

Engaging Innovation >



TORONTO REGION RESEARCH ALLIANCE

October 2005

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The Toronto Region Research Alliance (TRRA) is a non-profit corporation, established by the Toronto City Summit Alliance in collaboration with public and private organizations from the Golden Horseshoe involved with research and its commercialization. These include our universities and colleges, research hospitals, private research institutes, leading companies, financial institutions, venture capital firms, regional development organizations, and municipal, provincial and federal governments.



The TRRA's mission is to make the Toronto region a world-leading centre for research and research-intensive industry by:

- Building public and private research capacity
- Enhancing the commercialization of research
- Attracting new research-intensive companies while working to retain and expand those already here.

Our primary role is to serve as a neutral convenor, facilitator, catalyst and advocate for the region on issues and opportunities related to research capacity, commercialization and the attraction of research-intensive industry and investment.

The TRRA serves the broader Toronto region, comprising the Greater Toronto Area (GTA), the Waterloo Region, the Region of Hamilton-Wentworth, and the City of Guelph. However, where there is mutual benefit in doing so, the TRRA will collaborate with partners elsewhere in Ontario's Innovation Corridor.

REPORT FROM THE CO-CHAIRS



Gordon Nixon



John Evans

THE TORONTO REGION IS HOME TO AN EXTRAORDINARY RESEARCH COMMUNITY, unparalleled in Canada and exceptional by international standards. We have one of the leading biomedical research complexes in North America, world-beating strength in software, wireless and other information and communication technology fields, and cutting-edge capabilities in materials science and advanced manufacturing.

Over the past generation, we have built outstanding universities, colleges and research hospitals, attracted people from around the world, and created a diverse and creative society. We have also built a platform for sustained opportunity in a broad cross-section of research and industry sectors. With so much working in our favour, we should be one of the world's research and development powerhouses. Historically, however, we have not focused on achieving our full potential in this regard. That is now changing.

We believe the Toronto region can become a world-leading centre for research and research-driven industry, capable of attracting talent, knowledge-based companies, investment, and high-quality jobs from around the globe. Through shared vision and coordinated leadership, we can transform our intellectual wealth into greater economic growth, more and better jobs, and a higher quality of life for the region overall.

How will we do this?

We need to undertake strategic, coordinated action to grow our research capacity, building on our existing research strengths and creating an environment that will develop, attract and retain the best research talent in the world. Our focus must be on achieving a critical mass of top researchers, emerging talent and high quality infrastructure in research areas where we know we have the potential to excel internationally.

We need to transform more of our ideas and discoveries into innovative and marketable products, successful companies and high quality jobs here in Ontario. This means addressing the resource, skill and venture capital gaps that now impede our efforts to transform outstanding research into a stronger engine of growth for the region.

Finally, we need to brand and market the Toronto region as a leading centre for research and development. We know that knowledge-based industries invest in regions that offer top research talent and a critical mass of companies to serve as suppliers, service providers, partners and buyers. Competitive business costs matter and so does a high quality of life. The Toronto region possesses many of these advantages. The challenge now is to convince multinational companies to locate new R&D facilities here in the face of increasingly aggressive global competition from other city regions.

To accomplish all of this, we need to fundamentally change the way we work. Our business, finance, research, and political leaders must move to a new level of collaboration within our region to compete more effectively with the rest of the world.

Over the past year, the Toronto Region Research Alliance (TRRA) has set this process in motion by convening business, research and government leaders from across the Golden Horseshoe to set a common course. The TRRA has analyzed the barriers and opportunities the region faces, defined a vision for the region's emergence as a leading international centre for research and research-driven industry, and begun pursuing a strategy to achieve that vision. This report describes our work to date and our plan for the next three years.

The TRRA is greatly encouraged by the enthusiasm and support we have encountered over the past year and a half. Businesses, research institutions, local and regional organizations, and government partners at all levels have participated in shaping the strategy outlined in this report. They, in fact, are its prime movers. The TRRA's role will be to support them, acting as a catalyst and facilitator to enable the collective action required to achieve our mission. We look forward to continued collaboration with our many partners as we work together to move our region forward.



Gordon Nixon
Co-Chair, TRRA
President and CEO, RBC Financial Group



John Evans
Co-Chair, TRRA
Chair, MaRS Discovery District

Vision

THE TORONTO REGION IN TEN YEARS

In 10 years, the Toronto region will be a world-leading centre for research and research-driven industry. It will be recognized globally for its concentration of top research talent and ranked among the top five centres in the world for research performance in the life sciences, information and communication technology, and materials science and advanced manufacturing.

We will be a destination of choice for leading international researchers (developing and established) drawn by our strong public and private support for research, cutting-edge research facilities, excellent quality of life, and creative, diverse and tolerant society.

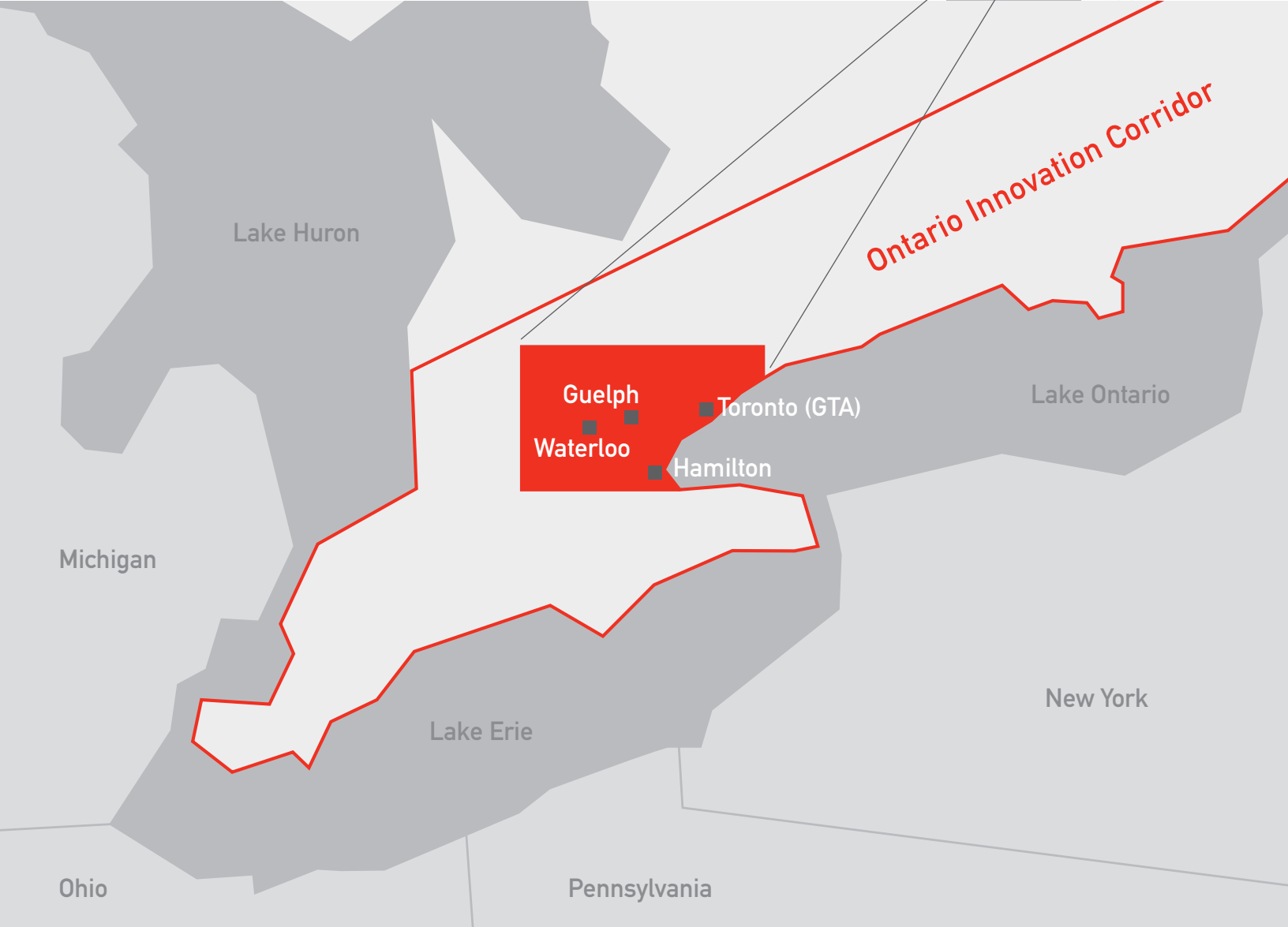
Our commitment to sustained public and private investment in research will place us among the top R&D spending regions in the world. We will have one of the highest levels of corporate R&D spending in North America, driven by a highly educated population, strong relationships between industry and the academic research community, a regulatory and tax environment conducive to R&D investment, and local institutions and initiatives that actively foster the synergies and partnerships that drive innovation.

Supported by this investment, we will be home to a large, vibrant and interconnected network of researchers, entrepreneurs, technology transfer professionals and investors who have the vision, drive and ability to take our ideas from the laboratory to the marketplace. As a result, we will lead the rest of Canada and most competitor jurisdictions in the US in our ability to transform our discoveries and ideas into successful new products and companies and we will retain an increasingly larger share of the economic benefits of these innovations here in Ontario.

We will be known among research-driven industries worldwide for our excellence as an R&D location and will be among the most frequently selected venues when leading firms seek to expand their R&D enterprises. Similarly, top international venture capital, law, and professional service firms involved in commercialization will view the region as an opportunity-rich environment and will establish operations here.

