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RED RIVER COLLEGE OF APPLIED ARTS, SCIENCE AND TECHNOLOGY

STRATEGIC RESEARCH PLAN 2012-2015

APPROVED NOVEMBER 2012

RED RIVER COLLEGE | APPLIED RESEARCH & COMMERCIALIZATION

APPLYING KNOWLEDGE, DELIVERING RESULTS ™

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EXECUTIVE SUMMARY

As Manitoba's largest institute of applied learning, Red River College (RRC) receives more than 32,000 student enrolments and employs more than 2,000 people. With its wide range of programs, and applied learning opportunities, and its focus on industry needs, the College is a significant contributor to the long-term health and success of Manitoba's economy.

The College's applied research program has been playing a supporting role in this important contribution – it has also served as a model for implementing research programs at College's nationwide. The research funding it has help the College attract has grown immensely – from $50,000 in 2004-2005, to over $2 million (annually) in 2012-2013 – and it has attracted over $25 million in capital investment from government and industry stakeholders.

An important consideration for this Strategic Research Plan is the College's Vision is to be *"renowned for providing accessible, innovative, applied learning and research in an advanced environment, creating skilled graduates to drive the Manitoba economy."* Its Mission is to *"enable students to build a career, enhance quality of life, and contribute to Manitoba's economic and social prosperity through exceptional applied education and research."*

Supporting its Vision and Mission are RRC's Academic Plan 2020 and Strategic Plan 2012-2015. These plans both identify the substantial role that applied research has come to play in enriching the student learning experience, enhancing the College's contribution towards the socioeconomic needs of the communities it serves and Manitoba's economy overall, and building on RRC's reputation as a leader in technology and innovation education.

The Strategic Research Plan, developed by Applied Research & Commercialization, is an extension of all of these key strategic elements and plans. It has been consolidated through research-focussed environmental scans: internally, to identify the resources and expertise that have the potential to contribute to industry research needs; and externally, to identify opportunities – locally, nationally, and abroad – to collaborate on innovative projects.

The objectives of this plan focus on leveraging RRC's current strengths in applied research, as well as building on areas that the College could benefit from developing further. Key aspects of these objectives include: continued building of research capacity in emerging areas of importance; efforts to network, partner, and collaborate across industry sectors; provision of unique research training opportunities for staff, students, and the College community; and increased faculty and student awareness of, and interest in applied research.

The applied research thrusts, or priority focus areas that have been identified as a result of the planning process, are synergistic between RRC's current and developing research strengths and the socioeconomic needs of its communities. The areas identified are Advanced Design & Manufacturing, Clean Technology, Digital Technology, and Health & Social Sciences.

Finally, the Plan documents much of the resources and stories associated with these priority areas. It demonstrates that there is much the College has to be proud of, and signals that there are more exciting developments to look forward to in the years to come.

INTRODUCTION

Red River College (RRC) serves as Manitoba's largest institute of applied learning with more than 32,000 enrolments in over 200 full-time and part-time programs. The college is dispersed through eight campuses in Manitoba and employs more than 2,000 people, including full-time and part-time faculty, administration, and support staff. The College is comprised of several academic and business units that provide a wide range of programs and training that are important to Manitoba's economy and its communities.

Applied Research & Commercialization (AR&C) is industry's gateway to the research-related knowledge, capabilities, facilities, and networks that reside at RRC. AR&C also proactively identifies practical applied research opportunities that can provide mutual benefit to both the College and potential industry partners. AR&C can manage the entire applied research process, including proposal development, intellectual property, coordinating resources, administration, business development, technology transfer, and more.

Since the inception of AR&C in 2004, RRC has served as a model for implementing applied research programs at College's nationwide. The program has initiated significant achievements in innovation areas critical to the Canadian economy, and has attracted over $25 million in capital investment from government and industry stakeholders. In addition, applied research has now been integrated into all RRC school-specific academic plans.

