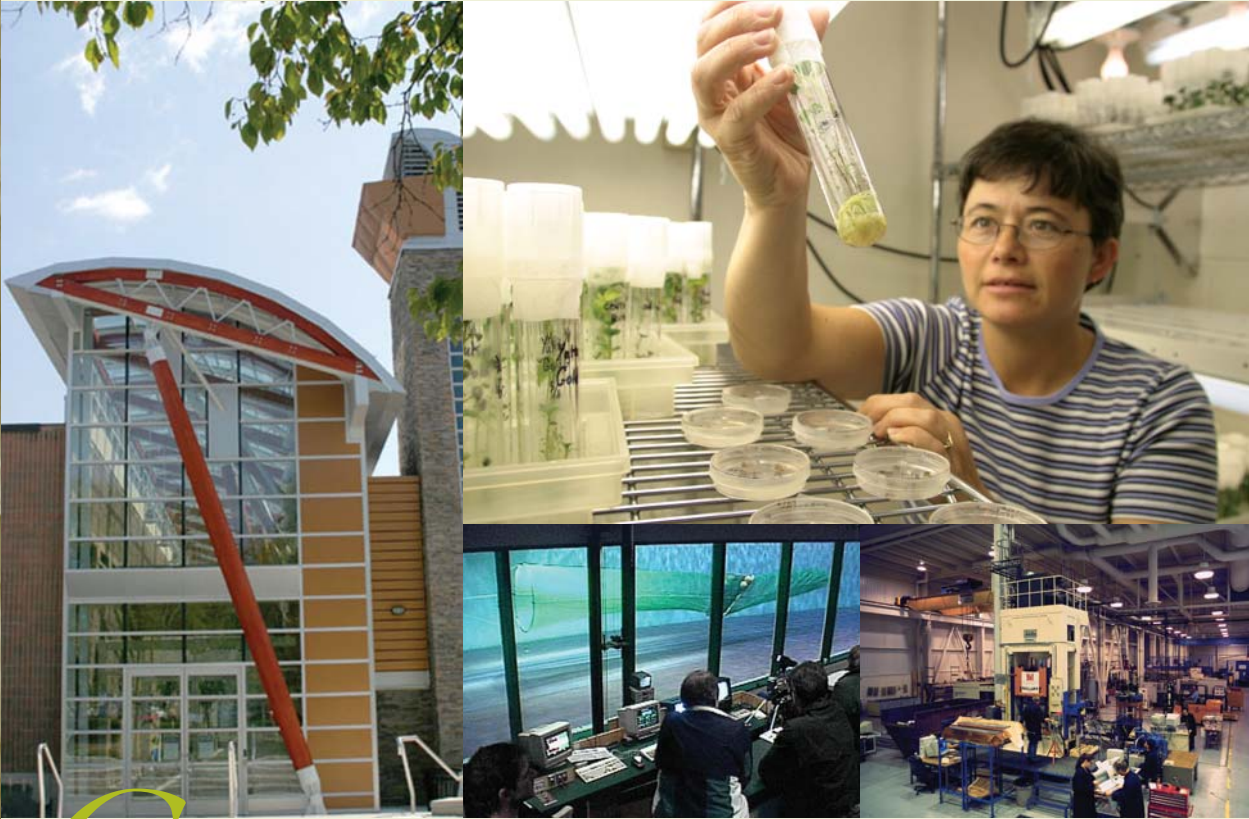


Canada's Colleges and Institutes of Technology



Partners in **Applied Research,
Development and
Technology Diffusion**

Ideas and solutions need p



Canada is a trade-dependent country which depends heavily on small- and medium-sized enterprises to help move it forward in terms of competitiveness, innovative use of technologies, and the production of high-value, quality products.

Over 150 colleges and institutes of technology serve Canada's business and industry in 900 communities. Colleges and institutes are mandated to be closely tied to their communities and to respond quickly to the changing knowledge and skill needs of their regions. They provide key support to economic development goals and strategies.

Colleges and institutes are the primary post-secondary institutions directly advancing technology transfer and diffusion. They invest in people, ideas and enabling technologies. Importantly, the results of college and institute research reach the marketplace and the Canadian public. Putting good ideas into good practice means not only conceiving and developing but implementing solutions to environmental, health, agricultural, energy, manufacturing and technology challenges of importance to Canadian well-being, quality of life and the country's competitive advantage.