Finally, our unmatched levels of collaboration between research, industry, financial, philanthropic and government leaders will have produced a lengthy track record of success by establishing shared goals for the region and mobilizing our resources to achieve them.

TORONTO REGION: THE CORE OF THE ONTARIO INNOVATION CORRIDOR



THE TORONTO REGION TODAY

Poised to Compete

Unlike many of our competitors, the Toronto region possesses a strong and unusually diversified economy with large R&D clusters, a very competitive business environment, engaged and supportive governments, a diverse and highly educated labour force, and an excellent foundation of world-class research.

A STRONG AND DIVERSIFIED URBAN ECONOMY

Ranked as one of the most successful economic regions in the world, the Toronto region consistently outpaces Europe's 'four motors'¹ in economic growth. The region drives over 20 percent of Canada's GDP, is home to 40 percent of Canada's head offices, and contributes a net \$3 billion annually in tax revenues to the rest of Ontario and \$17 billion annually to the rest of Canada.²

The Toronto region is also home to some of North America's largest manufacturing, service and R&D clusters including the second largest automotive cluster, the second largest financial services cluster, the third largest information technology and telecom equipment cluster, and the fourth largest pharmaceutical and biotechnology cluster in North America.³ While a few other regions may have larger clusters in specific areas, none have the powerful combination of high-ranking clusters found in the Toronto region. This uniquely diversified economy with high level strengths in a range of key technology-driven sectors has positioned the region extremely well to compete in rapidly growing new sectors emerging from the convergence of more traditional industries.

A COMPETITIVE BUSINESS ENVIRONMENT

Despite the strengthening of its currency, Canada continues to be the most competitive place to do business according to KPMG's 2004 Competitive Alternatives study of 11 OECD countries.⁴ With a nine percent overall cost advantage relative to the US, Canada offers a high quality, low cost alternative to US business locations. This advantage is even more dramatic in specific sectors such as corporate services (11.7 percent), software (13.1 percent) and R&D (21 percent).

ONTARIO OFFERS GENEROUS R&D TAX CREDITS

Through Government of Ontario tax credits, the Toronto region offers internationally competitive savings to R&D and technology-based businesses. These include:

- **New Technology Tax Incentive** 100% deduction of eligible costs arising from acquisition of intellectual property, including: expertise, techniques, processes, and formulae.
- **Business Research Institute Tax Credit** 20% refundable tax credit for R&D expenditures incurred as part of an eligible research institute contract. Qualifying expenditures are also eligible for an Ontario Innovation Tax Credit for a combined refundable credit of 30%.
- **Ontario Research Employee Stock Option Deduction** Eliminates capital gains tax on the first Cdn\$100,000 of the taxable portion of stock option benefits for employees of R&D companies.

HOME TO SOME OF THE MOST INNOVATIVE COMPANIES IN THE WORLD

HUSKY

Keeping our customers in the lead

Husky (Bolton)

Global innovator and leader in injection molding equipment and services to the plastics industry with 2,000 employees.

MAGNA

MAGNA (Aurora)

Most diversified automotive supplier in the world with its global headquarters in Aurora.

IBM

IBM (Markham)

World-class software development lab with 2,500 employees that drives 50% of IBM's global software business.

sanofi pasteur

The vaccines business of sanofi-aventis Group

Sanofi Pasteur (Toronto)

R&D leader in preventive and therapeutic vaccines, with a \$350 million Cancer Vaccine Program.

Algorithmics

Incorporated

Algorithmics (Toronto)

Award winning, leading global provider of enterprise risk management solutions.

XEROX

Xerox (Toronto)

State-of-the-art chemistry, chemical engineering and physics research with 10% of Xerox's global patents in 2004 and new products commercialized annually.

RIM

RIM (Waterloo)

World-leading designer and manufacturer of the BlackBerry with 1,333 person R&D centre co-located with its manufacturing facilities.

Alias

Alias (Toronto)

World leader in 3D graphics software tools for special effects, video games and industrial and automotive designs.

DOFASCO

Dofasco (Hamilton)

Canada's most successful steel producer, serving customers throughout North America with high-quality flat rolled and tubular steels and laser-welded blanks.

GENNUM

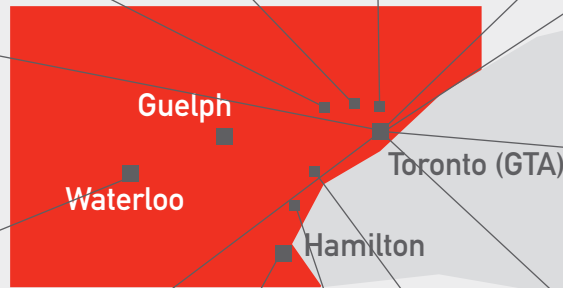
Gennum (Burlington)

Leading producer of hybrid and silicon integrated circuits, electrical components and sub-systems.

GOODRICH

Goodrich (Oakville)

Nose-to-tail airplane supply firm with world class R&D and landing gear manufacturing facilities.



MDS

Science advancing health

MDS (Toronto)

Leading provider of diagnostic laboratory services in North America, providing 150,000+ tests each day.

CGI

CGI (Toronto)

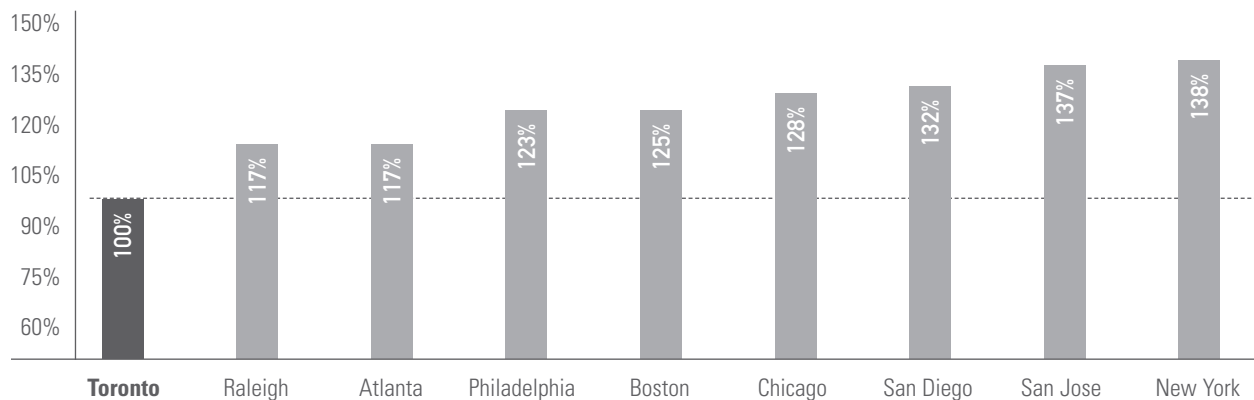
Among the largest independent IT services firms in the world, providing end-to-end IT and business process services.

> “Ontario is very stable and relatively low cost. There is good availability of technology, a well-educated and motivated workforce, strong technical expertise including engineering skills, and a well-established infrastructure. Ontario has great proximity to North American markets and gives us access to our core auto manufacturing clients.” STEVE RODGERS, VP, MAGNA

Measured against leading US and Canadian city regions, the Toronto region ranks as the most cost-competitive R&D environment in North America.⁵ Across 17 R&D-based industries, Toronto is 13 percent less expensive than Atlanta, 17 percent less expensive than Boston, and 35 percent less expensive than San Jose. This competitive advantage is due, in part, to the fact that the region’s labour costs for high technology industries are lower than those of every other major North American city region.⁶

TORONTO REGION IS THE MOST COST-EFFECTIVE R&D LOCATION IN NORTH AMERICA

R&D Operations – Indexed after-tax cost of startup and operation for R&D (over 10 years)¹ Indexed costs (Toronto = 100)

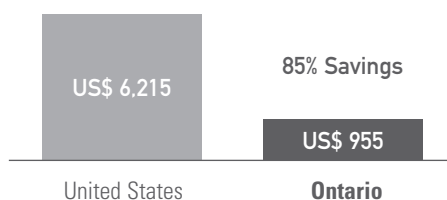


¹ Currency-adjusted, 2004 Source: KPMG 2004 – www.competitivealternatives.com

Canada leads the G7 in low overall labour costs, including benefits. Total payments for statutory and other labour benefits are 25.6 percent of salary and wages, compared to 34.2 percent in the US.⁷ This is largely because of our universal health insurance system, which represents a significant savings for employers. Employer-sponsored health benefits comprise only 2.1 percent of gross annual payroll in Canada and 9.6 percent in the US.⁸

ONTARIO PRIVATE SECTOR HEALTH CARE COSTS PER EMPLOYEE 85% LOWER THAN THE US

2005 Private sector health care spend per employee



Sources: Mercer National Survey of Employer-Sponsored Health Plans; Statistics Canada; Canadian Institute for Health Information (2004); Canada Revenue Agency; *Why the Canadian Way May be Looking Better and Better*, Journal of Treasury & Risk Management (April, 2005); Watson Wyatt Worldwide. Analysis by The Boston Consulting Group.

