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Innovation and Differentiation in Canada's Post-secondary Institutions

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Foreword

Universities and colleges have experienced a radical shift in circumstances in the past 20 years. The demand for advanced education has soared as the skill requirements for a good job escalated. Prosperity in Canada has increasingly been defined as an educated population prepared to compete globally. Yet, until recently, governments have been cutting transfers to cover operations of educational institutions. This revenue has been replaced in part by higher tuition fees and more active fundraising programs. But there have also been notable changes in the way university programs are organized such as the increase in class size and greater use of part-time lecturers and sessional teachers. Nevertheless, educational attainment of the Canadian population has risen as young people and mature workers have expanded their participation in higher education.

Canadians are vitally aware of the importance of advanced education. They know that Canada's competitiveness and their own future living standards will depend on the knowledge and skills of the work force. The main worry, as tuition costs increased, has been whether all qualified students have been able to access the appropriate university or college program. Both governments and philanthropists have therefore made significant investments in student aid through loans, grants, and bursaries. And CPRN has contributed several major papers examining their success in ensuring access (available at www.cprn.org). They have shown that our financial aid systems are not well-targeted to students in low-income families, but that early interventions to influence the aspirations of young people and their parents may be even more important than addressing financial barriers to participation in PSE.

So far, however, few questions have been asked about trends in the quality of the learning experience of students. Are Canada's universities and colleges able to match the quality of teaching and research provided by the best schools in other countries? What policy changes might be needed to allow our post-secondary institutions to realize their potential for excellence without compromising access?

CPRN launched in 2005 a series of studies of quality issues in our post-secondary system. Our goal was to stimulate a national conversation about this issue, and thanks to Red Wilson, founder of the Wilson Foundation, we were able to do this. This report, by Robert Crocker and Alex Usher, looks at the state of innovation on Canadian university and college campuses in teaching and learning as well as research dissemination, based on interviews with provincial officials, a brief survey of post-secondary institutions, and more detailed examination of six examples of innovative practices. Crocker and Usher focus on changes in general practice at an institution or across institutions, and, in particular, innovations designed to place an institution at the forefront of a field or to differentiate it from other similar institutions.

The cases examined illustrate some exciting innovations at our universities and colleges. And they also highlight the lack of formal evaluation of most innovations in teaching; the limited support both within institutions and externally for experimentation; and the lack of research on teaching methods in higher education.

We are preparing the fourth and final paper of the series which will synthesize the key findings of the first three studies as well as other recent research on quality in PSE, and explore the policy implications.

I would like to thank Robert Crocker and Alex Usher for their valuable contribution to our knowledge of innovation in post-secondary institutions and their insight into the changes needed in order to better foster innovation in teaching at our universities and colleges. I would also like to thank The Wilson Foundation, Industry Canada, The Roasters Foundation, and the Ontario Ministry of Training, colleges and Universities for their financial support for this study. A complete list of funders for the series on quality issues in Canada's post-secondary institutions can be found under "Our Support" at the end of this report.

Sharon Manson Singer, PhD
June 2006

Executive Summary

Background and Purpose

In the global economy, it is increasingly recognized that knowledge is the key to competitive success for Canada as a nation, as well as to the success of individuals in the labour market. Universities and colleges, in particular, have a central role in generating knowledge and fostering innovation, through both their teaching and research activities.

The purpose of this study was to examine the state of innovation on Canadian university and college campuses in two specific areas: teaching and learning, and research dissemination. The kinds of innovations of interest were those which involve changes in *general* practice at an institution or across institutions and, in particular, innovations designed to place an institution at the forefront of a field or to differentiate the institution in some way from other similar institutions.

The work was carried out in two stages. The first stage consisted of a series of interviews with provincial officials and a brief survey of post-secondary institutions. These were intended to examine the climate for innovation and to help identify examples of innovations. In the second stage, six examples of innovative practices were examined in more detail.

Interviews and Survey

The interviews revealed that most provincial governments now have in place specific agencies and funding mechanisms to promote innovation. Most of these are concerned with knowledge transfer and especially the promotion of commercial opportunities from research. Governments are also concerned with increasing access to post-secondary education and prompting articulation among institutions and programs. Beyond this, governments seem to be taking a less activist approach towards post-secondary education than in the past.

Competition among institutions for students, and competition for the "innovation dollars" available from the various new agencies were cited as driving forces for innovation. Some skepticism was expressed by provincial officials over the ability of institutions to respond to changes in the external climate and over the ability to sustain innovation once the current funding stimuli are no longer available.

Most survey respondents expressed the view that the innovation climate in their institutions is positive and that the main driving forces for innovation are internal. Administrative and institutional vision, pedagogical and personal development support, and dedicated financial and human resources were the most commonly cited examples of internal drivers of innovation. The main barriers to innovation cited were limited resources, limited incentives and opportunities, limited rewards and recognition, and resistance to change. Colleges also mentioned the limited opportunities for research in the college environment. Most of the respondents indicated that innovation is a means of distinguishing themselves from other institutions in their provinces and regions. Other than broad strategic plans, the main mechanisms used to promote innovation

seem to be institutes, centres and posts, unique approaches to curriculum, learning and credentials, partnerships and collaborations, and funds to stimulate innovation. Colleges, in particular, placed substantial emphasis on innovations in teaching and learning. Collaborative arrangements between colleges and universities are also reasonably common.

The Case Studies

The six cases were selected to include a range of examples including innovative uses of technology in teaching and learning, a pervasive climate for research dissemination, and large scale institutional transformation. Most of the cases represented innovations related to the reputation of an institution or the manner in which it attempts to differentiate itself from others. In two instances, e-learning and the evolution of community colleges, the cases represent a pervasive trend that cuts across institutions. Because of our definitions, the case studies focused on broad institutional change and on teaching and learning innovations rather than on research. A much more comprehensive study would be required to gain useful insight into research innovation.

Acadia University – In the early 1990s, Acadia University initiated what has become known as "the Acadia Advantage" as a response to concerns about the university's ability to maintain its enrolment in the face of emerging demographic trends and increasing competition among the many universities in Nova Scotia. The key element of the Acadia Advantage is the deliberate integration of computer and information technology into the teaching and learning process. This is accomplished by providing every student and faculty member with a laptop computer, and establishing a comprehensive support system, both for the technology and for its use in teaching and learning. The Acadia Advantage is a clear example of the creation of a unique institutional culture through the exercise of visionary leadership in response to perceived adverse conditions.

Distance Education and e-learning – This represents a more pervasive trend in the use of technology in teaching and learning, and an area in which Canada has some claim to world leadership. This innovation seems to be driven by demand for access to post-secondary education on the part of those not able to take advantage of traditional campus programs, emerging emphasis on life-long learning and a desire on the part of government and industry to promote the use of information and communications technology as a driving force of the new economy. E-learning takes various forms, distinguished by the types of technologies used and the intensity of use of these technologies. The emergence of the Internet has brought about a profound change in the ability to deliver programs directly to individuals without intermediary facilities. Several institutions in Canada have used distance education in general, and e-learning in particular, as a means of differentiating themselves from other institutions and as a way of attracting a new student clientele. Nevertheless, despite this growth, e-learning remains controversial in terms of whether it should be viewed as supplementing or replacing traditional modes of teaching and learning, and whether it is pedagogically effective or cost effective.

The University of Waterloo: Co-operative Education and Technology Transfer – The University of Waterloo has clearly built its reputation on these two areas. Co-operative education, while not unique to or originating with Waterloo, may be seen as the catalyst for its gaining independence from the University of Western Ontario in the 1950s, and for the

continuing attraction of its Faculty of Engineering in particular. A strong argument can also be made that the attraction of co-operative education is a major factor in Waterloo's success in attracting research funding, and in its ability to generate commercial applications for its research. This is because the co-operative program brings the university much closer to industries in a position to take advantage of research, and because it encourages an entrepreneurial culture among students, faculty and graduates. Added to this is the early adoption by Waterloo of a policy allowing intellectual property to remain in the hands of researchers. The synergy between co-operative education and technology transfer, aided by the intellectual property policy, clearly differentiates Waterloo from other Canadian universities of its size.

McMaster University: Problem-Based Learning – Problem-based learning is an innovation of the McMaster University Medical, School which dates from its formation in 1965. PBL is based on tutorials in which small groups of students engage in intensive studies of cases designed to illustrate clinical principles. The role of the instructor is to facilitate and ensure participation rather than to transmit knowledge. Because of this significant shift in instructor role, much effort must be devoted to instructional development. The McMaster model has been fairly widely adopted and subjected to some research on its effectiveness. However, controversy remains over both the effectiveness issue and over the fidelity of its implementation in other settings. Recent changes in the program at McMaster have been designed to address perceptions that the program yields inadequate preparation in basic science, low emphasis on some professional competencies and the need for increased skill in dealing with the vast growth in medical knowledge.

The Nova Scotia Community College – This is a case study of institutional transformation and of the exercise of leadership in the face of external forces forcing an institution to change, but not determining the specific direction of that change. The main external forces were provincial government concern with the shortcomings of the many separate vocational schools in the province and a reduction in federal "seat buying" in the 1990s. Following critical reports on the college system dating from the late 1980s, the separate institutions were merged under an independent board of governors in 1996. The first few years of the new institution saw considerable consolidation of programs and closure of some campuses. It was not until the appointment of a new president in 1998 that the situation began to turn around and the new college was set on a road to recovery. The key element designed to distinguish NSCC from other community colleges was the adoption of "portfolio learning" in which all students are expected to build a portfolio of examples of their work as their program progresses, and to use this portfolio as a primary tool in seeking employment and in continuing to learn beyond the program itself. This approach is credited not only with significantly improving employment rates for graduates, but also with bringing the college to the forefront as a major player in development of the Nova Scotia economy. The recent consequence of this attention is a decision of the Nova Scotia to reverse a decade of resource constraint and allow the institution to embark on a major expansion program.

Community College Developments – Like e-learning, this case represents a pervasive set of innovations that transcends a single institution, and that is driven largely by demand for increased access to post-secondary institutions and a perceived need for "hybrid" programs which blend academic and occupational studies. Several recent developments have challenged the traditional roles of community colleges and blurred the distinction between colleges and

universities. These changes are most evident in Ontario, British Columbia, and Alberta and have taken on somewhat different forms in each province. In Ontario the long-standing separation of the college and university sectors, with essentially no transfer arrangement, has been broken with approval for the colleges to offer applied degrees. In British Columbia and Alberta, colleges have long offered university transfer programs along with the more traditional occupational programs. The main change in British Columbia was the transformation of some colleges into "university colleges" with their own degree granting power. Alberta followed a similar pattern, moving from allowing some colleges to offer applied degrees, to allowing all to offer a wide range of bachelor's degrees. In all of these provinces, residual concerns about the quality of the new degrees have prompted provincial governments to establish external quality assessment bodies, to which proposals for new degrees must be submitted. All of these innovations are too new for any assessment of their impact to be made.

Conclusions

The interviews and survey support the idea that most innovation is internal. However, the cases suggest a more complex picture. For example, visionary leadership seems to have been exercised in response to significant external pressures and even crises. It is also clear from the cases that sustained effort over a long time is required to ensure that an innovation makes a mark. The e-learning and community college cases represent examples of many institutions rising to the challenges of the new economy and the demands for increased access to post-secondary education by using new technologies and new program structures.

Because some of the innovations studies were designed as a means of differentiating an institution from its possible competitors, many of the innovations studied are not readily "exportable". Indeed, uniform adoption of such innovations would defeat their main purpose. At the same time, many features of such innovations, especially technology use, likely find their way into other institutions without necessarily becoming defining features of these institutions.

The current external policy climate around innovation in teaching and learning is best described as passive. Government concern with improving access to post-secondary education, and with life-long learning, seems not to have been translated into policy initiatives that would encourage innovative ways to achieve these goals. While there is some evidence from the e-learning case study of institutional response to external policy thrusts, this seems to be the exception rather than the rule. Given the well established link between higher education and economic outcomes, governments and institutions should have strong reason to support research on how to properly define and measure the specific kinds of knowledge and skills that contribute most to these outcomes. More specifically, it is recommended that e-learning and other innovative approaches to achieving these goals be given greater impetus through support for both the development of practices and the conduct of research around these practices.

Introduction

This report is the third in a series on issues of quality in post-secondary education in Canada, commissioned by the Canadian Policy Research Networks. Its purpose was to examine the state of innovation on Canadian university and college campuses in two specific areas, teaching and learning, and research dissemination. The term "innovation" was taken to mean changes in *general* practice at an institution, rather than individual projects or programs. In particular, the interest was in innovations designed to position an institution at the forefront of some area of teaching and learning or knowledge mobilization and, hence, to differentiate the institution in some way from other similar institutions.

More specifically, this project was concerned with the following questions:

- What kinds of innovations (new ways of fulfilling the mission of the institution) are emerging in Canada's universities and colleges?
- To what extent is there differentiation (specialization in particular areas of strength that distinguish an institution from others) within the university and college sectors?
- What can we learn from case studies of innovative activity? What are the factors that have helped or hindered innovation in practice?

Background

In the global economy, it is increasingly recognized that knowledge is the key to competitive success for Canada as a nation, as well as to the success of individuals in the labour market. Universities and colleges, in particular, have a central role in generating knowledge and fostering innovation, through both their teaching and research activities.

In recent years there has been a great deal of research on issues related to access to post-secondary institutions, and the 2004 federal budget contained several measures designed to facilitate access for students from low- and middle-income families. Access of qualified students to post-secondary education is an important societal objective. However, attention also needs to be paid to the quality of these programs. Are Canada's universities able to match the quality of teaching and research provided by the best schools in other countries? What policy changes might be needed to allow our universities and colleges to realize their potential for excellence without compromising access? CPRN has launched a research project to address these issues.

The project began with the publication of *Measuring the Quality of Post-secondary Education: Concepts, Current Practices and a Strategic Plan* by Ross Finnie and Alex Usher. This report, published in April 2005, develops a conceptual model for examining PSE quality, reviews current approaches to measuring quality in Canada and other countries, and proposes both short- and long-term steps to improve quality measurement.

The second phase of the project examined the funding trends and incentive structure (funding formulas, regulatory constraints) facing Canada's universities and colleges, and how this affects

their ability to deliver on both access and quality. The report of this phase, prepared by Ken Snowdon (2005), focused on the regulatory and financial climate for innovation, with emphasis on the funding mechanisms for the post-secondary sector, including incentives for innovation and on the key policies that have an impact on the post-secondary sector, such as tuition policy and degree-granting authorization.

In this third phase, the focus was on examples of innovation and particularly on comprehensive innovations that may be helping redefine the ways in which post-secondary institutions function and on how innovation is used by institutions to specialize or to differentiate themselves from each other in a competitive climate. In this respect, the emphasis was not on particularly innovative research projects but rather on innovations that influence the climate of a whole institution or are potentially transferable to other institutions.