The vision of the College's Academic Plan 2020 is to be *"…recognized as one of North America's leading institutes of applied learning and research. The knowledge and skills learners acquire at the College are a catalyst for innovative achievement in Manitoba's business and social sectors. They build our economy and enrich our whole society."* The mission of the Academic Plan is that *"RRC deliver applied education that provides for career and personal success to a wide variety of learners. The result is a highly skilled, motivated and diverse workforce."*

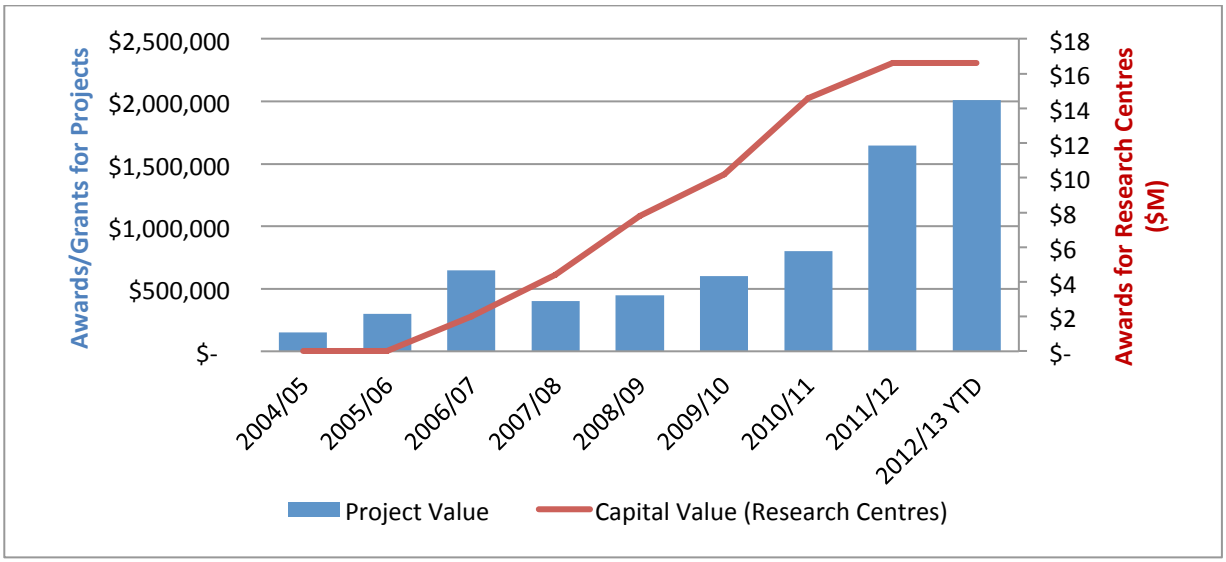
The College's 2012-2015 strategic theme of "*Fuelling Manitoba's economic growth and community development"* is supported, in part, by its initiative to "*Enhance the connections between academic programs and applied research activities with community and workforce development needs."*

Through the continued expansion of applied research and innovation within the College and the communities it serves, this **Strategic Research Plan 2012-2015** provides the background and research strategy to support its academic vision and mission, as well as its major RRC strategic themes and initiatives. It outlines RRC's current research-related strengths and resources, identifies research priority focus areas (or thrusts), and defines the objectives that will guide AR&C's future goals and actions.

APPLYING KNOWLEDGE, DELIVERING RESULTS ™

Led by AR&C and with the support of the faculty, staff and students within the College's Schools, RRC's ability to support industry through applied research has been recognized, awarded, and enhanced through grants and/or other financial awards from the Natural Sciences & Engineering Research Council of Canada (NSERC), Western Economic Diversification (WD), the Canada Foundation for Innovation, the Province of Manitoba and the National Research Council of Canada Industrial Research Assistance Program (NRC-IRAP). These contributions, along with financial and in-kind support from local industry, have driven the steady growth of the College's applied research program.

The annual value of the College's applied research funding has grown from $50,000 in 2004-2005, to over $2 million in 2012-2013, not including capital.



To date, over 30 research projects have been completed – serving at least 50 industry and community partners. Furthermore, over 500 businesses and 1,000 individuals have benefited from applied research related awareness, training, and networking events and workshops.

The progress and success of RRC's applied research program has also been recognized through various awards, including:

- The Manitoba Roundtable on Sustainability Award of Excellence 2009;
- The Winnipeg Chamber of Commerce Spirit of Winnipeg Award 2010; and
- The ACCC National Gold Leadership Award 2011.

THE RESEARCH PLAN

RRC's Strategic Research Plan reflects the College's Strategic Plan 2012-2015, which was developed following extensive research, as well as consultation and reflection with many internal and external stakeholders over a one-year period. External factors, such as local demographics and the economy were considered along with feedback, insight and ideas from the College community at large to identify the strategic themes, initiatives, and actions that are now included in the plan.

