

A low-angle, upward-looking photograph of several tall skyscrapers against a clear blue sky. The buildings are made of glass and steel, with many windows visible. The perspective creates a sense of height and scale.

START UP, SCALE UP AND STAY UP

*The Canadian Experience of
Applied Research in Colleges*

Robert Luke
19 August 2016
George Brown College



An Outline

**Start Up.
Scale Up.
Stay Up.**

An Outline

Start Up:

monkeys in trees

Scale Up:

launching rockets

Stay Up:

Bruce Lee

College applied research

What?

How?

Why?

Notes on national economies



CANADA'S INNOVATION ECONOMY

- Hewers of wood; drawers of water
- HERD~BERD imbalance
- S&T and R&D imbalance
- Canada's innovation carrying capacity

Notes on national economies

○ BERD as a percentage of GDP

- Australia: 1.19
- Canada: 0.85
- OECD: 1.61

○ HERD as a percentage of GDP

- Australia: 0.63
- Canada: 0.67
- OECD: 0.43

OECD.Stat data are for 2013

Pivot

We want to be price setters, not price takers.

Pivot

- The conference theme
 - “In an environment of ever increasing change and market complexity, the ability for businesses and the workforce to evolve will be a precious differentiator between competitors. Innovation will be critical for success in local, national and international markets.”



Pivot

- Digital disruption



The GBC Story

#1 Research College in Canada

SINCE 2007:



781

PARTNERSHIPS



7,592

STUDENT RESEARCH
EXPERIENCES



\$96M in

RESEARCH FUNDING
from government and partners



724

APPLIED RESEARCH
COLLABORATIONS



180

RESEARCH-ACTIVE
FACULTY MEMBERS



7

ACADEMIC
PARTNERS

IN 2015:



180

RESEARCH-ACTIVE
FACULTY



1,782

STUDENT
RESEARCHERS



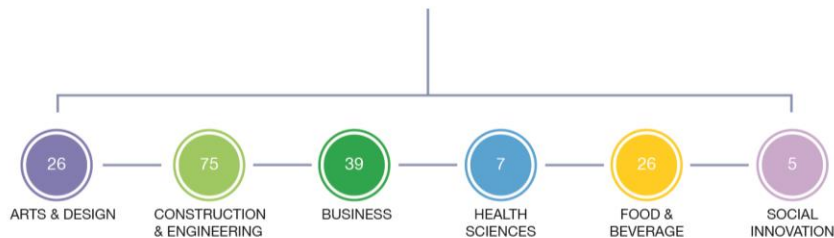
181

RESEARCH PROJECTS



172

INDUSTRY PARTNERS



A squirrel monkey is walking along a thick, dark brown tree branch. The monkey has brown fur on its back and a lighter, greyish-brown face and underbelly. It is looking down and to the left. The background is a dense, out-of-focus forest with various shades of green foliage. The text "Start Up: Monkeys in Trees" is overlaid on the right side of the image in a large, white, sans-serif font. The words "Start Up:" are underlined.

Start Up: Monkeys in Trees



Definitions and context

- OECD Frascati Manual
 - Basic research
 - Applied research
 - Experimental development



Basic research

- “...is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.”
(OECD Frascati Manual 2.1.64)



Applied research

- “...is original investigation undertaken in order to acquire new knowledge . . . directed primarily towards a specific practical aim or objective.”
(OECD Frascati Manual 2.1.64)



Experimental development

- “... is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.”
(Frascati Manual 2.1.64)

The continuum matters

- Insert college applied research within this context

What is college applied research?

College Applied Research

Collaborative applied research and experimental development with **private and public sector partners**.



College Applied Research

- “Last Mile” R&D services
- Regional, “additive” R&D capacity
- Complementarity in the R&D continuum
- Move SMEs from idea to invoice



College Applied Research

- Is industry-facing
 - Responsive: pull vs push
 - Match industry need with college
 - Skills and talent
 - Facilities and equipment
 - Market and networks
- Enhances student learning while supporting industry innovation

How do we deliver college applied research effectively?

Partnerships & Demand Driven Innovation

Outside In versus Inside Out

- What are the needs of our partners?
- How can we orient our expertise, facilities and networks to address these?
- Why is this important?

