeholder group. While some organizations noted more sophisticated and professional commercialization mechanisms, others spoke of relying exclusively on third-party (and often US) sources for the review of disclosures. Regional third parties (for example, Toronto Innovation Acceleration Partners, formerly MaRS Innovation) were noted as potentially valuable entities if incentives and access were understood as appropriate for each member.

Respondent Group: Northern Ontario innovation stakeholders

Issue: Regional capacity

The issues raised across this process have differed by region. During in-person consultations and in completed questionnaires received from Northern Ontario, we heard participants make explicit note of the difficulty they face accessing IP-related expertise, capacity, education and networks. This issue includes a lack of in-house TTO capacity at northern universities, non-existent regional IP expertise (some noted they go out of province in search of IP experts) and weak formal and informal networks between Northern Ontario stakeholders and their peers in the GTA and Southern Ontario.

OVERVIEW OF KEY THEMES

Acknowledging the diversity of opinions, incentives and approaches that the preceding stakeholder-specific views offer, here are general themes that have emerged throughout the consultations:

Issue: Accountability

While organizations cannot be held to account for mandates that were not clearly articulated, the consultation process makes clear that more must be done to ensure that all participants in Ontario's innovation system prioritize the development of IP capacity, programming and related activities and expertise if they are to yield economic outcomes for the province.

Issue: Education

We heard a call across all stakeholder groups for improved education with respect to IP. This includes IP education for TTO staff, employees in support intermediaries, students, entrepreneurs, directors and advisors. Whether designed for faculty, students or industry partners, increasing IP literacy through the development of curriculum and modules that can be easily accessed regardless of location, funding or internal capacity is in strong demand.

Issue: IP expertise

We heard that a lack of dedicated IP expertise and capacity across Ontario's innovation system is common and leaves many organizations with little choice but to either discourage active IP generation or direct entrepreneurs to use external legal counsel. Regional and institutional differences related to access to expertise, and a more foundational lack of IP literacy as it relates to what type of expertise is required, significantly hinders Ontario's commercialization potential.

Issue: Funding and resources

As a result of a lack of direct funding and resources for IP commercialization and protection, the knowledge created on Ontario campuses is often left on academic shelves or licensed and/or sold at a development stage that significantly limits the returns to Ontario's economy. Increasing the availability of funding and resources to de-risk the further development of early stage innovations through proof-of-concept/prototype development would allow institutions enhanced leverage in their negotiation with industry partners.

The transfer of technology from higher education institutions and higher education-related institutions to industry ... in Germany ...[with] the Fraunhofer Gesellschaft, which is particularly dedicated to practice-oriented research...with its 72 institutes has a central exploitation department in Munich, which administers and manages patent applications and exploitations as well as contracts... The working group at the Federal Ministry of Economics is currently discussing ...as to whether a separate legal personality should be created for research co-operations.

Source: Overview of Technology Transfer in Germany, Christian Czychowski, June 15, 2019, pages 134-136.

Issue: Structure

There is significant demand amongst smaller and less geographically accessible stakeholders to have access to centralized IP support and IP related resources. While in-person interaction remains core for all institutions, the roles and responsibilities of institutions with respect to IP related tasks (for example, invention disclosure, patent searches, industry-matchmaking and the servicing of orphaned IP) could be more effectively delineated through a centralized resource to ensure that those who require support can receive it, and that such support is consistent across the system.

The Intellectual Property Office of Singapore (IPOS) is one entity that is drilling the value of intellectual property into the minds of local SMEs. “In a future economy driven by innovation and digitalisation, it is important to help our SMEs rethink and reshape their business models so that they can use their intangible assets to grow,” explains Daren Tang, chief executive of IPOS. The office has introduced a number of initiatives and arrangements, such as patent-acceleration programmes, to help smaller businesses scale up through the commercialisation of intellectual property. IPOS’s outreach has gained traction, with almost 700 individuals and companies using its complimentary (sic) IP business and legal clinics to seek preliminary legal advice. “Growth rates for IP filings in Singapore in the last decade have generally been above our GDP,” explains Tang. “Between 2014 and 2018 total IP applications in Singapore grew by a compound annual growth rate of 5.4%.”

Kurt Brasch, IAM Media

In thinking about, discussing and debating the themes identified above, we were guided by this question: how can Ontarians benefit from IP generated by government funded research? The recommendations in the following section are our attempt at moving this discussion forward. We hope that all stakeholders will continue making efforts to develop an in-depth understanding of how IP generated at postsecondary institutions and other provincial research institutes can benefit all Ontarians.

SETTING A PATH FORWARD

It is our view that in order to best move the province of Ontario's prosperity agenda forward, it is essential that the Government of Ontario adopt a **"Made-in-Ontario"** approach to innovation that focuses on generating intangible stock assets that can be commercialized to the benefit of Ontario's economy. Key activities for consideration should be education, IP generation and licensing/transfer, developing receptors for publicly-funded research and addressing regional differences related to language and access to expertise.

Capacity-building: IP literacy

Sophisticated IP knowledge is a fundamental requirement for both innovators and support intermediaries. Strong IP literacy skills are essential to ensuring that the ecosystem is adept at capitalizing on the economic potential of generating and commercializing valuable IP. These IP literacy skills include both foundational knowledge about the various forms of IP but also about how IP can be used strategically for gaining commercial advantage and economic benefits.

There was wide recognition that sophisticated IP literacy is lacking across the ecosystem and we heard no feedback suggesting that existing IP education initiatives have sufficiently addressed the IP knowledge deficit. Generally, these activities consist of voluntary IP workshops delivered by IP legal experts. Some of the support intermediaries consulted reported that they also offer specific IP training for their staff. This training is often deemed to be inaccessible, too technical and inadequate for boosting IP literacy levels across the ecosystem. The overwhelming consensus among those surveyed was that they, and the innovators they engage with, would benefit from a comprehensive ongoing IP education program to enhance their IP literacy skills.