The Plan also reflects the College's Academic Plan 2020, which is based on the vision established by RRC's Board of Governors and developed through an extensive visioning and planning process. The Plan provides the framework for prioritizing the College's long-term activities and forms the bases for all RRC operations and its corporate and divisional plans.

With these plans as its foundation, AR&C conducted an environmental scan of research needs and considered this information within the framework of RRC's current educational and research strengths to develop the major objectives and priorities of this strategic research plan. The resulting Strategic Research Plan was then reviewed by RRC's Senior Academic Committee and approved by the Presidents Council.

MAJOR STRATEGIC RESEARCH OBJECTIVES

To support the College's overall strategy, and further increase applied research and innovation, AR&C has developed the following research objectives:

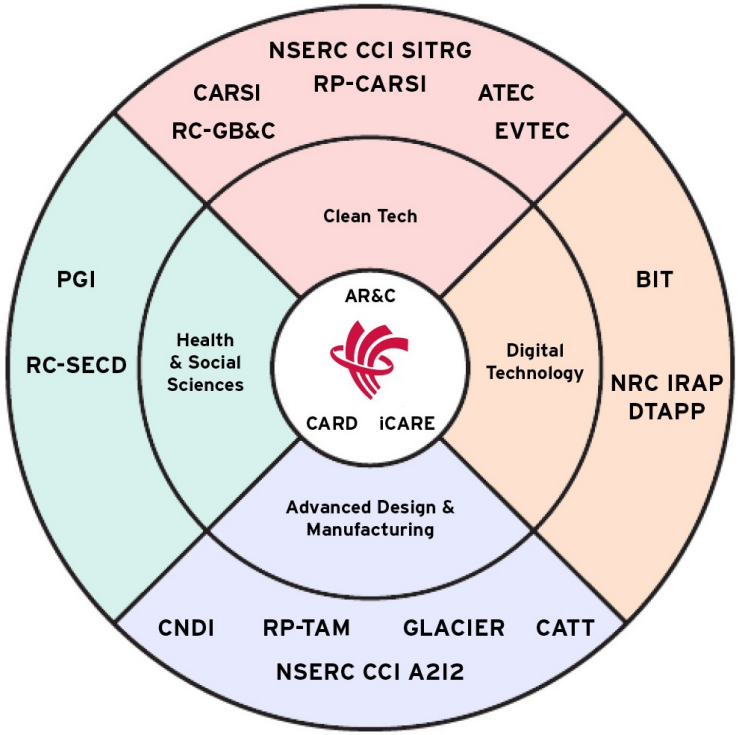
1. Continue to enhance capacity in current areas of research strength and expertise.
2. Build research capacity in emerging areas of socioeconomic importance.
3. Foster networking, partnerships, and collaborations across industry sectors.
4. Provide unique research training opportunities for staff, students, interns and the community.
5. Increase faculty and student awareness of, and interest and participation in applied research activities.

APPLIED RESEARCH PRIORITIES

Based on existing expertise, resources, facilities, and regional socioeconomic demand, RRC has identified the following research thrusts or priority focus areas:

1. Advanced Design & Manufacturing
2. Clean Technology
3. Digital Technology
4. Health & Social Sciences

Core College-wide resources (primarily AR&C-based) and School-based research infrastructure and personnel – such as Research Centres, Research Professionals, and Research Chairs – enable faculty, staff and students to undertake significant Research Programs and Initiatives in the priority research focus areas (as illustrated below).



A2I2	Advanced Aerospace Innovation Initiative
AR&C	Applied Research & Commercialization
ATEC	Advanced Transportation and Energy Centre
BIT	Business Information & Technology program
CARD	College Applied Research Development fund
CARSI	Centre for Applied Research in Sustainable Infrastructure
CATT	Centre for Aerospace Technology and Training
CNDI	Centre for Non-Destructive Inspection
DTAPP	Digital Technology Adoption Pilot Program
EVTEC	Electric Vehicle Technology & Education Centre
GB&C	Green Buildings & Construction
GLACIER	Global Aerospace Centre for Icing and Environmental Research
iCARE	Inventory of College Applied Research Expertise
NRC-IRAP	National Research Council Canada Industrial Research Assistance Program
NSERC CCI	Natural Sciences & Engineering Research Council Canada College & Community Innovation Grant
PGI	Paterson GlobalFoods Institute
RC	Research Chair
RP	Research Professional
SECD	Science of Early Childhood Education
SITRG	Sustainable Infrastructure Technology Research Group

College Applied Research Development (CARD)

Since 2004, the College has awarded over $400,000 to RRC staff, students, and faculty through the College Applied Research Development Fund for almost 60 projects. The awards help develop and build internal research capacity within the College, while providing a platform for innovation for those who are eager to conduct practical research, but are in need of opportunities and resources.