Ideas and solutions need places to grow and develop. Colleges and institutes of technology provide the skills, the incubating environment, and the knowledge to generate and bring ideas to fruition. Interaction between clusters and groups – business, industry, academe, researchers and students – is a hallmark of the fluidity of the college and institute system. Colleges and institutes and their constituent elements are in the business of filling gaps in knowledge and the application of skills and technology, and providing solutions.

Filling the gaps takes some unique institutional attributes. Mandated to train the workforce of tomorrow and re-train the workforce of today, colleges and institutes serve almost every

laces to grow and develop.



community in Canada, and house a capital inventory of over \$25 billion and a human resource base of 60,000 full-time and 150,000 part-time employees. Fundamentally applied in nature, colleges and institutes work closely with Program Advisory Committees to apply the needs and expectations of employers to curricula, co-op programs, clinical placements and simulated work environments. Applied skills and knowledge form the cornerstone to the sound socio-economic development of the country. Colleges and institutes ensure that economic needs and trends are identified, met and corresponding innovations applied.

The research, development and commercialization process in colleges and institutes primarily involves development and commercialization and is inherently applied; focusing on market needs or market pull, technology transfer, new processes, and prototypes – all with sound applications to economic development. It includes developing proof of concept in the marketplace; conducting applied research – the application of new knowledge to a specific problem or goal; prototyping and simulation; testing and analysis; and industrial/field/clinical trials. While both universities and colleges/institutes conduct development work, development is the dominant focus and strength of college and institute applied research.

The “outputs” of development are new and improved products or processes, documentation, the adoption of new technologies, the discovery of new uses for existing technologies or knowledge, the discovery of technical solutions to problems, or new policy development. Commercialization itself occurs in business and industry and includes new product launch, new business start-up, business development and expansion, or trade exploration. The benefits of college and institute applied research, development and technology diffusion are many and complex. Most importantly, they underpin the path of the economy in a future which will require Canada to become more trade-independent, more commercially innovative and more renowned for niche knowledge and skills in an increasingly competitive world.

Snapshot

Health and Life Sciences

In 2004, the Applied Research Division of Algonquin College (Ontario) with students in Photonics Engineering, Mechanical Engineering and Computer Science, created networked, simulated surgical environments using haptics and 3D technologies that simulate the look, touch and feel of real surgical intervention. The technology allows learners to experience the real-time sensations resulting from an instructor's demonstration of surgical interventions where learners and instructors are in different locations.

The outcome of the research was the design and development of a haptic surgical simulation training workstation prototype. The workstations for teacher and student are connected via the Internet to enable the simultaneous sharing of surgical movements and pressure. Private sector partners were Handshake Interactive Technologies, Inc. and MPB Technologies. The impact of this area of research in the health sector includes the development of haptic virtual reality surgery simulations training, so that teaching hospitals can deliver remote training, as well as collaborative work by surgeons separated by distance.

Manufacturing

The Industrial Research Development Institute (IRDI) is owned by Georgian College in Ontario. Since 1995, the 55,000 sq. ft. Institute, featuring state-of-the-art labs and an industrial-scale shop floor, has provided a wide range of engineering services to the manufacturing sector. Most research challenges are brought to IRDI by specific manufacturers.

IRDI offers five technology groups: metal stamping, plastics, machining, tribology (the science of friction, lubrication and wear) and hydroforming (a metal forming technique in which water is pumped into a

metal tube that is inside a die or mould. The water, at high pressure, pushes the tube out against the mould, forcing it into the desired shape.)

In the area of hydroforming, IRDI is leading the way in the development of more powerful analytic tools. With tube hydroforming technology becoming very popular and widely used in the automotive industry, it has great potential to save money and improve product performance. Georgian's free expansion hydroforming test system has produced extraordinary results, enabling manufacturers to better understand the opportunities and challenges associated with this technology.

IRDI is certified by the Fabricators & Manufacturers Association, International as an Education Centre, sharing expertise through a series of comprehensive workshops and seminars.

Researchers, technicians and technologists, and where possible students and faculty, can work together in value-creating groups to develop design solutions and prototypes.