Methods

The work was carried out in two stages. First, a series of interviews was conducted with provincial officials, and a survey of post-secondary institutions was carried out. These were intended to examine the climate and driving forces for innovation as well as the barriers to innovation, and to help identify examples of innovations that might be followed up in a second stage. While there was little difficulty with the interviews, the response to the survey was not overwhelming, with only 44 of over 200 institutions responding. However, since we were not interested in making precise population estimates but simply in gaining insights into major trends and finding interesting examples, this was judged sufficient for the purpose. In the second stage, six examples of innovative practices were examined in more detail. Consistent with the intent, most of these represented pervasive innovations related to the reputation of an institution or the manner in which it attempts to differentiate itself from others. In one instance, that of e-learning, the case represented a pervasive trend that cuts across institutions but that remains in a relatively underdeveloped state relative to its policy profile.

Interview Summary

The purpose of the interviews was to obtain a preliminary reading on the state of innovation in Canadian universities and colleges, as seen by knowledgeable persons outside the institutions themselves. The interview respondents were mainly senior officials of provincial ministries/ departments of education or advanced education. A secondary target group was provincial or regional bodies responsible for coordinating post-secondary education, or for promoting innovation or knowledge mobilization. Most of the interviews were conducted face-to-face, some with a single official and others with groups, although a number of interviews were done via telephone as well.

Involvement of Agencies in Promoting Innovation and Differentiation

With respect to innovation in the area of research and knowledge transfer, in general, it appears that departments of education (or advanced education, depending on the province) are less involved directly in this area than they have been in the past. This seems to be related to the establishment of provincial or regional agencies with specific responsibility for promoting innovation. Several such agencies were identified in the interviews. Some of these are provincial, such as the BC Innovation Council and the New Brunswick Steering Committee on Post-secondary Research. The latter seems to be unique in the country as an example of government-institutional co-operation to promote research dissemination. Newfoundland has renamed a government department to capture the term "innovation" (the former Department of Industry Technology and Rural Development is now the Department of Innovation, Technology and Rural Development). Springboard Atlantic is a regional consortium under the overall umbrella of the Association of Atlantic Universities, with a specific mandate in the commercialization of research.

Typically, these agencies are responsible for various small grants and awards programs intended to assist in efforts to commercialize research and to recognize outstanding "innovators." An example is the "proof of concept" grants available from Springboard. In some cases, such as in BC, the agency is concerned with promoting innovation in strategic sectors such as health or agriculture. Most of the resources come from provincial sources or, in the Atlantic Region, from the Atlantic Innovation Fund administered by the federal government's Atlantic Canada Opportunity Agency (ACOA). Most of the awards seem to go to university researchers. We interviewed officials of the AAU and Springboard on the role of that agency but confined our investigation of the remaining agencies to examination of their websites.

With respect to the issue of innovation in teaching and learning in PSE institutions, most provincial governments appear not to view this as part of their policy mandate. They are happy enough when these innovations occur, but do not see it as their mandate to stimulate such innovation. At most, they will be enablers of innovation if an institution comes to them with a request for a small grant to help get such an innovation off the ground. Generally, however, the attitude seems to be that developments in the classroom are best left to institutions.

While innovation in classroom learning is seen as being outside the purview of government policy, the same is not true of innovations in learning outside the classroom. Distance education is very much a preoccupation of provincial education ministries, as it comes under the rubric of their mission to promote access. Some provinces, such as Manitoba and Newfoundland devote quite a bit of attention to the quality of instruction in this area, in marked contrast to their attitude to in-school quality of instruction.

Policy Aims

Most of the government departments and innovation agencies seem to have no specific policy aims other than to promote innovation. However, the kinds of projects being supported by the innovation agencies suggests that the press is towards applied research and commercialization of research. Indeed, the term "innovation" seems to be defined largely in terms of commercialization of research. Our impression is that the innovation agencies in the Atlantic Region have been established primarily to take advantage of the availability of federal funding for innovation. For example, the Atlantic Innovation Fund (AIF) was mentioned as having been established because the region had not been notably successful in attracting Canadian Foundation for Innovation (CFI) funding. In particular, the CFI co-funding requirements were seen as working against the Atlantic Region because of the lack of research-based private firms. A similar point was made by the BC respondents.

Government policy in BC is based mainly on improving access to post-secondary education, as evidenced by the substantial expansion of the university sector. However, there is no specific model of what the new institutions should look like, and widely different models are emerging (e.g., regional institutions versus research institutions). This policy is operationalized mainly in terms of capital funding. However, respondents did mention that the BC government is interested in setting up more specialized institutions, including private universities.

Promoting institutional differentiation, as we have defined this term, seems not to be on the agendas of any of the agencies. There were indications that this was an issue in past years in Nova Scotia because of its large number of universities, but that this is not now an active policy area for government. Most provinces have relatively few institutions and, in the words of one official "everybody knows what they should be doing and contributing to the overall system, so we don't have to spend a lot of time looking over their shoulder on that score".

Innovation Climate and Barriers to Innovation

Two kinds of competitive pressures were mentioned in response to the question of what is driving innovation. One is competition among institutions for students, and the second is competition for the "innovation dollars" available from the various new agencies. Universities are well attuned to new sources of research funding and accustomed to operating in a competitive environment for research dollars. This raises the question of whether "innovation" funding is treated merely as another source of research rather than in a more strategic sense. The granting councils themselves are part of this as there is increased emphasis on partnerships, applied research and targeted initiatives. Universities seem adept at casting their activities in terms of the requirements set out by funding agencies.

Some respondents did mention resistance to change, the rigidity of university bureaucracies, and the lack of attention to time constraints as features of the institutional climate which militate against innovation. Others referred to lack of awareness of the need for innovation or to think of research in terms of its commercial possibilities. One respondent was concerned that the institutions in that jurisdiction may not be able to use all of the funding available under the government's innovation strategy. Others were concerned that the private sector in the Atlantic region is not robust enough to participate in co-funding and other partnership arrangements. Finally, there was concern that when current funding initiatives, such as AIF and CFI, dry up, the emphasis will shift to whatever new initiatives are on the horizon with no sustained emphasis on innovation (again defined as commercialization of research).

One of our respondents was concerned that the vesting of intellectual property rights in individuals, which seems to be common practice in the Atlantic Region, can be detrimental to achieving added value from research. The view was that unless there is some institutional stake in intellectual property, researchers will tend to move on to other activities before sufficient attention is paid to application. This is contrary to what seems to have emerged from the broader institutional survey which pointed, in particular, to Waterloo University as the shining example of where vesting intellectual property rights in individuals has had immense commercial payoff, and substantial long-term payoff to the university in the form of alumni support.

Innovation Examples

While most respondents were able to cite specific examples, few were able to respond to our invitation to give examples in strategic terms. The examples cited were typically individual research projects that had bridged the gap to commercialization. Examples of broad innovations of the sort that would meet our criteria were mainly in the teaching and learning area. This suggests the possibility that respondents were thinking of innovation mainly in research terms, and of differentiation mainly in teaching and learning terms.

Summary of Survey Responses: Universities

Vice Presidents Academic of AUCC member institutions were asked to respond to five questions on innovations at their institutions. These were:

1. How would you describe the climate for creating innovations in teaching/learning and research dissemination at your campus? Does the push for innovation in these areas lie within your campus, or is innovation driven by outside forces (either governments or broader changes in academe)?

2. What are the barriers to greater innovation in teaching/learning and research dissemination on your campus? To what extent (if any) is innovation stifled by inertia or internal dissent, and to what extent is it stifled by forces external to the institution?

3. To what extent (if any) is your institution using innovation in teaching/learning and research dissemination to distinguish itself from other institutions in your province or region? What initiatives in other areas has your institution taken to distinguish itself from other institutions? Is the process of institutional differentiation primarily driven from within the institution, or are external pressures (e.g., pressure from government) the more important factor?

4. Please name one outstanding example of innovation in teaching/learning and one in research dissemination at your own institution, along with the name of a contact person who is responsible for, or knowledgeable about, the innovation in question.

5. Please name one outstanding example of innovation in teaching/learning and one in research dissemination at a Canadian university or college *other than your own*.

Innovation Climate

The majority of respondents noted that the innovation climate for teaching and learning and research dissemination on their campuses was positive. Many provided examples of what it takes to develop a positive climate; administrative and institutional vision, pedagogical and personal development support, and dedicated financial and human resources were the most commonly cited examples. Some institutions noted that having relatively young faculty could also bode well for creating a climate for innovation if the other conditions were met, as young faculty are more likely to be most familiar and comfortable with new ways of doing things.

Some felt that their innovation climates were tentative, being either under development or in need of additional development. A very few felt that their innovation climates were negative as a result of little institutional support, wide-spread skepticism, and little knowledge of the benefits and rewards of innovative practices. Some felt that while innovation in research dissemination was strong and strongly supported in some areas on their campuses – primarily sciences and professional programs – other disciplines, such as the humanities and social sciences, experienced difficulties.

Overwhelmingly, those respondents who felt that their innovation climates were positive also noted that the drivers of innovation come primarily from within their institution. These institutions largely began positioning themselves early on and, as a result, have developed an internal culture of innovation. UBC, for example, commits over $2 million annually for innovation to the Teaching and Learning Enhancement Fund (TLEF), a fund which is operated on a competitive basis, with close to 100 applications received annually. According to the respondent, the TELF has "driven innovation on the UBC campus for 15 years;" indeed, it would likely be difficult for most individuals on the UBC campus currently to imagine what it was that was driving innovation on campus before TELF.

Others noted that while their innovation agendas have primarily come about through internal drivers, the results of these internal forces have positioned them well to respond to external factors, such as government policy directives or changes in industry standards.

Some of the respondents felt that there was equal force from internal and external drivers, and that sometimes one fed the other. A respondent from an Ontario research university noted that:

> *More and more government granting opportunities depend upon partnership and collaboration between universities, business, industry or agencies.*

These partnerships and collaborations were noted among other respondents to have resulted in internal interest and discussions around the pedagogical and research dissemination approaches that partners bring to the table. These types of discussions – and the innovations themselves – can become encouraged, entrenched, and formalized within their respective institutions.

A very few respondents felt that innovation on their campuses was driven primarily by external forces, namely provincial and federal governments. A respondent from a small Atlantic university said:

> *Federal accountability requirements resulted in an increase in efforts to enhance, measure, and evaluate innovation. The first application made by the university for a Canada Research Chair required the development of a strategic research plan, which encouraged the institution to identify research priorities.*

Barriers to Innovation

The barriers to innovation in teaching and learning and research dissemination identified by respondents can be grouped into four major themes:

1. Limited resources;
2. Limited incentives and opportunities;
3. Limited rewards and recognition;
4. Resistance to change.

Limited Resources

Almost all respondents cited a lack of consistent and committed financial and human resources. According to the responses, these constraints are primarily the result of external and internal forces. A respondent from a small Atlantic university noted that:

> *Limited government funding affects the hiring of necessary support staff and term employees to cover staff for release time needed for developing innovative initiatives. Furthermore, this results in a lack of support staff to help faculty redesign their courses and to provide training for those who want to incorporate technology and staff to troubleshoot when problems arise*.

A respondent from a large Ontario university had this to add:

> *Canada lacks significant funding to support innovation in teaching and learning in higher education. Innovations in curriculum and pedagogy have been fostered by federal grant programs, such as FIPSE, and by private funding organizations in the US. ... Similarly, a recent funding initiative in the UK has provided substantial support for educational development projects, and there are also infrastructures to certify faculty as teachers and to accredit programs that provide such certification, and to support and promote teaching innovations within disciplines (Learning and Teaching Support Networks).*

A respondent from a western research institution felt that there was a "lack of clear external funding opportunities to facilitate pedagogical research to put it on a more equal footing with other forms of scholarship."

Another respondent from an Ontario institution noted that while there is not enough external funding, budget and staff restraints are also the result of institutional resource allocation decisions:

> *The majority of funding is based on/committed to, existing and ongoing activities. New initiatives require support and development funding. The Institution has made it a priority to allocate resources to new projects and initiatives through an Academic Priorities Fund established within their strategic planning framework, Refining Directions, but this funding is limited. New approaches are also more costly than traditional approaches.*

Limited Incentives and Opportunities

Many respondents cited issues around lack of course relief time, noting that teachers and researchers alike need time releases and professional development opportunities to develop and incorporate new ideas. There were also concerns around large class sizes and teaching constraint requirements. One small Atlantic institution noted that the provincial government "narrowly defines" innovation, placing too much emphasis on physical sciences, engineering, and technology.

Limited Rewards and Recognition

Many of the respondents felt that the traditional ways of academic advancement and scholarly promotion hindered innovation. Traditional recognition and reward structures, some felt, are difficult to change because they are entrenched in institutional culture and are reinforced through governance documents, policies and procedures, and collective agreements. The treatment of teaching and learning as a scholarly pursuit has been said to be particularly vulnerable under traditional recognition and reward models. As a respondent from an Atlantic university noted:

> *Classroom-based "action" research initiatives may not be viewed as scholarly research by peers, chairs, and dean; this stifles efforts to evaluate innovative strategies.*

This climate, said another respondent from Ontario, can be particularly stifling to young faculty:

> *There is little flexibility to reward faculty for teaching innovations to the same degree of traditional research and publishing; this is compounded by the fact that it is usually young/new faculty at the start of their careers who embrace and develop innovations but are facing pressures to establish their academic careers.*

Another respondent from Atlantic Canada agreed:

> *New faculty, virtually without exception, are keen to develop their research agendas.*

A respondent from a large Ontario institution stressed that the difficulties run deeper than the institutions themselves:

> *There are "widely-held" perceptions that although universities hold a dual mission of research and teaching, the individual and institutional rewards and status that follow research productivity are significantly higher than those accorded to teaching. There are also widely-held, tacit assumptions about the nature of teaching that undermine its status as an intellectual, academic activity. These assumptions are often reinforced by the limited nature of current practices in evaluating teaching. Despite the introduction of teaching portfolios which are intended to elicit a more comprehensive view of the knowledge, practices and impact of a teacher, we lack mechanisms to ensure reviewers who are well-informed about educational theory and practice. Although undergraduate programs are subject to review by external consultants, external review of teaching per se is rare. In contrast, external review of research is the norm. Over-reliance on student evaluations of teaching also tends to restrict the 'range' of performance, leading many who make comparative judgments on teaching accomplishments (for merit or tenure and promotion decisions, for example) to perceive that research accomplishments account for more 'variance' across faculty and hence provide a more useful way to differentiate (and reward) faculty (Smith, 2005). These internal practices are reinforced by external agencies. Granting agencies focus decision making on applicants' research profiles. Consequently, faculty who devote intensive time and energy to teaching rather*

than research can jeopardize their careers. Similarly, many comparative indicators of universities give heavy weight to research.

Resistance to Change

According to some of the respondents, just as traditional advancement structures are entrenched in Canada's post-secondary institutions, so too are traditional values. These values, some feel, result in resistance to change and tensions between and within disciplines and departments. These factors combined can result in innovation paralysis.

Some respondents generally accepted that there is an "inevitable inertia that develops over time within program areas or on the part of individual faculty," noting that there are a number of long-standing faculty members who consider themselves teachers over researchers, and vice-versa. UBC noted that these "traditional attitudes toward scholarship separate teaching and research activities into mutually exclusive silos".