Inventory of College Applied Research Expertise (iCARE)

RRC is deploying iCARE, an innovative online application that will serve as the ultimate resource for College stakeholders and potential industry partners seeking to pinpoint applied research expertise among the faculty and staff. This tool will be a key strategic element to help achieve the objective of increasing faculty participation in applied research at the College.

In addition to an overview of College facilities and capabilities, iCARE will contain information about researcher interest, experience and expertise. This will enable RRC to quickly pinpoint the most appropriate researcher resource for a specific project.

CLEAN TECHNOLOGY

With rising energy prices and the increasing the importance of protecting natural resources, investments in clean technology continue to grow. RRC efforts in this applied research area continue to expand as well.

This research area was launched with the establishment of the Centre for Applied Research in Sustainable Infrastructure (CARSI) in 2007, which provides infrastructure to enable faculty, staff, and students to conduct applied research and learning in clean technology. As with the majority of research initiatives in this thrust, CARSI received significant support from private and public organizations, including external funding from the Canada Foundation for Innovation, matched by the Manitoba Research and Innovation Fund, as well as multiple industry partners and the Schools of Construction and Engineering Technologies and Transportation Aviation and Manufacturing.

Green Buildings

CARSI is a state-of-the-art research facility that incorporates all sustainable infrastructure applied research into a single building. Through CARSI, the College's mission is to develop advanced sustainable infrastructure technologies and products in Manitoba, to the benefit of the environment and Canadian economy. Most notably, CARSI played a significant role in the testing and demonstrating of key technologies used in Manitoba Hydro's new downtown headquarters – now one of the most energy efficient office buildings in North America.

Based upon these developments, the College was awarded a $2.3-million NSERC CCI grant in 2010 to establish the Sustainable Infrastructure Technology Research Group (SITRG). SITRG's goal is to improve the energy performance of commercial and industrial buildings through applied research.

This funding continues to present significant opportunities for faculty and students to work on applied research projects, and for industry to benefit from human, physical, and financial resources made available to them to support innovation in sustainable infrastructure.

Current and future significant developments in this research thrust include: air leakage testing of Manitoba's commercial buildings, testing and demonstration of concentrated solar power technology, innovative greenhouse applications, wind turbine applications, and more. Also, with the support of a private donor and the Province of Manitoba, an endowed research chair focussed on Green Buildings & Construction is being established.

Sustainable Transportation

Established in 2008 (with support for research equipment from Western Economic Diversification), the Advanced Transportation & Energy Centre (ATEC) has played host to a number of innovative projects, including:

- Hybrid Hydrogen Internal Combustion Engine transit bus cold-weather evaluation;
- Hydrogen Fuel Cell transit bus demonstration;
- Engine/Transmission integration into bus prototype to meet new environmental requirements;
- Red River Raycer solar car; and
- Plug-in Hybrid Vehicle conversion, demonstration, and monitoring.

In 2011, the Electric Vehicle Technology & Education Centre (EVTEC) was established with support (including for a faculty research position) from the Province of Manitoba. Located within ATEC, EVTEC is playing a key role in the development, testing, and demonstration of a prototype all-electric transit bus in partnership with Mitsubishi Heavy Industries, New Flyer Industries and Manitoba Hydro – this $3-million, three-year project is the first of its kind in Canada.

Sustainable Infrastructure & Transportation Cluster Development

RRC has been a National Research Council Canada Industrial Research Assistance Program (NRC-IRAP) network member since 2008. Together, AR&C and NRC-IRAP have worked to support, enhance, and expand the sustainable infrastructure and transportation cluster in Manitoba through its network-developing activities, including:

- Technology awareness, training, and networking workshops and seminars;
- Technology advisory support services for small- to medium-sized enterprises (SMEs);
- Linking industry with College resources;
- Identifying and creating linkages with international opportunities; and
- Local cluster map development.