Canada also offers a distinct advantage in the area of corporate tax rates, with 2004 corporate income and capital tax equivalents 4.5 per cent lower than in the US.⁹ Canada’s unique system of R&D tax credits compounds this advantage, offering the most generous credits of any industrialized country for eligible R&D costs.¹⁰

TORONTO REGION OFFERS UNPARALLELED ACCESS TO NORTH AMERICAN MARKETS

Close proximity to US markets

- 135 million people within 1 hour flight (800km radius)
- Close proximity to 3 major US border crossings
- Strong near-shore service provision for northeast US clients

Economic engine for Ontario

- Through NAFTA, access to 400 million people and \$11.4 trillion market
- Strong real GDP growth in Toronto (5.3% in 2004, 3.6%p.a. estimated for 2005-2008)¹
- Ontario exports – \$200 billion/yr (90% to US)



SUPPORTED BY A WELL-DEVELOPED INFRASTRUCTURE

AIR ▪ Several airports, including North America's fourth largest (Toronto-Pearson) ▪ Non-stop flights to 110 global centres in 44 countries (65+ international airlines)

ROAD ▪ Seven major highways (including second most traveled super-highway in North America) ▪ Publicly supported, integrated regional and local transit systems

RAIL ▪ Two major rail carriers provide access to US markets and deep water ports

WATER ▪ Largest, most efficient electronically cleared container facility in the Great Lakes (2M+ metric tons annually through St. Lawrence Seaway)

TELECOM ▪ 100% digital telecom infrastructure ▪ Largest free-calling area and most cellular phones per capita in North America

ENERGY ▪ 25MW capacity from Ontario Power Generation

¹ Conference Board of Canada (Sept/04) Sources: Economist Intelligence Unit, www.2ontario.com; Greater Toronto Marketing Alliance, Conference Board of Canada *Metropolitan Outlook – Autumn 2004*.

> “Ontario’s diversity is a huge competitive advantage when you’re making products for the worldwide market – it is a real source of innovation.”

DR. HADI MAHABADI, VP, XEROX RESEARCH CENTRE OF CANADA

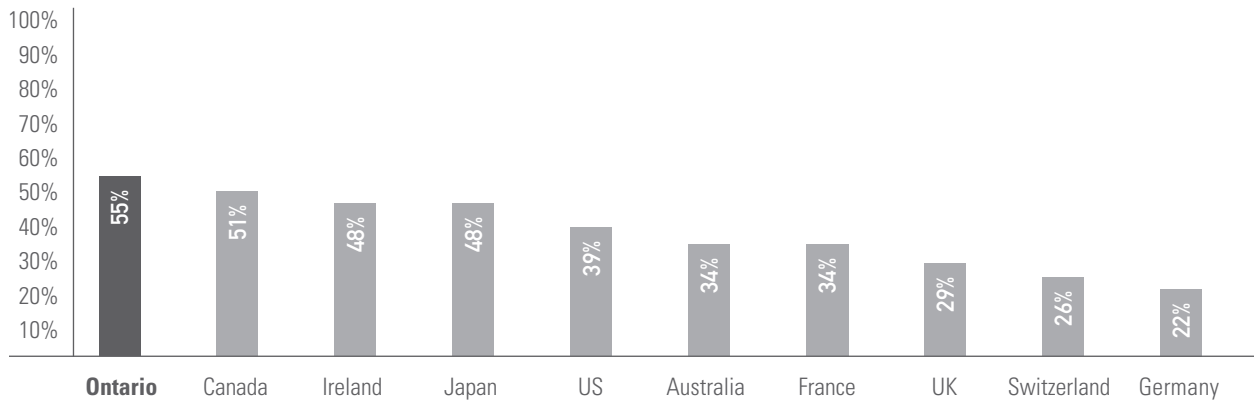
THE WORLD’S MOST EDUCATED AND DIVERSE LABOUR FORCE

Low costs do not drive innovation. People and ideas do.

Canada, and with it Ontario, has the highest rate of post-secondary attainment (54 percent) of any industrialized nation, comparing favourably with the United States (37 percent), Japan (34 percent), Germany (28 percent), and the United Kingdom (26 percent).¹¹ With eight universities and 10 colleges, the Toronto region has the highest concentration of post-secondary institutions in the country and attracts top academics and students from across Canada, as well as other nations.

ONTARIO’S WORKFORCE IS AMONG THE MOST WELL-EDUCATED AND HIGHLY SKILLED IN THE WORLD

% Ontario population age 25-64 with tertiary level education¹ (2001)

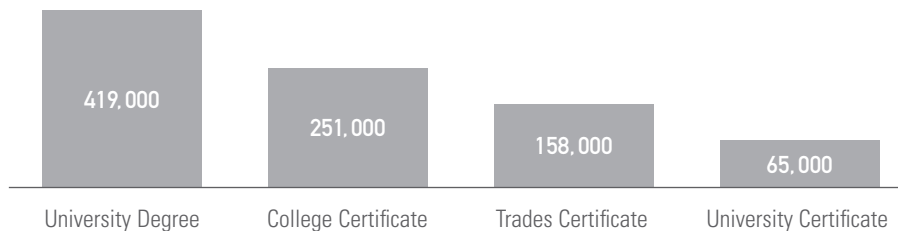


¹ Tertiary level education includes trades certificate/diploma, college, or university. Ontario based on Statistics Canada data, all others based on OECD data.

Sources: OECD Education at a Glance (2003); Statistics Canada; www.ontario.com; Greater Toronto Marketing Alliance; Ontario Ministry of Training, Colleges, and Universities 2005

LARGE CONCENTRATION OF SKILLED IMMIGRANTS

Known for its high quality of life, the Toronto region has increasingly become a magnet for highly skilled talent from over 169 countries around the world. Almost three-quarters of newcomers in the region over the age of 15 have a post-secondary certificate or degree. Ranked first among North American cities on Richard Florida’s ‘Mosaic Index’ of multicultural diversity and with 40 percent of the region’s population originating outside of Canada, the Toronto region’s multilingual capabilities make it an increasingly attractive business location for international firms serving clients around the globe.



Ontario Immigrant Skill Base (2001) – Number of Workers. Source: Statistics Canada data.

> “You need to have the engineering expertise close to the point of development. The people in Ontario are a fundamental reason for being here.”

GERRY CONABOY, DIRECTOR OF GOVERNMENT RELATIONS, GOODRICH

CONCENTRATION OF RESEARCH EXCELLENCE

The Toronto region is also home to a remarkable concentration of world-leading research enterprises spanning diverse areas of research and engaging some of the world’s top scientific talent. The remarkable breadth and depth of the region’s research community is unparalleled in Canada and rivals that of leading competitor regions in the US and other countries.

The region’s particular strengths have enabled it to build vital and growing economic clusters in the areas of biotech/pharmaceuticals, information and communication technology, and advanced manufacturing.

BIOTECH AND LIFE SCIENCES

The Toronto region is home to the third largest medical-hospital complex in North America, comprising more than 60 hospitals, 37 medical institutions, 8,200 physicians and 54,000 health professionals.¹²

BIO-PHARMA INVESTS IN THE TORONTO REGION

Pharmaceutical companies have invested more than \$1.1 billion in local R&D in the region over the past decade, including:

- Aventis Pasteur’s (now Sanofi Pasteur) \$350 million investment over 10 years for a worldwide Cancer Vaccine Program, anchored at a \$25 million corporate research campus and at the Sunnybrook and Women’s College Health Sciences Centre.
- AstraZeneca’s \$250 million investment over 10 years for facility expansion and the creation of 700 new jobs.
- The Structural Genomics Consortium at the University of Toronto – funded by a landmark \$70 million grant from the Wellcome Trust in the UK and support from GlaxoSmithKline – for research on over 350 proteins that will be made available to scientists worldwide.
- Eli Lilly’s 65,000 square foot research facility at Sunnybrook and Women’s College Health Sciences Centre, which has global mandates to improve the effectiveness of drugs under development for osteoporosis, heart disease, cancer, mental health and infectious diseases.
- Apotex’s new \$150 million R&D facility, which will be the largest of its kind in Canada.

Source: SHI Consulting

Foremost among its assets are 12 research hospitals in Hamilton and Toronto, including international leaders like The Hospital for Sick Children, one of the top three pediatric research hospitals in the world, and Princess Margaret Hospital, Canada’s foremost cancer research centre. These are linked to the University of Toronto’s medical school (North America’s largest with the third most highly cited faculty in the world), and McMaster University, known internationally for its innovative inter-disciplinary approach to health research and training and for pioneering the field of clinical epidemiology.

While York University does not have a medical school, it houses a collection of leading research institutes including the state-of-the-art York Centre for Research in Mass Spectrometry, engaged in collaborations with MDS Sciex, Norgen, and Eli Lilly, and the York Centre for Vision Research, known internationally for its cutting-edge multi-disciplinary work.

> “The Toronto and Ontario environment has been very conducive to success for us: access to people for clinical trials, a world class regulatory system, good infrastructure, skilled people and a great place to live...We bring people from all over the world to work here. Once we set them up, they like it very much.”

MARK LIEVONEN, PRESIDENT, SANOFI PASTEUR LIMITED

> **“Ontario gives us access to highly skilled engineers and some of the most attractive R&D incentives anywhere.”** ROBERT SCHAD, PRESIDENT AND CEO, HUSKY

These assets are complemented by the University of Guelph’s Veterinary College – the oldest in North America – which is co-located with Canada’s most advanced food and veterinary laboratories.

This remarkable concentration of research excellence is one of the critical factors responsible for placing the Toronto region ahead of many other North American competitors when it comes to attracting biotechnology and pharmaceutical companies and investment from around the world.

The Toronto region houses the fourth largest pharmaceutical and biotechnology industry cluster in North America.¹³ This is one part of the region’s broader life sciences sector which comprises over 700 firms,¹⁴ 140,000 medical and biotechnology jobs¹⁵ and \$4 billion in annual revenue.¹⁶

The Toronto region’s strengths are augmented by the new MaRS Centre. This recently completed 700,000 square foot commercialization convergence facility will house business, legal and financial advisors alongside public and industry researchers and will actively promote start-up companies built on innovations in the life, physical, and information sciences, as well as engineering.