Composite materials, often referred to as reinforced plastics, are used to improve the performance, durability and cost-effectiveness of manufactured products. The composite materials industry has experienced remarkable growth resulting in increased demand for industry-specific applied research and development and skills transfer for the workplace. The Centre de développement des composites du Québec (CDCQ) or the Québec Centre of Composite Development at Cégep de Saint-Jérôme in Québec contributes to the growth of businesses in the composites sector through research and development activities and projects, as well as the provision of specialized training for companies operating within the sector. For example, CDCQ worked

Applied Research

with a group of specialists from the Cirque du Soleil to strengthen their knowledge of the properties and mechanical applications of composites used for stage structures, sets and props. Customized training allowed the Cirque du Soleil to target those structures or parts thereof that could benefit from the use of composites, and to optimize the properties of these materials.

CDCQ has also been involved in workplace technology transfer with a leading manufacturer of premium quality mannequins. CDCQ developed a manufacturing process for 12 mannequin components, as well as tooling methodology (moulds) and the materials used (content).

Textile Technologies

In 2005, the Centre for Textile and Geosynthetic Technologies (CTT Group) of Cégep de Saint-Hyacinthe (Québec) introduced the SilverClear™ innovative solution to market. SilverClear™ is an anti-bacterial and bactericidal product for the treatment of nanomaterials and textiles. The formula, developed by the CTT Group research team and based on silver nanocrystals, is colourless, economical, and ecological. It is also easy to apply, does not affect the feel of the material and is an efficient anti-odor treatment. SilverClear™ allows textile enterprises to add value to their products and the formula can be customized for use in a wide range of different sectors including: hospitals and health care; dressing of wounds and burns; cleaning of clothing; and, the manufacture of specialty textiles, bed linen, underwear and hygiene products.

The development of a chemical intelligent treatment allows the CTT Group and its industrial textile partners to expand into new directions and development in the field of intelligent nano- and textile materials.





Marine and Aquaculture

A hub for advanced marine technology, the Marine Institute is dedicated to applied research and technology transfer in support of the marine industries and operates several well-equipped, specialized research centres. For example, the School of Fisheries provides applied research to meet the needs of the harvesting, processing, and aquaculture sectors of the seafood industry, and the food industry in general. The Centre for Aquaculture and Seafood Development (C-ASD) is comprised of five independent recirculating systems and a flow-through fresh water quarantine unit which services a full range of industrial clients, from owner/operator start-up companies, to large, national corporations in the areas of applied research, product and process development, technology transfer and advisory services, and support for education and training.

The Fishing Technology Unit (FTU) is committed to improving the viability of the local fish harvesting sector while focusing on the development of technology and harvesting strategies that lead to the improved sustainability of global fish resources. At the centre of FTU operations is the world's largest circulating water channel or "flume tank", equipped with a 20m long x 3m high observation window. The tank enables researchers to construct scale models of new fishing gear designs and to simulate their behaviour under controlled conditions. Underwater cameras and a data acquisition system provide information on the performance of the models.

The Irish Fisheries Sea Board (BIM) tested two scale models of Irish fishing trawls using the tank with the results viewed live on screen 2,000 miles away in Ireland.

Knowledge

Aerospace

The Stevenson Aviation and Aerospace Training Centre of Red River College delivers timely manufacturing training and research to Manitoba's growing aviation and aerospace industries.

Ranging from value stream mapping, problem solving and future state in a simulated manufacturing plan lab to determining training requirements for any new applied composites technology, the Centre is a hub for applied research.

Although the Centre's partners include major industry players such as Standard Aero, Bristol Aerospace and Boeing, small- and medium-sized enterprises are also attracted to the Centre to gain access to technology transfer and exposure to new developments, especially in the area of composites. Being lighter and stronger than conventional materials, composites are especially attractive to the aerospace industry and are becoming increasingly common in other industries such as sports equipment. Working with composites requires special techniques and equipment that many small- and medium-sized companies do not yet have. Bridging these types of gaps in key technology and skills access and diffusion is key to the growth and competitiveness of the industry.

Skills

Fuel Cell Energy

The Northern Alberta Institute of Technology (NAIT) Fuel Cell Applied Research Project is the first commercially operated high-voltage fuel cell in Canada. The purpose of the project is to investigate and demonstrate ways of using the electricity and heat produced by fuel cells and to develop a fuel cell education program. NAIT power engineering students will be given the opportunity to work with the fuel cell and learn new skills that may benefit future employers. The NAIT Fuel Cell Applied Research Project also provides an opportunity for the students, businesses and the public to learn more about how fuel cells work and the role they can play in their daily lives.

NAIT is partnering with Alberta Innovations Science through the Alberta Energy Research Institute, ATCO Gas, Western Economic Diversification and Climate Change Central to install and integrate a 200 kW phosphoric acid fuel cell that produces electrical and heat energy used by the facility.