Sustainable Infrastructure & Transportation Cluster Map

AR&C, with support from NRC-IRAP and NSERC, developed the Manitoba Sustainable Infrastructure and Transportation Cluster Map, an online, interactive application that tracks organizations committed to sustainability across the province of Manitoba. The Cluster Map is online now at mbsustainableclustermap.ca. Prospective organizations can sign up to take advantage of the map's benefits, including enhanced visibility and the ability to seek out potential research partners.

Clean Water Technologies

Building upon existing expertise, RRC is developing a regional clean water technology special interest group, focused upon solutions for water and wastewater treatment to improve water quality and mitigate negative environmental impacts. The primary goals will be to increase community engagement/awareness of clean water technology, and provide technical, information, and business assistance, to SMEs, enabling them to better evaluate and implement appropriate clean water technology, which will increase their productivity and/or competitiveness.

ADVANCED DESIGN & MANUFACTURING

Manufacturing is Manitoba's largest industrial sector – generating about 11 percent of provincial GDP and forming an important part of the economic structure of the province. Over the past decade, RRC has established and grown four major manufacturing technology initiatives representing an investment of over $20 million in state-of-the-art technology. While these assets are now being used to train students and industry employees, their value is about to be further leveraged through the implementation of the Advanced Aerospace Innovation Initiative (A2I2).

CATT: This is a unique joint-use (RRC and StandardAero) facility located within StandardAero's industrial campus, established in 2009 with support from Western Economic Diversification (WD), the Province of Manitoba. CATT houses an array of cutting-edge laser systems, for application ranging from pulsed micro-welding for crack repairs to hybrid welding, that are capable of welding, cladding and cutting parts and materials with complex geometries and thickness variations.

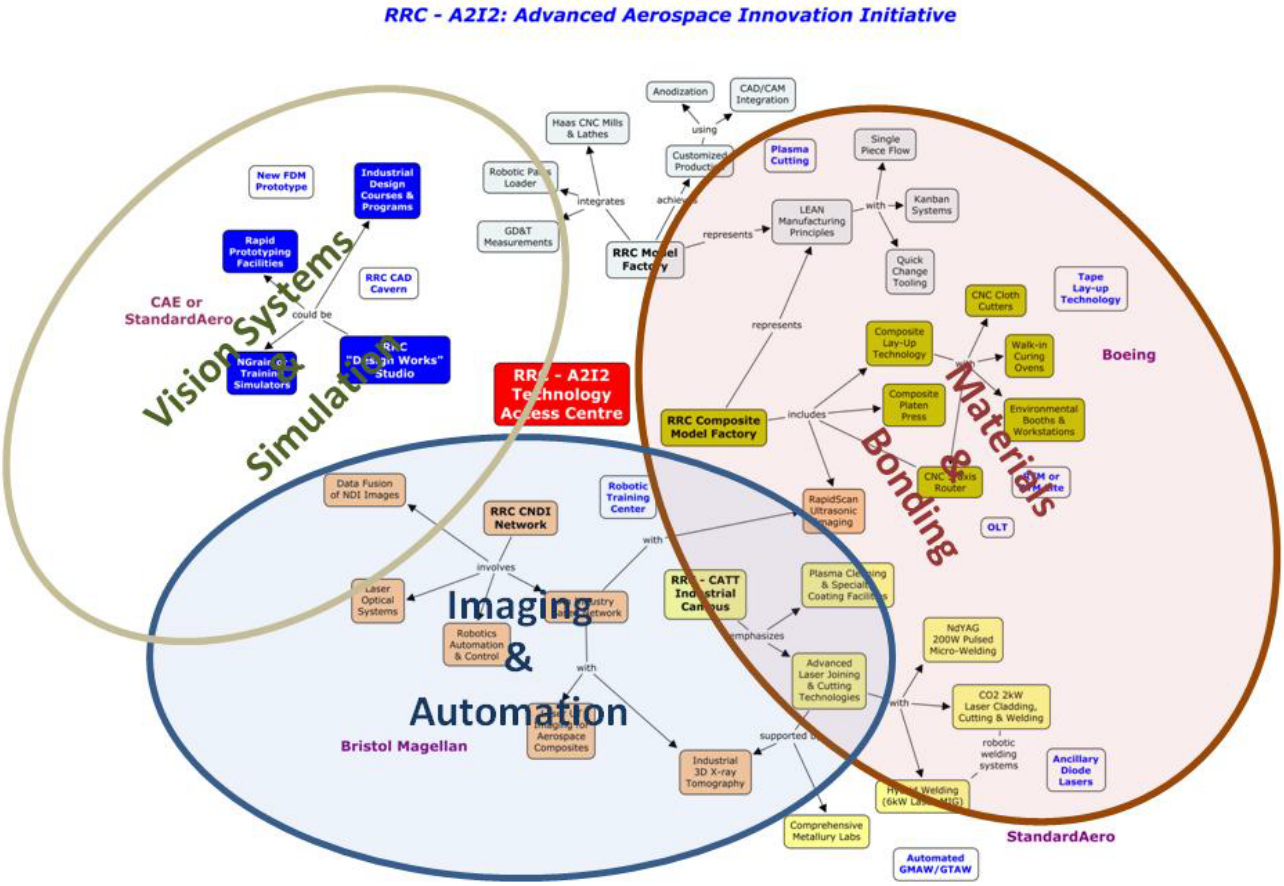
CNDI: This Centre, with multiple locations at the College, industry and the community, received funding (from WD and the Province of Manitoba) in 2011 to establish a distributed network of technologies, facilities, and expertise in non-destructive inspection of components and assemblies to enable data fusion of images and post-processing of data at remote locations. CNDI emphasizes visualization of defects using ultrasonic imaging and x-ray radiography. These capabilities enable advanced manufacturing with composites and metals, technician training on new processes and equipment, and the integration of academic training with industrial process development.

