



UNIVERSITY OF
TORONTO

ECONOMIC IMPACT REPORT

PRODUCTIVITY • INNOVATION • QUALITY OF LIFE • CORE POPULATION OF 100,460 • WORLDWIDE COMMUNITY OF 641,480 • CONTRIBUTES \$15.7 BILLION TO THE CANADIAN ECONOMY • EMPLOYS 23,000 PEOPLE • COMPETITIVE ADVANTAGE • SPIN-OFF COMPANIES: SYSOMOS, SNOWBUSH, DNN RESEARCH • PROSPERITY • TORONTO • MISSISSAUGA • ONTARIO • CANADA • KNOWLEDGE DISSEMINATION • \$6.58 BILLION IN ECONOMIC BENEFIT FOR TORONTO • \$83 MILLION IN R&D THROUGH INDUSTRY COLLABORATION • 6,800 CONSTRUCTION-RELATED JOBS • 24 NEW START-UP COMPANIES IN 2011 • \$1.1 BILLION IN RESEARCH FUNDING • 152 RESEARCH INSTITUTES AND CENTRES • IDEAS: RAPID-RESULT TESTING FOR INFECTIOUS DISEASES, REDUCTION OF SCAR FORMATION, A NEW MOBILE KEYBOARD • 982 INVENTION DISCLOSURES • 252 LICENSED INVENTIONS • ENTREPRENEURSHIP ECOSYSTEM • BUSINESS INCUBATORS • TECHNO, THE ENTREPRENEURSHIP HATCHERY, UTEST, THE CREATIVE DESTRUCTION LAB • CLOSE TO 10% OF ALL R&D CONDUCTED BY THE CANADIAN HIGHER EDUCATION SECTOR IS PERFORMED AT U OF T

2013





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INTRODUCTION

Universities are creating the most skilled members of Canada's workforce and the innovations that will ensure the competitiveness of our industries. In today's global and knowledge-based economy, universities have become essential contributors to our future prosperity and quality of life.

As Canada's leading research-intensive university, the University of Toronto's contribution to the economy is significant. U of T is a vibrant and diverse community of 20,000 faculty and staff, and 80,000 students across three distinctive campuses and many partner sites. More than a key resource to the Toronto Region and Ontario, the University is respected as Canada's foremost institution of higher education and advanced research.

Some of the ways the University of Toronto contributes to the economy are obvious. As an employer, U of T creates jobs. Similarly, the University's activities entail spending in the local economy. Other less obvious but key contributions are harder to measure so discretely. This includes the University's role in providing a competitive advantage to the Province by boosting productivity, or the new commercial opportunities created through its inventions and spin-off companies.

The University of Toronto has helped hundreds of thousands of individuals to reach their potential and contribute to the economy and society. This report shines a light on how this translates into greater prosperity for the Toronto Region, Ontario, and Canada as a whole.