Intentional Innovation

- Start from outcomes
 - Enabling private (and public) sector innovation: help get new products and services to markets and create new jobs and wealth in the economy
 - While fostering innovation literacy in all graduates
 - Teaching, learning, practicing innovation

Intentional Innovation

Help industry to

- ***Validate*** practicality and usability of new technologies/products/processes
- ***Simulate*** impact of their use
- ***Adapt*** those technologies for deployment under diverse conditions

Testing practicality and market/ user/ practice
adoption and adaptation

Intentional Innovation

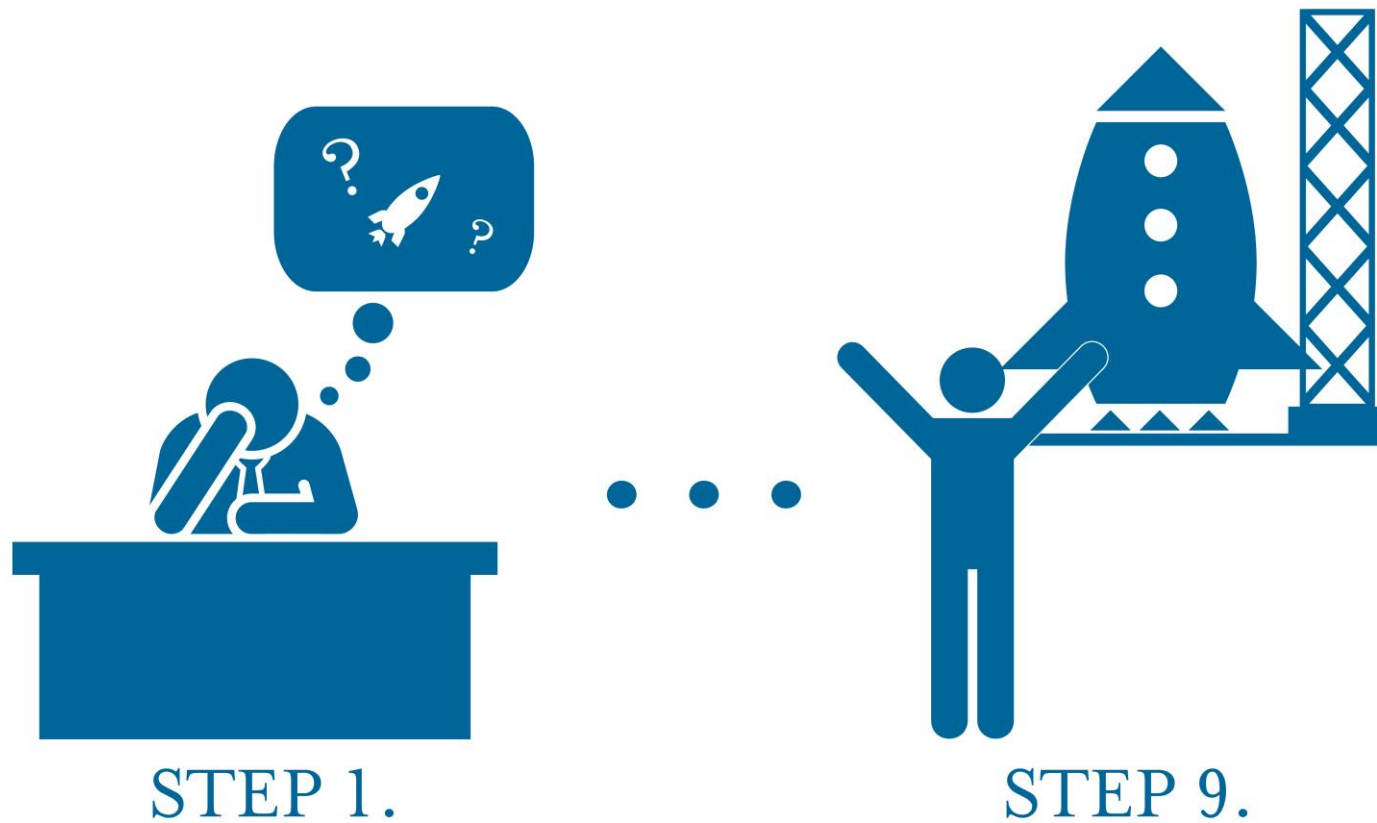
- Professional innovation support services
- Project and portfolio management using PMI
- Horizontal integration of disciplines
- Engaging publics – inside vs outside sell
 - Innovation Advisory Board
 - Partners
 - Networks