Composite Model Factory: Part of a joint initiative with the University of Manitoba, this is a complete technology suite for aerospace composite part mock-up and production is available at this Model Factory (established in 2008 with external funding from WD) which is focused on training with

technologies used by large composite manufacturers. A significant draw for this resource is the local Boeing plant, a Tier 1 partner to the 787 Dreamliner program. This is also the base for the Canadian Manufacturers & Exporters (CME) Lean Manufacturing Simulation initiative.

Model Factory (metal fabrication): The suite of technologies in the Model Factory support both aerospace and manufacturing sectors in Manitoba and encompass production planning, production management, and the production event itself. Model Factory technologies include but are not limited to: CAD/CAM suites, CNC mills, CMM, robotics systems and materials treatment.

A2I2: This initiative will make the College's resources available to industry members of all sizes, especially SMEs. In 2012, NSERC awarded RRC with a $1.69-million College and Community Innovation Program Technology Access Centre Grant to establish A2I2, which aims to leverage roughly $7 million in contributions from supporting organizations. The three main modalities provided by A2I2 are technology diffusion and training, applied research assistance, and specialized technical services provision. Supported by technical managers and professionals, A2I2's services will be focused upon three central themes: Advanced Materials & Bonding, Imaging & Automation, and Vision Systems & Simulation, as illustrated below.



Industry-supported Research Chairs will be the next phase of enhanced research support for this thrust, to enable greater capability in targeted technical areas (such as imaging to support advanced manufacturing) important to industry.

DIGITAL TECHNOLOGY

Digital technology represents massive economic potential for Manitoba – both in the creation of new technologies and start-up businesses, and in the adoption of existing technologies to increase productivity across all industry sectors. RRC recognizes the emerging importance of digital technologies and is working to meet the applied research needs of industry in this rapidly evolving area.

The College's CARD fund currently supports faculty applied research projects in digital technology. For instance, RRC Graphic Design instructors are developing an iPhone app for the Canadian Museum for Human Rights that will be designed to enhance visitors' experience. This app will feature augmented reality – a function that allows smartphones to overlay digital and display information over real world images.

RRC also has collaborative relationships with TRLabs and MTS Allstream. With TRLabs, a not-for-profit information and communications technology research consortium, the College contributes instructors and students, who develop and execute original research projects. MTS Allstream has supported RRC's applied research and learning initiatives and programs since 2003. TRLabs and MTS Allstream have combined efforts with RRC students to develop mobile applications such as downloadable movie trailers and an innovative collaborative health technology platform.