The suggested curriculum would be designed to achieve two goals: 1) To increase the IP sophistication of innovators and support intermediaries to facilitate informed strategic decision-making around IP generation and commercialization, including increasing capacity to work with IP experts; and, 2) To provide innovators and support intermediaries with the requisite skills to know how, when, and where to seek IP legal expertise.

The essential learning outcomes of an IP education program should, at minimum, ensure that participants are able to:

- Grasp each key form of IP (industrial design patents, utility patents, trademarks, copyright, trade secrets, plant varieties and contracts.)
- Identify and seize IP commercialization opportunities as they arise.
- Identify key IP legal issues and prioritize follow-up with relevant experts.
- Understand issues around public disclosure of inventions and global considerations (for example, differences between grace periods, non-disclosure agreements.)
- Understand strategic issues around freedom-to-operate.
- Know when to seek expert legal advice, from which experts and how to take charge of engagements with the relevant IP legal experts.
- Develop a basic IP strategy.
- Negotiate IP agreements with third parties from a position of strength.
- Recognize potential conflict of interest issues and know how to resolve them.

Capacity-building: Centralized provincial resources

We consistently heard that Ontario institutions that receive public funds and support entrepreneurial activities possess limited capacity to assist ventures to scale and commercialize. This gap is perpetuated in part by the absence of “in-house” expertise, such as IP lawyers or patent agents. Recognizing the high costs associated with IP generation, strategy, protection and management, including multi-jurisdictional patent filing, without the necessary prioritization that comes with this expertise, funding this level of capacity rarely materializes as a budget priority which compromises a firm’s potential to scale globally.

We also heard from smaller-sized support intermediaries that not only was there a gap in “in-house” expertise, but access to “outside” expertise, such as IP lawyers or patent agents, was limited in smaller regions, creating polarity within the system. In larger centers where resources are more accessible, they are not sufficiently leveraged across the entire ecosystem.

Most, if not all institutions surveyed, have different industry and technical specializations. Across Ontario, there are gaps where ventures in an industry cannot receive assistance within their community. As such, many ventures go without assistance. In addition to regional disparity, Francophone and Indigenous ventures encounter further language and cultural barriers.

What we heard from participants in the in-person consultations was the need for a coordinated strategy for IP generation, protection and management for research and innovation supported with public funds. More specifically, the key service gaps that would be addressed through a collective provincial resource that would provide the following services:

- IP strategy and expert advice
- Prior art and IP intelligence
- IP rights generation
- Patent access and freedom-to-operate (FTO)
- IP education

This resource could provide multiple services accessible to institutions across Ontario for: IP licensing offices, early-stage ventures, and more established Ontario SMEs, allowing them to operate effectively in an increasingly competitive, IP-intensive global marketplace.

RECOMMENDATION:

- A) That a standardized web-based IP education curriculum be developed to achieve the essential learning outcomes. This IP education program should be mandatory for any individual or entity who receives public funds in support of entrepreneurial activities. It should be offered for free or at a nominal cost, available on demand and easily accessible throughout the province.
- B) To address the issue of access to necessary expertise across the ecosystem, the Government of Ontario should create a centralized provincial resource to provide consistent, sophisticated legal and IP expertise & education. The province should convene a group of experts to develop and implement this recommendation, as well as establish the necessary metrics for monitoring outcomes.

Accountability

Ontario's innovation ecosystem is comprised of upstream knowledge generation activities and downstream commercialization drivers. Between them lie a series of support intermediaries who have been established to help the commercial actors, most notably start-ups and SMEs, to grow and scale up. In an intangible economy, the key to their growth is the ability to view, access and transact with the knowledge that is created in Ontario's postsecondary institutions.

RICs and other sector-specific entities established to function in support roles have a valuable role to play in the translation of knowledge into economic outcomes that support Ontario's competitiveness in the knowledge-based economy. Only half of the 18 RICs surveyed as part of this work noted that their mandates include a focus on IP. Ensuring that these organizations are structured and managed to effectively play this role, and to do so in a manner that evolves alongside the needs of the firms they support, should be an important priority for the government that funds them.

Without a clear mandate to focus on the commercialization of intellectual property, stakeholders in Ontario's innovation ecosystem have treated IP generation and commercialization as a peripheral activity rather than a systemic core driver for business growth. Consequently, Ontarians have not reaped the dividends from local knowledge generation that could and should have been expected.

In addition, what we heard in the in-person consultations were concerns related to the absence of accountability mechanisms (data collection practices, metrics, and overall performance measurement) employed to reflect and report on support intermediary activities and outcomes. Additionally, impacts are inconsistently applied and often tracked only at the organizational rather than system level.

Acknowledging that the structure of the economy and of the drivers of growth have evolved since Ontario's initial investments in the creation of RICs and other support intermediaries, the time is now opportune to develop and implement a standardized approach to board and management governance for all entities that receive public funds.

This approach should be consistent with the principles articulated in existing directives that set out statements of purpose, principles, mandatory requirements and responsibilities that Ontario ministries and receiving entities must follow in conducting their business, such as accountability, value for money, and a focus on outcomes. This will help address a significant gap in attention paid to IP amongst these organizations as well as standardize and formalize a system-wide approach to data collection and performance measurement. The efforts toward the implementation of a standardized governance and performance framework must consider the different needs, asset bases and industrial activities of local ecosystems. Not all RICs should provide the same services if the needs of their local and regional clients differ. These roles and the composition of Ontario's innovation ecosystem need to be evaluated in order to determine the right combination of locally available as opposed to regional or centralized services.

