Innovation in Research, Scholarship & Education
University of Ontario Institute of Technology
Strategic Research Plan Summary 2013-2018

1. Goals of the Strategic Research Plan

Innovation in Research, Scholarship & Education reinforces UOIT's aspiration to be ranked amongst the top 50 science and technology universities in the world, the *Times Higher Education (THE)* top 100 under 50 universities, and the top 35 research intensive universities in Canada. This goal demands that UOIT improve our competitiveness amongst Canadian research universities and position our faculty members as global leaders and innovators across all disciplines and in targeted fields.

This goal requires that UOIT researchers lead and help define provincial, national and international trends in research and innovation. *Innovation in Research, Scholarship & Education* responds to Canada's and Ontario's S&T strategies. These strategies focus on attracting to and retaining in Canada the best minds to enrich our capabilities, create new knowledge, and mobilize that knowledge and research uptake for social and economic benefit. These strategies aim to extract intellectual, social, scientific, and economic value from investments in research.

Through Innovation in Research, Scholarship & Education, UOIT will:
1. Identify and invest in new strategic research priorities,
2. Build on and strengthen existing research strengths,
3. Foster excellence in targeted fields,
4. Integrate research, entrepreneurship and innovation with undergraduate and graduate education and community engagement,
5. Invest in infrastructure that enables excellence and promotes regional, national and international collaboration with academic, community and industry partners
6. Invest in entrepreneurial capacity that enables the effective mobilization of UOIT-develop fundamental and applied knowledge and discoveries to private, not-for-profit, and public sector receptors.

2. Research and Training Strategic Priorities

This Strategic Research Plan identifies themes that integrate UOIT's research capabilities with 21st century social, health, economic, scientific, and engineering grand challenges, such as educating citizen leaders, supporting smart communities, ensuring sustainable energy and environments, and enabling advanced manufacturing. Recognizing the inevitability of intellectual, social, and economic change, UOIT invests in leading-edge blue-sky and applied research in all disciplines. These thematic areas are multidisciplinary and cross-Faculty in scope, capture existing and emerging research strengths, and are fields of research in which UOIT has developed and will develop an international reputation of excellence.

2.1 Advanced Manufacturing for 21st Century Innovation

Manufacturing is Canada's single largest business sector. At UOIT, research in materials and manufacturing focus on developing the technologies needed to meet the challenges of the 21st century. Our research involves the development of sustainable and environmentally friendly approaches and techniques for manufacturing processes, product development and energy systems. Our research will address many of the 21st century engineering grand challenges.

Materials and manufacturing research is interdisciplinary and encompasses the manufacturing cycle, sustainable

manufacturing and production processes, automotive and transportation, product life cycle analysis, energy systems and nuclear engineering, business and management engineering, human and health factors, pharmaceutical research, amongst others. Future transportation systems require rigorous research efforts in areas such as advanced materials, intelligent systems, batteries and storage and fuel cell technology. Researchers are engaged in the discovery of new materials to reduce the cost and improve the long-term performance of fuel cells as a viable alternative to existing power supplies.

Manufacturing research also incorporates material science, including the development of nano-crystalline materials such as carbon nanotubes, which have applications in fields of renewable energy and biomedical devices. Manufacturing research seeks to understand how to improve processes on the shop floor through effective systems integration and how to improve the manufactured outcome of new modes of transportation by engaging in human factors research. UOIT recognizes that supply chain decision-making increasingly uses information and knowledge based engineering and management technologies to problem solve.

2.2. Education for the 21st Century

Excellence in education for the 21st century workplace cannot be achieved without a systematic and thorough research focus that examines the teaching/learning nexus and the evolving nature of third level and professional education in the 21st century. The nature of the 21st century workplace has an important impact on the content and methods of creating relevant and effective learning experiences in universities and colleges, and at the intersections between secondary educational preparation and the workplace, tertiary education and educational policy development.

UOIT's faculty is engaging in an assessment of ways in which tertiary level learning and teaching can be reformed and improved through the use of digital technologies. UOIT's faculty will research the integration of learning and teaching across the life-span in the digital economy, with a particular focus on learning in the academy, learning for professional development, e- and m-learning strategies and technologies, professional and clinical education needs of work environments, design principles in educational and engineering practice, and the pathways for advanced and life-long education.