Benefits

- Industry Partners access timely problem-solving knowledge and facilities for economic development
- Students get real world, practical problem-solving opportunities and a superior learning experience;
- Faculty participate in industry innovation, contributing as well as refining their expertise
- The College enhances its reputation, strengthens industry and community links, contributes to social and economic development and fosters excellence in teaching and learning

Scale Up: Launching Rockets





Technology Readiness Levels (TRL)

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Level 9:	Actual technology proven through successful deployment in an operational setting.
Level 8:	Actual technology completed and qualified through tests and demonstrations.
Level 7:	Prototype ready for demonstration in an appropriate operational environment.
Level 6:	System/subsystem model or prototype demonstration in a simulated environment.
Level 5:	Component and/or validation in a simulated environment.
Level 4:	Component and/or validation in a laboratory environment.
Level 3:	Analytical and experimental critical function and/or proof of concept.
Level 2:	Technology concept and/or application formulated.
Level 1:	Basic principles of concept are observed and reported

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Complementarity

- We need a breadth and depth of skills, competencies, credentials
- This creates a multiplier effect

Complementarity

- How people work together in organizations
- How organizations work together in national economies



Australian Government



NATIONAL
INNOVATION &
SCIENCE AGENDA

WELCOME TO THE IDEAS BOOM

- “Establishing Industry Growth Centres in key sectors of competitive advantage: Advanced Manufacturing; Food and Agribusiness; Medical Technologies and Pharmaceuticals; Mining Equipment, Technology and Services; and Oil, Gas and Energy Resources”



Australian Government



NATIONAL
INNOVATION &
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WELCOME TO THE IDEAS BOOM

- “Australia’s rate of collaboration between industry and researchers (at 2-3%) is currently the lowest in the OECD. Australian businesses do not have as much internal research expertise as key comparator countries either.”



Australian Government



NATIONAL
INNOVATION &
SCIENCE AGENDA

WELCOME TO THE IDEAS BOOM

- "Businesses that collaborate on innovation with research organisations are three times more likely to experience productivity growth, improved sales and exporting activity."

(<http://innovation.gov.au/page/national-innovation-and-science-agenda-report>)

Economies; Scale

- Supply and demand
- Division of labour
- Intentionality

Language Matters

- Define what and how we deliver applied research, according to what and how these are defined elsewhere
- OECD Frascati Manual
- Red=Vermillion



Stay Up:
Bruce Lee

Gravitational Pull

- “A goal is not always meant to be reached, it often serves simply as something to aim at.”



Strengthening the brand of applied research is important because...

- Companies often do R&D episodically (as needed), and choose partners to solve problems
- Companies form perspectives of potential partners based on their own interactions, and perspectives of those in their business network.
- Colleges will benefit if they can guarantee a certain minimum level of AR&TD capabilities. Ideally these would be relatively consistent across geographies/industries.

Measurement Matters

Applied Research

Canada's colleges and institutes play a lead role in strengthening regional capacity to innovate by undertaking applied research that leverages their strong connections to industry and communities. Colleges and institutes provide talent, access to state of the art equipment and facilities that generate economic and social gain.



Fast Facts

- › Expertise in **1,450** areas of research specialization in priority sectors ranging from natural resources and energy, environment, health, information and communications technology, manufacturing, and social innovation
- › **763** specialized research centres and labs
- › **6,040** partnerships with companies and community organizations
- › **2,585** faculty and staff engaged in applied research
- › **31,346** students engaged in applied research projects of which **10,101** received support to pursue an entrepreneurial idea

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**GOOD
DATA
MATTER MORE**

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Political Advocacy

- Telling stories
- Linked to data
- Focus on complementarity, and collaboration to compete together
- Build resilient regional economies

Conspicuous Contribution

- Like education, applied research is
 - Transactional
 - Transformational

Student Success



Excellence in Research & Innovation Badge

Recognize Innovation Literacy: Research, problem solving, leadership and entrepreneurship skills, and the ability to recognize innovation in the product development lifecycle

- Highly Qualified and *Skilled* Personnel
 - flexible innovators in the workforce

“As one of the 7,500 students who have participated in applied research during your tenure, I can attest to the profound impact such opportunities have on us. The skills we acquire, the network we form and the experience we gain makes our transition into the workforce so much easier. For so many of us, applied research has allowed us to explore interests and discover passions we might not otherwise have known were there.”

James Henderson; 2016 graduate; Student member of the GBC Innovation Advisory Board



Barn Raising the Innovation Economy