A TORONTO REGION INDUSTRY SUCCESS

“Toronto is a good place to be,” says John Rogers, Vice Chair and recently retired CEO of MDS Inc., a leading diagnostic services company and the world’s number one supplier of mass spectrometers and radio-isotopes for nuclear medicine. “There are advantages to being a Canadian-based company in the global environment and, in Toronto, you have a lot of connections with the academic institutions and research institutions.”

In 1967, five former Toronto employees of IBM launched MDS to provide business and systems support to healthcare professionals in the region. By the 1980s, the company was providing diagnostic services across Canada and was a world leader in scientific instrumentation research, development and manufacturing.

MDS continued building its portfolio in the 1990s – becoming a leading contract research organization for drug development and biotechnology worldwide.

Throughout its growth, MDS has deliberately kept its head office and most of its research in the Toronto region, says Mr. Rogers. “There is no lack of resources in Toronto,”

he explains. “You have a very good, intelligent workforce coming out of the various universities and the opportunity to collaborate with universities.” Indeed, one of MDS’s most important units – MDS Sciex, a leading producer of mass spectrometers for use in drug research – grew out of research done for NASA at the University of Toronto. Scientists there were building a probe to measure the chemical composition of matter in space and send the data back to earth. MDS picked up the technology and adapted it for the drug development business.

The collaboration that built MDS Sciex “represents what this region is all about,” Mr. Rogers says. MDS Sciex now funds a research chair at York University and, Mr. Rogers adds, remains in “constant touch with the University of Toronto, Mt. Sinai Hospital and other health centres in the region about various projects they have underway.”



MATERIALS SCIENCE AND ADVANCED MANUFACTURING

Located in the core of one of North America's manufacturing heartlands, the Toronto region's traditional strengths in steel, plastic, automotive and aerospace manufacturing have fostered a thriving research enterprise in materials science and advanced manufacturing. Excellence in basic research, combined with strong industry/university partnerships, has generated a continuum of research ranging from cutting-edge basic science in the areas of quantum materials, nanoelectronics and photonics to heavily applied work in metal forming, polymer materials, steel and machining.

Key institutions like McMaster University's Brockhouse Institute for Materials Research, the University of Toronto's Nanotechnology Program, Materials and Manufacturing Ontario – an Ontario Centre of Excellence – and the Canadian Institute for Advanced Research's program in Quantum Materials are all contributing to a flourishing of materials research in the region and exciting theoretical breakthroughs as well as successes in applied research.

McMaster University is working to accelerate this process by augmenting the region's material sciences and advanced manufacturing research strengths in a major new Innovation Park located adjacent to its Hamilton campus. Similar to MaRS, this will be a bridge between the region's researchers, government partners, and manufacturing industries, including the region's leading automotive, aerospace and steel producers.

A TORONTO REGION INDUSTRY SUCCESS

One of North America's most profitable steel companies, Dofasco, is breaking new ground in world-wide steel production in part because of its collaboration with universities and other manufacturers in the Toronto region.

Dofasco Automation Technology uses advanced mathematics to predict precisely when, in the production process, molten steel gains its optimal chemical characteristics. This has created efficiencies worth hundreds of millions of dollars for the company. Another Dofasco technology, tubular steel, is a new kind of metal that enables the auto industry to build lighter cars with enhanced mileage and no loss of safety.

Both technologies reflect one of Dofasco's unique advantages in the global steel industry – location. Headquartered in Hamilton, Dofasco operates alongside a world-class engineering school at McMaster University and in the midst of the region's automotive industry cluster.

Dofasco employees work closely with research scientists at McMaster University and elsewhere in the region to develop new technologies, including one that solved one

of the steel industry's most vexing production problems. Molten steel can break out of molds and pour into machinery, causing damage and costly delays in production.

Tackling this problem, a McMaster doctoral student and later Dofasco scientist developed statistics-driven software to predict the point at which metal under production can potentially break-out, allowing Dofasco's mills to increase their production while avoiding costly mishaps.

"We have been able to push the operation closer to its limit," says one Dofasco scientist, adding that Dofasco "has one of the highest concentrations globally of people with specific expertise in this technology, largely due to our ties with the Chemical Engineering department at McMaster." Dofasco is now looking to market its technology to manufacturing industries around the world.

DOFASCO[™]

> “IBM’s ongoing investment in Canada is due to the strong skills of the Canadian software R&D team, as well as the supportive efforts and cooperation received from all three levels of government.” MARTIN WILDBERGER, VP AND DIRECTOR, IBM TORONTO LABORATORY

INFORMATION AND COMMUNICATION TECHNOLOGY

Our strengths in biotechnology/life sciences and materials science are matched by the region’s extraordinary capability in information and communication technology (ICT). The Toronto region has the third leading information and communication technology cluster by employment size in North America, surpassed only by San Francisco and New York.¹⁷

While driven, in part, by the size and diversity of our industrial base and its wide ranging technology needs, our success can also be attributed in large measure to the deep wells of talent that have developed in our research institutions. The University of Waterloo is a North American software leader and, together with the University of Toronto, one of the top sources of software engineers for Microsoft’s core R&D enterprise in Redmond, US.

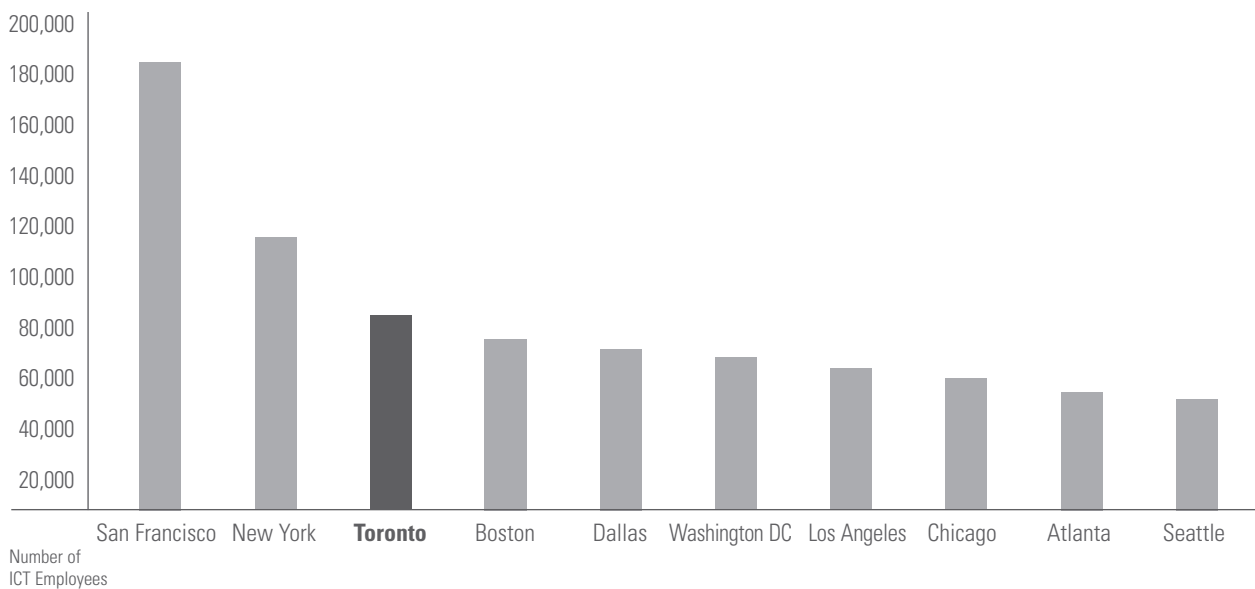
Other regional strengths include: semi-conductors, distributive computing, digital media, systems design, artificial intelligence (machine learning), networking and communication, knowledge representation/natural language processing and photonics.

Our institutional strengths are complemented by the extraordinary capacity of the region’s business information and communication technology business sector. The Toronto region is home to IBM’s third largest global software laboratory, employing 2,500 staff and generating products that drive over 50 percent of IBM’s software profits worldwide.

The region is also home to Research in Motion (RIM), creator of the BlackBerry and responsible for transforming the surrounding Waterloo area into a world-renowned centre for wireless communication technology. RIM’s founders have also invested more than \$100 million to launch the Perimeter Institute – a Waterloo-based international centre for theoretical physics that has quickly attracted some of the most prominent physicists in the world and has become a pre-eminent institute in its own right.

ICT CLUSTER RANKING COMPARISON

Rankings of top North American metropolitan areas by size of ICT industry – 2003 Sources: E&B DATA; Greater Toronto Area *Information and Communications Technologies Study 2004*.



A TORONTO REGION INDUSTRY SUCCESS

The Toronto region is at the heart of IBM's worldwide software business. IBM opened its first Toronto-area laboratory in 1967, as a sub-contractor in hardware applications with just a handful of personnel. By 2003, IBM was investing \$322.4 million in research and development in Canada, most of this going to the Toronto Lab.

In 2001, IBM invested in a new, state-of-the-art campus for its Toronto Lab. Today, this campus is IBM's third-largest software laboratory in the world – home to 2500 employees.

"The Toronto Lab has a global role" in the software businesses that make up 15 per cent of IBM's revenue, says Michael Gauvreau, Manager of Human Resources and Communications at the lab. Toronto leads IBM's worldwide development of database software, web-integration tools, electronic commerce and new "on demand" software that allocates work among servers in server farms. The campus also attracts clients and collaborators from around the world, eager to study IBM technologies under development. "We touch all of IBM's software technologies," Gauvreau explains. "No other IBM site can make that statement."