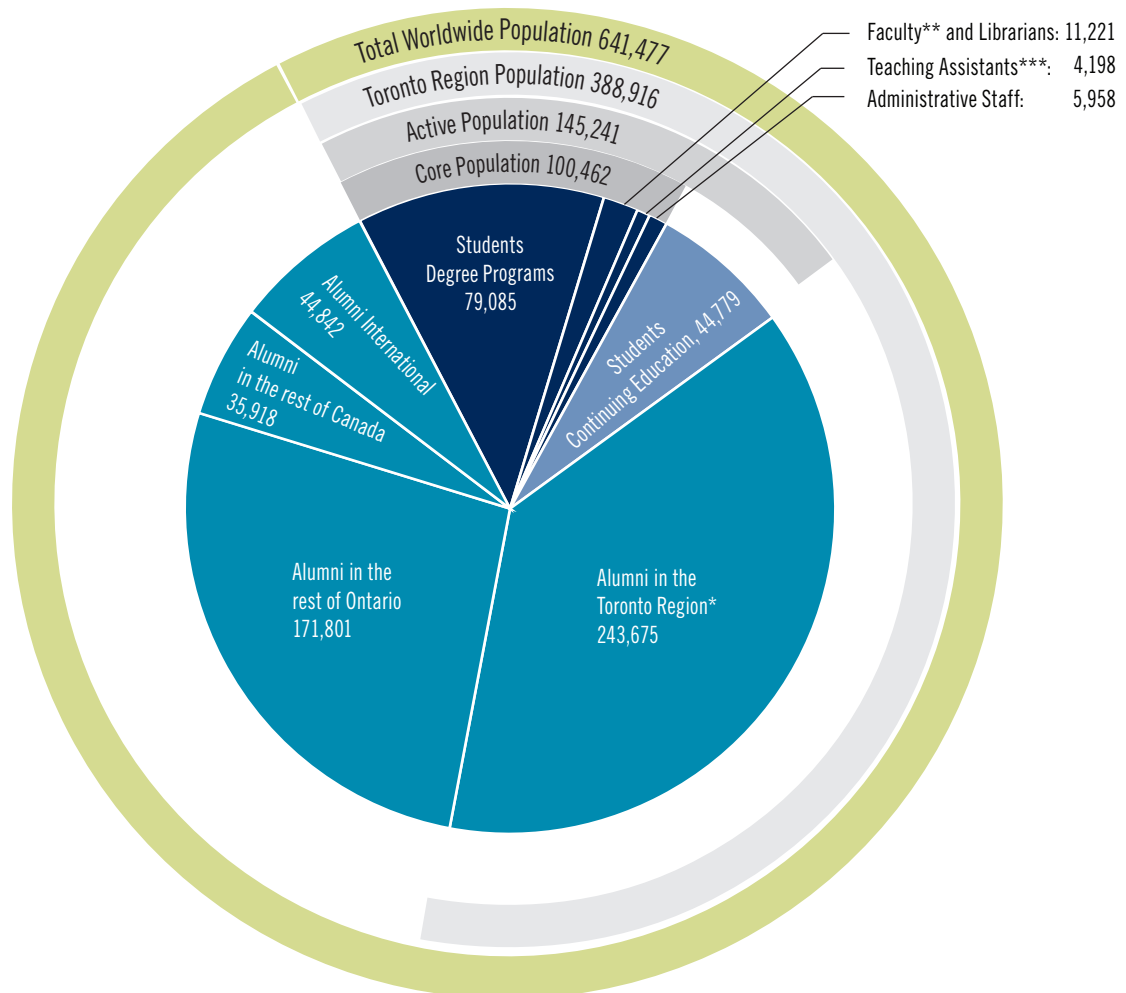
HIGHLIGHTS

- The University of Toronto contributes \$15.7 billion to the Canadian economy every year.
- Its core population is 100,000 individuals. Worldwide, its alumni count approaches 500,000.
- The University is a research powerhouse, attracting \$1.1 billion in research funding a year.
- U of T is a leader in commercialization and the creation of new start-ups.

POPULATION

The impact of the University of Toronto is felt foremost through its people. The University's core population, those individuals who work and study at the University on a daily basis, is approximately 100,000. When continuing studies students are included, this number increases to 145,000—greater than the population of Prince Edward Island.

When the wider local U of T community is counted—the 244,000 alumni who live in the area—the local population in the Toronto Region* rises to 390,000. An additional 250,000 alumni live across Ontario, Canada and abroad, bringing the worldwide U of T community to **640,000**.



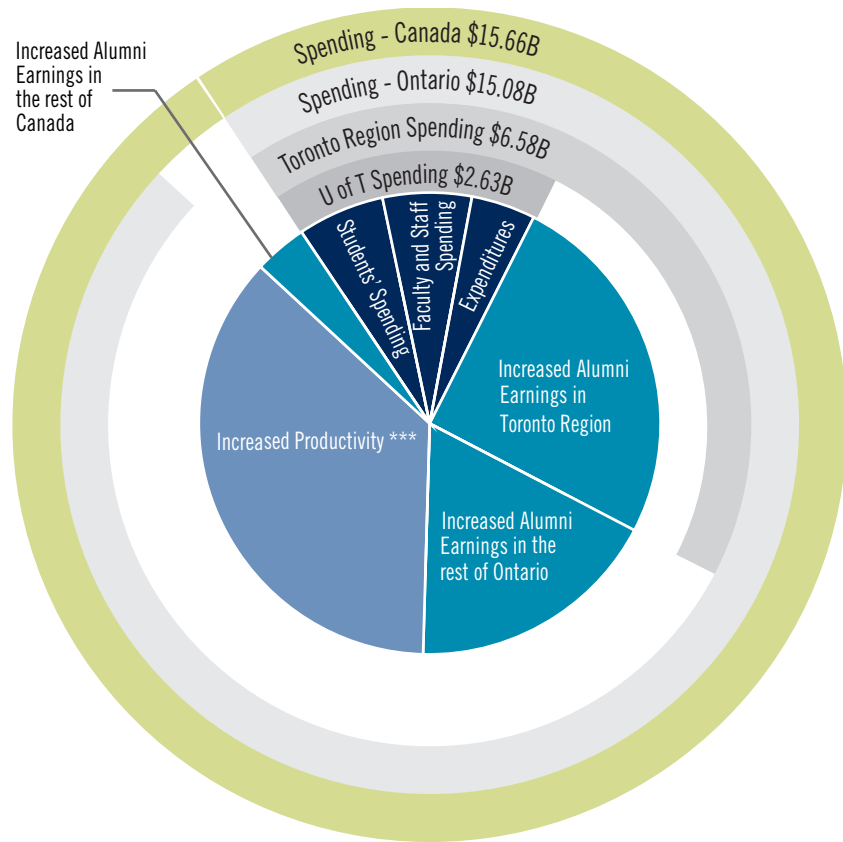
* Toronto Region refers to the Toronto Census Metropolitan Area (CMA) and includes municipalities considered by Statistics Canada "to have a high degree of integration with the City of Toronto, as measured by commuting flows derived from census place of work data."

** Includes clinicians paid by partner hospitals.

*** Includes graduate students counted under Students – Degree Programs. Some double counting of these individuals is included in the Subtotal – Core Population.

MEASURING VALUE

The University’s activities generate significant economic benefit. While quantifying these impacts in its entirety is difficult, major effects can be approximated. In total, it is estimated that the University of Toronto contributes **\$15.7 billion** to the Canadian economy every year.