One respondent offered the following comment:

> *The main barrier experienced internally is cultural. Many academics, primarily in the humanities and in some disciplines in the social sciences, believe that the only research audience that matters is the academic audience. Interestingly this is not the case with the fine arts who appreciate that the products of their research/creation are primarily meant for external, non-academic audiences. Humanists and some social scientists generally have not yet embraced the need to participate actively in knowledge exchange between other stakeholders in the academy, examples of which include policy makers, media, public, educators, legal practitioners, NGOs etc.*

Innovation as a Means of Differentiation

Most of the respondents noted that their universities use innovation in teaching and learning and research dissemination to distinguish themselves from other universities in their provinces and regions, further noting that while a good deal of this was driven by internal forces, external forces such as government and industry played a role in differentiation as well. The role that external forces play on an institution's ability to be distinctive – respectfully so – should not be underestimated here, as a respondent from a mid-sized Ontario university pointed out:

> *We are concerned about MacLean's rankings and our reputation as a student-focussed environment, so we pay attention to the quality of teaching and learning, and innovation in these areas. Hence the outside environment has made us sensitive to this, and these pressures have become internalized.*

Many noted they used this distinctiveness to gain a "competitive" edge. Indeed, as a respondent from one research university noted:

> *[Our u]niversity's reputation for innovation is well-established among Canadian post-secondary universities, and is an important factor in our recruitment of both students and faculty. Increasingly, it is also of importance in our advancement*

activities: we have had considerable success in recent years attracting the interest of private donors to new interdisciplinary teaching and research endeavours.

This sentiment was shared by both large and small universities, to attract students, donors, and the attention of community and government members. As the respondent at one small institution suggested:

[Our institution} uses its teaching/learning innovations to distinguish itself from other universities by actively promoting programs to both the government and wider community. We emphasize that we are a small liberal arts university with a focus on teaching.

Another small university's respondent put it more bluntly:

The driving force is competition for students. We minimally emphasize this at present, but with a Strategic Plan process now in place we will be more self-consciously marking out our territory in the "primarily undergraduate" market via our distinctive ways of doing things.

Given the responses, it seems as though Canadian universities' responses to the challenge of innovation can effectively be grouped into four themes:

1. Policies, procedures, plans, and philosophies;
2. Centres, institutes, programs, and posts;
3. Unique learning models, curriculum, and credentials;
4. Partnerships and collaborations.

Policies, Procedures, Plans, and Philosophies

Most of the universities that responded to the survey noted that they have adopted guiding and governance documents that act as blueprints for developing an institutional culture of targeted innovation strategies and research dissemination. One large university, referring to its strategic plan, said that

One of the pillars identified in [our strategic plan] is Learning. The language in that section makes reference to education for global citizenship and contributions to a civil and sustainable society. This reference has proven to be one of the stronger defining elements of [the strategic plan]. Thus, [our institution] is positioning itself so that, in part, it distinguishes itself from other universities by its educational goals. This has important implications for our pedagogy and curriculum.

In terms of research dissemination, the University of Waterloo seems to have differentiated itself from its peers through its policy on Intellectual Property. Although the U of W is not the only institution to have a policy of giving its staff 100 percent ownership rights to the Intellectual Property they create, the university was the first in the country to adopt such a policy. The

policy is widely credited for its impressive record of technology transfer and the creation of a large number of spin-off companies, particularly in the high tech sector. However, as we shall see in a later section, people within the institution tend to see the causes of Waterloo's knowledge dissemination practices as being too complicated to attribute to a single policy. This will be further examined on page 35.

Centres, Institutes and Programs

Some of the respondents noted that their universities had formalized activities and developed institutional activities that they use to distinguish themselves from others. The University of Waterloo, for example, has created the position of Associate Vice-President (Learning Resources and Innovation). This senior administrative officer has the specific task of managing the institution's innovation strategy and the resources that are required to fulfil it. This may very well be a unique staff position among Canadian universities. Waterloo has also created the Centre for Learning and Teaching through Technology (LT3), which serves to evaluate new technologies and assist faculty members in embracing them. More generally, though, the many centres for teaching and learning at Canadian institutions that were set up in the late 1980s and early 1990s are starting to have the internal knowledge and depth to begin to make a real difference in supporting new pedagogies, though the take-up rate of these centres' services remains uneven.

Another interesting institutional development is that of the faculty-driven working group. Generally speaking, these groups bring together faculty members who have interests in areas such as technology integration, curriculum development, learning models, evaluation tools, and classroom-based research on learning assessment and evaluation of innovations.

Unique Learning Models, Curriculum, and Credentials

By far the most commonly identified methods of distinguishing innovations are "unique learning models", and curricula, such as the problem-based learning curriculum at McMaster's Faculty of Health Sciences. Nearly all of the respondents indicated that they set themselves apart from others by offering learning experiences that cannot be had elsewhere. It is in this area where we see perhaps the highest level of innovative and institutional "branding".

Interestingly, almost all of the respondents noted that their interdisciplinary approaches to learning models, curriculum, and credentials are what set them apart from other institutions. In analyzing the responses, the distinguishing factor here seems not to be that these universities merely *offer* interdisciplinary approaches to teaching and learning, rather it is that they offer specialized interdisciplinary programs and credentials. In positioning themselves to be "unique" in this area it seems that universities have taken a more "disciplined" approach to interdisciplinary approaches. This is even more intriguing considering that within academia, interdisciplinarity continues to evoke considerable suspicion amid a lingering perception that such courses of study lack solid theoretical foundations.

Other approaches cited include co-operative education programs, internationalization, and technology integration.

Partnerships and Collaborations

A few respondents noted the importance that partnerships and collaborations play in setting them apart from others. Partnerships and collaborations with other post-secondary institutions, industry, governments, agencies, and community groups serve primarily to disseminate research, it seems, and, to a lesser extent, to create joint academic programs.

Summary of Survey Responses: Colleges

As for the universities, respondents to the college survey were mainly Vice Presidents Academic or equivalent. Again, despite low response rates, the results yielded some insight into the climate for innovation in colleges.

Innovation Climate

Due to provincial differences in legislated mandates and authority, comparing Canadian colleges to one another in terms of innovation is more difficult than comparing universities. Like the universities, the majority of respondents noted that the innovation climate for teaching and learning on their campuses was positive. However, many of the institutions that responded stated that research at their institutions was very limited or non-existent, not viewing the work that they do in curriculum development, evaluation, and teaching and learning innovations as being research-oriented; these respondents tended to interpret "research" in a very narrow sense.

Overwhelmingly, the college respondents focused their responses on initiatives such as curriculum review, curriculum renewal, learner-centered pedagogical approaches, faculty development, e-learning, distance education and technology integration in the classroom. The majority of respondents felt that they excelled in these areas, due mostly to institutional support structures and mandates that firmly entrench the improvement and scholarly pursuit of teaching and learning into institutional cultures.

While innovation in the field of teaching may be nothing new, the recent extension of research – even of the applied variety – into the college setting represents something close to a fundamental change in mission. This change is primarily concentrated in two jurisdictions – Alberta and Ontario – and appears to be driven by external forces. In most cases, the mandate shift was the result of government policy changes, such as the implementation of applied degree programs, and institutions that were not prepared for these external innovations must now position themselves to bring about internal innovations in response to them. As a respondent from an Ontario College noted:

> *Research dissemination hasn't been required because it is a new activity for this institution; however, we are in the process of securing a full-time research administration position to facilitate the development of research programs and the dissemination of results.*

Another Ontario college respondent concurred:

> *We understand that new funding from the Ministry of Training, Colleges and Universities will be tied to some extent to innovative approaches to teaching and learning. We are in the early stages of developing our capacity to do applied research and therefore, to disseminate results. This is a lesser concern for us in the immediate future, but will take on increased importance in the next 3-5 years.*

Colleges in Alberta appeared to have been developing research mandates for some time, although the readiness and vigour with which they formally entrenched and pursued these activities within their institutional mandate appears to differ amongst institutions. One respondent from the province noted that:

> *The push now is both internal and external. Internally we're 'pushing the envelope' beyond the applied research mandate, and externally, the push is coming from accreditation bodies that require faculty research for programs offering baccalaureate degrees, which we are developing and launching. With respect to research dissemination, our climate is moving from cool to warm. Prior to new legislation in the province, research was more an underground, volunteer activity, than a valued normalized part of faculty workloads. Recent activities in Alberta that allow Academic Degree granting by Colleges, and more Collaborative Degree Completion opportunities move Alberta Colleges in a direction of acknowledging the role research plays in teaching and maintaining curriculum relevant to new knowledge.*

A handful of Alberta respondents, however, stated that innovation in both teaching and learning and research dissemination was strong on their campuses as a result of internal and external supports and drivers. One such respondent noted:

> *Colleges in Alberta have long been steeped in both industrial, trades, career, and technology education, as well as two years of university studies through elaborate multi-institutional transfer agreements. We have, for about ten years, been doing four-year Applied Degrees and four-year academic degrees through collaborative arrangements with intra-provincial and extra-provincial universities. 'Research' has been specifically excluded from our provincially approved mandates. I think with the assumption that while universities are recognized as research institutions, colleges have been limited to 'teaching' institutions. I would say that colleges have been involved in academic and community projects, innovation, entrepreneurial and teaching activities that are in every description research activities. We have done these activities under the umbrella of innovation or applied research.*
>
> *Recently, applied research has been allowed to be included in our mandates and GPRC changed its mandate to include it as soon as the 'window' was open to do so. More institutions are involved in innovation and applied research. Several, including our own, are talking about developing Centres of Innovation and Applied Research. More institutions are now seeking funding for research. While it has been our practice, our institution just passed a policy on work-loading research which allows for research grants to fund release time for faculty.*

Another Alberta respondent from Mount Royal College offered the following:

> *Research at [our institution] is part of our aim of making knowledge serve the community, and 'dissemination' is one of the criteria used in determining if a research project will be supported. Consequently dissemination is understood to be part of the process of doing research. Innovation in dissemination of research*

> *is another matter; to date our focus on research dissemination has been in quite conventional, but effective ways. Because of [our] close connections with its various communities, much of the research we do is like that supported through the Social Science and Humanities Research Council's 'Community University Research Alliance Program'. While such a model might seem innovative at some institutions, it's what we do almost as a matter of course.*

The pursuit and dissemination of applied research has not only occurred in provinces such as Alberta and Ontario, where colleges have been moving towards degree-granting status. In the words of one respondent from the Atlantic region:

> *Innovation in applied research has taken a priority seat in [our] college program and planning during the past couple of years. In [our] response to the Canadian Innovation Strategy, [we have] taken significant measures to build [our] own applied research plan. With the incorporation of applied research as additional mandate, the College launched a research and development program in year 2000. During the past few years of preparation and planning the College now boasts of a credible applied research program offering in-house potential for innovation, technology transfer and commercialization. The push for innovation in applied research lies within the College, supported, to some degree, by outside forces (governments, funding agencies, etc).*

Indeed, the majority of College respondents who noted that their institutions had positive climates for innovation in dissemination of research noted that, while internal forces seemed to shape the type of activities they pursued, external forces were of great importance to making these activities viable and in ensuring that research is disseminated. Said one:

> *The impetus for innovation and applied research is still largely internal, though more and more we are being approached by external industry and other groups (NGOs) to participate in applied research.*

Although most of the respondents have taken measures to move away from being solely seen as "community" colleges – both in name and in mandate – the importance of "community" appears to still be deeply entrenched in the ways in which they go about their business.

Barriers to Innovation

While the college respondents cited the same barriers to innovation in teaching and learning and research dissemination as the universities – namely limited resources, limited incentives and opportunities, limited rewards and recognition, and resistance to change – they also noted that they experienced physical barriers that were primarily geographical and structural in nature. As well, more than a few respondents noted that they were limited by their mandates, and that this was primarily due to government legislative restrictions.

Limited Resources

As with the universities, almost all respondents cited a lack of consistent and committed financial and human resources. According to the responses, these constraints are primarily the result of external and internal forces. One respondent from Western Canada offered this:

> *A significant barrier to greater innovation is the current provincial funding model for colleges, which is designed to compensate purely on the basis of instructional hours, and does not recognize the value of research activity or research dissemination. Resources to initiate innovative projects are dependent on project-based, external funding, which limits the institution's capacity to strategically plan for new innovation and requires significant resources to obtain additional funding.*

From the east coast, another respondent added:

> *Our major challenge at this point is access to external funding sources. The current (funding) climate for funding college research is not as great as it could possibly be.*

An Ontario institution's response illustrated that colleges face a rather unique challenge with respect to human resources:

> *Our perception regarding the greatest barrier is the uneven preparation of college teachers in terms of pedagogical and andragogical practices. The longstanding tradition has been to find content experts from industry and the larger community with little emphasis on the actual teaching-learning side of things; until recently professional development in terms of teaching has not been adequately supported.*

Limited Incentives and Opportunities

Almost all of the respondents noted that there were limited incentives and opportunities within their institutions. Largely, these comments focused on workloads, with faculty being too "busy" to pursue opportunities. Interestingly, some of the colleges noted that their institutions grant faculty course-release time to pursue innovation projects.

Limited Rewards and Recognition

Most of the colleges that responded do not have the same, or even similar, requirements for tenure as do universities. Indeed, whereas university respondents underline that career incentives vastly favour research activities over teaching ones, in the college sector the exact opposite seems to be the case. Said one Alberta college respondent:

> *... because research and publication are not requirements for tenure and because there is no promotion through academic ranks, the peer-review process has minimal effect.*

Reward and recognition for innovation appear to be less tangible within the college system, save for teaching awards and release time. Indeed, institutional culture and governing documents may not encourage innovative activities. One Ontario college offered this:

> *The structure of the collective agreement that faculty work under does not foster innovation in teaching/learning. For a long period of time, there was little movement in members of faculty at the institution, due primarily to cutbacks in budgets and lack of growth in programming at the college. In the last four years, a number of new program initiatives have resulted in a large (>20 percent) increase in faculty numbers, which, coupled with the retirement of long-standing members of faculty, has created a climate of renewal in some areas which we anticipate will overcome much of the inertia. Recent (2005) capital budget increments in Ontario have provided an opportunity to begin the renewal of instructional infrastructure which has contributed to an increased enthusiasm amongst members of faculty where it has been invested. Continued planned reinvestment will create an opportunity for more improvements across our institution.*

Resistance to Change

Colleges, like universities, also have individuals within their institutions who resist change. There appear to be two primary problems here: informed resistance to change and uninformed resistance to change. The former has to do primarily with faculty who "cling" to traditional ways of doing things. These individuals may be suspicious of change. The latter has to do with lack of recognition or familiarity of the need and value of change, which may stem from the teaching culture of some of these institutions not valuing research. One Atlantic respondent stated:

> *Most of our instructors do not come from academic backgrounds, so would have little exposure or experience to innovation and research.*

Innovation as a Means of Differentiation

While most of the college respondents stated that innovation was largely driven by external forces, differentiation appears to come primarily from within, and the college respondents appeared to take great pride in these innovation generators. These have been broken down into a number of discussion areas similar to the ones seen in our earlier discussion of universities, including: policies, procedures, plans, and philosophies; centres, institutes, programs, and posts; unique learning models, curriculum, and credentials, partnerships and collaborations; and innovation funds.

