

1. Objectives of the BCIT Strategic Research Plan

BCIT's Vision: Integral to the economic, social and environmental prosperity of British Columbia.

The British Columbia Institute of Technology (BCIT) is characterized by: a culture of direct interaction with business and industry; a broad and seamless range of educational programming at levels from trades certificates and technology diplomas to undergraduate and graduate degrees; a focus on career-oriented training and education of highly skilled and highly qualified personnel; and a focus on applied research which enhances practical research experience of our faculty and graduates, advances the state-of-practice within industry and the research community, and increases economic and commercial activity within British Columbia and Canada.

To remain integral to the province's prosperity BCIT must provide a level of education that makes our graduates the first choice of many businesses and industries in BC and around the globe. BCIT must continue to challenge our students through programs that provide real-life, contextual instruction that integrates applied research into our curriculum.

The 2009-2014 BCIT Strategic Plan, including and building on the vision and guiding statements developed through an open and inclusive process, asserts that *"BCIT supports employer success and economic development by focusing applied research activities in areas that engage faculty and students to solve business and industry problems to increase competitive strength,"* and sets *"remaining at the forefront of technological change and the state-of-practice through our programming and applied research"* as a strategic initiative and objective for the Institute.

As such, the BCIT Strategic Research Plan focuses on the following core objectives:

- Enhance and expand research at BCIT by fostering and supporting new and existing student and faculty researchers and research programs.
- Foster trans-disciplinary research at all levels to advance the state-of-practice in industry while increasing faculty and student knowledge and career readiness.
- Collaborate with other academic, institutional and industrial partners to maximize research benefits by taking advantage of the combined knowledge, skills and infrastructure these partnerships bring.
- Maximizing the economic, educational and academic benefits of applied research through effective technology transfer, commercialization and knowledge translation.

To achieve these objectives, BCIT aims to:

- Reinforce BCIT's role as a leader in linking research to social, cultural, scientific, educational, technological and economic development.
- Enhance student participation and training in applied research.
- Ensure effective dissemination, application and commercialization of research results.
- Increase internal and external funding and partnerships to foster research excellence.
- Increase the number of faculty and students engaged in research activities.

- Enhance research infrastructure.
- Promote provincial, national and international partnerships and collaborations.
- Expand partnerships with communities, scholars, industries, institutions, government ministries and agencies for the purpose of identifying and pursuing common and complementary objectives.
- Expand institutional capacity for research management, support and facilitation.

2. BCIT Research Priority Areas

Since its creation in 1964 as an Institute of Technology, BCIT has responded to the needs of industry partners by developing a unique and comprehensive portfolio of trade, technology and degree programs focusing on sectors key to the economic future of British Columbia. For the past 20 years, BCIT has also invested in research and technology development capacity in strategic areas to meet the needs of industry partners and maximize the Institute's impact on economic development and environmental sustainability. Through the vertical integration of research and technology transfer, outcomes include new knowledge, technologies, national and international standards and codes, changes to industry practice and government policy, and training of highly skilled and highly qualified personnel.

Both training and research capacity have been enhanced by the development of a number of Bachelor degree programs and have been further advanced with the addition of Master's programs in Applied Science and Engineering in 2011. The securing of Canada Research Chairs (CRC) in key strategic areas is providing the foundation for expanding research capacity and impact. The priority areas build upon and enhance existing concentrations of highly qualified faculty, industry partners, academic collaborators and state-of-the-art facilities, which all serve the research needs of the local and national community. In this regard our areas of highest research priority closely align with activities within BCIT's Technology Center as well as activities within our Schools of Business, Computing and Academic Studies, Construction, Energy, Health and Transportation.

Core research infrastructure has been developed including facilities that are unique in Canada and potentially unique internationally. As stated earlier, one of BCIT's main strategic objectives is to expand collaboration both internally and externally. Due to BCIT's unique position with the university, polytechnic and college communities, BCIT has been able to develop strategic partnerships with industry, government, aboriginal and other community groups as well as national and international post-secondary institutions and researchers. Future CFI funding would be used to augment existing research infrastructure to enhance our existing long term programs.