CONTRIBUTION	DIRECT (BILLIONS)	INDIRECT* (BILLIONS)
Students' Spending	\$0.64	\$0.96
Faculty and Staff Spending (From Salaries)**	\$0.65	\$0.97
Expenditures (Non-Salary)**	\$0.47	\$0.70
Subtotal – U of T Spending	\$1.76	\$2.63
Higher Alumni Earnings – Toronto Region	\$2.63	\$3.95
Subtotal – Toronto Region	\$4.39	\$6.58
Higher Alumni Earnings – The rest of Ontario	\$1.86	\$2.79
Increased Productivity***	--	\$5.71
Subtotal – Ontario	\$11.95	\$15.08
Higher Alumni Earnings – The rest of Canada	\$0.39	\$0.58
Total – Canada	\$12.34	\$15.66

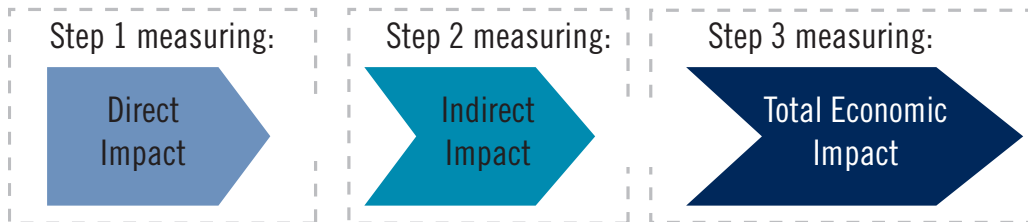
*Multiplier of 1.5x of direct spending used to calculate indirect effects. All figures rounded.

**Captures local spending only.

***The Increased Productivity calculation is for the Province only. The multiplier is not applied to this figure.

What is an economic impact study?

Economists use models to evaluate effects of activity on an economy that includes the following steps:



What is direct impact?

Direct impact measures changes in the economic activity during the first round of spending. For example, the university pays salaries and purchases goods and services. The direct impact measures these effects in the economy.

What is indirect impact?

An effect where, depending on the value of the multiplier, an initial incremental amount of spending leads to increased spending, increasing income further and, hence, further increasing consumption.

What is a multiplier?

A multiplier is a factor that measures a change in a variable in response to a change in some other variable. Multipliers vary widely by industry and area (1.0 – 3.0), and tend to be higher for large urban regions because more of the spending stays within that region.

THE EFFECT OF DIRECT SPENDING

In addition to its importance as a contributor to human capital, the institution's activities add significantly to the city's economic success. Through their spending the University and its faculty, staff and students contributed an estimated \$1.8 billion directly to Toronto's economy.

To capture "ripple effects," where spending in one area spurs spending elsewhere in the economy, multipliers are used. Using a standard a multiplier of 1.5, the University's \$1.8 billion in direct spending grows to **\$2.6 billion** in indirect economic benefit for the Toronto Region.

HIGHER ALUMNI SALARIES

A university education improves an individual's economic prospects, and consequently that of the larger community. Job growth for university graduates has remained strong despite the recent recession. From 2008 to 2012, jobs requiring a university degree grew by 15%, for an additional 700,000 more jobs across Canada. In contrast, 640,000 jobs which required only a secondary school education were lost.

A university degree also affects one's earning potential, resulting in a salary differential compared to those with less education.¹ When applied to U of T's roughly 450,000 alumni living in Canada, this salary differential adds an approximate \$4.9 billion to the country's economy. When the 1.5 multiplier is applied to this figure, the indirect impact of the salary premium of the University's alumni grows to **\$7.3 billion**.

INCREASED PRODUCTIVITY

Another recognized, but difficult to measure, contribution to the economy is the innovation flowing from the research conducted by the University. Discoveries are continually being translated into economically beneficial applications that grow our collective prosperity.

One way to capture this output is by estimating productivity gains that can be attributed to the University's R&D activities. R&D linked productivity gains may arise due to a business's adoption of innovative new products or services, or through improved processes that create efficiencies or reduce costs. This is an annual cumulative value added to the economy. Using the most common methodology² to capture this impact, the University of Toronto's R&D adds an additional **\$5.7 billion** to the Ontario economy.