Policies, Procedures, Plans, and Philosophies

Those respondents who stated that they actively encouraged teaching and learning and research dissemination innovation noted that their strategic plans, collective agreements, and even their institutional mandates entrenched these values within and throughout the institution. Said one Ontario institution:

> *Our Academic Strategy 2005-2008 specifically names 'scholarship and innovation' as one of four core values to be pursued. The college is investing close to $2M annually for the next three years to advance the strategy. A significant portion of the investments relate to innovations in teaching and learning.*

Centres, Institutes, Programs, and Posts

Many of the respondents cited institutional "hubs" of innovation. A Western College provided the following:

> *With respect to teaching and learning, we believe the College is viewed as a best practice institution in the areas of faculty development, teaching support, curriculum models, and integration of learning technologies. We base this on the number of requests we receive for site visits to our Academic Development Centre, the number of consultations we engage in with other institutions related to faculty development, and the frequency with which we see our programs, services and initiative emulated in Western Canada.*

Unique Learning Models, Curriculum, and Credentials

Applied degrees appeared to be high among that which distinguishes colleges from one another. Again, like the universities, this was not so much in that they offered applied degrees, more in which type of degrees they offered. Colleges, like universities, have set up centres of excellence and specialization that offer credentials that no other institutions do. e-learning, just-in-time delivery, and outcomes-based learning appeared to be common place among the colleges.

Partnerships and Collaborations

Many of the unique models cited by colleges are rooted in partnerships with other universities and colleges, such as joint and collaborative degree-programs like Mohawk College and McMaster University's Bachelor of Nursing degree. As well, a number of Alberta colleges cited community and industry partnerships.

Innovation Funds

A few of the institutions surveyed said that they had some kind of internal strategic fund that provided support for specific innovation projects within their institutions.

> *The College faculty, support staff and management are encouraged to look at innovative ways to improve teaching and bring forward new teaching ideas, student support and programming. This is done through a college-wide 'innovation fund' and also through a college-wide 'development fund' that all staff can access to apply for funding to generate new creative ideas.*

The Case Studies

In this part of the report, we single out six case studies in innovation at post-secondary institutions across Canada. These cases illustrate change in both colleges and universities, in the east, west and centre of the country. Some look at innovations in teaching; others at innovations in knowledge transfer. Some innovations affect single institutions, while others are more systemic in nature. In part, these case studies were chosen on the basis of the "nominations" solicited from institutions and provinces; in part, they were chosen based on the authors' knowledge of the post-secondary scene in Canada. The overall goal is to show change and innovation in the PSE sector in its myriad incarnations, and, on the basis of these cases, to draw lessons about the nature of such innovations.

The case studies were conducted through a combination of document analysis and interviews, both face to face and by telephone. Much of the documentation reviewed came from the Web sites of the various institutions. Other documentation was found through the interview respondents and literature searches.

Case 1: Acadia University: "The Acadia Advantage"

Background

Acadia University is a small, primarily undergraduate university located in Wolfville, Nova Scotia. One of the oldest universities in the country, Acadia has long had a strong reputation for its liberal arts programs. Because of this, Acadia has attracted students from across Canada and outside the country. Indeed, in 2004, approximately half its student enrolment of about 4,000 was from outside of Nova Scotia, a far higher proportion than is typical for universities in the region. In the annual Maclean's rankings of Canadian universities, Acadia has consistently ranked highest in reputation among undergraduate universities, and close to the top in the overall rankings.

Despite its ability to attract out-of-province students, Acadia, like other universities in the Atlantic region, found itself challenged in the early 1990s by local demographic trends, with the decline in numbers of high school graduates placing downward pressure on enrolments. While that trend has had less impact than thought at the time, Acadia took the view that it needed to find a way to differentiate itself from other universities. Thus was born what has become known as the "Acadia Advantage".

The Acadia Advantage was chosen as one of our six case studies mainly because of its status as a defining feature of one university. This innovation was also prominent among the recommendations received from our interview informants in the Atlantic Region.

Specifically, the key element of the Acadia Advantage is the deliberate integration of computer and information technology into the teaching and learning process. This is accomplished by providing every student and faculty member with a laptop computer, establishing a comprehensive support system both for the technology and for its use in teaching and learning,

and encouraging faculty and students to use the technology as an integral part of their programs. Acadia took an early decision to wire the entire university for Internet communications. In particular, the usual computer labs and classrooms wired at the front were replaced by a pervasive network, which extends to student residences and classroom desks.

Genesis of the Acadia Advantage

The Acadia Advantage had its beginnings in a comprehensive review of the future initiated by its new president, Dr. Kelvin Ogilvie, in 1994. At the time, the university was struggling to maintain its enrolment and was seen as in need of a vision which would clearly distinguish it from several other similar universities in the region. Related to all of this was the job market for graduates and a sense that something was needed to give Acadia students an edge over others in this area. This led to the idea that the university should create a culture of entrepreneurship, not in the narrow business sense, but in the broader sense of independence and the ability make decisions and accept the consequences of these decisions. Ogilvie also held the strong view that the environment would be a prominent issue for the future and that Acadia could benefit by having its students at the forefront of environmental literacy. A more specific problem, being confronted by most universities at the time, was increasing demand for computer facilities, particularly for student computer labs, and for library resources. The latter was seen as a particular problem for a small university trying to keep its library resources up to date. It was felt that the Internet was likely to become a primary research tool in the future, and that libraries could be expected to transform themselves into resource centres for information retrieval and use through technology rather than continuing an infinite expansion of buildings and stacks.

These three issues – entrepreneurship, the environment and the need to address both technology and library resource demands – became the three pillars on which Acadia set out to secure its future. The Acadia Advantage was initially seen as incorporating all of these elements. The first two essentially became underlying themes for the development of Acadia programs. However the third, and especially the decision to take the use of technology in teaching and learning much further than most other universities at the time, became the visible face of the initiative and the feature that has attracted the most attention. Indeed, the Acadia Advantage is now viewed as synonymous with technology integration. This is therefore the aspect on which we will focus in this account.

One reason for this seems to be that, in deciding how to finance the major expansion of information technology needed, Acadia took the position that this could be done through student fee increases only if something visible could be given to students. At the time, laptop computers were relatively expensive and not commonly owned by students. Acadia took the position that the socioeconomic barriers to computer ownership could be reduced by a centralized way of providing computers that would ensure their pervasive availability while keeping costs at a reasonable level. Thus emerged the idea of charging a substantial fee premium, but justifying this on the grounds of the advantage that an Acadia student could gain by achieving a high level of technological literacy. This was coupled with the use of the fees to provide every student with a laptop computer, to be used throughout their university career. This feature alone was sufficient to clearly distinguish what Acadia was doing from what most other universities were doing at the time. As far as we can tell, no other Canadian university has made possession of a computer a requirement of enrolment, much less facilitated this by a central supply, support and

cost structure. However, it is only by doing this that Acadia has been able to make technology integration an inherent part of the development of its programs.

Acadia officials have pointed to two other institutions, both in the United States, as models for Acadia's adoption of an integrated approach to technology. The first was the University of Minnesota at Crookston, a small rural campus of the University of Minnesota system. When faced with the possibility of closure because of declining enrolment, that institution was reported to have turned itself around by becoming the first "laptop university" in the United States. (http://www.academic.umn.edu/img/assets/14041/umc_sp.pdf.) The second model was Wake Forest University in Winston-Salem, North Carolina. Wake Forest also claims to be one of the first universities to provide laptop computers to its students (www.wfu.edu/wfunews/2006/021006t.html). The University of Minnesota at Crookston appears to have been the pioneer in adding a technology component to its fee structure. Wake Forest, as a private university, was able to charge high enough fees that the technology component could be rolled into the whole. Interestingly, while both of these institutions continue to refer to themselves as pioneers in technology integration, this no longer seems to be a featured part of their programming or strategic planning. This may foreshadow the future of the Acadia Advantage. While few other universities have explicitly adopted the Acadia model, technology integration into teaching and learning is now becoming relatively commonplace.

Major Components of Technology Integration

Of course, placing a computer into the hands of all students and faculty is only one step in building a comprehensive approach to technology integration. On the hardware side, the entire computing and communications infrastructure had to be rebuilt. The main component of this was to replace computer labs with full-scale wiring of all university offices, residence rooms and classrooms, totaling more than 7,000 network access points. The latter included wiring of all student desks to permit student use of their computers during class sessions. The university also extended the idea of a "help" centre by creating an all-inclusive unit which essentially provides hardware and software support on demand. For example, hardware repairs are typically made on the spot. If the repair requires more than a couple of hours, a new computer is issued.

Two other major areas of development were required to facilitate use of the technology in teaching and learning. The Acadia Course Management Environment system (ACME) was created to provide a set of communications and management tools for student and faculty use. Similar to such systems as WebCT, the system includes a conference forum, e-mail management, testing, grade tracking, content management and other components designed to create an interactive course environment. The final pillar of the system is the Acadia Institute for Teaching and Technology. That unit and its functions warrant detailed description.

The Acadia Institute for Teaching and Technology (AITT)

At the outset, the technology innovations associated with the Acadia Advantage were launched with the hope that, once the system was built, users would find innovative ways to incorporate the technology into teaching and learning. At a minimum, it was felt that students would become more technologically literate – a valuable outcome in itself. However, it became clear early on that a support system was required, not only for the technology but also for its uses. The Acadia

Institute for Teaching and Technology was therefore launched to stimulate interest and to provide expertise for technology integration. According to its website, the mandate of the AITT is:

> *to provide leadership in the creation of innovative experiences and teaching environment. Specifically, the AITT supports this mandate by providing:*
>
> - *Training – providing workshops, in-class and one-on-one sessions on technology-based teaching tools enhancing the professional development of faculty*
> - *Application Development – building teaching applications specific to on-campus teaching needs*
> - *Support – offering technical support in conjunction with the User Support Centre*
> - *Pedagogical Leadership – fostering knowledge and interest about leading-edge teaching innovations and their impact on teaching*
> - *Research – supporting research that examines the effectiveness of technology in learning (http://aitt.acadiau.ca/team/team.html)*
>
> *The AITT now provides these services to both its own campus members and educational institutions around the world with the goal of leveraging technology resources to enhance teaching and learning. (http://aitt.acadiau.ca/team/team.html).*

AITT staff members are responsible for a range of work, including maintaining the ACME system, providing workshops to faculty and students, multimedia production and website management, as well as numerous projects on the use of technology in the classroom. An example of the outreach work of the AITT is the investment of $2.4 million by the provincial and federal government in the AITT to help train over 1,000 teachers in Nova Scotia to integrate technology in their classrooms. Through AITT, Acadia faculty have also begun to research the effectiveness of technology tools and resources on achieving learning objectives, as well as the impact that technology has on campus life.

Acadia's focus on technology in the classroom has resulted in a high level of academic innovation with much higher rates of faculty technology use and development projects than other institutions that have invested in educational technology. According to information presented on the AITT Web site (http://aitt.acadiau.ca), the use of course management tools averages less than 20 percent at most universities but is upwards of 75 percent at Acadia. The use of Acadia's Course Management Environment (ACME) has increased significantly, particularly the use of the interactive ACME functions of testing, note sharing, and discussion groups. For example, in 2001-2002, over 160,000 tests were written on-campus using ACME and 3,000 discussion groups were formed in more than 1,000 course sections. *(http://aitt.acadiau.ca/team/team.html.*

The AITT website describes dozens of cases of the use of technology in Acadia's programs and courses.

One of the most interesting aspects of the system is that the technology seems not to have supplanted regular classroom teaching in any significant way. That is, most classes are held in normal class settings, on regular schedules, with the technology being clearly supplementary to these key features. Our Acadia informants have indicated that the university places high value on face to face faculty-student interaction in class settings and that faculty, by and large, have not contemplated abandoning regular class sessions in favour of the flexible scheduling that can be facilitated by the technology. Despite the emerging trend towards on-line distributed learning[1] found in many institutions, the Acadia Advantage does not include a radical change in thinking about the meaning of a "course" or an institution or about the changing relationship of instructors and students inherent in emerging distributed "e-learning" models.

Research on Technology in Teaching and Learning

AITT has conducted some in-house research on uses of its services and perceptions of their value. The most recent was a faculty survey conducted in 2005. Approximately 100 of just over 200 faculty members responded to this survey. Of those, 87 percent indicated that they were using some aspect of the ACME system. The most frequent uses were providing course information (82 percent) and e-mail (70 percent). Two other uses, the testing module and discussion groups attracted about 25 percent of the respondents. Several other possible uses (e.g., surveys, notes, student self-evaluations) were reported by only small numbers of respondents. A large proportion of respondents indicated that they use other resources, particularly word processing, spreadsheets, and PowerPoint) that are part of the system. Smaller proportions reported the use of peripheral hardware such as cameras and scanners. However the laptop docking stations and multi-media projectors were reported as available and preferred by more than 80 percent of respondents.

Annual student computer use surveys have been conducted since the earliest days of the Acadia Advantage. The most recent survey, in 2004, confirmed a pattern of increase use of computers and showed support for most aspects of the Acadia Advantage, with the notable exception of its cost, where there was about an even division of opinion. Support for most aspects of the program has not changed much over time, but student views on cost have improved somewhat.

It is noted that both of these surveys had low response rates (around 50 percent for faculty and 14 percent from students) making it difficult to generalize the results to the full faculty and student populations.

In addition to the regular surveys, some faculty members have reported on their work through articles and presentations. A collection of articles is available on the AITT Web site (http://aitt.acadiau.ca/research/). Much of these are descriptive or promotional in nature. However, there are a few examples of comparative studies.

External Recognition and References

There is little doubt that Acadia has received a considerable amount of external attention. In its early years, the university received many visitors. Some of this activity seems to have been

[1] This trend is discussed at length in our case study on distance education and e-learning.

generated by the involvement of IBM and the desire of that company to showcase Acadia as an example of technology integration.

In 1999 Acadia was included in the Education and Academics category of the Computerworld Smithsonian award of the Smithsonian Institution. Acadia University was also named one of North America's leading post-secondary institutions at the fourth annual Conference on Ubiquitous Computing held in 2001 at Seton Hall University. Acadia received the Pioneer Award that recognizes outstanding commitment to the creation of a successful ubiquitous learning environment. Acadia is the only Canadian university to receive the Pioneer Award. Finally the university received the Canadian Information Productivity Award, which recognizes the use of technology in the transformation of organizations. Acadia was praised as the first university in Canada to fully utilize information technology in the undergraduate curriculum.

While it is not possible to determine the role of the Acadia Advantage in Acadia's high standing in the annual Maclean's rankings of Canadian universities, it seems highly likely that the high profile of this innovation is a significant contributor to its first rank standing on the reputational survey.

The Future of the Acadia Advantage

It is clear that technology integration is now a pervasive feature of life at Acadia, and that Acadia continues to use this model as a defining feature of the university. Nevertheless, as many of the features of this model are becoming more commonplace at other institutions, and as literacy in information and communications technology becomes more taken for granted, the question arises as to whether Acadia can continue to identify itself with this model.