RECOMMENDATION:

The Government of Ontario should appoint a Special Advisor to assist in the development and implementation of a standardized governance framework for all innovation and entrepreneurship support organizations receiving public funds that have the potential to generate IP for the benefit of Ontario's economy. This framework should provide clear direction on: organizational mandate and transparency, conflict of interest policy, board membership skills matrices, and metrics for management performance.

Structure

Ontario's publicly funded researchers do important work which generates valuable new knowledge that has broad applications across a variety of sectors. Some of the new knowledge generated from this research holds the potential to generate valuable intellectual property that can accrue economic benefits. How to facilitate an ecosystem that capitalizes on this economic potential is central to our work, however, decisions and policies regarding what research to fund as well as how to perform this research are not part of our mandate.

The provincial institutions that house researchers often create an entity, usually known as a technology transfer office, that uses new knowledge to generate intellectual property and then help facilitate the commercialization of this intellectual property. Generally, this takes the form of a transfer of knowledge to a technology transfer office with a mandate to commercialize it. Technology transfer offices created within Ontario research organizations come with considerable diversity in name, size, funding, specialization, resources, etc.

Managing such a commercializing function has unique challenges for organizations that perform basic research which by its nature is far upstream of any commercialization potential. Intellectual property strategies are inherently more speculative than applied research and come with the added expense of needing to regularly file patent continuations as additional knowledge is generated from the earlier research. Original commercializing assumptions and strategies need to be revisited as the research unfolds over the years. In order to realize this objective, specialized expertise is required but is not always intrinsic to the structure of the institution.

This challenge is compounded by the reality that both the passion of research teams and the core mission of the institutions they work within are much more oriented to the pursuit of new knowledge than to the development of future commercial potential. (Additional research on TTOs is available in [Appendix F](#)).

Throughout the consultation we heard consistent feedback from representatives from across Ontario that there was a need to address various gaps in expertise and resources in order to create winning conditions for their organizations, and the researchers they support. While this recommendation for structure focuses on mandates, expertise and gaps therein, without access to the resources and services suggested in the capacity-building recommendation, addressing the gaps inhibiting commercialization outcomes could be challenging.

RECOMMENDATION:

All commercialization entities (such as Tech Transfer Offices) within research organizations that receive public funds should have a clearly defined mandate regarding their roles and responsibilities in generating IP for the benefit of Ontario's economy. The mandate should be accompanied by a plan that accounts for issues of institutional alignment and capacity to fulfill this mandate. The Ministry of Colleges and Universities should create a mechanism for commercialization entities to identify their comprehensive IP policies where they exist, their intention to create them where they do not, and to articulate perceived gaps inhibiting commercialization outcomes.

CONCLUSION

Commercialization of intellectual property generated from publicly supported institutions can facilitate Ontario's prosperity and increase our competitiveness for generations to come. Every step of this process, from early discussions and research, to developing questionnaires, consulting stakeholders from each corner of the province, and distilling the data into this report, had one objective at the core: to advise how the Government of Ontario can facilitate prosperity through a well governed, well resourced and well positioned innovation ecosystem and see Ontario resume its place in the top 10 North American jurisdictions for GDP per capita.

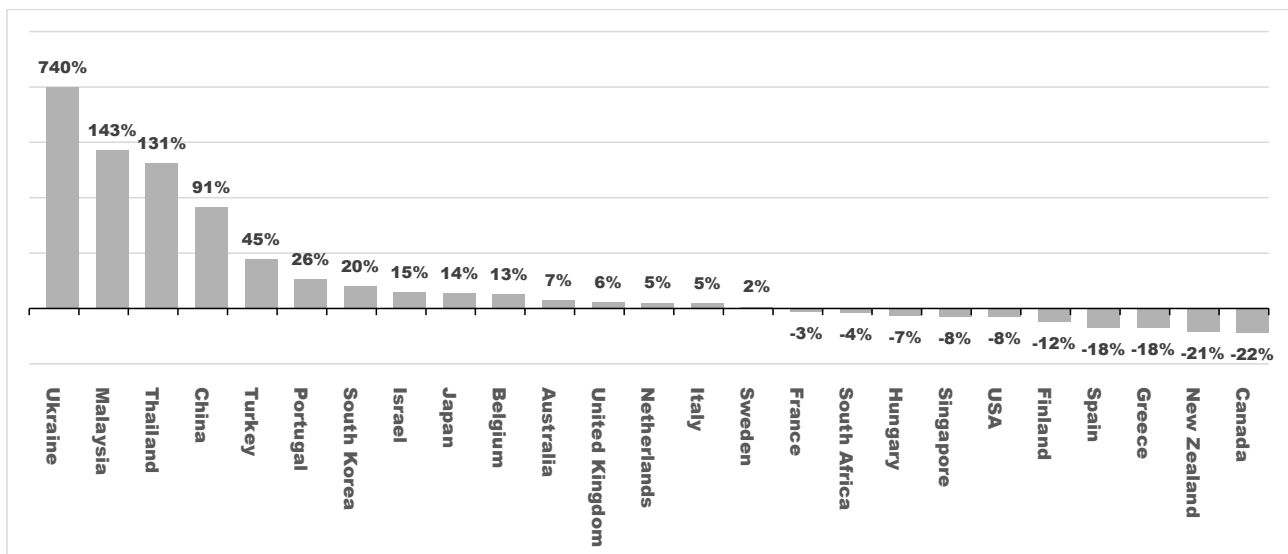
While few in number, we believe that when implemented together, the four recommendations in this report have the potential to unlock positive economic outcomes for the residents of Ontario. Successfully implementing the recommendations in this report as well as adopting a "Made in Ontario" approach to innovation will open the door for the Government of Ontario to implement policy directives for the ecosystem that are well positioned to support it.