¹ U of T's differential is based on Stats Canada and COU data

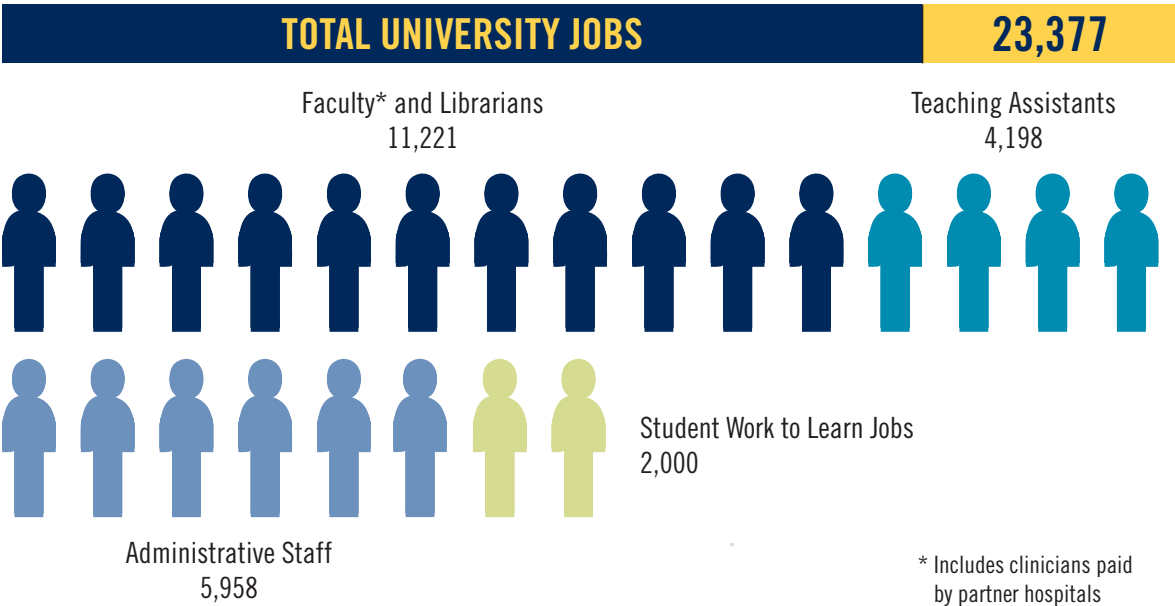
² Martin, F. (1998). The Economic Impact of Canadian University R&D. *Research Policy*. 27(7): 677-687.

EMPLOYMENT

Much of the University of Toronto's direct spending in the local economy is through the salaries to its employees. The University is one of the largest employers in the city, employing more than 23,000 individuals.

The University has over 11,000 faculty and librarians engaged in research and teaching. The institution is supported by roughly 6,000 staff in administrative and other service roles.

The University is also a major employer of students. Many graduate students work as teaching assistants that support the faculty in delivering courses. Each year the University employs approximately 2,000 students in work-to-learn jobs.