Energy production efficiency is about 65 percent - much higher than other heat engines. NAIT's applied research project team has investigated ways to use the clean energy produced by the fuel cell, such as heating the swimming pool and domestic hot water in the Activities Centre, plus other thermal sinks on campus.



Learning

Applied Geomatics

The Applied Geomatics Research Group (AGRG) at Nova Scotia Community College is undertaking research on the environmental health applications of geomatics – research which is developing Canada’s global reputation as a place where outstanding research and training is conducted. The AGRG examines environmental impacts on the health of humans, as well as the effects of the human population on the environment.

Four key topics of AGRG applied research are: climate change and extreme weather events, water quality and hydrogeology, species occurrence and habitat modeling, and coastal zone management. For example, one recent project involves integrating environmental and geomatics technologies for landscape monitoring, assessment and restoration. Applications include: classifying and mapping natural vegetation communities and agricultural land use; expanding climate and hydrology networks via wireless or satellite technology; investigating the relationship between scale and landscape monitoring and assessment; designing, developing and testing new environmental instrumentation; and better integrating remote sensing with temporal hydrometric network data products in a GIS environment for improved land use modeling and management.

Renewable Energy

Renewable energy applies to a number of energy sources that have one thing in common: they all produce electrical, thermal or mechanical energy without depleting natural resources. Renewable energy sources generally include water, biomass, wind, sunlight, earth and waste. The Aurora Research Institute of Aurora College

in the Northwest Territories is involved in the area of distributed power generation systems and new developments in energy storage technologies.

Currently, remote communities in the Northwest Territories produce electricity by diesel generation. Use of diesel as a fuel for internal combustion engines releases at least a hundred times more smog-forming pollutants than the most efficient power plant. Pollutants released from diesel have been shown to increase the risk of health problems from asthma to lung cancer. In addition, the use of fossil fuels such as diesel contributes to climate change, which endangers the flora and fauna on which humans depend. Distributed generation technologies are expected to mitigate climate change and to improve the environmental quality and human health of the residents in the Northwest Territories. The Research Institute is leading the way by installing a hybrid system to generate power for its own facility. The system consists of a 1.4kW photovoltaic array and an 850 watt wind turbine.

Transformative Technologies Information Technology

Colleges and institutes often act as technology, prototype and commercialization hubs serving small- and medium-sized enterprises.

For example, in 2005 SAIT Polytechnic (Alberta) joined forces with Microsoft, HP, Cisco and DIRT Environmental Solutions to create a new centre to allow small- and medium-sized businesses an opportunity to evaluate and beta test new software and hardware solutions prior to adopting them.

Affectionately dubbed the “PlayPen”, the Centre of Innovative Information Technology Solutions (CIITS) offers the Solutions

Simulation Pod which allows companies to beta-test new IT solutions and model their current business processes in a secure environment. It also offers the Training Cluster, a state-of-the-art learning environment that accommodates all types of computing devices including desktop, network, tablet and laptop hardware all within each individual learning station.

Initially aimed at the energy manufacturing sector, the Centre will expand into the health and construction sectors.

Virtual Reality

Since 2001, the Centre for Advanced Visualization at Niagara College in Ontario has been involved in the applied research, service and transfer of Virtual Reality (VR) technology to local businesses, governments and medium and large engineering partners.