A new strategic plan for Acadia is currently under development. Although not yet complete, a draft has been made publicly available (http://admin.acadiau.ca/vpaoffice/newsite/planning/plansept05.htm). This draft outlines a mission consistent with Acadia's history as a liberal arts institution but refers specifically to its mission as "transformative". Specifically, the current draft of the mission statement states that

> *The mission of Acadia University is to provide a personalized, transformative liberal education; promote a robust, respectful, and inclusive learning community; and inspire a diversity of students to become scholars, lifelong learners, engaged citizens, and global leaders.*

Interestingly, neither the mission statement nor any other part of the draft Strategic Plan speaks directly to the Acadia Advantage or to its particular components. However, the strategic planning process includes a comprehensive review of Acadia's information technology vision and planning. Officials have indicated that, once this review is complete, subsequent drafts of the strategic plan will address the future of the Acadia Advantage.

A likely scenario, consistent with what seems to have occurred at Acadia's two model institutions, Crookston and Wake Forest, is that the core features of the system will remain but will become an integral part of the university's outlook and programming. In the end, technology is a tool, not an outcome, and its use can be made consistent with any broader vision that Acadia, or any other institution for that matter, wishes to articulate.

Role of External Forces in the Acadia Advantage

The above description clearly shows the Acadia Advantage to have been almost entirely internally driven. The only significant aspect of the external climate that may have come into play was the fact that universities in Nova Scotia were not subject to government restrictions on their fees. Relatively high fees and differential fees across institutions are part of the overall university climate in Nova Scotia, so Acadia's decision to use fees to fund its unique approach was not subject to government oversight. Indeed, in our discussions with Acadia officials, there was only brief mention of the possibility of high fees deterring students. The more general view was that as long as a tangible benefit could be identified, students would be willing to pay the fees.

While the Acadia Advantage was initiated in an era of Nova Scotia government activism in post-secondary education, that activism was more directed towards program consolidation and cost reduction than towards access. University participation rates are high in Nova Scotia and there is likely less incentive for government to act to improve access than is the case in some other jurisdictions. It is possible that both the Acadia case and that of the Nova Scotia Community College may have been driven in some negative sense by government activism. The need for a university to develop its own niche is obviously greater in a jurisdiction where there is significant competition than in areas in which competition is not a major issue. That may be especially true at a time when universities in Nova Scotia saw themselves as under threat by government "rationalization" activities.

Finally, it is noted that the Acadia Advantage has benefited significantly from infusions of external funding to assist in development of the infrastructure and to purchase services. The involvement of IBM, local telecommunications companies and others in supporting the initiative as a showcase for new technologies can also be said to have contributed to its success. This presents a more positive picture than that conveyed above, as the initiative itself has become an attraction to external agencies, rather than being influenced by these agencies.

Case 2: Information and Communications Technologies in Distance Education: e-learning

Background

It is no exaggeration to say that developments in information and communications technologies (ICT) over the past fifteen years or so, and particularly the growth of the Internet and the World Wide Web, have brought about a profound transformation in virtually all areas of human endeavour. While some may argue that the Internet is merely another communications tool, the ability to transmit documents worldwide, the powerful search tools available and the ability to use "hyperlinks" to create a "web" of connections among people and documents are but a few of the indicators that this is more than a simple technological innovation and is essentially "transformative" in its nature.

No study of innovation in higher education can ignore the effects of ICT on the way post-secondary institutions function. Indeed, a case can be made that universities have been one of the primary driving forces in the development of ICT and were the earliest adopters of the new

means of communications. Much of the research and development that has contributed to the growth of ICT, on both the hardware and software sides, has been conducted in universities. Obviously, much could therefore be said about both the uses of ICT to facilitate research and the role of university research in the development of ICT. However, our focus here is narrower and more directly related to post-secondary institutions as teaching and learning entities.

Unlike the other case studies in this set, the story to be told here is not confined to a single program or institution. Although it has by no means reached a mature stage, ICT has found its way into many aspects of teaching and learning. In fact, the previous case study describes how ICT has become a defining feature of one university. However, to further narrow down the topic, our concern here is specifically with the use of ICT in distance learning.

Distance learning (sometimes also called distributed learning) is defined as "teaching and learning which occurs when students and teachers are separated by space and time." e-learning[2] may be defined as the specific instance of the use of new information and communications technologies in teaching and learning. While the term includes uses of ICT to enhance conventional classroom learning (as was described in the Acadia case study) the main concern here is with ICT as a vehicle for distance learning.

Distance learning has actually had a long history, with "correspondence courses" having been a small part of the programs of some institutions for many decades. Originally thought of as a course in which students receive a package of mailed documents and with communication being conducted mainly by mail, the correspondence course has undergone many changes with the emergence of electronics technologies. Radio and television broadcasting, audio and video taping, teleconferencing and other media have been widely used to expand on the original correspondence course idea. However, none of these media have lived up to their earlier promise to fundamentally transform teaching and learning. It was not until the development of direct bilateral communications, beginning with e-mail and extending to the Internet, that technology can be said to have had a profound impact on the way teaching and learning is taking place.

It is almost impossible in a brief report to do justice to the scope of e-learning in Canadian post-secondary education, much less to the problems that continue to surround its development. The goal here is simply to draw attention to this phenomenon as a significant feature of innovation universities and colleges. This report is therefore confined to discussion of some policy issues around the topic, a few examples of contemporary approaches to e-learning and some comments on its future.

Why e-learning?

Three reasons are usually given for institutions to offer and students to participate in e-learning and other forms of distance education. When compared to conventional classroom-based learning, distance learning may be seen as advantageous 1) if it improves access to programs, especially for students in remote locations or to disadvantaged groups; 2) if it costs less than conventional learning; or 3) if it can improve the quality of learning. An improvement in any of

[2] Use of the lower case "e" seems to reflect the near abandonment of the "shift" key in Internet communications.

these areas would be sufficient reason to offer such programs, as long as little sacrifice has to be made in the others. Students may even be prepared to live with some minor sacrifices in outcomes if this facilitates access or reduces cost. Others may feel that their learning experiences are enhanced by the independence offered by distance learning, especially in the context of the new technologies, which place a vast array of learning resources at their fingertips.

Of course reduced cost for students does not necessarily translate into reduced institutional or public costs. At the institutional level, some have argued that distance education can begin to reduce the need to construct new expensive physical infrastructure (though others fear that this will signal the end of universities and colleges as we know them.) This has to be traded off against the developmental and maintenance costs of an e-learning system. As far as we can tell, none of these trade offs, either institutional or individual, have been adequately investigated.

Forms of e-learning

e-learning can take a number of forms, distinguished by the types of technology used and the intensity of use of the technology. Before the advent of the internet, tele-learning, involving the use of audio- or video-tapes or teleconferencing, was a common form. This was sometimes supplemented by computer-mediated communications, using telewriters or similar devices. A simple enhancement of these forms occurred when e-mail came into common use. However, all of these technologies could be seen as an attempt to emulate conventional presentation techniques. For example, videotape or teleconference presentations tended to look much like conventional lectures.

All of this changed when the Internet, and particularly the World Wide Web, came into general use in the mid 1990s. As well as being completely independent of location, the Internet offered the possibility of a fundamentally different approach to content presentation, student-instructor and student-student communications, tracking progress, library searches, assessment and many other aspects of course and program management. One of the major features is the use of "hypertext" to reformat how content was presented and to create direct links to content sources beyond the immediate content. Related to this was a greatly enhanced ability to use graphics. Rather than following the linear sequence of textbooks or lecture notes, it became possible to create a "web" of connections that fundamentally changes how courses are developed and presented. A whole new field of "instructional design" soon emerged to deal with the intricacies of the hypertext approach to presentation.

At the same time, course management software packages also emerged to facilitate the integration of course components. One of these, known as WebCT, is of particular interest in this review of Canadian post-secondary innovation because it was originally developed at the University of British Columbia, and was ultimately successfully commercialized to become the largest selling package of its kind. Course management packages effectively allow the instructor and students to control all aspects of the course. Links to institutional registration systems can also be made to track registrations, record grades and perform other administrative tasks. Such packages also typically include conference forums, internal e-mail systems and other communications devices.

It is important to note that, although course management may appear to be relatively self-contained within these packages, a substantial support structure is required to manage the whole system. In addition to having substantial hardware demands, the packages are complex to operate, particularly in requiring knowledge of hypertext programming language for preparation of content – hence the need for instructional designers. Institutions which have adopted this form of e-learning have had to invest large amounts in development and incur significant operating costs.

The External Policy Climate for e-learning

On the surface, it would appear that the access argument has trumped all the others as a driving force for e-learning, particularly as an argument for government involvement in this area. The thrust towards lifelong learning, which is now found in most mission statements of government agencies and educational institutions, adds to the incentive to move towards unconventional means of learning. Governments may actually be prepared to incur additional costs if this yields improved access or facilitates life-long learning. This is particularly true in Canada whose scattered population and large number of remote communities has provided a strong incentive to move in this direction. For these reasons, expansion of distance education, and particularly the encouragement of uses of new technologies for that purpose has become a major part of the strategic planning of many institutions.

One additional force appears to be at work at the policy level. With ICT being seen as an all-pervasive element in economic development, both government and industry, particularly the technology industry, have a strong incentive to see ICT become an integral part of education. Through education, it is possible to enhance the idea that ICT literacy is essential to economic development and to expose an ever increasing number of students to the wonders of this technology. ICT in education may thus be seen as part of the larger picture of bringing ICT to the forefront of economic development.

As an example of high level policy attention to this issue, the Council of Ministers of Education, Canada and Industry Canada established in 2000 an Advisory Committee for On-Line Learning. Such a joint effort reflects a convergence of both federal and provincial/territorial government concern with this area. This committee, composed of university and college presidents and senior industry officials, issued a report in 2001 (http://www.cmec.ca/postsec/evolution.en.pdf) which made the case for expansion of on-line learning, using many of the same arguments given above, and set out a blueprint for the expansion of on-line learning.

That report, like many others, started with the premise that the development of ICT amounts to a new economic and social paradigm – a revolution comparable to the invention of the printing press or the industrial revolution. The thrust of the argument is represented in terms of three preoccupations of the committee:

- Fostering a culture of lifelong learning;
- harnessing the transformative power of the new learning technologies; and

- ensuring that Canada's post-secondary institutions and learning industries are in the best position to secure the benefits and avoid the pitfalls of the move to on-line learning.

The committee warned that the price of inaction on e-learning would be deterioration of the position of Canada's post-secondary institutions, including the disappearance of some due to declining enrolments and the loss of capacity of Canadian institutions to be the intellectual driving forces for development of our society.

The proposed action plan put forward by the committee included three main elements:

- Enhance the quality of the post-secondary learning experience through institutional strategies, expanding the amount of high-quality online learning materials, and supporting learning research and learnware produce development;
- improve the accessibility and flexibility of post-secondary learning opportunities; and
- create synergies and greater critical mass within post-secondary education Canada.

As the advisory committee report made clear, Canada has been at the forefront in many aspects of e-learning including expanding the broadband capabilities needed to provide access to e-learning, the development of e-learning materials and research and development in this area. Specific strategies to continue this leading role were proposed, including ensuring faculty commitment to development, funding for research and development, and linking institutions and learners through universal broadband access.

Virtually all provinces have some form of strategy, organization or funding programs to encourage the development of e-learning. However, these seem to be in a continual state of flux as governments take more or less activist roles in relation to institutions. As an example, the British Columbia Open Learning Agency, which was widely seen as one of the major innovators in this area, was disbanded following the election of a new government in 2001 and its post-secondary activities reverted to the institutions. A consortium known as the British Columbia Open University evolved from this. However, this organization was recently absorbed into the new Thompson Rivers University and is now known as Thompson Rivers University, Open Learning (TRL-OL).

Some provinces have made this area an integral part of broader ICT and economic development strategies. For example, Nova Scotia's Information Economy Initiative (IEI) has concentrated on expanding bandwidth and connectivity and on using this to encourage e-learning initiatives. The Open Learning and Information Network in Newfoundland has developed programs and provided expertise in e-learning to clients in a number of countries. Again, however, organizations of this nature seem to spring up and disappear (or merge with other organizations) with such rapidity as to make it almost impossible to present an up-to-date picture.

In some provinces, e-learning is also seen as a tool to encourage regional economic development. In Manitoba, the new University College of the North (which is primarily a distance education institution, though not all of its courses can be described as e-learning) exists primarily to offer courses and degree programs which serve Northern Manitoba, primarily but not exclusively

education and nursing programs geared to remote and aboriginal communities. In this, it exists as a counterweight to a pre-existing "Campus Manitoba" consortium, through which the three universities in the province's south aim to provide at least the early years of university education via distance education.

Examples of Institutional Involvement in e-learning

Despite the high profile now being given to lifelong leaning and particularly to e-learning, relatively few post-secondary institutions appear to be making a concerted effort in this direction. A perusal of websites for a large number of universities and colleges revealed only a dozen or so which highlight distance learning as a feature of their programs. Most of the most active universities are members of a consortium known as the Canadian Virtual University. A more detailed examination of this group revealed only a couple which describe their specific approaches to e-learning. As far as we can determine, only a few institutions have made a significant conversion from correspondence and media-enhanced courses to full e-learning courses.

Athabasca University: Athabasca describes itself as "Canada's Open University" with some justification, since it is the only university in the country which offers programs only by distance learning. Athabasca promotes accessibility, flexible scheduling, affordability, open admissions, a year-round entrance policy and credit for prior experiential learning as key elements of its approach. Athabasca has experienced rapid growth in the past few years, and now serves close to 32,000 students per year. Athabasca offers full programs in a variety of undergraduate and graduate areas. However, many students also take individual courses for transfer to programs at other institutions.

Athabasca divides its offerings into two main types, individual and group. Many individual courses remain much like conventional correspondence courses, being self-paced, including flexible start and end times, and with most material being received by mail. E-mail is a regular feature of these courses. For most individual courses, an on-line component is optional. However, some now have a required on-line component. Group courses follow a normal semester course calendar. These are of two types: on-site through collaborating institutions, and e-classes. e-classes may vary in the amount of on-line work required but generally appear to involve the main components described earlier.

As a university dedicated entirely to distance learning, Athabasca also emphasizes research on teaching and learning, and particularly on e-learning. Indeed, one of its research missions is to become one of the leading institutions in the world for research in this area. In support of this, Athabasca has been awarded two Canada Research Chairs, in distance education and in e-learning, sponsors a journal, the *International Review of Research in Open and Distance Learning* and operates a research institute, The Canadian Institute of Distance Education Research (CIDER).

University College of the North: This institution, which has been developed out of the old Keewatin Community College, was given official degree-granting status in 2004. In addition to the college's old vocational programs, a new set of university programs – primarily but not exclusively in education and nursing – are now offered as well.

The stated mandate of the institution was to give Northern Manitoba an institution of its own to satisfy its own human resource needs. This was an admission, in effect, that while it was technically possible to deliver distance education courses from urban sources, the content of these courses was far enough removed from the realities of remote and aboriginal communities to limit their effectiveness. As a result, while this institution uses distance and e-learning course delivery methods, it is based on the premise that such courses in effect still need to be developed and/or modified locally in order to be optimally effective.