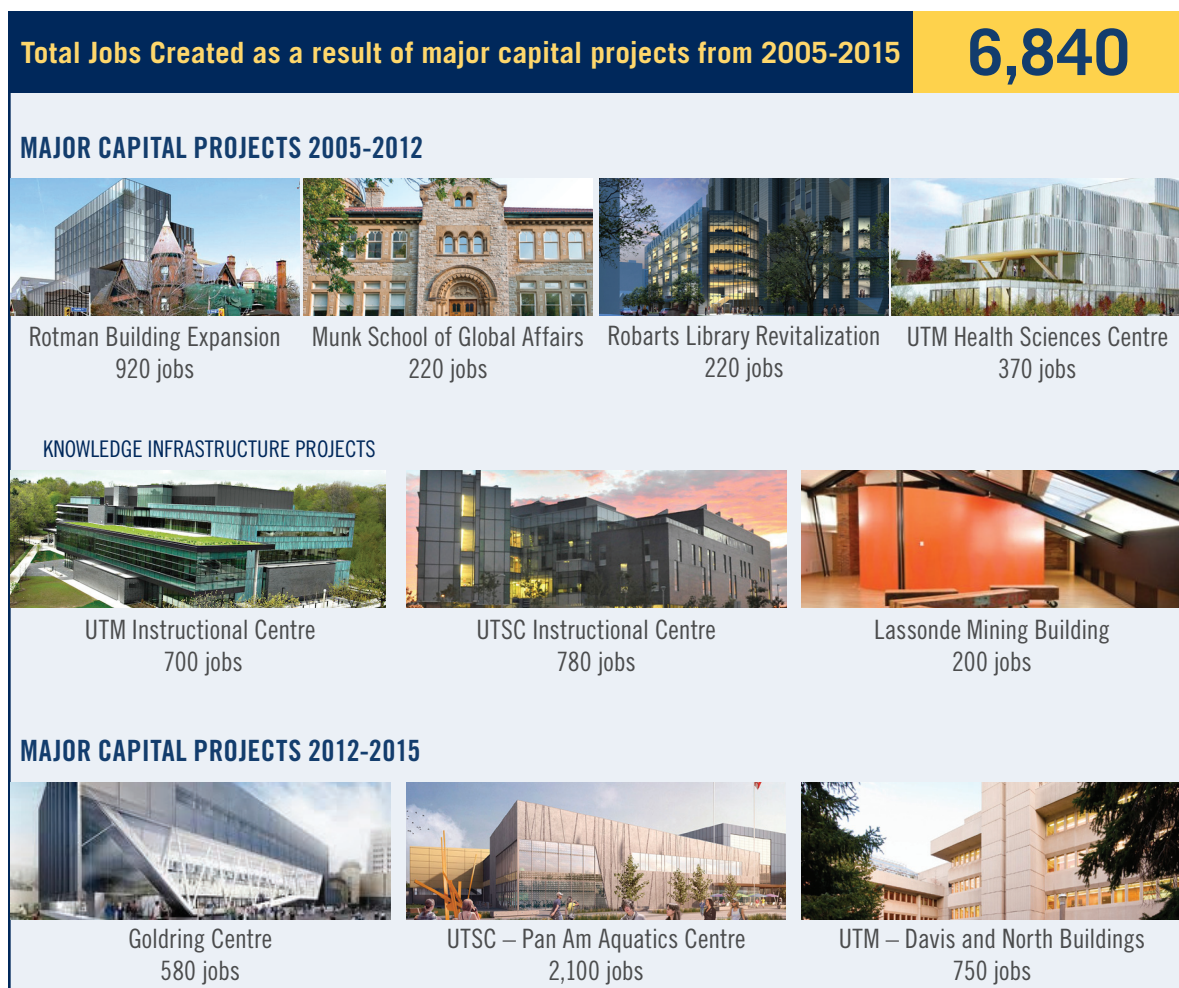


INDIRECT EMPLOYMENT: START-UPS

The commercialization of discoveries made in the University's labs often result in the creation of a new spin-off company. These start-ups are often led and staffed the University's graduates. In 2011, **24** new start-up companies were spun out, creating **78** new highly skilled jobs.

INDIRECT EMPLOYMENT: CONSTRUCTION

The University of Toronto has a significant footprint across its three campuses in Mississauga, Scarborough and downtown Toronto, and in recent years each has expanded. To accommodate the 43% growth in enrolment since 2000, the University has undertaken a number of building projects. The seven major capital projects completed in the last eight years resulted in approximately 3,400 construction-related jobs. The three major building projects currently underway will result in an additional 3,400.



Estimated number of jobs is based on assumption that one job is created for every \$100,000 of spending as per methodology employed by Knowledge Infrastructure Program (KIP).

The University of Toronto's faculty produce more research and scholarship than almost any other institution worldwide. In North America, only Harvard University publishes more academic papers.

This prodigious output reflects the breadth and depth of academic excellence at the University of Toronto. It is this excellence that in turn attracts the world's talent. These researchers come to work alongside the foremost experts of their fields. This "brain gain" is of immense value to the competitiveness of the Toronto Region, Ontario and Canada.

What is a Canada Research Chair (CRC)?

Canada Research Chairs is a Government of Canada program which provides 2,000 research professorships in eligible degree-granting institutions. The program invests \$300 million per year to attract and retain the world's most accomplished minds.

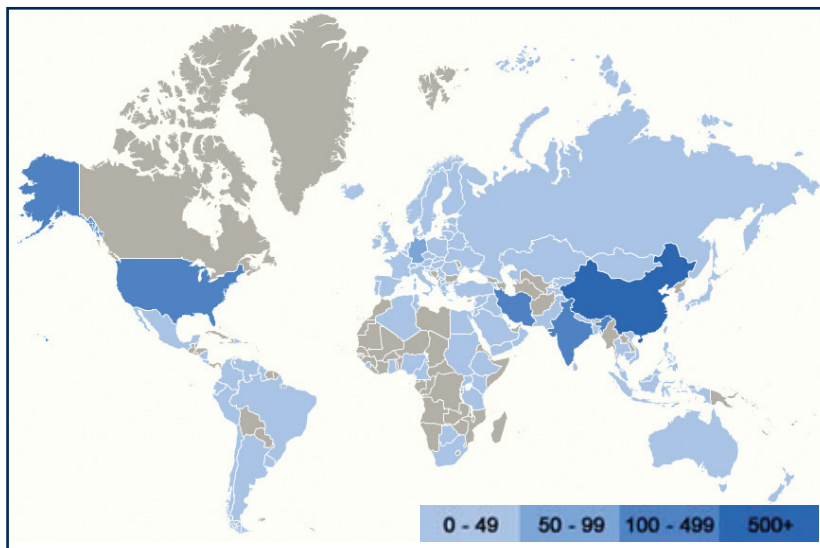
What is a Canada Excellence Research Chair (CERC)?

The Canada Excellence Research Chairs program awards world-class researchers up to \$10 million over seven years to establish ambitious research programs at Canadian universities. The awards are among the most prestigious and generous available globally.

The University has **238** Canada Research Chairs—more than any other institution in Canada. The University also recently attracted two leading experts in their fields through the Canada Excellence Research Chairs, Frederick Roth, an expert in using computation to map the genome, and Oliver Ernst, a leader in the field of the neurological and degenerative diseases. Both Professor Roth and Ernst received \$10 million from the federal government to support their research.

The University of Toronto also attracts more graduate students than any other university in Canada. In 2012-2013, **14%**, or 2,077 of U of T's 15,287 graduate students came from abroad. These international students enrich our community through their economic and intellectual contributions, and as a whole, are a highly-skilled and engaged population from which to draw new immigrants.

WHERE OUR INTERNATIONAL GRADUATE STUDENTS COME FROM



CENTRES AND INSTITUTES

Another indicator of U of T’s breadth of talent is its network of **152** research centres and institutes. These units allow researchers to investigate complex topics from multiple angles. They foster excellence and attract new faculty and students with the promise of developing new synergies across traditional disciplinary boundaries.