2.1. The Built Environment

Research strength in this area includes: Architectural Ecology, Acoustics, Building Science, Civil Engineering, Construction, Green Roofs, Living Walls, Structural and Earthquake Engineering, and Sustainable Development. Established research initiatives and facilities include: The Building Science Centre of Excellence, The Centre for Architectural Ecology, The Sound Transmission Facility, The Afresh Home, The Building Science Materials and

Instrumentation Laboratory, The Building Envelope Test Facility, and the Water Penetration Test Chamber.

The CRC in Whole-Building Performance is based at the Building Science Centre of Excellence that was created in 2005. The Centre's vision is to establish BCIT as a key provider of applied building science knowledge, and train graduates through advanced educational programs, leading edge applied research, technology development, and knowledge transfer. Initial infrastructure development and research activities are centered on themes related to building envelopes and their durability and energy performance, and healthy indoor environment. Research conducted through the Centre advances best practice guidelines and building codes and standards, helps to resolve current and future deficiencies in building design and construction, and improves the overall performance of buildings, thus contributing to sustainable development. Current research capacity includes evaluation of building envelope performance (i.e., hygrothermal, energy, durability) at materials, components, and building systems levels through laboratory and field testing and advanced modeling and computer simulations. Securing the CRC has allowed BCIT to evolve the Building Science Centre to the next level and enable BCIT to increase its national and international leadership in this area.

2.2. Information and Communications, Wireless and Sensor Technologies

Research strength in this area includes: Cellular Gateways and Networks, Wireless Networks, Software Development, Games Design, Optics and Imaging, Sensor Technology, Cold Atom Based Sensor Technology, Data Analysis, Data Mining, Modeling, Digital Signal Processing, Distributed Computing, DNA Profiling, Network Communication Infrastructure and Protocols, and Network Security. Internal and external funding support has led to the establishment of facilities and research initiatives at BCIT. These include an on-going collaboration with UBC investigating the development of novel sensor technology based on Cold Atom Physics, the Internet Engineering Laboratory, and the CUBE – BCIT's 3D Simulation Development Laboratory.

2.3. Bioscience and Human Health

Research strength in this area includes: Safety and Chemical Analysis of Natural Health Products, Provenance and Quality of Agri-foods, Plant and Animal Development using Spatial Modeling, Development and Prototyping of Medical Devices, Orthotics and Prosthetics, Prevention of Birth Defects, Drug Development and Delivery, Molecular Diagnostics, Application of Translational Genomics, Molecular and Cell Biology to Human Diseases such as Autoimmunity, Infectious Disease, Cancer, and Inflammation, Biomedicine, Bioscience, Biotechnology, Food Science, Food Technology, Forensic DNA Analysis for Human Identification, Drug Analysis, Chemical Analysis. Established research initiatives, facilities and working groups include: HEAL (Herbal Evaluation and Analysis Laboratory), CREATE (Centre for Rehabilitation Engineering and Technology that Enables), the Dr. Tong Louie Living Laboratory, the Integrated Molecular Biology Laboratory, the Advanced Laboratory for Prototyping Health and Automation, and the Learning and Teaching Centre.

Technological innovations have begun to advance solutions to improve independent living and community access for people living with disabilities and the aging population. At the same time,

rapid advances in electronics, communications and materials have changed how the general population communicates, moves and lives. The Canada Research Chair in Rehabilitation Engineering Design, supported by BCIT's Schools of: Construction and the Environment; Health Sciences; and Computing and Academic Studies, generates new solutions for disability-related problems regarding access, mobility, and assistive technology, and will advance BCIT's vision to remain integral to the province's prosperity by conducting research that makes a tangible contribution to our society. The Schools of Health Sciences and Computing and Academic Studies, and CREATE (Centre for Rehabilitation Engineering and Technology that Enables) at BCIT, as well as the UBC/Vancouver Coastal Health's ICORD (International Collaboration On Repair Discoveries) research initiative are partners of this multidisciplinary research and development effort.

2.4. Natural Resources and the Environment

Research strength in this area includes: Sustainable Resource Management, Management, Protection and Restoration of Rivers and Streams, and Mining and Mineral Exploration. Established research initiatives and facilities include: the Rivers Institute.