APPENDIX A: CHANGE IN PCT FILINGS FROM 2014 TO 2017

The Patent Cooperation Treaty (PCT) is a 152-member country agreement that provides a unified procedure for filing international patents. Given that PCT filings must be filed in the home country of the applicant company or inventor, they are considered a proxy for a country’s ability to generate valuable IP assets. Over the past three years of reports from 2014 to 2017, global PCT filings of patents have grown by 14% while filings from Canada shrank by over 22%. Canada’s reduction in filings is the worst performance amongst the 152 member states.

Canada’s filings decreased by 687, Spain’s by 307, Finland by 216, New Zealand by 74 and Greece by 23.

Figure 6: Change in Patent Cooperation Treaty (PCT) filings from 2014 to 2017



Source: World Intellectual Property Organization (WIPO)

APPENDIX B:

IN-PERSON CONSULTATION PARTICIPANTS

The Expert Panel undertook in-person consultations with many innovation partners over the course their work. Findings from the consultations were developed and analysis was performed to draw out key themes to inform thinking on recommendations. A list of participating organizations is listed below:

University Technology Transfer Offices (TTOs)

1. Algoma University (Sault Ste. Marie)
2. Brock University (St. Catharine's)
3. Carleton University (Ottawa)
4. Lakehead University (Thunder Bay)
5. Laurentian University (Sudbury)
6. McMaster University (Hamilton)
7. Nipissing University (North Bay)
8. Ontario Tech University (Oshawa)
9. Queen's University (Kingston)
10. Ryerson University (Toronto)
11. Trent University (Peterborough)
12. Université de Hearst (Sudbury)
13. University of Guelph (Guelph)
14. University of Ottawa (Ottawa)
15. University of Toronto (Toronto)
16. University of Waterloo (Waterloo)
17. University of Windsor (Windsor)
18. Western University (London)
19. York University (Toronto)

College Technology Transfer Officers (TTOs) or Equivalent

20. College Boreal (Sudbury)
21. Algonquin College (Ottawa)
22. Canadore College (North Bay)
23. Cambrian College (Sudbury)
24. Centennial College (Toronto)
25. Conestoga College (Waterloo)
26. Durham College (Oshawa)
27. Fanshawe College (London)
28. Fleming College (Peterborough)
29. George Brown College (Toronto)
30. Georgian College (Barrie)
31. La Cité Collegiale (Ottawa)
32. Mohawk College (Hamilton)
33. Niagara College (Niagara)
34. Northern College (Timmins)
35. Sault College (Sault Ste. Marie)
36. Seneca College (Toronto)
37. Sheridan College (Oakville)
38. St. Clair College (Windsor)
39. St. Lawrence College (Brockville)

Campus-Linked Accelerators (CLAs)

- 40.** ACCEL at the Centre of Entrepreneurship (Centennial College, Toronto)
- 41.** Accelerator Centre
- 42.** EPICentre (University of Windsor, Windsor)
- 43.** Digital Media Zone (Ryerson, Toronto)
- 44.** Dunin-Deshpande Queen’s Innovation Centre (Queen’s University, Kingston)
- 45.** Imagination Catalyst (OCAD University, Toronto)
- 46.** Innovation Hub (St. Lawrence College, Brockville)
- 47.** InnovationYork (York University, Toronto)
- 48.** Sault Ste. Marie Innovation Centre
- 49.** Start-up Garage (University of Ottawa, Ottawa)

On-campus Entrepreneurial Activities (OCEAs)

- 50.** Brilliant Entrepreneurship (Oshawa)
- 51.** Centre d’entrepreneuriat de La Cite (Ottawa) - CEPI
- 52.** Fast Start (Durham Region)
- 53.** Genesis (Windsor)
- 54.** Henry Bernick Entrepreneurship Centre (Barrie)
- 55.** Northern College Innovation Hub (North Bay)
- 56.** Sudbury Youth Entrepreneurship Hub (Sudbury)
- 57.** University of Toronto Entrepreneurship (Toronto)

Regional Innovation Centres (RICs)

- 58.** Communitech (Waterloo)
- 59.** HalTech
- 60.** Innovation Guelph
- 61.** Innovation Initiatives Ontario North
- 62.** Invest Ottawa
- 63.** Innovate Niagara
- 64.** Launch Lab
- 65.** MaRS Discovery District (Toronto)
- 66.** Northwestern Ontario Innovation Centre
- 67.** NORCAT
- 68.** RIC Centre
- 69.** TechAlliance
- 70.** Venture Lab
- 71.** WETech

Medical & Research Institutions

- 72.** Bruyere Research Institute (Toronto)
- 73.** CHEO
- 74.** FACIT
- 75.** Hopital Montfort
- 76.** Hospital for Sick Children (Toronto)
- 77.** Lawson Health Research Institute
- 78.** Ontario Genomics
- 79.** Ottawa Hospital Research Institute
- 80.** Perimeter Institute
- 81.** Sunnybrook Hospital

Sector Specific Organizations

- 82.** CENGN
- 83.** ENCQOR
- 84.** MITACS
- 85.** Ontario Centres of Excellence
- 86.** Thalesgroup
- 87.** Vector Institute

APPENDIX C:

THE DIFFERENT TYPES OF IP RIGHTS

1. **Contracts:** Agreements between two (or more) entities that include a transaction of Intellectual Property and/or Intellectual Property Rights and/or Confidential Information, where these terms may be defined as:
 - a. **Confidential Information** means all information and data relating to and derived from either party, their technology, and/or business plans, and includes but is not limited to inventions and discoveries whether or not patentable, designs, prototypes, business information, business plans, sales information (including current or potential customers), software, algorithms, databases, marketing, product, and/or market research information, trade secrets, processes of manufacture, know-how, research and development plans, laboratory protocols, laboratory notebooks, experimental data, employee identities, and information about employee position, performance, and remuneration. Confidential Information includes, but is not limited to, information in verbal, written, or machine-readable form, and information gathered from inspection of any property, activities, or facilities, regardless of whether the information is specifically marked as confidential or proprietary. However, Confidential Information shall not include information which:
 - i. the recipient can show was in their possession prior to its disclosure by the disclosing party, and which is not subject to another obligation of secrecy and/or non-use;
 - ii. becomes available to the recipient on a non-confidential basis from a source other than the disclosing party, provided that source is not themselves under obligations of confidentiality with respect to that information; or
 - iii. becomes part of the public domain through no fault, act, or omission of the recipient.
 - b. **Intellectual Property** means anything that may be protected by any Intellectual Property Right including, but not limited to, works, performances, discoveries, inventions, trademarks (including trade names and service marks), domain names, industrial designs, trade secrets, data, tools, templates, technology (including software in executable code and source code format), Confidential Information as applicable, mask work, integrated circuit topographies, documents, or any other information, data, or materials and any expression thereof.