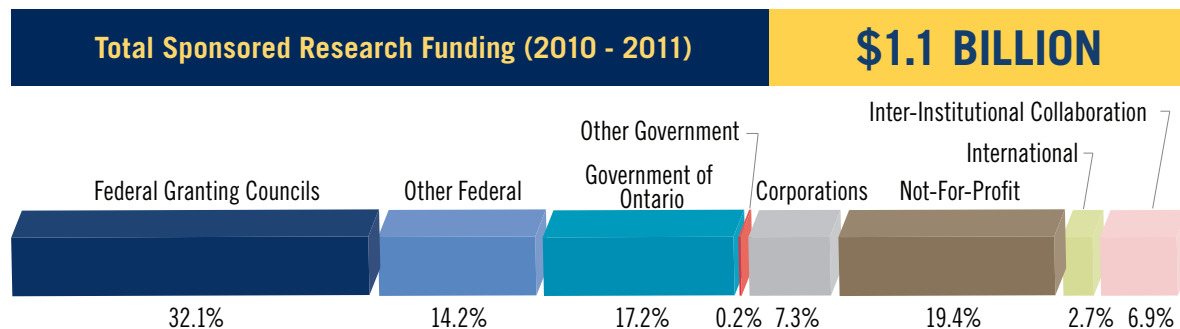
<p>MARTIN PROSPERITY INSTITUTE</p>	<p>FRASER MUSTARD INSTITUTE FOR HUMAN DEVELOPMENT</p>	<p>THE CITIES CENTRE</p>
		
<p>The Martin Prosperity Institute is the world’s leading think-tank on the role of sub-national factors—location, place and city-regions—in global economic prosperity. It takes an integrated view of prosperity, looking beyond economic measures to include the importance of quality of place and the development of people’s creative potential.</p>	<p>The Fraser Mustard Institute for Human Development is developing new interconnections to study how to improve young lives and promote human development. It is unique in building integrative research and educational programs across university divisions and affiliated institutions that include international leaders in health, education, social welfare and basic sciences.</p>	<p>The Cities Centre is a multi-disciplinary research institute which facilitates research on cities on a wide range of urban policy issues, both in Canada and abroad. It provides a gateway for communication between the University and the broader urban community, as well as with institutions and organizations around the world through cross-sectoral and cross-cultural exchanges, learning collaborations and joint research projects.</p>

The University of Toronto and its partner hospitals attract the largest amount of research funding of any university in Canada. Close to **10%** of all R&D conducted by the Canadian higher education sector is performed at U of T.

This immense concentration of research creates a critical mass that not only attracts talent, but also investment from around the world. It is a magnet for high tech businesses to set up shop in the metropolitan region. For instance, Toronto’s biomedical industry has over 700 companies which employ over **80,000** people, the 4th largest life sciences cluster in North America.

SPONSORED RESEARCH

In 2010-11, U of T and its partner hospitals attracted **\$1.1 billion** in research funding. The largest source of funding is the federal granting councils—the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council and the Social Sciences and Humanities Research Council. U of T receives roughly 15% of all grants awarded by the federal granting councils each year.



INDUSTRY PARTNERSHIPS

The University is a ready partner and resource for industry. Businesses often face technical challenges that stretch their internal R&D capacity, and turn to U of T researchers to solve problems or gain competitive advantage. Universities have unique facilities and unparalleled expertise that attract even leading technology companies. In 2011-2012, U of T received \$83 million in industry-sponsored research funding.

An example of the sort of research the University conducts with industry is the Southern Ontario Smart Computing Innovation Platform, a new \$210 million supercomputing network established in 2012. This consortium was created with the support of industrial lead IBM and both the federal and provincial governments. This vital new platform will capitalize on the new era of big data to tackle issues in health care, water, energy and cities, while creating jobs and driving industrial productivity throughout the province.

COMMERCIALIZATION

The University and its partner hospitals are leaders in transferring discoveries into applications with real commercial value.

The path from the lab to the marketplace can take many routes. Not every discovery is developed into a discrete product. An early step in the innovation process is the invention disclosure, whereby researchers assert intellectual rights over their discoveries. Many of these inventions are licensed to existing companies who apply the new knowledge to improve their existing lines of products or services.

The University actively supports its researchers through its Innovations and Partnerships Office. U of T also works with the MaRS Discovery District and MaRS Innovation, a network of fourteen universities, institutes, and hospitals in downtown Toronto, sharing resources and expertise to identify and leverage the commercial potential of discoveries made by faculty and students.

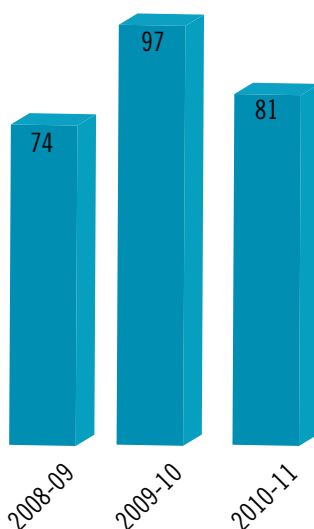
Data from the most recent three year span between 2008-09 and 2010-11 indicate that U of T researchers filed **982** invention disclosures—the third highest among its Canadian and US peers. U of T licensed **252** inventions over this period—again the third highest among peers. The University also reported the creation of **53** spin-off companies—more than any other Canadian university in its peer group.