The Toronto Lab hosts as many as 60 university professors and academic researchers at any one time. According to Gauvreau, "the Toronto region has recognition in IBM worldwide for having a very talented workforce." The Toronto Lab rarely needs to look beyond Canada, recruiting many of its scientists from nearby University of Waterloo and University of Toronto. The Toronto Lab also helps to keep cutting-edge software developers in Canada by being one of Canada's largest employers of university computer science co-op students and interns even before they graduate.

IBM Canada created the Centre for Advanced Studies to manage its relationship with Canada's universities and governments. The Centre's success has made it an international model and it is being replicated in IBM research locations around the world.



A TORONTO REGION INDUSTRY SUCCESS

Scientists at Xerox have long searched for ways to make a better print toner while reducing costs to their customers. The company has now succeeded, thanks to technology developed over 11 years at the Xerox Research Centre of Canada (XRCC) located in Mississauga. Xerox's new technology grows uniform toner particles from molecules, creating a superior product that enables toner cartridges to last five times longer and produces imagery so fine that it looks like lithography.

This is only the latest in a long line of Xerox breakthroughs from the Toronto region, one of only five Xerox research centres in the world. XRCC is Xerox's top international laboratory for materials research, partly because the region hosts five leading chemistry and engineering faculties. Toronto region innovations "are used in 28 major Xerox products worldwide," says Dr. Hadi Mahabadi, who heads the XRCC.

The centre has strong links to the region's universities where many Xerox scientists have teaching positions. Being alongside a cluster of top engineering and chemistry schools is also critical for recruiting top scientists, says Dr. Mahabadi,

and "Canadian immigration policy is also a major factor for us, because Canada attracts some of the best people in the world." XRCC employs scientists from 36 countries, almost all of whom were already in Canada when they were hired.

The XRCC is now working to revolutionize the world of paper with an emerging suite of "printed organic electronics." This work may ultimately lead to computers that fold up like paper, are as light and malleable as a sheet, store data like a computer and display it like a computer screen.

XRCC is one of Xerox's most productive laboratories worldwide with 984 patents, over 950 publications, 74 patents and 165 invention disclosures in 2004 alone and innovations commercialized every year.



> “We keep our research in Toronto because of the ability to get a great supply of young, very bright people with lots of science and math background, ...generous R&D tax credits and research grants, ...and industry interaction, both formal and informal, with universities and research labs.”

DR. DAN ROSEN, VP, ALGORITHMICS

GROWING GOVERNMENT SUPPORT FOR RESEARCH

Canadian governments at all levels have contributed to a remarkable growth in research funding over the past decade.

The federal government has boosted research funding more than 50 percent since 1996, to \$7.5 billion annually. Federal funding for health research alone has grown 10 times since the mid-1990s to nearly \$2.5 billion in 2004. Through various matching programs, this has leveraged comparable growth in provincial support for research. Building on this expanded base, in 2003 the Government of Ontario committed additional investments of \$1 billion, including a substantial cancer research program, bringing critical new resources and focus to the province’s cutting-edge work in this area.

Together, the Ontario and federal governments now invest over \$2 billion annually in science and technology research and development conducted in publicly supported institutions in Ontario.

Signaling its unequivocal commitment to the support of research-intensive enterprise, the Government of Ontario recently established a new Ministry of Research and Innovation, led by the Premier of Ontario, the Honourable Dalton McGuinty. Ontario has also created an impressive Centres of Excellence network and has invested more than \$30 million in ORION, the most advanced fibre optic education network in the world, linking more than 67 research and post-secondary institutions throughout the province.

KEY CHALLENGES

Building on the strengths outlined above, the Toronto region’s R&D community is mobilizing to deliver a coordinated and strategic regional effort to move the Toronto region to the forefront of international R&D centres. This mobilization is both critical and urgent when we consider the region’s current performance in key areas related to competitiveness:

- Despite our outstanding research capacity, we are leveraging substantially less public research funding per capita than comparable urban regions in British Columbia and Quebec.¹⁸
- Our commercialization efforts are lagging behind those of competing regions, not just in the US, but here in Canada.¹⁹
- Venture capital financing for early stage initiatives continues to decline disproportionately in Toronto region and is largely concentrated in information and communication technology with little available in biotechnology – one of our other areas of strength.²⁰
- There is not yet a coordinated effort in place to aggressively market the Toronto region internationally as a premier R&D location, despite our enormous strengths and competitive advantages in this regard.

Moving the bar on these and other measures of competitiveness is now our top priority.

> “We’ve got great creative people from Canada.” JIM BALSILLIE, CHAIRMAN AND CO-CEO, RIM

WHAT WE NEED TO MOVE AHEAD

Action Plan

TRANSFORMING RESEARCH INTO GROWTH

Research is the source of new knowledge, knowledge fuels innovation, and innovation drives growth.

Place matters a great deal in this dynamic. Although national policies set the stage for robust innovation, most innovation occurs at the regional level where companies, workers, research institutions, and governments connect. Every region possesses unique assets that it can leverage to create greater prosperity. Sustained job and wage growth, however, depend on maintaining a dynamic regional environment that generates new knowledge and attracts companies that drive innovation.

In highly successful regions, innovation is concentrated in industry clusters, critical masses of linked industries and institutions that enjoy competitive success in a particular field.²¹ Regional economic growth relies on the aggressive development of these clusters, which increase productivity, wage levels, rates of business formation, and innovation.

Not surprisingly, regions internationally are mobilizing to develop and grow their industry clusters through a broad range of activities. These include: establishing new regional economic development initiatives, investing in innovation infrastructure and networks, launching programs to spur commercialization, actively promoting their regions as desirable knowledge-economy locations, and aggressively courting international firms to locate in their jurisdictions.

Successful clusters, once created, have a powerful self-reinforcing logic that encourages the largest clusters to capture most of an industry's development activity. As a result of this concentration dynamic, just nine city regions in the United States account for over 90 percent of research and commercial investment in the US biotechnology industry.²²

Creating a successful regional dynamic involves breaking down the barriers between sectors, and the institutions and organizations within them, and finding new ways to work together. This requires new forms of association and innovative organizations that can catalyze the latent potential in a region by introducing new synergies across disciplines, professions, and sectors, uniting diverse but necessary ingredients for innovation, and eliminating barriers to collaboration.

The TRRA was conceived in June 2003 to do just that. Since then, momentum in support of TRRA's mission has grown substantially. During this time, the TRRA has worked closely with its partners and stakeholders in industry, government and the research community, to develop the coordinated regional strategy outlined below to remove barriers to the region's success and to align key players in support of real opportunities for growth and development.

BUILDING RESEARCH CAPACITY

The Toronto region has a great start on the quantity and quality of research necessary to join the front ranks of world research centres but, if we are to transform the Toronto region into a world-leading centre for research and research-driven industry, we need to aggressively transform these strengths into true pre-eminence and put in place the measures that will sustain and grow our excellence over the longer term.

To this end, the TRRA has developed a two-pronged strategy. First, we will work to ensure a strong overall research environment because research excellence can only emerge from a strong research base. Secondly, we will pursue opportunities to accelerate investment and capacity building in a small number of priority research areas where we know we have the capacity to excel internationally, specifically:

- Biotech and the life sciences
- Information and communication technology
- Materials science and advanced manufacturing.

Within this context, the TRRA has established a clear action plan to move the region forward. Over the next three years, we will pursue the following objectives and related strategies:

Sustained and competitive levels of public research investment. This is a critical factor in our ability to compete with other regions internationally. In the competition for scarce public resources, there needs to be a strong voice advocating for research investment at an internationally competitive level. We also need to ensure the right mix of different funding types. This is a complex task and requires effective monitoring to identify and respond to gaps and weaknesses in the research system. The TRRA will work with its partners to:

- Take stock annually of public research investment in the region and report publicly on our performance relative to key competitor regions.
- Identify gaps/weaknesses in the funding mix and identify and advocate for solutions.
- Mobilize and coordinate high-level advocacy efforts to secure adequate, balanced and sustained public research investment.

An improved share of Canada's public research funding. The Toronto region and Ontario currently lag behind other regions in Canada when it comes to per capita distribution of public research funding, despite our relatively greater research capacity. One possible reason for this is that we do not do an effective job of setting regional priorities, coordinating our large-scale requests for funding across institutions, and making a case for their overall strategic importance to our region. The Toronto region needs a neutral broker to work with our universities and hospitals to develop longer-term strategic priorities for the region and to develop and advocate for funding proposals that will advance these. The TRRA will work with its partners to:

- Develop longer-term strategic capacity building plans for each of the priority research areas. These will build on our existing strengths while positioning the region for future success.
- Where necessary, coordinate the development and advancement of funding proposals that have the backing of the entire region and, therefore, a greater chance of success.

- Mobilize and coordinate sustained, high-level advocacy activity in support of specific research capacity building initiatives.
- Leverage additional private and philanthropic investment in key capacity building initiatives.
- Monitor and report to the public annually on the Toronto region's research capacity building performance.

Establishment of a world-leading Ontario cancer research program. The TRRA will work to advance the realization of the 2003 Ontario government commitment to invest \$1 billion over 10 years to establish an Ontario cancer research program. The TRRA's focus will be on ensuring this new program complements the region's existing cancer research enterprises while positioning us to compete more effectively for international talent and resources.

A key role for the Toronto region in public health. In May 2004, the federal government announced that Ontario would be home to the National Collaborating Centre for Infrastructure, Info-Structure and New Tools Development, one of six regional centres for collaboration on public health. The Ontario government has also announced its intention to establish a new Ontario Health Protection and Promotion Agency by 2006-2007. The TRRA will work to ensure these two key initiatives are located in the Toronto region and implemented in an integrated manner, building on the critical mass of public health expertise in the region.