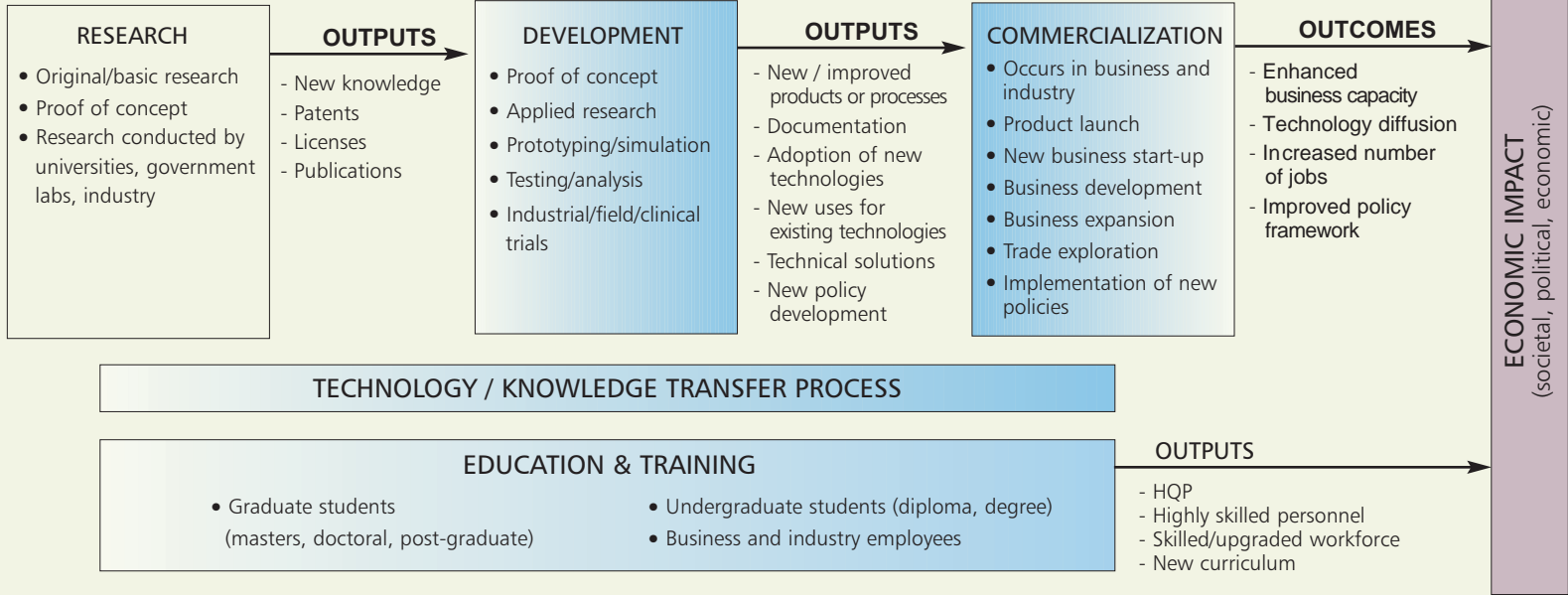
The Centre focuses on VR, or real-time 3D modeling, as a way to communicate complex urban planning and architectural ideas to the public, and to prepare a number of communication modalities, including photosimulations and animations.

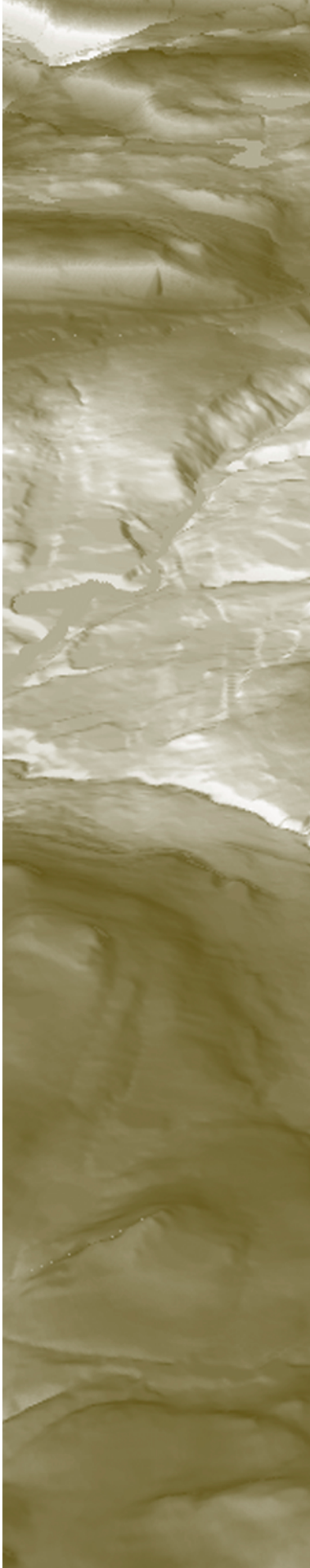
Research involves removing access barriers to VR technology, as well as improving the ability of VR to tell a story that is relevant to the land use planner by increasing realism, creating a better connection with the audience, and including dynamic elements such as moving traffic and crowds.

A number of firms, including Synectics, TSH, Delcan and Parsons have used the Centre’s 3D visualizations to enhance their competitiveness by using the technology to clearly show proposed solutions to various problems.

Canadian Colleges and Institutes Role in Research, Development and Commercialization

TECHNOLOGY / COMMERCIALIZATION / IMPLEMENTATION ASSESSMENTS





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