- c. **Intellectual Property Right** means any right that may be granted or recognized under any Canadian or foreign legislation regarding patents, utility models, copyright, neighbouring rights, moral rights, trademarks, trade names, service marks, industrial designs, mask work, integrated circuit topography, privacy, publicity, celebrity and personality rights, and any other statutory provision or common or civil law principle regarding intellectual and industrial property, whether registered or unregistered, and including rights in any application for any of the foregoing.
- d. The following is a non-exhaustive list of contract types where Intellectual Property Rights are often transacted:
 - 1. Employment Agreements
 - 2. Sales Representative Agreements
 - 3. Consulting Agreements
 - 4. Non-Disclosure or Confidentiality Agreements
 - 5. Master Service Agreements (MSAs)
 - 6. Material Transfer Agreements
 - 7. Licensing Agreements
 - 8. Franchise Agreements
 - 9. Joint Venture Agreements
 - 10. Research Agreements
 - 11. End User Agreements
 - 12. Terms of Services
 - 13. Customer Agreements
 - 14. Sales Agreements

2. **Copyright Including Moral Rights and Neighbouring Rights:** Protects literary, artistic, dramatic, or musical works (includes software code, but does not offer sufficient protection to exclude competitors). Copyrights exist during your lifetime and for 50 years following your death. Generally, copyright exists upon creation of the work without registration.

- a. **Moral Rights:** Moral rights are rights of creators of copyrighted works that include the right of attribution, the right to have a work published anonymously or pseudonymously, and the right to the integrity of the work. Moral rights are distinct from copyrights: a creator may assign the copyright in a work but will still retain moral rights unless they are specifically waived.

- b. Neighbouring Rights:** In copyright law, neighbouring or related rights are the rights of a creative work that are not connected with the work's actual author. For example, neighbouring rights include the rights of performers, phonogram producers, and broadcasting organisations.
- 3. Domain Names:** A domain name is a registered Internet address that enables Internet users to locate an entity's website.
- 4. Geographical Indications:** A sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. The sign must identify a product as originating in a given place.
- 5. Industrial Designs or Design Patents:** Protects the visual features of shape, pattern, configuration or ornament, as applied to a finished article. Industrial designs have features that appeal to the eye and the design must be new. Holders should file an industrial design application before the design is publicly disclosed. Registration protects your design for up to 15 years from filing date.
- 6. Integrated Circuit Topography (ICT):** ICT registrations give the creator exclusive rights for a period of ten years after registration for electronic integrated circuits or IC products that are configured and interconnected. In the US, registrations for two- and three-dimensional layouts of ICs are known as **mask work**.
- 7. Patents:** Patents, also known as utility patents, protect new and non-obvious inventions or improvements to existing inventions. Patents can be a product, process, machine, composition, or improvement thereof. Patent applications should be filed before the invention is publicly disclosed. Patent protects your invention for 20 years from the filing date.
- 8. Plant Breeders' Rights (PBR):** Also known as plant variety rights (PVR), plant breeders' rights are rights granted to the breeder of a new variety of plant. They give the breeder exclusive control over the propagating material (including seed, cuttings, divisions, tissue culture) and harvested material (cut flowers, fruit, foliage) of the new variety for a number of years.
- 9. Personality Rights:** Personality rights are generally considered to consist of two types of rights:
 - a. the right of publicity,** or the right to keep one's image and likeness from being commercially exploited without permission or contractual compensation. This is similar (though not identical) to the use of a trademark, and in common law jurisdictions, infringements of publicity rights may fall within the tort of passing off; and
 - b. the right to privacy,** or the right to be left alone and not have one's personality represented publicly without permission.

10. **Trademarks:** Combination of words, sounds, or designs used to distinguish your product or service from others. Trademarks protect business names, brand names, logos and slogans. Trademark can be disclosed and trademark registrations last for 10 years and can be renewed in perpetuity.
11. **Tradenname:** Also known as a trading name, operating name, or business name, a tradenname is a name under which a company operates that is different from its registered name. Registration of tradenames with a relevant government body is often required.
12. **Trade Secrets:** Valuable business information that is derived from its secrecy. Examples include sales methods, client lists and supplier lists. Holders of trade secrets are advised to keep them secret through strong confidentiality / non-disclosure agreements and (cyber) security measures.
13. **Utility Models:** Utility models provide protection of “minor inventions” through a system similar to the patent system, where the patentability requirements are generally limited to novelty only (and not the more stringent requirement of inventiveness).

APPENDIX D: IP EDUCATION

What should a successful IP Education Program look like?

1. Guiding Principles:

a) What do we mean by IP knowledge?

There is an abundance of material that provides information about the various forms of IP, including patents. This is information that is easily accessed through publicly available sources like the Canadian Intellectual Property Office (CIPO) or the World Intellectual Property Office (WIPO).

However, the Expert Panel believes that a different type of curriculum is needed, albeit one that may well build from existing material. In our view, the material must resonate with the target audiences, must be easy to digest and must be readily accessible on demand. An IP education program must succeed at building greater confidence in the IP system among members of our target audience.