A Toronto region National Research Council facility. The Toronto region is the only major urban region in Canada without a National Research Council (NRC) institute. These institutes typically represent \$50 to \$150 million in public research investment, are important R&D anchor facilities in their regions, and often attract industry R&D programs interested in leveraging their concentrated expertise. The TRRA

LARGE, DIVERSE, AND CREATIVE COMMUNITY

One of North America's largest urban centres

- Population over 6.1 million

A dynamic and diverse culture

- North America's most multicultural/diverse city¹
- Over 90 different ethno-cultural groups
- More than 80 languages spoken

Rank 2nd best city in North America for recreation²

- One of North America's largest recreational waterfronts
- Unique river and ravine park system containing North America's largest urban park – Rouge Valley
- Hundreds of kilometres of waterfront, park and urban cycling paths

Ranked 4th in North America for culture and creativity¹

- 2nd largest live theatre centre after New York
- Leading centre for film and TV production – “Hollywood North”
- World leading entertainment clusters (games/animation, media, music, museums)

SAFE COMMUNITIES WITH STRONG PUBLIC SERVICES

Substantially lower crime rates than US³

Publicly funded health-care system providing universal medical and hospital care

High quality public education system with 17 publicly funded post-secondary institutions

Expansive subway/transit network with 4th largest commuter rail system in North America

¹ Based on Richard Florida's 'Mosaic Index' which measures multiculturalism and diversity (Toronto #1) and his 'Bohemian Index' which measures creativity of a city through employment in artistic and creative occupations (Toronto #4)

² Anderson Worldwide Recreation Rankings

³ Relocation Crime Lab Index, 2003 (8/2003)

has been in active discussions with the federal government regarding the establishment of comparable institutes in the Toronto region. A concerted push is needed to secure this critical investment for the region. The TRRA will work with its partners to:

- Coordinate efforts to secure funding support from the NRC and other government and industry partners.
- Develop and advance proposals for several Toronto region NRC facilities. Proposals currently under development include:

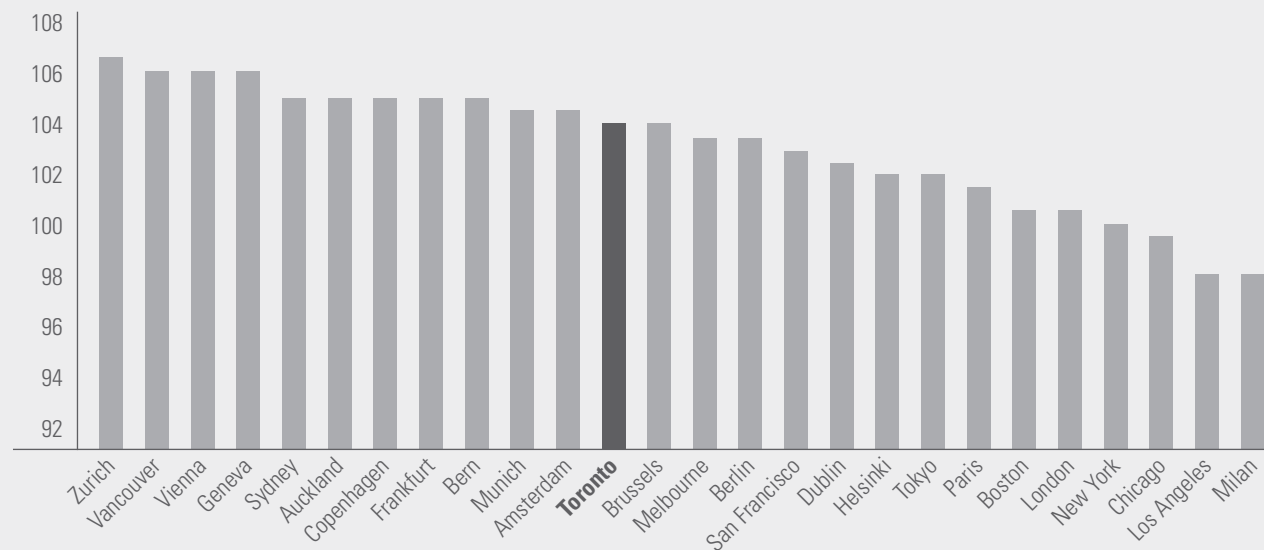
Translational Biomedical Research Institute – Focused on the development and application of new treatments and technologies, this institute will attract Canadian and international risk capital to emerging companies and move biomedical discoveries into the marketplace or to the bedside. Partners include the University of Toronto, MaRS and the Battelle Institute.

Convergent Technologies and Software Research facility – Focused on advanced software research with convergence applications at the frontier of biotech and information technology, this institute will also help to drive growth in the region’s medical and assistive devices sector. This effort is led by York University and the Town of Markham, in partnership with IBM and the University of Waterloo.

Institute for Quantum Computing – Focused on harnessing the power of atoms to tackle large computations and complex problems beyond the powers of today’s technology, this facility will advance our understanding and management of quantum computing. Led by the University of Waterloo with the generous support of Mike and Ophelia Lazaridis, this initiative is designed to move Canada to the forefront of quantum technology research and to spark breakthroughs in many disciplines. Partnership with the NRC is one of a range of potential funding options under consideration.

TORONTO REGION AMONG THE BEST PLACES IN THE WORLD TO LIVE – SECOND IN NORTH AMERICA

Mercer Quality of Life Index – 2003



A critical mass of top research talent. Although the Toronto region is home to exceptional research institutions and a significant number of the world’s most highly cited researchers, we need even more established leaders and promising young researchers. In choosing where they want to work, leading researchers look for a critical mass of high calibre peers and graduate students in their field, access to state of the art research facilities and equipment, competitive compensation, a research environment that rewards excellence, and a high quality of life for themselves and their families. Securing more of this highly skilled technical talent must be a critical priority in our broader effort to achieve and sustain world-class excellence. The TRRA will work with its partners to:

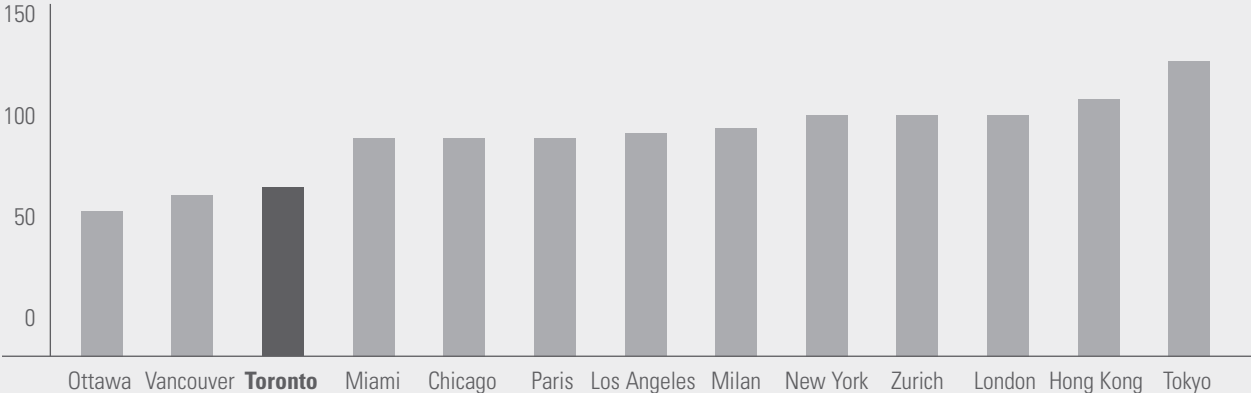
- Explore mechanisms to facilitate the development and attraction of leading research talent.
- Identify barriers to retaining talented researchers and work with research institutions and funding partners to formulate effective solutions.
- Secure the critical infrastructure in priority research areas that is needed to attract and keep top talent.
- Foster a regional culture that values and celebrates the contributions and successes of our research community.

Strengthened institutional collaboration. While competition among research institutions is necessary and healthy, there must also be a willingness to collaborate to advance the region’s research enterprise overall. This is already happening, but we need to accelerate and extend these collaborations, making them a permanent feature of the region’s research culture. The TRRA will work with its partners to:

- Establish a Research Working Group with representation from key research institutions and research funders to identify priorities and coordinate action with regard to the above initiatives.
- Establish ad hoc working groups as needed to tackle short-term projects and initiatives with multiple regional stakeholders.

ONE OF THE LOWEST COST OF LIVING RATINGS IN THE WORLD

Cost of Living Survey – 2003 Source: Mercer Quality of Living Study



IMPROVING COMMERCIALIZATION PERFORMANCE

There is no doubt that the Toronto region can improve its commercialization performance and generate more strong, new technology-based companies. The creation of the MaRS Centre represents a significant step forward in this regard and a prime regional asset.

The TRRA is working closely with MaRS, the region's technology transfer offices, our venture capital community, local industry and senior levels of government to ensure we have the necessary financing, skills, and commercialization infrastructure in place to support the smooth passage of new ideas and technologies into the marketplace.