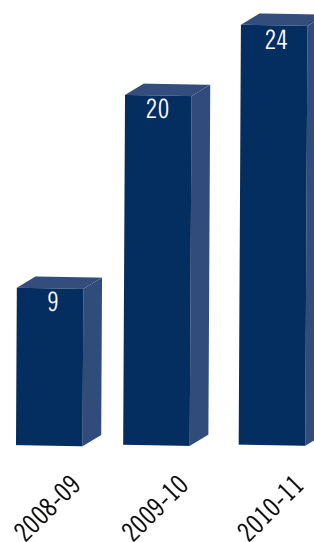
INVENTION DISCLOSURES



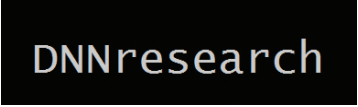


LICENSES






STARTUP COMPANIES



SPIN-OFFS: MARKET LEADERS

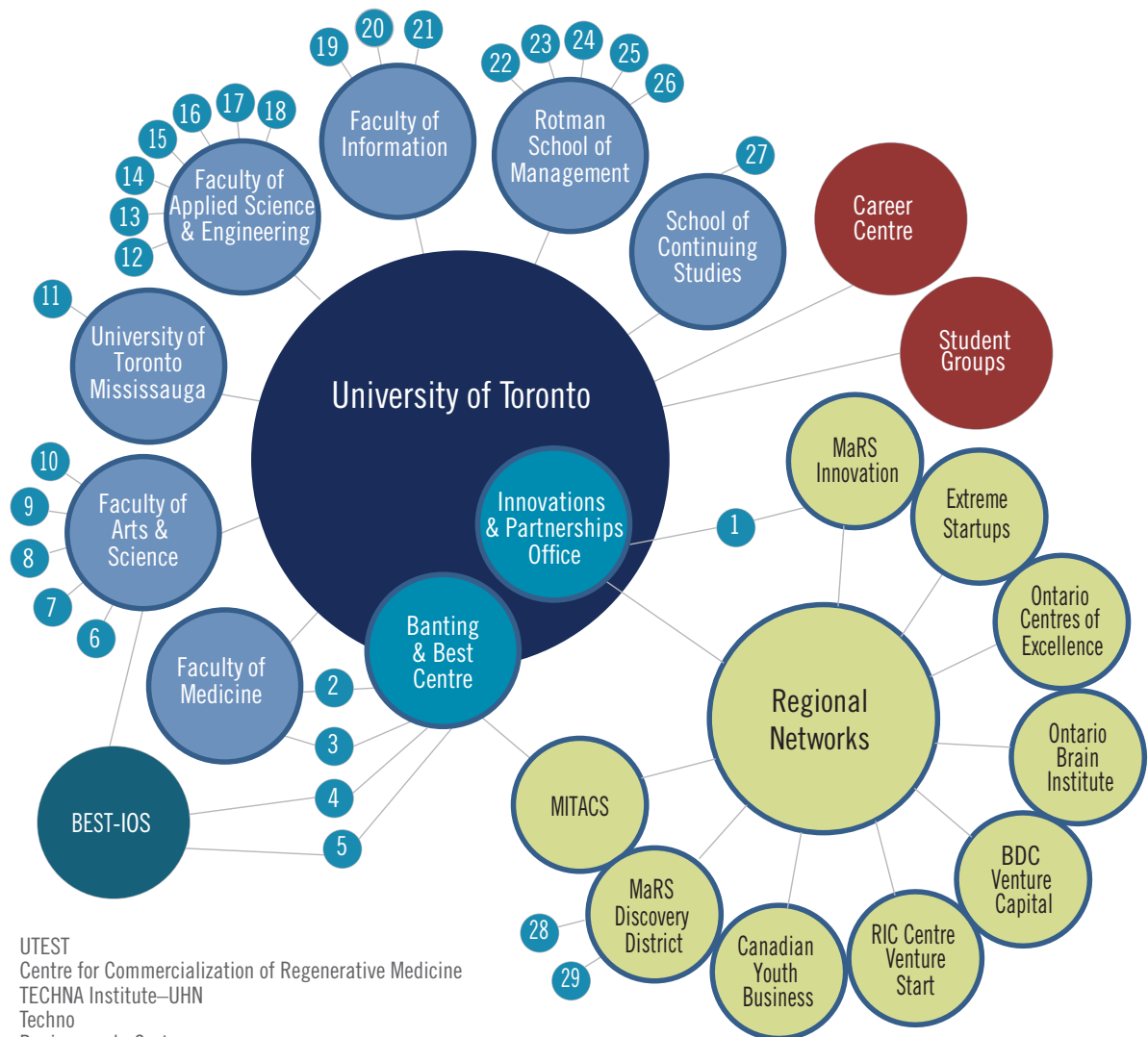
		
<p>Google acquired DNN Research in 2013, a spin-off founded by Professor Geoffrey Hinton and graduate students Alex Krizhevsky and Ilya Sutskever. The company focuses on deep neural networks, which involves helping machines understand context, and which has profound implications for areas such as speech recognition, computer vision and language understanding. Google has already implemented a deep neural network, in part based on Hinton's work, for voice search in its Android mobile operating system.</p>	<p>Since its launch in 2007, Sysomos has redefined social media analytics. Businesses around the globe use social media faster and more efficiently than previously imagined, thanks to this technology first developed in by U of T Professor Nick Koudas and his student Nilesh Bansal. Clients of the company quickly grew to include such global companies as Microsoft, Disney, Shell, Proctor & Gamble and Coca-Cola. In 2010, the Canadian company Marketwire acquired Sysomos for \$34 million.</p>	<p>Snowbush IP is helping to make the internet faster. As one of the world's leading analog intellectual property suppliers, their products are a critical element of high-speed data communications and video applications, such as internet routers and HD broadcast equipment. Founded by U of T professors David Johns and Ken Martin in 1998, Snowbush's technology has shipped in hundreds of millions of products. Sold in 2007 for \$20 million, Snowbush IP is now a division of Semtech Corporation.</p>