First, it is essential that the content be client-focused. This means that the program must be centred around the real-life experiences of Ontario innovators and academic researchers and the challenges they face in developing their IP portfolios and strategies. The governing principle must be on equipping them and their intermediaries to overcome these challenges.

Second, the program's emphasis must be on the strategic uses of IP rather than merely on the mechanics of specific forms of IP. IP strategic skills lie at the intersection of law and business. The content of the program must therefore adopt a multidisciplinary approach to IP strategy, involving legal experts, business experts and innovators from all IP domains (STEAM innovators – science, technology, engineering, arts and humanities and math).

This kind of IP knowledge will better equip all the groups within the innovation ecosystem with the capacity to make informed decisions about IP and how best to deploy IP to the benefit of Ontarians.

b) Legal expertise is essential

Issues surrounding IP generation and commercialization require the guidance and advice of legal experts. There is no way around this. A company founder or a scientist who has had personal experience with patents can be an invaluable mentor but that individual is not a patent expert.

It is therefore critical that innovators, academic researchers and intermediaries are able to identify the appropriate IP legal experts to advise them. For example, for those working in STEM disciplines, where patents are generally the primary forms of protection, a registered patent agent or patent lawyer with requisite expertise will have to be involved. For those working in the realm of art and design, a lawyer with expertise in copyright law is essential.

This kind of IP knowledge will better equip the groups within the innovation ecosystem with the capacity to identify the right IP legal experts and to engage in sophisticated IP strategic discussions with them.

c) An independent process

The IP education program must be developed in an impartial and comprehensive manner. Due to institutional, industry and professional silos, no one group or institution can act alone to develop the appropriate curriculum. The process must ensure that oversight is given to a multidisciplinary and independent body of experts (“honest brokers”) who can determine the appropriate content and establish metrics for determining successful outcomes.

2. A Two-step IP Education Program

Capacity-building in IP literacy and IP strategy across the system requires a two-level approach in step with the guiding principles outlined above:

1) IP Basics: A web-based foundational IP education program to ensure that everyone within the ecosystem has the essential building blocks to achieve better IP commercialization outcomes and to develop basic IP strategies.

This foundational IP education program should, at minimum, ensure that participants:

- Have a solid grasp of each key form of IP (patents, trademarks, copyright, industrial designs, trade secrets, plant varieties, etc.)
- Can identify key IP legal issues and prioritize them for follow-up with relevant experts.
- Understand issues around public disclosure of inventions and global considerations (for example, differences with grace periods, non-disclosure agreements.)
- Understand issues around freedom to operate.
- Know when to seek expert legal advice, and from which experts (for example, IP lawyer, patent agent, and with the relevant technical background) and how to take charge of engagements with the relevant IP legal experts.
- Know how to develop a basic IP strategy.
- Can identify and seize IP commercialization opportunities as they arise.
- Know how to negotiate IP agreements with third parties from a position of strength.
- Recognize potential conflict of interest issues and know how to resolve them.

2) IP Advanced: An advanced, web-based, IP education program that explores such things as sophisticated strategies for company growth, negotiating license and other agreements to retain and extract maximal value from IP, strategies for resisting predatory/aggressive litigation tactics, and revenue generation in a global marketplace.

This program will assume that participants have a good grounding in learning outcomes 1-6 of the IP Basics program.

Building on IP Basics, IP Advanced will ensure that participants will be able to, at minimum:

- Know when to seek expert legal advice, and from which experts (for example, IP lawyer, patent agent, and with the relevant technical background) and how to take charge of engagements with the relevant IP legal experts, especially in sophisticated discussions around IP strategy in a global marketplace.
- Know how to develop a sophisticated IP strategy for business growth including methods of insulating oneself from predatory competitors or frivolous lawsuits.
- Know how to implement, monitor and adjust their IP strategy to meet changing environments or conditions.
- Identify and seize IP commercialization opportunities as they arise.
- Identify trends and best practices within the industry in which they operate.
- Know how to negotiate complex IP agreements with third parties from a position of strength.
- Recognize potential conflict of interest issues and know how to resolve them.

As part of recommendation implementation, working group(s) should determine the content, method of delivery and implementation of:

a) The IP Basics course in a manner that achieves the learning objectives and meets the guiding principles described above.

b) The IP Advanced course in a manner that achieves the learning objectives and meets the guiding principles described above.

And will be tasked with developing:

c) Metrics to ensure that the two IP programs are accomplishing their key objectives of raising literacy levels and strategic skills across the system and are achieving greater IP commercialization outcomes for the province.

d) A mechanism for regular review, update and adjustment of the IP Education Program.

APPENDIX E:

FUNCTIONS OF A COLLECTIVE RESOURCE

A Collective Resource would provide the following services:

- 1. IP Strategy and Expert Advice.** The Collective Resource will engage with early-staged ventures and SMEs to generate a deeper understanding of the IP ecosystem and the value of developing an IP strategy, such as through best practice programs and IP audits conducted by experts. The IP advisory assistance will range from high-level directional advice to directed business advice via internal IP staff or external IP service providers through facilitated negotiated fee reductions on third party IP services. The Collective Resource will also engage in consultations with groups that have traditionally been underrepresented or have historically made less frequent use of the IP system, and will both provide access to these services as well as create custom services to support these groups. The support includes providing financial support for IP based services, such as invention disclosure reviews.
- 2. Prior Art and IP Intelligence.** Prior art libraries will be developed and utilized to reduce the strength of attacks against Ontario's SMEs from existing IP holders. In particular, the prior art library will assist in building invalidation defenses against operating and non-practicing entities to address patent assertions. The Collective Resource will also provide an IP intelligence database that is sector specific, for business, research and IP strategy planning.
- 3. IP Rights Generation.** Generating IP Rights will include a cohesive offering that addresses the management of both registered rights (such as patents) and unregistered IP rights (such as trade secrets and customer agreements). The Collective Resource will ensure that Ontario-headquartered companies own high-valuable IP and data stocks. For example, the Collective Resource will provide strategic patent generation through financing, funding, or subsidizing patent filings for generation of high-quality patents. The negotiation of pre-set and reduced costs on patent services with accredited third-party service providers (i.e., patent prosecution services, IP landscape tool access) is also contemplated. By lumping services together, more competitive rates may be obtained from qualified service providers increasing the yield per dollar spent on IP. At the same time, an increased volume of work will help further build IP expertise in Ontario. The Collective Resource will also work with research institutions to transfer inventions into the hands of industry to generate value for Ontario, including, for example, to patent inventions that otherwise would go un-filed, or avoid abandoning patent rights too early.