The action plan outlined below is designed to move the region to the forefront of commercialization in Canada and to speed the transformation of more of our R&D into innovative products, high growth companies and quality jobs for Ontarians. The TRRA will play a key catalytic role in this process, working in partnership with all levels of government, MaRS, other regional organizations, industry and research institutions to realize the following objectives:

Improved access to early-stage risk capital. The Toronto region faces a critical shortage of pre-seed and seed stage risk capital for potential new technology businesses. Except for a brief period during the market boom of 1995-1999, there has never been sufficient risk capital available in Ontario to capitalize on most of the valuable scientific research carried out by our scientists. Other jurisdictions have successfully resolved this problem with joint public/private investment programs. Ontario needs to do the same. The TRRA will work with its partners to:

- Advance the implementation of the *Ontario Next Step* program, a joint public-private venture initiative designed by the TRRA to generate \$500 million in new investment to finance new technology ventures arising from publicly funded research in Ontario.
- Leverage the proposed *Next Step* program and TRRA's networks and contacts to attract more international venture capital firms to establish offices in the region.

TORONTO REGION COMMERCIALIZATION CHALLENGES

- The Toronto region's commercialization ratio (gross license income to \$million research expenditures) lags that of Canada overall (1% vs. 2%) and is significantly lower than the US university average (3%) or that of US hospitals and research institutions (7%).²³
- In 2001, Toronto region institutional research generated 0.04 US patents per \$1 million research expenditures, compared to 0.09 for Canada overall, 0.12 for US universities, and 0.15 for US hospitals and research institutions.²⁴
- Toronto region venture capital (VC) investment is low relative to other regions in Canada based on a 1996-2004 compound average growth rate of 1.8%, relative to 19.8% in the rest of Ontario, 8.4% in Quebec, 11.1% in British Columbia, 6.0% in Alberta, and 6.9% in Canada overall.²⁵
- New VC investment in the Toronto region, as measured by 2002 VC investment as a percentage of GDP, trails that of Ontario, Quebec and key US competitor regions like California and Massachusetts.²⁶
- VC investment growth in the Toronto region lags in all sectors relative to the rest of Ontario, Ontario overall, Alberta, British Columbia, Quebec, and Canada.²⁷

MaRS DISCOVERY DISTRICT: ACCELERATING INNOVATION

The MaRS Discovery District is a not-for-profit corporation created by academic, business, and scientific leaders to foster a stronger culture and more efficient marketplace for commercialization in Ontario.

The MaRS Centre, a cutting-edge convergence centre located on Toronto's famous University Avenue (home to one of the largest medical complexes in North America), is designed to directly connect new ideas and discoveries with commercialization resources like entrepreneurial talent, venture capital, and receptor industries. The Centre co-locates public and private research laboratories, start-ups and established companies, business and scientific support services, and venture capital all under one roof. In total, over 1.3 million square feet of space has been designed to create optimal interaction.

The MaRS Centre is also the focal point of the City of Toronto's designated Discovery District - two square kilometres in the heart of downtown Toronto that are home to seven world-renowned hospitals and more than 30 specialized medical and related sciences research centres. The Discovery District also includes the University of Toronto, while Bay Street, the heart of Canada's financial district, is only blocks away.

MaRS also serves the broader region through satellite branches like MaRS Landing in the City of Guelph, facilitating interaction among the region's diverse R&D hubs. MaRS' benefits will also be extended virtually through the MaRS Portal – an online community connecting commercialization stakeholders from across the province and beyond.

By building a more closely knit commercialization community, MaRS will improve Ontario's technology transfer productivity, increase capital flows, and grow the number of successful new companies spinning out of Toronto region and Ontario research institutions.

Increased technology transfer resources, scale and expertise. University and hospital technology transfer offices play a critical role in the commercialization process, identifying potential commercial opportunities and providing the legal, financial and technical support necessary to patent and license discoveries and establish new start-up companies. These offices are significantly under-resourced, and consequently lack the staff and in-depth expertise to fulfill these mandates effectively.²⁸

However, more resources alone are unlikely to solve the problem entirely. Effective commercialization requires highly developed and active networks linking innovative researchers and their ideas to a broad range of industry receptors, fellow innovators, and potential investors. It also requires concentrated expertise in diverse technology and industry sectors. We need to 'scale up' some of these functions by developing shared, regionalized capabilities to augment and complement those of individual technology transfer offices. The TRRA will work jointly with MaRS, and with other partners to:

- Help create a made-in-Toronto region CONNECTS program to link our researchers to the investors, receptor industries, and specialized professional expertise they need to successfully commercialize their ideas.
- Develop a regional strategy to scale up the region's technology transfer infrastructure through a combination of shared regional and individual institution level functions.
- Facilitate the coordination of university and hospital based technology transfer 'centres of excellence,' specialized in different technology sectors, to serve the broader region through agreements with peer institutions.
- Advocate for increased resources to support this enhanced and more effective regional technology transfer system.

A cadre of skilled entrepreneurs to manage new start-ups. No amount of capital, education, or technology can produce successful commercial ventures without entrepreneurship – the business skill, commitment and drive required to turn a new idea or discovery into a thriving business. Not surprisingly, relatively few scientists are themselves entrepreneurs. The absence of a pool of serial entrepreneurs available to take on the challenge of a new technology start-up is a critical impediment to successful commercialization. We need to develop a cadre of skilled entrepreneurs with the expertise, networks and experience necessary to successfully manage and grow new technology start-ups. The TRRA will:

- Support MaRS' efforts to develop and secure funding for internship, training and development programs to increase our pool of skilled commercialization personnel.
- Leverage TRRA networks and contacts to assist MaRS in recruiting skilled entrepreneurs to work with new start-up companies.

A TORONTO REGION INDUSTRY SUCCESS

No Canadian invention has dazzled technology aficionados more in recent decades than the BlackBerry wireless handheld.

One of Canada's most visible high technology success stories, this five-ounce handful of communications is the creation of Research In Motion Limited (RIM). RIM was founded in 1984 by University of Waterloo Co-op student Mike Lazaridis and his partner Doug Fregin, and is now a global leader in the design, manufacture and marketing of innovative wireless solutions for the worldwide mobile communications market.

RIM has consistently won awards for its product innovations and, not surprisingly, in an annual *Report On Business Magazine* poll determining Canada's most respected companies, RIM placed first in one of the most important categories – innovation.

There is no doubt that RIM's brilliant wireless technology has users singing its praises – and contributing to RIM's growing bottom line. Sales in fiscal 2005 were more than US\$1.3 billion, compared to US\$595 million the previous year – a far cry from RIM's sales of \$500,000 in 1992. Meanwhile, at last count, RIM had more than 3.1 million BlackBerry subscribers worldwide (up from two million in November 2004).

RIM invests heavily in ongoing R&D. R&D expenditures jumped US\$38.5 million last year to US\$101.2 million in fiscal 2005. 1,333 people are currently employed at RIM's state-of-the-art Waterloo, Ontario R&D facility, which houses research, testing and certification laboratories to facilitate new product development and help speed up the time to market for new products. In 2002, RIM also opened an 18,300-square-metre manufacturing facility. Locating its manufacturing plant in Waterloo close to its R&D facility has given RIM a strong competitive advantage in getting products to market faster than other companies that manufacture offshore.

RIM currently employs approximately 3,500 employees around the world, 1,227 more than in 2004, and continues to hire in key areas. In addition to offices in Canada, RIM now has offices in the US, UK, Germany, France, Italy, Hong Kong, Australia and Singapore. However, the location of RIM's head office, R&D, and manufacturing facilities close to the University of Waterloo, allows it to take advantage of a deep talent pool of knowledgeable and highly skilled young people.



Sources: RIM 2005 Annual Report. Government of Canada, Innovation in Canada Case Study #7. Available at: www.innovation.gc.ca/gol/innovation/site.nsf/en/in04212.html

PERIMETER INSTITUTE: MOVING THE TORONTO REGION TO THE FOREFRONT OF THE QUANTUM REVOLUTION

Launched in 2000 in the City of Waterloo, through the vision and leadership of Research in Motion Co-CEO, Mike Lazaridis, the Perimeter Institute has rapidly become one of the world's foremost facilities devoted to fundamental research in theoretical physics.

This award-winning complex has attracted a critical mass of international scientists, collaborating to break new ground regarding the ultimate nature of space, time and matter. Their focus is on foundational research – achieving breakthroughs in thinking from which new technologies can later arise. Perimeter scientists have set their sights on major advances in the fields of superstring theory, quantum gravity, the foundations of quantum theory and quantum information theory – an area that is laying the groundwork for a new generation of computers.

Scientists at the Institute enjoy an unusual degree of research freedom. The Perimeter Institute provides a more research-intensive atmosphere than standard academic departments, while still benefiting from collaborations with neighbouring universities in the Toronto region and others around the world. A world-renowned Scientific Advisory Committee meets regularly to review the Institute's achievements and to help guide new research activities.

Perimeter is a public-private partnership. It began with a personal \$100 million donation from Mike Lazaridis and \$10 million personal donations from fellow RIM executives Doug Fregin and Jim Balsillie. These extraordinary gifts attracted \$20 million in donations from other private individuals and \$55 million in public support from federal, provincial and municipal governments.

Perimeter is closely linked, through joint appointments, to the Quantum Materials program of the Toronto region's Canadian Institute for Advanced Research (CIAR). CIAR is unique in the world in its mission to link the best minds in Canada to their peers worldwide in long-term, multi-disciplinary explorations of fundamental scientific questions. Together, these two remarkable institutions have transformed the Toronto region into a leader in quantum physics, positioning the region at the forefront of the next information technology revolution.