2.5. Energy, Manufacturing and Transportation

Research strength in this area includes: Advanced Manufacturing Processes, Marine Manufacturing, Alternative Fuels, Bio Diesel, Demand-Side Energy Processes, Energy Systems, Industrial Energy Applications, Industrial Networking Technology, Industrial Waste Recycling, Pulp and Paper, Wind Energy, Renewable Energy Sources, Energy and Environmental Testing, Engine Performance Using Alternative Fuels, Composite Materials, Plastics, Water-Based Paints, Simulation and Industrial Instrumentation. Established research initiatives and facilities include: BCIT's Smart Microgrid including the NSERC Smart Microgrid Network (NSMG-Net), the Centre for Energy Education and Research (CEER), the Industrial Instrumentation Process Laboratory, the Advanced Prototyping Hub, Engine Performance Testing Laboratory and Marine Vessel and Port Simulation Facilities, Centre for Innovation in Manufacturing.

2.6. Business, Economy, Human Capital, Culture and Education

Research strength in this area includes: Business Intelligence, Sustainable Resource Management, Transportation Economics, Millennial Students, Clinical and Education Practice, Mobile Devices for Clinical Teaching and Learning, eHealth, Technology Assessment and Utilization, Digital Learners in Higher Education, Crime and Intelligence Analysis for Public Safety and Security initiatives.

3. Institutional Planning and Approval Process

BCIT's five main campuses (Burnaby Campus, Downtown Campus, Marine Campus, Aerospace Technology Campuses, and Great Northern Way Campus) and a number of satellite campuses at various locations in British Columbia are home to 1,600 full-time faculty and staff and 500 part-time faculty and staff. Student enrolment exceeds 48,000 annually. With an annual operating budget of \$260M, the Institute's activities span six Schools: the School of Business; the School

of Computing and Academic Studies; the School of Construction and the Environment; the School of Health Sciences; the School of Energy; and the School of Transportation.

After receiving its first allocation of CRCs in 2009, a Research Task Group (RTG) was created with representation from all areas at BCIT to help develop policies regarding research at BCIT. The RTG operates under the leadership of the VP Education, Research and International and the Dean Applied Research. The RTG builds upon the existing work completed by previous BCIT committees and workgroups to stimulate research in alignment with the institutional Strategic Plan as well as assess progress towards the meeting of BCIT's research objectives.

In addition, BCIT has in place significant administrative and operational infrastructure to support its research activities. BCIT's Institute Research Committee (IRC) as well School Research Committees (SRC) in each of the schools have been created to operationalize and administer research policies, practices and funding. These committees monitor the research performance of BCIT as a whole as well as for each of the schools. They also review the progress of research activities in the priority areas and review and approve applications for internal and external funding. Additionally the IRC is responsible for administering the selection process for BCIT's CRC candidates.

Research activities are also supported by the Applied Research Liaison Office, which assists with developing research proposals, sourcing and securing funding for research activities, technology transfer, intellectual property management and commercialization activities, and liaising with private industry and publicly funded clients/sponsors. Research activities are also supported by the expertise of the BCIT Technology Centre in: design and development of prototype devices, systems and applications; analysis, testing and evaluation of new technologies; and commercialization and licensing of new technologies and products.

BCIT also retains an independent Research Ethics Board with both internal and external members from other BC universities and related organizations. Research involving human subjects can only be carried out after review and approval by this board.

Internal Funding and CRC Support

In addition to approximately \$2.7M annual funding to support ARLO and the Technology Centre, as well as additional funding from within each of the schools, two new sources of funding of approximately \$250K total annually were created in 2011: The VP Research Seed Fund which is intended to allow new and existing researchers to explore new areas of interest and the Discovery Parks Fund which is intended to allow existing research programs to leverage their current research and funding to obtain further resources.

We are currently in the selection process for a third CRC to enable BCIT to take a national and international leadership role in one of the areas of research priority for BCIT. Our CRC research programs are targeted to benefit multiple research areas at BCIT to promote our multi-disciplinary industry focused approach to research. Funding for the development of CRC applications and establishing the CRCs at BCIT are also drawn from these internal funds.