- 4. Patent Access and FTO.** The Collective Resource will assist with the freedom to operate (FTO) challenges of Ontario SMEs. That assistance includes providing advanced IP generation in return for preferred FTO license access, or acquisition of key patents for FTO for ventures as they scale. The Collective Resource will also secure broad licensing rights to IP portfolios that come available to protect Ontario SMEs, including the securing of those rights from Ontario's research institutions. The Collective Resource that provides access to global patents will deter IP attacks against Ontario SMEs through a patent pool intended to protect Ontario-generated IP.
- 5. IP Education.** The Collective Resource would be responsible for the development, implementation, deployment and maintenance of the IP Education Curriculum as defined in Appendix D.

APPENDIX F: TECHNOLOGY TRANSFER AND INTELLECTUAL PROPERTY POLICY AT UNIVERSITIES – SHIRI M. BREZNITZ

Source: Shiri M. Breznitz. 2014. The Fountain of Knowledge. Stanford University Press (Ch. 2+7).

University Policy

While it is evident that universities have the ability to disseminate academic ideas and commercialize technology, the particular process and its timing make a difference in the outcome of these changes. Many universities need to improve their technology-transfer organization and policy, but change cannot come simply from copying the Stanford or MIT model. Each university is unique in its ability to commercialize technology. Any model that a university chooses to follow needs to fit that university's characteristics, regional environment, culture, history, and the resources available for commercialization. A liberal arts college is not likely to spin out biotechnology firms, nor are teaching institutes that do not focus on research likely to invent the next Internet. That said, universities should have a clear IP policy.

Second, changes to the university technology-transfer policy and organization need to take place in collaboration with other regional players, including industry and regional agencies. Cooperation with other regional players places any policy or organizational change in a regional context. This context provides the university with guidance to what technology commercialization mechanisms will work best in the region to achieve the ultimate economic development impact. To properly evaluate university actions, we must consider industry perspectives in these efforts. Thus, we must also look at industry knowledge of and participation in universities' activities directed at technology transfer and commercialization. Universities can create programs to support the transfer of technologies to the private market; however, those programs will not generate the desired impact unless industry finds them useful and accessible.

Third, technology commercialization needs to become part of what universities define as research excellence and not solely as a means to make a profit. If technology commercialization is to be sustainable, it needs to become part of a faculty promotion and tenure process. Junior faculty in particular are wary of engaging in risky activity that may cost them their position.

Government Policy

Canada and Ontario do not have a policy regarding IP generated from publicly funded research. Ontario universities vary in their approach to IP. Though most allow faculty the option of exerting a right of ownership over IP they create. As the Expert Panel report recommends:

“All commercialization entities within research organizations that receive public funds should have a clearly defined mandate regarding their roles and responsibilities and ensure that there is a plan to address any issues of institutional alignment, and capacity to fulfill this mandate. The ministries should create a mechanism for commercialization entities to articulate perceived gaps inhibiting these outcomes.”

That said, universities should not be measured on their return in currency alone. The experience of universities such as MIT and Stanford, which played a central role in the success of their respective regions, teaches us that universities’ return from patenting and licensing does not even come close to covering the expenses of basic research. Universities are generally active in their communities. They provide policy and economic support that extend from other activities that are not related to technology transfer. Trying to impose market values on universities’ regional impact is difficult to impossible.

The Innovation ecosystem

Universities do not operate in a vacuum. External university factors have a direct impact on the ability of universities to commercialize technology. Moreover, any attempts to improve or change technology commercialization at universities need to take the university’s environment and region into account. Two external factors affect the ability of a university to commercialize technology: history and environment. Historical factors, based on national, international, and regional policies such as intellectual property rights laws and tax incentives, play an important role in the ability of universities to succeed in their technology transfer and university-industry relationships (Lawton Smith and Ho 2006; Mowery et al. 1999; Pike 2002; Rahm, Kirkland, and Bozeman 2000; O’Shea et al. 2005). Environmental factors relate to the relationships among institutions on national and regional levels. The ability of a group of local institutions to transfer knowledge and hence to affect the ability of a locality to innovate depends on their number, strength, and collaboration efforts. Sharing of information and collaboration among institutions drives innovation (Nelson 1993).

Technology Commercialization Process at Universities

Universities are intricate and varying institutions. Hence, internal factors such as institutional policy, culture, and organization influence their ability to disseminate academic ideas to the private market. Although we would like to think that all universities are the same, their differences are broader than the topics they teach or the faculty they employ. Universities have different histories, cultures, and structures that affect the way they interact with the region in which the university resides, the way they view technology commercialization, and local economic development.

Below is a list of best practices for technology transfer at universities:

The technology transfer offices in universities have four main purposes: (1) to evaluate inventions and determine whether they are patentable, (2) to patent the inventions, (3) to license the technology, and (4) in some cases, to assist in the creation of spinout companies. The technology transfer office's responsibilities are quite loose and open to interpretation, however, and they differ significantly between universities. Some universities will only patent a technology that has market demand to which it can be licensed. For many the spinout of companies is not a priority; their goal is to garner income from licensing their patents. Furthermore, in many cases the professionalism and actions of the technology transfer office affect the likelihood of being able to license a technology.