ATTRACTING RESEARCH-DRIVEN INDUSTRY AND INVESTMENT

There is clear agreement in the region, at all levels, that a new more strategic, coordinated and aggressive approach is needed to market the Toronto region's R&D strengths internationally and to attract the companies and investment we are seeking. This means taking stock of our R&D capacity, positioning our offering competitively in relation to other regions, and aligning our regional energies and resources in support of a single coordinated approach to identifying and recruiting attraction targets. The action plan outlined below is designed to meet this challenge by targeting the following objectives:

Creation of a comprehensive fact-base to track R&D capacity and performance. There is currently no coordinated effort underway to monitor the region's R&D capacity and to track progress in growing our research-based industries. We need a comprehensive fact-base on our public and private R&D capacity and performance monitoring over time to substantiate our strengths, position these effectively against competitor regions, and successfully market the region to international companies and investors. The TRRA will work with its partners to:

- Design and build a comprehensive online R&D fact-base that covers the region's research capacity, commercialization performance and R&D investment levels and is accessible and relevant to the full range of R&D stakeholders in the region.

- Develop new data sources, where necessary, to tell the region's story effectively and to position the Toronto region competitively relative to other jurisdictions.
- Monitor and report annually on the region's performance with regard to research capacity, commercialization, and growth in R&D investment and industries.

Development and marketing of a Toronto region R&D brand. Much more can be done to strengthen and coordinate the communication of our superior capacity in order to move the region onto the short list of venues that international knowledge-based companies automatically consider in their relocation and expansion plans. The TRRA will work with its partners to:

- Research key R&D location drivers in target sectors and industry perceptions of the Toronto region relative to competitor locations.
- Collect intelligence on positioning, marketing and attraction efforts of competitor regions.
- Develop and implement a coordinated R&D brand strategy for the Toronto region.
- Design and implement a pro-active, regional R&D marketing strategy including TRRA public events (e.g. annual research summit, awards event) and a coordinated Toronto region presence at key international R&D events.
- Develop a web presence to provide companies and location selection firms with up to date, sector relevant information on the region's merits as an R&D location.
- Attract key international R&D conferences and events to the region.

A strategic and targeted attraction campaign for research-driven anchor investments. The region does not yet have a strategic, fully coordinated program to market the region's R&D capacity to selected top international firms. While the Greater Toronto Marketing Alliance and other municipally based organizations effectively coordinate some of this activity within parts of the region, there continue to be many disparate efforts by individual research institutions, municipalities and other levels of government. We need to align and coordinate these efforts, using in-depth industry and competitive analysis to strategically target prospects, and to mobilize the participation of our senior industry, research and political leadership to strengthen our marketing and sales process. The TRRA will work with its partners to:

- Convene and facilitate tables comprising senior leaders from top R&D-driven firms in the region to explore ways to foster greater private sector R&D investment in the region.
- Perform industry research to identify target sectors and firms most likely to be seeking a North American R&D location within the next five years.
- Develop marketing and sales strategies tailored to target sectors and firms.
- With partners, plan and lead high-level sales missions to target firms, with the participation of CEOs of peer firms already in the region, top corporate customers, local marketing organization partners, leading researchers in related fields, senior regional, provincial, and federal elected officials and TRRA volunteers.

A culture that values and promotes research success. Few of our political and civic leaders are aware of our extraordinary research capacity or of the critical relationship of research to our ability to grow and sustain knowledge-based industry and high quality jobs. In recent years, the media have significantly increased their science and technology coverage. We need to build on this opportunity, creating more bridges between the scientific community and the public, more vehicles to share our successes, and more ways to increase public understanding and support for research as a building block for the region's prosperity. The TRRA will work with its partners to:

- Actively engage regional decision makers to increase their understanding of the links between research and our future economic prosperity.
- Encourage regional leaders – civic, industry and government – to speak publicly on this issue and provide them with the information they need to do so effectively.
- Engage and serve as a resource to the media, helping them to increase the public's awareness of our exceptional research strengths and their importance to the future of our region.
- Collect information on the region's research capacity, strengths and successes and tell our story – showcasing our successes here at home, as well as internationally.
- Host an annual Toronto Region Research Summit to report on the region's progress, advance capacity building initiatives, address opportunities and challenges related to the region's research enterprise, and publicly celebrate our success stories.

ALIGNED FOR SUCCESS

Our success in meeting these goals will depend on our ability to become a network that can set objectives, coordinate resources and work collaboratively across institutions, disciplines and sectors. Competitor regions such as New York, Atlanta, and San Diego, have already forged such alliances and are reaping the benefits. The Toronto region now has to do the same if we are to compete successfully for the global investment we need to grow our key industry clusters and support emerging new ones.

Clusters are as much a product of regional culture, organization and initiative, as they are of concentrated talent and investment. This realization has catalysed the mobilization that is now underway in our region.

Together, our research-based companies, research institutions, regional organizations, financial community and government partners have identified the assets we can build on and the challenges ahead of us and are now working aggressively to put our own virtuous cycle in motion.

We look forward to meeting the challenges ahead together and invite the support and participation of all individuals and organizations that wish to contribute to this critical endeavour.

Contributors >

The Toronto Region Research Alliance would like to express its profound appreciation to the many partners, supporters and volunteers that have assisted in its development since June 2003. Their support has been, and will continue to be, an invaluable resource and the key to our success.*

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FOOTNOTES

- 1 The "four motors" are Europe's leading industrial regions – Baden-Wuerttemberg (Germany), Catalonia (Spain), Lombardy (Italy) and Rhone-Alpes (France).
- 2 Toronto City Summit Alliance. April 2003. *Enough Talk: An Action Plan for the Toronto Region*. p.3.
- 3 The Boston Consulting Group marketing study, May 2005 using data from Michael E. Porter, Cluster Mapping Project, Harvard Business School Institute for Strategy and Competitiveness; and E&B Data, *Greater Toronto Information and Communication Technology (ICT) Industry Profile 2004*.
- 4 The KPMG Competitive Alternatives Study covers: Australia, Canada, France, Iceland, Italy, Japan, Germany, Luxembourg, Netherlands, United Kingdom and United States. See <http://www.competitivealternatives.com>
- 5 Based on a 10-year average annual total of location sensitive costs across 17 R&D sectors. 2004 Competitive Alternatives study, KPMG.
- 6 2004 Competitive Alternatives study, KPMG.
- 7 Source: Project Eagle, Royal LePage, Toronto. KPMG Management Consulting, 2002.
- 8 Source: Project Eagle, Royal LePage. *Employee Benefits, 1995*, prepared by the Research Centre, Economic Policy Division, US Chamber of Commerce and KPMG, *Employee Benefits Cost Survey, 1996*. Adapted from KPMG *Corporate Taxation and Employee Benefit Cost Guide for Large Service Firms*, prepared for the ICT Branch, Industry Canada, March 2000.
- 9 Project Eagle, Royal LePage.
- 10 These include capital equipment, overhead, process R&D, salaries and materials.
- 11 OECD Education at a Glance (2002); Statistics Canada Custom Tabulations for Ontario (12/2002) as per http://www2.ontario.com/welcome/ooed_601.asp
- 12 Greater Toronto Marketing Alliance. See <http://www.greater.toronto.on.ca/new-sectors/index.html>
- 13 Based on 2000 employment data from Institute on Competitiveness and Prosperity. *First Working Paper: A View of Ontario: Ontario's Clusters of Innovation* available at: <http://www.competeprosper.ca/clusters/clusterprofiles.php>
- 14 Toronto Economic Development, *Medical and Biotechnology Cluster Profile, 2003*.
- 15 Greater Toronto Marketing Alliance. Biomedical PowerPoint Presentation available at: <http://www.greater.toronto.on.ca/new-sectors/index.html>

- 16 Toronto Economic Development, *Medical and Biotechnology Cluster Profile, 2003*
- 17 E&B DATA – *Greater Toronto Area Information and Communications Technologies Study 2004*. Available at: <http://www.greater.toronto.on.ca/new-sectors/ict/ict-study.html>
- 18 Based on most recent data available from federal research funding agencies 2003 CFI, 2002-03 CIHR, 2002-03 NSERC, 2001-02 SSHRC. Analysis performed by The Boston Consulting Group.
- 19 Data from PWC Money Tree, Macdonald & Associates Limited, Ontario Ministry of Finance, Statistics Canada, US Department of Commerce. Analysis performed by The Boston Consulting Group.
- 20 Ibid.
- 21 Porter, Michael E. (2000) "Location, Competition and Economic Development: Local Clusters in a Global Economy" *Economic Development Quarterly* 14, no. 1, February 2000: 15-34.
- 22 Cortright J., Mayer, H. *Signs of Life: The Growth of Biotechnology Centers in the U.S.* The Brookings Institution Center on Urban and Metropolitan Policy.
- 23 Data from Association of University Technology Managers (AUTM) 2000 and 2001 Surveys
- 24 Data from AUTM 2000 & 2001 Surveys, University of Toronto Innovations Foundation 2000-2001 Annual Report, and interviews conducted by The Boston Consulting Group. Analysis performed by The Boston Consulting Group.
- 25 Data provided by Macdonald & Associates Limited (now Thomson Macdonald). Analysis performed by The Boston Consulting Group.
- 26 Data from PWC Money Tree, Macdonald & Associates Limited, Ontario Ministry of Finance, Statistics Canada, US Department of Commerce. Analysis performed by The Boston Consulting Group.
- 27 PWC Money Tree, Macdonald & Associates Limited, Ontario Ministry of Finance, Statistics Canada. Analysis performed by The Boston Consulting Group.
- 28 See Advisory Council on Science and Technology, *Public Investments in University Research: Reaping the Benefits – Report of the Expert Panel on the Commercialization of University Research, presented to The Prime Minister's Advisory Council on Science and Technology, May 4, 1999 and Canada's Innovation Strategy – A Response by PARTEQ Research and Development Innovations.* Queen's University, Kingston.

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