SPIN-OFFS: UP-AND-COMERS

		
<p>Professor Shana Kelley founded Xagenic in 2010 to develop a new technology that promises to transform diagnostic testing for infectious diseases. Xagenic is developing a platform for rapid-result molecular diagnostic testing that can be performed outside of laboratories, providing results in as little as twenty minutes. This easy-to-use and inexpensive device promises to eliminate unnecessary delays, reduce costs, and vastly improve the way patients receive care.</p>	<p>Dr. Benjamin Alman has discovered a breakthrough treatment to reduce scar formation. The new anti-scarring drug, ScarX, is a topical cream applied daily for three weeks which can reduce the size of surgical scars by half. Every surgical patient is a potential customer. With 240 million surgeries performed worldwide each year, the international market is enormous, estimated to be worth \$8.5 billion. The discovery has spawned an agreement with NovoTek Therapeutics, which will develop and commercialize the medication for the Chinese market.</p>	<p>Whirlscape was founded by Professor Khai Truong and U of T alumnus Will Walmsley to develop the next generation of mobile keyboard for touchscreens and wearable devices. Their technology, Minuum, uses a specialized auto-correction algorithm that corrects highly imprecise typing. This algorithm bridges the difference between what one types and what one means, in real time — getting it right even if every single letter is missed. The Minuum crowdfunding campaign launch received international media coverage, and raised twice its funding goal in a single day.</p>

ENTREPRENEURSHIP

The University of Toronto offers a growing ecosystem of incubators and commercialization services. For students, the University offers highly coveted academic courses and training programs, career resources, and opportunities to connect with seasoned entrepreneurs. For faculty and researchers, the University provides business incubator facilities and focused training programs.



1. UTEST
2. Centre for Commercialization of Regenerative Medicine
3. TECHNIA Institute-UHN
4. Techno
5. Business a la Carte
6. Department of Chemistry pre-incubator
7. Entrepreneurship 101 (in development)
8. Economics of Entrepreneurship course
9. CS Business of Software course
10. Hacker Academy
11. Masters of Management of Innovation
12. Centre for Engineering Innovation & Entrepreneurship
13. The Entrepreneurship Hatchery
14. Mobile Applications Laboratory
15. Minor in Engineering Business
16. Certificate in Entrepreneurship for Engineering
17. Certificate in Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE)
18. Entrepreneurship speakers' series
19. ThingTank Lab
20. Knowledge Media Design Institute; Design Jam
21. Career preparation & entrepreneurship continuing education courses
22. Centre for Entrepreneurship & Innovation
23. Creative Destruction Lab
24. Next36
25. MBA Major in Innovation & Entrepreneurship; Business Innovation Lab
26. Rotman Commerce entrepreneurship course
27. Entrepreneurship courses
28. JOLT
29. Entrepreneurship 101

ENTREPRENEURIAL SUPPORTS

The following are a few examples of the supports U of T has developed to foster the burgeoning interest in entrepreneurship at the University.

	<p>THE ENTREPRENEURSHIP HATCHERY</p> 
<p>Each summer the BEST-IOE hosts the Techno program for current and recent students who want to build their own company. During this month-long workshop, teams of young scientists and engineers learn the fundamentals of entrepreneurship and apply these lessons in a hands-on environment. Techno alumni have already created thirty-eight companies in the workshop's first three years.</p>	<p>The Faculty of Applied Science and Engineering's new Entrepreneurship Hatchery supports undergraduates looking to start their own business. The Hatchery provides an environment where students, faculty and entrepreneurs can come together in a spirit of creativity. Students gain access to space, equipment, and mentoring from faculty and alumni. Young entrepreneurs also gain connections to funders as they take their product from concept to prototype, as well as strategic partners and potential investors along the way.</p>
<p>UTEST: UNIVERSITY OF TORONTO EARLY STAGE TECHNOLOGY</p>	
<p>The UTEST program provides nascent software companies with start-up funding, office space in the MaRS Discovery District facility, mentoring and business strategy support. UTEST accepts companies in the very earliest stages of idea generation—before they are ready for traditional incubators—and awards each company up to \$30,000 in start-up funds. UTEST is jointly administered by the Innovations and Partnerships Office at the University of Toronto and MaRS Innovation.</p>	<p>The Creative Destruction Lab at Rotman School of Management leverages the business school's leading faculty and industry network and its location in the heart of Toronto. Participants receive guidance from experienced entrepreneurs on how to most effectively allocate scarce resources to maximize chance of venture success, access to early-stage investors, and introductions to strategic relationships including customers, partners, recruits, and investors.</p>

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