At this point, the institution is too young to fully implement its own mandate. Little of the work for course development seems to have been done internally; to no small extent, the existing universities have been assisting in the development of content. In terms of media, not surprisingly, much of the web development has been done using off-the-shelf tools like WebCT. And though, ideally, study can be done at home with quality supports, bandwidth issues in northern Manitoba make this impractical at the moment and a great deal of the instruction is being done in one of the ten community delivery centres. Although the institution is now beginning to attract staff from all over Canada, it still lacks an academic Senate (an interim governing council, which is primarily made up of community representatives, is currently serving as both Board and Senate).

Superficially, the development of UCN bears some resemblance to the decision to create UNBC ten years earlier, but there are key differences. UNBC functions primarily as a traditional campus in Prince George which, although its function is to provide service to Northern British Columbia, frequently gives a lot of its spaces to students from the south unable to gain admission to the overcrowded universities in Victoria and Vancouver. UCN, on the other hand, while physically located in Thompson, provides instruction in a highly distributed manner. Its specifically aboriginal focus and mission to meet very specific local labour market needs also distinguish it from similar northern-based institutions.

Thompson Rivers University – Open Learning: Thompson Rivers University was established in 2005 as the successor to the University College of the Cariboo. Based in Kamloops, TRU exists primarily as a regional university. However, with its formation, TRU also assumed responsibility for what was formerly known as the British Columbia Open University, itself the post-secondary arm of the former more comprehensive Open Learning Agency. TRU-OL offers a wide variety of on-line programs and courses, either directly or through other institutions.

The Canadian Virtual University: The Canadian Virtual University (CVU) is a consortium of the leading distance learning universities. Students have to register at the university offering the program of interest, but may take courses at other participating institutions as long as they meet the requirements of the home program. Although described as a place where a student can mix and match courses, it appears as if CVU mainly provides a portal for student access to participating universities.

Memorial University of Newfoundland: Memorial appears to be one of the few institutions that have made a substantial transition to e-learning and is one of the few to provide on its website comprehensive information on how its e-learning system works. More than two-thirds of about 150 distance courses have been converted to web format. Memorial uses WebCT as its

basic platform and has integrated this with its registration system for registration and grade tracking.

Royal Roads University. Born out of the closing of a former military college, Royal Roads specializes in business and professional programs, mainly at the graduate level, aimed primarily at working professionals. Royal Roads operates on what it refers to as "blended learning" involving mainly on-line courses with brief periods of on-campus residency.

Contact North. A partnership of universities, colleges and school boards, Contact North maintains a network of 145 learning centres across Northern Ontario. Contact North is a classic example of a network built in the late 1980s around the idea of using teleconferencing as the primary mode of delivery of distance programming. This approach requires establishment of centres equipped with audio and video teleconferencing equipment, through which courses can be broadcast in real time from a central site to remote sites. Contact North launched a new e-learning technology platform in 2004. However, this appears designed to complement rather than supplant the existing network.

Research on Distance and e-learning

The claims of benefit for distance education and e-learning have been previously described in terms of access, cost and learning quality. An even broader claim is that the use of ICT in education contributes to economic development by placing Canada at the leading edge of the new economy. This raises the obvious question of how do we know if any of these claims are valid.

A recent Canadian review of this field (Ungerleider and Burns: http://www.cmec.ca/stats/SystematicReview2003.en.pdf) addressed the two questions of the "effectiveness" and "efficiency" of the use of networked ICT in education. That review was based on a rigorous process for identifying and selecting research literature on this issue. Thirty-seven of an initial 135 studies met the main selection criteria of being conducted since 2000 and having a comparison group to which e-learning approaches could be compared. Of these, twelve were in a suitable form for statistical meta-analysis and the remainder were appropriate for qualitative analysis.

The overall conclusion of the review was that research in this area is in its infancy and that few conclusions can be drawn as to either the effectiveness or efficiency of e-learning. The study did reveal that the traditional divides between rural and urban, male and female and lower versus higher socioeconomic status students exist in e-learning as in other areas of education. This suggests that e-learning has not yet lived up to its promise of improved accessibility. Specifically, the review expressed surprise that large investments are being made in this area without commensurate investment to determine if the many claims made for its benefit are valid, and made a number of recommendations on how to enhance research in the area.

Obstacles to the Expansion of e-learning

Despite its high profile, e-learning has yet to become a stable feature of the educational landscape in Canadian post-secondary institutions. Some of the issues being raised are

fundamental to the nature of teaching and learning, while some involve resources, access to computers and other more pragmatic matters.

At a fundamental level, debate continues over the value of any form of distributed learning as a substitute for classroom-based learning. Some fear that technologically-based education is a significant threat to established ways of doing things and particularly is a threat to the stability of faculty and physical infrastructure. Others are concerned about the loss of collegiality that comes with lack of face-to-face interaction. In this respect, the Acadia experience is instructive. Despite a decade of being fully wired and with a full range of support for ICT-based learning, the technology remains supplementary to the classroom.

On a pragmatic level, even within the distance learning environment, a considerable commitment of resources is required to convert established systems (correspondence courses, teleconference sites and the like) to computer-based technologies. In particular, course development costs can be high because of the addition of the "instructional design" component involved in preparing Web-based materials. Considerable computer and bandwidth capacity is also required. Some of the start-up costs have been borne by various government incentive programs, but these are typically transitory and institutions are left with the ongoing costs. The system seems far from reaching critical mass, where the unit cost of operating an e-course is comparable to that for a regular course. Adding to this, the evidence on effectiveness and efficiency is by no means commensurate with the benefits being advocated.

The Future of e-learning

We would not presume to make predictions from this relatively brief review. However, a major attempt to divine the future of e-learning was made at a Contact North Roundtable held in 2003 (http://www.cnorth.edu.on.ca/cnorth/e-Learning/snapshot-document_1.pdf). At that session, a number of leaders in the area assembled to assess the state of the art and to examine the future. The following observations are drawn from a "snapshot" report from that roundtable.

- Many of the myths about e-learning are being dispelled since the 1990s and e-learning is being placed on a more realistic footing.
- e-learning should be seen as a way of enhancing the learning process and not as a replacement for existing processes.
- Nevertheless, e-learning can be transformative because it represents a shift from time and place-bound learning and opens new ways to access information.
- e-learning faces a number of challenges. Further research and development are required to realize the opportunities presented by the new technologies.

The point about e-learning not replacing more conventional forms of learning seems to be in conflict with the main external driver, that of e-learning as a vehicle to enhance access to post-secondary education. If e-learning is used to provide access to students in remote areas or to others who find it inconvenient to attend campus-based classes, then e-learning should either be as good as other forms of learning or else such students will have to resign themselves to an inferior mode of delivery. As indicated earlier, it is possible that the access argument has

trumped other arguments to the point at which students are willing to take, and governments willing to support, some loss of efficacy in order to achieve the access goal. If this is not true, and if there is no loss of efficacy, then a case can be made for replacing conventional learning with e-learning. While this point cannot be pursued in detail here, it does illustrate how far we have to go in addressing both the rationale for and the efficacy of e-learning.

On the latter point, it is important to reiterate that universities are perhaps in a better position than any other agencies to conduct the needed research, not only on the technological side but also on the learning side. We cannot expect the whole e-learning enterprise to be put on hold until its benefits are clearer. Nevertheless, it is reasonable to expect universities to take the lead role in conducting the needed research, in parallel with the ongoing expansion of e-learning programs.

Case 3: The University of Waterloo: Co-operative Education and Technology Transfer

Over the course of examining institutional responses to the initial questionnaire, Waterloo was one of the few institutions that received widespread mention for its innovative practices – in particular, its co-op programs and its technology transfer policies were cited. While these might seem like two discrete sets of policies, the institution itself sees the two as intimately related.

Co-operative Education

Co-op education is, strictly speaking, not an innovation that was adopted by the University of Waterloo. Co-op education is actually the institution's *raison d'etre* and arguably pre-dates the institution by a couple of years. The decision of Waterloo College to create an "Associate Faculty" of Science and Engineering which specialized in co-operative education was an extremely controversial one at the time. Although it was enthusiastically backed by the local community and by big businesses in southern Ontario (many of whose US parent corporations had experienced the benefits of co-operative education in the US at institutions like the University of Detroit, the University of Cincinnati and Northeastern University), this innovation caused serious concern among other Ontario universities, who claimed that the practice of alternating work and learning would seriously undermine a student's education, and would not produce truly qualified engineers. This concern was most pronounced at the University of Western Ontario, which at the time (1957) was still Waterloo College's parent university and the acrimony over the creation of the co-op program was the catalyst which led to Waterloo's decision to become an independent degree-granting institution in 1957.

Waterloo was far from the first university to try co-op programs: English polytechnics had similar types of programs, and in the United States over three dozen universities had some form of co-op education prior to Waterloo's adoption of the method (indeed, the existence of positive extant models of co-op programs in the US was key to selling the provincial government on the idea in the first place). What was different at Waterloo was that it was the first institution to put co-op at the heart of its identity, as opposed to being one program offering among many. This is not to say that all Waterloo programs were co-operative in nature. In fact, co-op remained exclusively the preserve of the engineering faculty for many years, only slowly extending out to Mathematics (1964), Environmental Science (1967) and then finally into the Faculty of Arts (1975). But given the size of the Engineering program within the institution, co-op was from the

beginning a major focus of the institution. It seems to have been the centrality of co-op in the institution's mandate that helped give co-operative education at Waterloo a degree of academic respectability that it had never previously achieved when implemented at other institutions.

Co-op, at its heart, involves a promise both to students and to employers that the students will in fact be employable. This is a challenge given that students in their first few terms of university are little better than unskilled labour and are hence not particularly useful to business. Waterloo's solution to this problem was to immerse their students in the most advanced technology available. Not only does this practice give Waterloo students an advantage over students from other institutions, but also makes them attractive to employers, whose own workers may not have been exposed to these kinds of technologies. But it does require the institution to go to the expense of always acquiring the latest technologies and – more unusually – making this technology available to students as quickly as possible. As Waterloo's former president James Downie observed, "in the late 1960s we already had students in computer labs at a time when other universities were debating whether or not to let professors into the labs."

Until recently, evidence for the benefits of co-op has been largely anecdotal. It has always been asserted, for instance, that co-op students ended up better prepared for the job market. And certainly, the co-op program has been credited with helping to create the innovative research/hi-tech cluster that has sprung up around the campus over the last forty years. However, more recently, some data has come available to look at the actual impacts of co-op education.

Using the terms adopted by Finnie and Usher (2005), there is now some evidence that there are positive outcomes both in terms of "learning outputs" and "final outcomes". Evidence from the first comes from the first iteration of the National Survey of Student Engagement (NSSE)[3] conducted on the Waterloo campus, which revealed that Co-op students were – contrary to prevailing wisdom on campus at the time – *more* engaged in their learning than were non-co-op students ("engagement" in the NSSE terminology being a correlate of "more likely to have positive learning outcomes").

Evidence for positive final outcomes comes from the annual survey of Ontario Graduates done for the annual Key Performance Indicators survey, which can be analyzed in such a fashion as to disaggregate the employment and earnings results of co-op students and non-co-op students.[4] In disciplines where there was a substantial sample of co-op students to examine, co-op students were found to have an average earnings premium of between 5 percent and 26 percent over non-co-op students, depending on the field of study. The premium was smallest in engineering and the highest in the social sciences. No doubt there is an element of self-selection in all this; Waterloo co-op students tend, on average, to have higher grades than their non-co-op counterparts when they enter university and so may be expected to have some earnings premium

[3] The NSSE is a student survey instrument that queries students about experiences that are known to be related to student development. Because of the known relationship between these "engagement experiences" and learning outcomes, characteristics of student engagement are in effect proxies for institutional quality. NSSE, which was created in 1999, is now in use in several hundred campuses in the United States and as of Winter 2006 was being deployed in 30 Canadian universities as well.

[4] Technically, comparisons on co-op vs. non-co-op are only available on a province-wide basis; however, since such a large fraction of co-op students are Waterloo-based, the comparison is probably reasonably valid for the campus on its own.

immediately thereafter. As a result, some of the alleged "benefits" of co-op may in fact be evidence of selection bias. That said, it does seem intuitively likely that among social science graduates, few of whom have much practical work experience, co-op social science students with four work terms under their belt are probably able to attract a significant wage premium.

For all these benefits, there are costs as well. Experience at Waterloo has also shown that co-op is a relatively expensive program to run. Extra costs come in three different forms:

1) the cost of running a co-op office. Waterloo employs about 100 staff – the equivalent of a decent-sized faculty at many institutions – simply to ensure that the system of work placements runs smoothly. At Waterloo, students themselves bear more or less the entire cost of this (roughly $6.4 million in 2002), though an extra set of fees ($420 per semester) charged to co-op students

2) the cost of providing extra course sections. In order to permit students to graduate in a reasonably timely manner, the institution has to offer many more course sections, spread out over the full calendar year. It has been estimated (Downey, Kalbfleisch and Truman, 2002) that as a result each co-op student costs roughly 18 percent more to teach than a non-co-op student. Waterloo does not receive any extra government funding as a result of this, so effectively the institution funds this difference out of its own pocket.

3) the associated physical plant costs of running year-round. Because Waterloo's physical plant is effectively in full use (or something close to it) 12 months a year, the costs of maintenance is higher and the pace of physical plant depreciation is faster. Again, the institution receives no public compensation for this.

Technology Transfer

In addition to being known for its co-op programs, Waterloo is also known for its success in technology transfer. The statistics are quite clear: Waterloo's ability to attract research funding, both public and private, is substantially higher than average for an institution of its size. It has also shown a certain knack for acquiring patents and creating spin-off companies. This is not simply a matter of a few big companies such as the now world-famous Research in Motion (RIM) – in fact, the entire Waterloo high-tech cluster is effectively an offshoot of the university (prior to the establishment of the University of Waterloo, the major local industry was rubber).

The process of technology transfer between universities and high-tech industrial clusters was memorably explored by Anna-Marie Saxenian in her book *Regional Advantage*. Waterloo's path to becoming the hub of a high-tech cluster was somewhat different from that of other high tech universities (MIT, UT Austin, etc). While in all cases, the success of both the cluster and the university depended on the strength of the human bridge between the academy and industry, the link in most cases (e.g., Stanford) was built by academics. In Waterloo, on the other hand, the bridge appears to have been built at least in part by students.
This seems to have happened in ways both overt and subtle, but in all cases essentially occurred because of the central place of co-operative education within the institution. The obvious means of technology transfer is the co-op students themselves: their constant shifting back and forth between the academy and industry means that they serve as a two-way conduit for the transfer of knowledge. Another vector was students acting as a kind of "walking advertisement" for the

university. The presence of highly skilled Waterloo co-op students and recent graduates in firms across the country led to decision-makers in those firms being more likely to consider Waterloo as a technology partner. More subtly, the presence of co-op students in the classroom creates a challenge for professors in that, if they want to stay ahead (or simply keep up) with their students' technical knowledge, they too need to remain current with trends in technology and industry. As a result, simple pedagogical considerations propel University of Waterloo professors into interactions with industry that would be rare elsewhere.