2.3 Energy and the Environment

The 2012 report on Canada's energy future, **Now or Never,** outlined a clear vision for Canadian energy development and a low-emissions economy. Now or Never proposed priorities to achieve long-term and affordable energy solutions that address the challenges and opportunities of responsible development and energy efficiency, including a strong nuclear industry, natural gas as a game-changing fuel, energy efficiency and conservation, continuous improvement of the environmental footprint of non-renewable energy resources, hydro-electricity, and renewable fuels.

At UOIT, our research in the field of energy combines a focus on innovation with conservational and environmental stewardship. Our research in these fields will focus on nuclear energy, natural gas as a transportation fuel, hydrogen production, and renewable energy such as algal biofuel, wind, solar and geothermal. These research directions address engineering innovation, advanced approaches to the education of managers in the safe operation of nuclear power plants, and collaboration with leading partners to advance a safe and efficient energy future for our planet.

Environmental research aims at understanding underlying mechanisms of ecosystem function and health, with an emphasis on freshwater resources. Research foci include studies of nuclear waste management, energy, nutrient, and contaminant dynamics in aquatic ecosystems, ecotoxicology of contaminants found in municipal and industrial wastewater, algal blooms, invasive species and pathogen fate in the environment.

2.4 Human Health and Community Wellness

UOIT is deeply committed to enriching the world of which it is a part through innovative research directed toward enhancing the capacities of local, national and global communities to thrive and grow in ways that are both healthy and sustainable. Our goal is to promote the well-being of society through problem-based research and the application of ICT and data analytics that have genuine and constructive consequences for individuals, collectivities, and the communities in which we live and work.

Sustainable and healthy communities are those that are capable of planned growth that maintains physical, social, economic, and environmental health, while promoting social justice and citizen participation. Our researchers engage with community and institutional partners to define the problems, design research initiatives intended to yield insight into those problems, and develop policies, programs and products to generate positive change. Initiatives in health promotion, social determinants of health, human health biology, health informatics and analytics, improving quality, safety, and experience of care, improved water quality, community development, sustainable energy technologies and usage patterns, countering violence, and environmental risks are all indicative of UOIT's research expertise in this area.

UOIT's ability to support healthy and sustainable communities requires the creation of partnerships that connect researchers to community groups and organizations, policy makers, and government agencies.

2.5 Information & Communication Technology (ICT) and Informatics

Amongst the challenges that face the communications industry, government, health care, and the public in relation to ICT and informatics are how to (i) manage the exceptional amount of data that each person and organization generate daily through interactions with one another or between organizations, (ii) preserve the integrity of those data, and (iii) employ information and communications technologies to enable the right person to connect to the right content at the right time and at the right location, reliably, securely and with satisfactory quality.

As a technology focused university, UOIT places great importance on research and development that addresses challenges which enable communications between two parties anywhere, anytime. Such ICT and informatics research will enable high quality and reliable communications, and improved health care, secure financial interactions, advanced manufacturing, and enhanced learning. At UOIT, ICT is a core research field and an essential platform technology that permeates and supports research. ICT is the backbone required to build energy efficient wireless infrastructures, develop intelligent transportation systems, ensure energy sustainability, create healthy communities, manage health informatics and enable learning.

2.6 Life Sciences and Biotechnology

UOIT promotes innovative research that enhances our research strengths in Life Sciences and Biotechnology. Applying advanced investigational methods in molecular biology, toxicology, synthetic chemistry, physiological studies, epidemiological methods, population studies, qualitative and quantitative research methods and computational methods, our researchers address fundamental and applied research challenges on aquatic and terrestrial ecosystems, agricultural crops, symbiotic and pathological micro-organisms, and micro- and macro-organism forensic models. Our researchers engage in developing molecular targets for human and animal health and nutrition and clinical and population based studies of determinants of human health, including those that

lead to novel interventions such as bio-based products, ecosystem science, molecular biology, infectious diseases, forensic science, pharmaceutical chemistry, biological chemistry, microbiology, and radiation biology.

As we accelerate into the 21st century, our researchers employ high-throughput technological tools and instruments and have a strong vision for the use of biotechnology to initiate work on the forefront of proteomics, genomics and systems biology. Their success will require close partnerships between ICT and informatics and life sciences. Through the use of technology, UOIT will advance the next generation of cutting-edge technology-based life sciences research.