Business Information Technology (BIT) program

The BIT program provides a foundation in information technology and specialized technical training, business courses and practical applied training through industry projects and co-op work terms in the following areas:

- Application development for business systems
- Database management
- Network management
- Web development

A student consultancy and industry incubator are in development, with the potential to co-locate with Ramp Up Manitoba, a not-for-profit organization of entrepreneurs, developers, and designers focused on increasing the number of technology start-ups in Manitoba. This could greatly enhance connections with local SMEs and start-up companies to fuel innovation in digital technology.

Other opportunities arise from the Digital Media Design and 3D Computer Graphics courses, which are designed to build and advance job-ready graduates, while supporting the development of SMEs

through research and project opportunities. A research chair focussed on mobile computing and security is in development with local partners.

Digital Technology Adoption Pilot Program (DTAPP)

With the support of Industry Canada's DTAPP, RRC is assisting Manitoba SMEs in adopting digital technologies to increase their productivity, with a focus on the construction and manufacturing sectors. The College has done extensive research to identify the most critical digital technologies for each sector and through continued consultations, is developing Digital Technology Strategies for each sector. Training and awareness workshops are also being provided along with advisory services for individual SMEs.

HEALTH, NUTRITION & SOCIAL SCIENCES

Health, nutrition and social sciences are important to the College's strategic objective of fuelling community development. This area is seeing a boon in technological applications, combined with an increased need for new and innovative approaches. There are clear socioeconomic needs for early childhood education, as well as a growing number of interested stakeholders in the food-processing sector. Nursing also presents research opportunities in the areas of patient management. Finally, Indigenous Education has taken root at RRC, where the pursuit of education and governance lends itself to post-instruction research engagement opportunities with graduates.

Science of Early Childhood Development (SECD)

The Early Childhood Education (ECE) Program at RRC has been engaged in the SECD project since 2001, after they were unable to find sufficient undergraduate resource material on early child development. Instructors across Canada echoed their concern. With support from their project partner (the University of Toronto) and funders, including the Lawson Foundation, the Winnipeg Foundation, the World Bank, and the Agha Khan Foundation, RRC led the creation of the SECD to translate the current body of research in early child development into an accessible, learner-friendly online format for post-secondary ECE students and professionals. Today, many Canadian colleges and multiple national and international organizations have adopted the SECD as a resource for faculty and students. The scope of the project has expanded to include the creation of an award-winning online introductory course in 2007, an expanded second edition in 2008, and several international editions. RRC has recently established a Research Chair in the SECD.

Paterson GlobalFoods Institute (PGI)

The PGI is home to the College's newly established School of Hospitality and Culinary Arts, and the College's first student residence. With building renovations expected to be complete in late 2012, the College received a $2-million investment from Western Economic Diversification in 2012 to acquire specialized food science equipment that will expand PGI's technological and applied research

capabilities. With this state-of-the-art technology, the College will work directly with local businesses to develop and test new food product and process technology, leading to further commercialization and business opportunities.

DEVELOPING INTERNATIONAL OPPORTUNITIES

To enhance applied research and learning experiences for RRC students, faculty and staff, and to identify opportunities to collaborate towards leading edge and innovative projects, AR&C expanded research partnerships in Brazil, Uruguay, and Japan. Memorandums of understanding have been signed with the Instituto Federal de Educação, Ciência e Tecnologia de São Paulo; the Pontifical Catholic University of Rio Grande do Sul; the Catholic University of Uruguay; and the Universidad ORT Uruguay. Also, research project and program partnerships have been established with Japanese companies, such as Mitsubishi Heavy Industries and Neubrex.

CONCLUSION

The Strategic Research Plan reinforces and supports RRC's overall Strategic Plan, as well as its vision to be "…*renowned for providing accessible, innovative, applied learning and research in an advanced environment*…" and mission to "…*enable students to build a career, enhance quality of life, and contribute to Manitoba's economic and social prosperity through exceptional applied education and research*." It focuses on increasing engagement from faculty, students, and industry to enhance applied research, learning, and innovation at the College.

This also defines specific objectives and research thrusts based on the socioeconomic needs of the communities that the College serves, as well as the current identified research-related resources and facilities that the College has to offer. However, it also provides the needed flexibility to adapt and incorporate other opportunities, should new community needs be identified and/or new RRC resources emerge.

With this plan in place, the College can anticipate a continued increase in research funding, activity, partnerships, and industry engagement – resulting in increased benefit to the College's communities, and the economy.