This brings us to the rather special faculty requirements in a co-op system; professors at Waterloo are expected to do their job rather differently than their colleagues at other universities. Obviously, there is a temporal aspect to this – Waterloo's year-round academic structure means that professors are shift workers and cannot count on having summer vacations every year. But there is also a cultural aspect: professors know that their courses will need to be continually revised in light of changes in technology and the feedback of students who are trying to apply their classroom-acquired knowledge in their co-op jobs. At other institutions, these things might seem like impositions – but at Waterloo, it is understood from the start of the hiring process that this is all part and parcel of working at Waterloo; indeed, in many cases, the professors go to Waterloo because they are actively seeking this kind of experience.

It would be excessive, however, to seek to ascribe the institution's success in knowledge transfer entirely on the basis of Co-op; another key reason is the institution's Intellectual Property (IP) Policy. Though it is no longer the only institution to do so, the University of Waterloo was the first Canadian university to adopt a policy permitting researchers to maintain full IP rights to all discoveries made on campus. This policy does not always find favour with government officials, who are sometimes uneasy about the University allowing private individuals to fully appropriate the benefits of research which was partially funded through public money. And nor do professors always take advantage of the policy – in many cases, professors do not want to take on the burden of commercializing their own research and simply sell the IP back to the University. But to many, Waterloo's early adoption of its IP policy both signified – and helped shape – an institutional culture that favoured a certain degree of entrepreneurial skill.

The Process of Innovation

As a case study in innovation the University of Waterloo experience is very difficult to assess, because technically there is no start point, or moment of "intervention". There is no point where policy "changed", and from which effects can be measured on a pre-post basis. To the extent that Waterloo is an innovative institution, it is innovative simply because at its birth, a small group of visionary leaders with unorthodox views on the nature of Engineering education gave it a controversial and idiosyncratic mission and it has followed this mission along a logical path ever since, despite the significant extra costs incurred. The spread of co-op within the institution and whatever improvements have occurred since its introduction have come about through action-oriented self-reflection about what works and what doesn't, but the program itself has never been subject to any kind of systemic or rigorous process of evidence-based inquiry.

The fact that the institution started its life as a professional school was probably an important one. It meant that the University's central institutions – and indeed, its very culture - were from the very start attuned to the relationship between the academy and industry and never really had

an "ivory tower" bias. "Co-op" and "IP", then, are arguably just two manifestations of an underlying institutional culture that promotes experimentation and encourages dialogue between the university and industry. This is an important point: the University has never wavered in its support of co-op programs even though there might be financial arguments for abandoning it, because the campus culture prevents them from even considering such a cost-benefit analysis. Expensive or not, it is part of the campus identity.

Culture, of course, is only part of the story – good policy, such as the policy on IP, is also important. But these two are intertwined; Waterloo's culture was clearly influenced its policies on co-op and IP, but then again, its culture also helped shape those policies in the first place. Waterloo's strength is that the values of innovation are widely shared within the university, and that a number of policies and institutional supports continually reinforce these values.

Case 4: McMaster University and Problem-based Learning

Synopsis of Problem-based Learning

The McMaster medical school was founded in 1965. From the very beginning, the school made the decision to eschew a traditional program of medical education in favour of a system of "problem-based learning", or PBL. McMaster's Professor Spaulding, who chaired the school's education committee in the early years, placed an early emphasis on problem-solving; a visiting professor by the name of Barrows is credited with introducing a more advanced and complete notion of PBL (Spaulding, 1991).

PBL is sometimes described as "case study" learning but this does not fully capture the essence of the McMaster curriculum. As Camp (1996) and Butler, Inman and Lobb (2005) have pointed out, there are a lot of programs in existence which describe themselves as PBL but which in many respects are not "true" PBL in the eyes of the McMaster cognoscenti.

Study in the McMaster PBL system is organized in small tutorials of six to ten students. Learning is "inquiry based" in the sense that most learning is done by examining a series of case studies through which students are meant to gain an understanding of certain clinical principles. Faculty, far from engaging in didactic lectures, act as "tutors". Sometimes, they are not even experts in the particular field under discussion – their purpose is rather to ensure participation by all students and ensure that they know "how to learn". Because of this, PBL is sometimes described as "student centred".

Clearly, effective "teaching" in a student-centred format is very difficult and requires a very different set of skills than those required in ordinary classroom teaching, as it requires mastery of process in addition to mastery of content. The role of teaching and learning services to instructors thus takes on a much more central role in this kind of program than in others. Even a quick look at the faculty development workshops at McMaster http://www.fhs.mcmaster.ca/facdev/workshops.html reveals the depth of resources which are devoted to instructional development.

Over the past 30 years, this system of teaching gained widespread currency, and has been adopted in a number of medical schools around the world, most notably Harvard. Indeed, most

US medical schools have some form of PBL in their curricula and the innovation has also spread into other areas of post-secondary education, including architecture, law, business and engineering. To all these converts to PBL, McMaster is, in the words of one observer (Camp, 1998) effectively "Mecca".

Does PBL Work?

There is a considerable literature on Problem-Based Learning in medicine. A number of reviews have been very positive, including a major meta-analysis of literature to 1992 (Albanese and Mitchell, 1993). The general findings are that students tend to enjoy PBL more than alternative methods of instruction (and that faculty derived greater satisfaction from the method of instruction as well), and overall are more "engaged" in their studies, in the sense that Pascarella and Terenzini (2004) or Kuh (2001) would describe as being consistent with positive learning outcomes. In terms of competencies, or "final outcomes" (as opposed to learning outputs), PBL students score as well as, or better than, non-PBL students in clinical evaluations and faculty evaluations; but there was some evidence to suggest that their knowledge of basic sciences might be deficient. Since then, more literature has appeared but there has been little to alter the basic terms of this debate: PBL is seen as a good way to train family doctors, where the requirement for good interpersonal skills is high, but not as good in terms of training specialists and researchers because the curriculum is "science-lite" (Glew, 2003).

The quality of the available data upon which any analysis of PBL's effectiveness must rest is less than perfect. In the first place, it is not clear that the various studies were measuring the same underlying phenomenon. PBL is a philosophy, or an approach to curricula – it is not a curriculum in and of itself. It can therefore be implemented in various different ways. Indeed, some authors (Camp, 1998) suggest that many alleged forms of PBL are so far from the McMaster model that they cannot be considered "true" PBL and hence the two should not be equated from an evaluation standpoint. Indeed, as Barrows (1994) has stated, if PBL is introduced through a "case" basis but is implemented in a teacher-centred, rather than a student-centred manner, then it will degenerate into mere problem-solving as opposed to true "understanding". Alternatively, it may be the quality of the underlying curriculum and case studies that makes the difference. As Schmidt (1998) notes, the fact that students from a PBL school may turn out graduates with better skills in certain areas does not necessarily mean that PBL is successful – it may simply mean that the curriculum also provides more extensive skills training in particular areas. More generally, there has been concern about a gap between PBL theory and PBL practice. Many institutions are committed to it in theory, but the programs are under-resourced, staffed with physicians who have too little time to teach, and who are not trained in (or do not truly believe in) PBL methods.

Change at McMaster

Perhaps not surprisingly, McMaster's position as the fountainhead of PBL made it somewhat resistant to changes in the curriculum, even in the face of evidence that there were areas ripe for improvement (Norman and Neville, 2004). Although McMaster cannot be accused of any of the failures of PBL implementation that crop up in the literature, the general critique of PBL did, however, eventually affect the views of the faculty. As a result, in 2001 a number of senior faculty began meeting informally (in what later became known as the "Cabernet Cabinet", or

"Cab-Cab") to discuss curriculum renewal. This led to a more formal Task Force on the MD Program Curriculum, which made its final report in 2004.

During their deliberations, two general areas stood out as being in need of revision:

1) Addressing the "soft on science" criticism. McMaster faculty appear to have taken to heart the criticism that the curriculum, while being very good at helping students to suggest treatments to alleviate symptoms, was not as good at conveying understanding of the underlying medical causes.

2) Increasing the breadth of the curriculum to strengthen students' professional competencies. Although some attention had previously been paid to certain competencies which were not strictly speaking "medical" (such as patient communication, ethics, public health, etc.), these were fairly marginal elements in the curriculum.

In addition, there was a desire to see greater emphasis on applied learning. While the old curriculum seems to have been effective in getting students to search for information and critically appraise it, the vast growth in medical literature and meta-analytic clinical studies led to a sentiment that new medical practitioners required additional skills to help them choose between different "sets" of medical data and information. An increased emphasis on electronic media was also desired (although there was already movement in this direction by the Medical Library following an external review two years earlier).

The result of this bout of introspection was the new COMPASS curriculum. At a stroke, the entire case-study curriculum was replaced, that is to say that all existing cases were discarded and an entirely new set of cases was written to take their place. These new cases were written in such a way as to address the criticism that students were deficient in certain areas of science. There is now less emphasis on how to treat patients in particular situations and more emphasis on the discovering the medical causes of the situation in the first place.

Another major change is the introduction of a new and more intensive professional competencies program. A weekly course/tutorial on professional competencies, team-tutored by one MD and one outside professional (drawn from a variety of professions, e.g., ethicists, social workers, public health administrators, alternative medicine practitioners, etc.), is now given throughout the pre-clerkship period.

One line of criticism of medical PBL that does not appear to have made much impact on the Cab-Cab is the criticism that it is too oriented towards family medicine. Indeed, McMaster appears to have turned this criticism on its head, preferring to emphasize that PBL is particularly well suited to turning out family doctors and that therefore a specialization in this area is entirely appropriate.

It is probably too early to say whether or not the new curriculum is a success. As with its earlier curriculum, it has won plaudits for its vision from others in the field, but evidence of success, *per se*, is thin, and it seems unlikely that there will be much in the way of conclusive data emanating from this program change. While the department is being commendably thorough in terms of

gathering qualitative data of a formative nature in order to provide helpful program feedback, there does not appear at present to be much in terms of structured outcomes measurement.

The McMaster case is similar to that of Waterloo in that problem-based learning is less an innovation than it is an entire culture. Similar too, in that the "innovation" was present at the start of the institution (or in this case, the faculty) and not a change or intervention that was made to an existing set of programs, and also in that the innovation was pushed through by a group of visionaries with a vision for education in a particular professional domain. As a result, many of the conclusions about the importance of culture that were drawn in the Waterloo case apply here also.

But there are two key differences. First, McMaster was "Mecca" for the PBL movement in a way that Waterloo – which was avowedly copying certain American institutions, at least at the outset – was not. Second, unlike co-op programs, PBL has come under a fairly critical, evidence-based scrutiny. The former, arguably, was a force *against* further change and innovation. The fact that so many people were copying the innovation may have created a feedback loop that suggested that all was well. The latter, eventually, seems to have been a catalyst for change, as it is clear that the evidence-based literature was a factor in the Cab-Cab's discussions. But, again, wide buy-in within the organization was probably key to making the launch of COMPASS a success. A group of experts, reviewing the evidence alone, would not have been able to introduce a new curriculum on its own.

Case 5: The Nova Scotia Community College: Reinvention of an Institution

Background

The Nova Scotia Community College (NSCC) is a medium sized comprehensive community college serving the whole province of Nova Scotia. This college was chosen as one of our case studies because it has been widely recognized as having undergone a rapid and profound transformation, both structural and in programming, over a short period of time. This was accomplished in a climate of adversity in the mid-1990s as the college, like most other post-secondary institutions, was faced with budget reductions and external pressures from government and industry. The college sector was especially affected by changes in the way federal funding under the employment insurance program was allocated to students in trades and technical programs. In particular, there was a large scale shift in the 1990s away from "buying seats" in institutions to direct support of individuals, who were free to select programs.

These pressures were more severe in Nova Scotia than in other jurisdictions because of the large number of post-secondary institutions in the province and because an activist government at the time was engaged in various activities widely interpreted as aimed at institutional consolidation. While this mainly affected the universities, the college sector was not immune to pressure because it was widely seen as not having moved much from its vocational school origins in the 1950s, while most other provinces had long since created much more comprehensive college systems.

A Decade of Change

Although the changes at NSCC may appear rapid, close to a decade-long series of events seem to have led to the transformation. The first event was a government white paper (Province of Nova Scotia, 1988) which noted that Nova Scotia was the only province without a provincial community college system and recommended consolidation and a change in governance. Indeed, the "system" at the time consisted of no fewer than 19 separate institutions (even more than the number of universities in the province), each functioning independently, but with administrators reporting to the Department of Education. There was also one technical institute, the Nova Scotia Institute of Technology, along with a couple of federal institutions. Most of these offered trades programming, with many low enrollment programs at various locations, leading to a perception of much duplication.

It is important to note also that the 1990s was a period of much broader upheaval in post-secondary education in Nova Scotia. The government of Premier John Savage and the education minister of the day took a highly activist approach to changing what was regarded as an inefficient and expensive system, characterized by no fewer than 13 universities, not to mention the 19 colleges. Participation in university education was higher in Nova Scotia than in any other province. Nevertheless, the college system was perceived as quite weak because it had not moved from its earlier emphasis on trades to the more comprehensive applied arts and technology programs that characterize more modern community colleges A coordinating body for the three Maritime provinces, the Maritime Provinces Council on Higher Education (MPHEC), had considerable power over funding and program approval. MPHEC attempted to do a capacity study in the mid-1980s, with a view to rationalizing programs, but this was rejected by the institutions.

The government's answer to its perceived lack of control of the system was to establish the Nova Scotia Council on Higher Education as an arm's length body, with a mandate to "rationalize" the system. At the same time, because of the severe financial constraints facing the government, partly due to the federal government's attempt to get its financial house in order, the post-secondary budget was cut substantially. The Council made a number of moves in the direction of consolidating programs, and even institutions. A reduction in the number of teacher education programs, including closure of the venerable Nova Scotia Teachers College in Truro and merger of the Technical University of Nova Scotia with Dalhousie University were the most visible of these initiatives. There was even discussion at the time of the idea of establishing an umbrella system, "The University of Nova Scotia". However, by the late 1990s, with the election of a new government, the activist period seemed to be drawing to a close and the university system stabilized. This was not to be the case for the college system.

While the colleges seem not to have been caught up directly in this turmoil, they were obviously not immune to the budget reductions and were subject to criticism from many sources. In 1989, legislation was passed creating the Nova Scotia Community College as an umbrella organization, something the government did not manage to do with the universities. However, that entity continued to be administered from the Department of Education. This structure was criticized in an Auditor General's report in 1993. The Auditor General's conclusion is worth quoting at it foreshadows later events.

> *The Nova Scotia Community College, according to its Mission Statement, has a key role to play in the economic recovery of the Province. At the present time, it is not well-prepared to meet that challenge. There are serious deficiencies in many areas of the College's operations including performance measurement, programs and accountability. … Until Government makes key decisions … or empowers the College to make those decisions, the system is unable to move from the status quo.* (Province of Nova Scotia, 1993)

The recommendation that the college be made independent under its own board of governors was not implemented until 1996. From 1996 to 1998, a major consolidation occurred, with closure of no fewer than five campuses, elimination of a large number of programs and a substantial reduction in staff. Full scale program reviews, involving industry and labour, were also initiated during that period, with a view to making programs more responsive to employment trends. However, it was only with the arrival of a new president, Ray Ivany, in 1998 that rebuilding can be said to have really begun.