The level of resources associated with the technology transfer office impacts its commercialization ability. Several studies showed that technology transfer offices that have personnel with higher levels of education and business experience tend to have better understanding of the technology and negotiation processes with firms. Understanding business and product development allows for more flexibility and trust and promotes the willingness of inventors and investors to work with that TTO (Lockett and Wright 2005; Shane 2004; O'Shea et al. 2005). Since university and industry have different business perspectives, highly educated technology transfer office employees who have knowledge of both the technical and business jargon reassure both inventors and investors that their product is getting the best available treatment.

Moreover, the professionalism of the TTO impacts faculty disclosure rates and commercialization interests. A study by Owen-Smith and Powell (2001) showed that larger and more experienced TTOs are able to provide personal and professional care when working on faculty inventions, thus encouraging faculty to disclose and patent technologies. By 2004, Yale University's technology transfer office employed eighteen people, each with five to seven years of industry experience. At the same time, Cambridge Enterprise (Cambridge's TTO) had eighteen employees, fifteen of whom had no industry experience. The differences in these two offices in terms of employee experience surfaced in my interviews, which revealed constant complaints about Cambridge Enterprise's lack of business understanding. Hence, the business experience and knowledge base of TTO employees have more weight than the sheer number of TTO employees. What is known today as "The Silicon Fen" is based on many technologies that came out of the University of Cambridge's TTO, which for many years operated with only two employees.

Both Clarysse et al. (2005) as well as Lockett and Wright (2005) found that the business development capabilities of the technology transfer office positively influence startup formation. The variables they found to be of the greatest importance were the marketing, technological, and negotiating skills of the technology transfer office staff, the establishment of a clear administrative process for spinout companies, a clear due diligence process, and availability of competent staff to administer these processes (Lockett and Wright 2005; Clarysse B. et al. 2005).

Another factor that relates to the availability of resources is the use of outside lawyers. Siegel et al. (2003) found that spending more on outside lawyers reduces the number of licensing agreements but increases revenues. The authors hypothesize that hiring external lawyers allows TTO staff to spend more time on connecting the invention to the right firm, which results in a successful license and higher revenues. While examining the TTO staff, Siegel et al. note that when TTO officers receive incentives (compensations) there will be higher licensing activity.

Importantly, technology transfer offices, much like universities themselves, differ in their compensation abilities. For example, technology transfer offices vary in their ability to offer attractive wages and benefit packages to attract high-level employees, who are highly compensated in the private sector. Accordingly, many technology transfer offices differ by the education and experience of their employees. In many, industry experience and a doctorate in the sciences is a necessity. In order to solve the issues of staff compensation, some public universities' technology transfer offices became private organizations that are fully owned by the university. For example, Isis at the University of Oxford, United Kingdom, and Yissum at the Hebrew University, Israel, are private organizations.

The size as well as the age of the technology transfer office has also been found to affect university technology transfer (Carlsson and Fridh 2002, p. 230). According to Chapple et al. (2005), U.K. technology transfer offices show low levels of absolute efficiency. Their study found that older offices appear to be less efficient by the number of licenses compared with research income and invention disclosure. This may suggest that older TTOs have not changed or adapted to the "third role" of universities. Moreover, larger universities are more general and include many fields of technologies, and we know from other studies (Owen Smith and Powell 2001) that technology transfer in the life sciences is very different than in the physical sciences. This finding, according to the authors, suggests the possible need to invest in smaller, specialized offices instead of the general growth of the office (Chapple et al. 2005; Owen-Smith and Powell 2001).

A recent study by O'Shea et al. (2005) found that the historical background and past technology transfer success of each university is related to future capabilities and options for the university with regard to spinout capability. When a technology transfer office has successfully seen an invention go through the commercialization process, and sees returns in the form of royalties, the office is strengthened and motivated to continue with the commercialization process. Yale University has seen success in technology commercialization via its patenting of Zerit™, one of the drugs used in the treatment of HIV/AIDS patients.

APPENDIX G: GLOSSARY

Accelerators or Incubators: Accelerators and incubators support entrepreneurs to transfer knowledge and intellectual property from institutions into the economy. These intermediaries are often housed in universities, and they provide a combination of services for start-ups including mentorship, funding, networking, training and/or office space. Typically, incubators support start-ups entering the beginning stages of building their company, whereas accelerators advance the growth of existing companies with an idea and business model in place.

Commercialization: Commercialization is the process of taking an invention or scientific discovery (i.e., new technology or new or improved manufacturing process) to the market.

Freedom to operate: Freedom to operate, also known as FTO, means you have the freedom to test, market, or sell a product or service in a specific area. The phrase is often used when determining if a specific action can take place without infringing on the intellectual property rights of another.

Intellectual Property: Intellectual property refers to creations of the mind and can include things like inventions, industrial designs and artistic works, such as manuscripts.

Regional Innovation Centres: Regional Innovation Centres (RICs) are not-for-profit intermediaries that act as local focal points for innovative start-up companies and entrepreneurs throughout Ontario. The Ministry of Economic Development, Job Creation and Trade funds a network of RICs across the province that helps Ontario's entrepreneurs and innovators to clear commercialization hurdles and attract the talent, capital and customers they need to grow and succeed in international markets.

Technology Transfer: Technology transfer is the process of transferring (disseminating) technology from the place where it is developed to wider distribution.

Technology Transfer Office: Sometimes referred to as Technology Licensing Offices, these offices are responsible for technology transfer and other aspects of the commercialization of research that takes place in a university or college. Technology transfer offices act as a liaison between university or college inventors and industry partners. Other public institutions, such as hospitals, may also have technology transfer offices.