3. Canada Research Chair Gender Equity and Diversity

UOIT recognizes its responsibility to the academy and the Canadian public to ensure that Canada Research Chairs are allocated in ways that respect diversity and encourage gender equity. To this end, UOIT is committed to allocating one half of the Canada Research Chairs to women. In addition, UOIT will continue to enhance its support and commitment to diversity amongst Canada Research Chairs.

It is recognized that with a small number of CRCS, the percentage may shift significantly in either direction. However, UOIT is committed to monitoring gender balance and diversity on an ongoing basis to ensure equity targets are achieved.

4. University Deployment of Canada Research

The University aims to allocate one CRC in each Faculty and, when numbers permit, at least one Tier 1 and one Tier 2 per Faculty (Table 1). Once the one CRC per Faculty goal is achieved, CRCs will be allocated on the Faculty's share of Tri-Council research grants over a previous three-year period. UOIT employs CRCs to attract and retain internationally recognized researchers in priority areas. All CRC competitions are open to nomination and application from scholars inside and outside of the university.

Collaborations with industry, that allow UOIT to attract investment in sponsored research chairs in priority fields of research, are a priority for 2012-2017.

Chair	Faculty	Thematic Area	Agency	Tier	Gender	Start	End/Renewal
Aquatic Toxicology	Science	Energy & the Environment	NSERC	1	M	2004	2018
Battery Technology and Electric Energy Storage	FEAS	ICT/Informatics or Energy & Environment	NSERC	2	TBD	2014	2019
Advance Manufacturing	FEAS	Advanced Manufacturing	NSERC	2	TBD	2014	2019
Big Data Analytics	Science	ICT/Informatics	NSERC	2	TBD	2013	2018
Health Informatics	FBIT	Human Health & Community Wellness	CIHR	2	F	2007	2012
Robotics and Automation	FEAS	Advanced Manufacturing	NSERC	2	M	2009	2014
M- Learning & Educational Informatics	Educ	ICT/Informatics/ Education	SSHRC	2	TBD	2014	2019
Serious Gaming	FBIT	ICT/Informatics	NSERC	2	TBD	2013	2018
Complex Chronic Conditions & Disabilities	FHS	Human Health & Community Wellness	CIHR	2	M	2013	2018
Digital Life, Media & Culture	FSSH	ICT/Informatics	SSHRC	2	F	2012	2017
TBD	TBD	TBD	NSERC	1	TBD	2014	2021

5.   Collaborations

UOIT strives to meet the highest international standards in its recruitment of academic staff and students. UOIT faculty members publish in top tier international journals, present at international conferences, and establish research collaborations with colleagues at top tier universities and research institutes. International research collaborations are increasingly important for the establishment of our reputation internationally.

International connections will be individual and institutional. Individual faculty members form strong ties with colleagues at research universities and institutes internationally. UOIT strongly encourages these ties as they reinforce disciplinary expertise and present opportunities to recruit outstanding undergraduate and graduate students.

At the institutional level, UOIT will expand its academic linkages with top tier universities and research institutions. These linkages address core academic goals and objectives, expanding international mobility opportunities for faculty members and students, and enhancing our research capacity and reputation.

6.   Performance Metrics

By engaging in research and knowledge mobilization, UOIT impacts positively the advancement of knowledge, supports our communities' social and economic well-being through policy analysis and program implementation, and enhances our partners' business competitiveness. We employ qualitative and quantitative performance metrics to measure our success in achieving our research goal and objectives.

Effective research and performance metrics allow UOIT to a) assess, track and report on institutional and Faculty performance, b) adjust strategy, c) build expertise through recruitment, collaboration and networking, d) allocate internal resources to promote research in priority areas, and e) attract funding to sustain the research enterprise. The Vice President Research, Innovation and International will report quarterly to the Senior Leadership Team and Provost Council and annually to the University on our performance on these metrics.

7.   Planning and Approval process

The Strategic Research Plan Steering Committee engaged UOIT's community through: (i) a survey of core faculty members, (ii) regular presentations to the Research Board, (iii) reports and presentations to the Provost Council, and (iv) town halls in 2012.

The SRP was reviewed by Research Board, Academic Council and approved by the Board of Governors. The Vice-President Research, Innovation & International will establish a SRP website, publish an annual report card, conduct a mid-term assessment, send an electronic copy of the 2013-2018 SRP to each faculty member and senior administrator, and present an annual update to the Board, Academic Council and to Faculty Councils.