Like many other such innovations, the transformation of the Nova Scotia Community College is widely seen to have been driven by strong leadership of one person, in this case the new president. Our informants were emphatic that the turnaround of the NSCC was mainly attributable to Ivany's leadership. However, as is commonly the case, and as the above account suggests, the exercise of leadership occurs in a climate of both crisis and opportunity. The crisis of the time was both financial and structural. The opportunity was created by the government's willingness to consider a radically new structure and by subsequent improvements in the funding climate. Nevertheless, governments and budgets can only dictate the broadest elements of change. The details at the programming level are typically, and were certainly in this case, internally driven.

The 1998 Strategic Plan

By 1998, the provincial government, though moving back from its activist stance towards institutional or program rationalization, began to place more emphasis on the value of skills-based education to the provincial economy, and had begun to loosen the financial constraints on the institutions. This finally gave the college an opportunity to complete its consolidation and to move on to new initiatives.

One of the first acts of the new administration was to develop the college's first strategic plan. The title of that document, "A New College for Nova Scotia", the introductory declaration that "NSCC will transform itself into an activist college" and the concluding declaration that "NSCC is a vehicle for the development of Nova Scotia", amount to bold statements that things would not be the same.

The college's new mission and vision statements were consistent with these transformative directions:

> ***Mission*** *– Building Nova Scotia's economy and quality of life through education and innovation*

> ***Vision*** *– Our approach to education will be one that engages Nova Scotians in new ways to apply knowledge and skill. We will integrate our education with community building and economic development. The college experience will inspire confidence, reflection, and self-reliance, challenging people to make use of what they learn, for their own benefit and for the benefit of all.*

Seven strategic directions were identified. Some of these, such as working with employers and connecting with communities, were fairly standard. However, at least two were intended to identify NSCC with a unique student experience; one that departs from that encountered in other college settings. The strategy of providing "*A Distinctive Student Experience*" was defined in terms of strengthening the "hands on" applied nature of NSCC education, creating opportunities through employment or service to the community, helping students establish connections for future opportunities, and other statements that define NSCC programs as having a work experience component. However, it is the very first strategic objective, "*Portfolio Education*", that seems to embody most explicitly the distinctive nature of the NSCC student experience

Portfolio Education

In its simplest form, a portfolio is a collection of examples of a student's work, often known as "artifacts", prepared over time and designed to show the student's capacity and growth. Portfolios have long been used in such fields as architecture and design, serving much the same purpose as, or perhaps amplifying on, the usual written resumé. In recent years, portfolios have received increasing attention in elementary and secondary schools, primarily as evaluation tools considered to be more "authentic" than written tests or other more traditional ways of assessing students. The portfolio is intended to contain work of the student's own choosing, presumably the best examples available. Over time, additions to the portfolio can help establish a pattern of growth.

The Nova Scotia Community College has extended this simple idea into a pervasive feature of the student's learning experience. By identifying itself as the "Portfolio College", NSCC has created a unique identity; one intended to set it apart from other similar institutions. As well as being a strategic objective in its own right, the idea of portfolio learning fits with broader objectives of enhancing "hands on" experience, connecting with the community and workplace and, most important, contributing to the goal of lifelong learning by instilling the idea that the portfolio is a continuous work in progress, which does not end when the student leaves the college.

The following is NSCC's statement to students of what constitutes portfolio learning:

> *Portfolio learning is a self-directed, student-centered process, through which you have the opportunity to talk about yourself, what you are doing in your particular program(s) at NSCC and where you want to go in life. Each portfolio experience is as unique as you are; no two are the same!*
> (http://www.nscc.ca/Admissions/Portfolio/Portfolio_Learning.asp)

Portfolios are expected to contain a clear statement of the student's career goals, a conventional resume, a list of skills related to program and career goals, evidence of what the student has

learned, work samples and, most importantly, a reflective piece on the student's understanding of self, their college experience and their life goals.

All students entering the college since 2001 are required to complete a portfolio as an integral part of their program. NSCC portfolios are designed to serve a range of purposes. Specific benefits have been identified as:

1. Giving an edge in the marketplace
2. A route to self-development
3. Development of self-confidence
4. Identifying learning gaps
5. Enhancing real learning (beyond formal learning)

(Paraphrased from http://www.nscc.ca/Admissions/Portfolio/Benefits.asp)

Although required, portfolios are graded only as incomplete or complete. Nevertheless, the message conveyed is that portfolios are never complete and that portfolio development should be considered part of one's life work.

Some examples of individual student portfolios are given on the NSCC website (www.nscc.ca/Admissions/Portfolio/Examples.asp). There is also some testimonial evidence on the perceived value of portfolios. However, as far as we can determine, there has been no systematic evaluation of how portfolios affect learning, labour market outcomes or other longer term goals. It is also not clear if the goal of making the portfolio a life-long project is being achieved. We were not able to establish the origin of the idea as it applies to a whole program or institution and have not seen examples of other institutions where portfolios play such a prominent role in learning.

The 2003 Capital Investment Program

With the strategic plan, NSSC obviously made a transition from consolidation to growth. However, according to our informants, NSCC, and particularly President Ivany, recognized that the college would have to prove that it could live up to its transformative vision before it could be expected to get the attention of government for support of a major initiative to improve its outdated facilities. Apparently government was eventually convinced because in 2003 it announced an investment of $123 million in capital funding for new buildings and renovations. This has led to the construction of a new flagship campus in Dartmouth, to be opened in 2007. The Dartmouth campus is the first purpose-built facility for the college and will accommodate about 1,700 students when complete. The old central campus in Halifax is now being demolished and students are being temporarily accommodated until the new facility is completed. Four other campuses are also undergoing extensive renovations. When complete, the new facilities will provide capacity for an additional 2,500 students.

Further Indicators of Change

Programs, facilities and portfolios are not the only indicators of change at NSCC. After remaining fairly constant during period of structural change in the 1990s, enrolment has increased substantially in recent years, from about 6,600 in the late 1990s to close to 9,000 in 2005-06. Employment rates for graduates have also increased from about 75 percent in 1996 to more than 90 percent in 2005.

The Role of External Forces in the NSCC Transformation

The NSCC case is in strong contrast to the other Nova Scotia case documented here. Although occurring in the same era and within the same overall post-secondary policy context, it is clear that the Acadia Advantage was mainly an internal initiative while the NSCC transformation, at least in its broadest form, was driven almost entirely by external forces and particularly by government policy decisions. From the 1988 White Paper to the 1996 decision to establish an independent board of governors and through the consolidation period from 1996 to 1998, the actions affecting the NSCC were almost entirely government actions. It is only since 1998 that the college has appeared to function independently. Thus, the 1998 strategic plan and the specific focus on portfolio learning can be considered to be internal initiatives. More recently, however the impact of government policy can again be seen in the provision of funds for expansion. NSCC officials, have argued that this would likely not have come about had the college not proven itself to be a significant player in development of the Nova Scotia economy. This may, therefore, be seen as an example of how governments can be persuaded by institutional actions to take policy decisions that might not otherwise have occurred.

Case 6: Recent Developments in Community College Systems

One of the largest changes in Canadian post-secondary system has occurred not at the institutional level but at the system level. Over the past fifteen years, major changes have occurred within the college systems three of Canada's four largest provinces. Arguably, these changes have been the most fundamental change in the Canadian post-secondary system over the past decade.

Over the 1980s and 1990s, the changing occupational structure of the economy began changing the skill requirements of part of this "middle" sector of the economy. Put succinctly, the job market began to demand more individuals who had some combination of "technical/vocational and traditional "analytic" skill sets. What attracted a great deal of attention in the early 1990s was the phenomenon of "reverse transfer" – a never very-well documented but widely believed process whereby university graduates would seek to gain college diplomas to make themselves more employable.

In two provinces – British Columbia and Alberta – colleges have, for some time, occupied a kind of hybrid position between universities and technical colleges. In both provinces, colleges were, geographically speaking, spread far and wide, and in both provinces, provided not only technical education but also general academic education which could be applied towards a university degree. More or less since their creation, colleges in these two provinces effectively offered the first two years of a university education, with the credits fully transferable to a university degree if, and when, a student chose to progress to a university in their own province. In part, this

system reflected a certain view about the mix of skills required in the labour market; in part, it was also an attempt by both governments to find a cheaper alternative to building a costly network of universities across their provinces.

Though the timelines differ, institutions in both provinces have been running in similar directions over the past decade or so. In the early 1990s, a number of colleges became "university colleges", providing four years worth of undergraduate courses. This meant that they were effectively universities, although their mission statements still implicitly stressed teaching over research and their degrees were still technically awarded under the auspices of "established" universities such as UBC. As of 1996, though, several institutions, such as Malaspina University College and the University College of the Fraser Valley became degree-granting in their own right. In effect, certain colleges were permitted to "become" universities.

In Alberta, the thrust was slightly different. In 1995, the Government of Alberta permitted Mount Royal College to offer "applied degrees" in addition to their traditional set of diplomas and certificates. As Marshall (2004) notes, this broke the national monopoly that universities had previously enjoyed in awarding "degrees". The Government of Alberta went further in 2003 and permitted all traditional colleges to offer full Bachelor's degrees in Arts and Science, albeit with a government "Quality Council" substituting for a more traditional Senate as the ultimate arbiter of whether a program is in fact "degree level". Superficially, this is similar to BC, except that in Alberta, the colleges have not "become" universities – rather, they have added a degree-granting function to their existing duties as colleges. Thus, the Alberta case is a much more serious case of "blurring the lines" between universities and colleges.

Arguably, though, no college system in the country has changed as much over the past ten years as that of Ontario. Although the system has not grown, especially in terms of student numbers, the range of programs offered and the types of inter-institutional arrangements underpinning these programs have changed considerably.

Since their creation in the 1960s, Ontario Community Colleges (more formally, Colleges of Applied Arts and Technology, or CAATs) played the role of multi-disciplinary teaching institutions with a largely vocational and/or remedial mission. Unlike the colleges in Canada's other large provinces, there was no intention at the outset to create a "laddered" approach to post-secondary education, with universities and colleges recognizing each others credits and permitting transfers within the system. Instead, the university and college system was "siloed", with colleges allowed to work only in areas not covered by university programs. As in most of the rest of the country, the (unspoken) task of community colleges was to prepare people for the "middle" segment of the occupational structure (Skolnik, 2002).

In response to this phenomenon, the Ontario government put gentle pressure on universities to take steps to accommodate more credit transfer. The issue split the Council of Ontario Universities, with the larger research institutions generally being more resistant than smaller teaching institutions to these kinds of arrangements. This split was especially apparent when it came to anything resembling a blanket credit-recognition scheme. Individually, however, many community colleges began striking partnership deals with universities (even the more research-intensive ones) and began to deliver programs with integrated college and university content.

Among the most prominent of such arrangements are those between Seneca College and York University (branded as Seneca@York), and the Guelph University-Humber College alliance.

This was not the first time in Canadian history that a university senate had sanctioned the creation of a degree program that had content provided by a community college – a number of institutions had already done that in teacher education programs from vocational and industrial arts. What made these integrated college-university programs a genuine innovation was that the new programs were coming simultaneously from spontaneous interactions between institutions, across a range of disciplines. Though it amounted to less than a new institutional "type", it was certainly a new form of market-driven collaboration across sectors.

Still, this was not enough for community college leaders at the turn of the century, who felt that their institutions were mature enough (most were over thirty years old at the time) to offer some kind of degree-like credential, if not in competition with universities then at least in those areas that universities did not operate. As a result of some astute lobbying, colleges were granted the power to grant "associate degrees" in 2002, in much the same manner that Alberta colleges had been granted the same privilege seven years earlier (although the meaning of the term "associate degree" was not exactly the same in the two provinces). In what might be seen as a concession to the universities – some of whom objected to the decision that it would devalue the meaning of the term "degree" – colleges were not given blanket approval to develop programs, as existing universities were able to do. Rather, an external quality review committee, known as the Postsecondary Education Quality Assessment Board (PEQAB), was given power to review all applications for new programs and make recommendations for rejection or acceptance to the minister of Training, Colleges and Universities, with whom final responsibility for new program approval rests. Approval has now been given to several dozen new programs in this manner.

It is much too soon to make any judgments about the success of the applied degree program, although it is worth noting that there is some evidence that Ontario high school students, having spent their secondary school years associating the word "applied" with the word "remedial", are not being attracted by these new "applied degrees" and hence enrolment is somewhat lower than expected. That said, it seems clear that these new institutional arrangements will continue to develop in an incremental way across many colleges, until there is a competitive market in various fields of "applied degree" study between colleges in much the same way that universities compete with one another's undergraduate programs.

In sum, in the space of a decade, three major new forms of post-secondary education have arisen on Community College campuses in Ontario and Alberta. The first, joint degree programs with universities, arose through spontaneous local co-operation, while the second and third, (applied degrees in both provinces and actual Bachelor's degree awards in Alberta), while still reliant on local initiatives to set up new degree programs, required government enabling legislation. For the most part, these major changes have come without significant opposition. The most potent criticisms of these innovations – that a surfeit of institutional innovation could lead to a more generalized confusion about and even devaluation of Canadian credentials – has not yet come to pass. This may be a sign that the Alberta Quality Council and the Ontario PEQAB are being effective in their roles as quality assurance agents, but it is probably too early to tell for sure.

Conclusions

In this study, the term "innovation" was defined as changes in *general* practice at an institution, rather than in individual projects or programs. In particular, we were interested in innovations in teaching and learning or knowledge mobilization and particularly in innovations designed to differentiate an institution in some way from other similar institutions. The results of this study must be interpreted in terms of this definition. Hence, it is not possible to answer the research questions from the perspective of research innovations, which generally have a much narrower focus (though not necessarily smaller impact).

It is also not possible to generalize from case studies to the population as a whole. It is obvious that much more is going on in Canadian universities and colleges than can possibly be captured here and, while each of the cases stands out in some way, we would not claim that this set is by any means exhaustive or representative. At the same time, there are some common features which help identify the conditions required for successful innovation and differentiation. The value of the case studies is that they can provide some insights into the underlying driving forces for innovation and thus into the "big picture" of how innovation is initiated and sustained, and of the barriers to innovation and the internal and external impacts on innovation.

Because of these limitations, the specific research questions have been reformulated to yield answers that can be given within the scope of the study. Specifically we attempt here to speak to questions of the characteristics or qualities required for innovation to take hold, the factors influencing innovation, and the role of internal and external forces in driving innovation.

Factors Influencing Innovation

The prevailing view expressed by our informants is that the overall climate for innovation in Canadian post-secondary institutions is positive. Informants were also of the view that innovation is mainly supported by internal features of the institution, particularly by the presence of high quality faculty and staff and of administrative vision and support.

The case studies support the idea that most innovation is internal, but the cases also point to a more complex picture. In some of the cases, the innovation was clearly driven by inspired leadership. The Acadia Advantage and the transformation of the Nova Scotia Community College can hardly be spoken of without invoking the names of the presidents of the institutions at the time the innovation began. Nevertheless, in these cases, the vision of the leaders seems to have been inspired by a perception of significant external pressure or threat to the institution. These seem to be cases of the leadership rising to the challenges presented and overcoming obstacles to implementing their vision. In the Acadia case, there was also a need to bring the governing body on-side as the innovation required a significant infusion of new resources and a unique way of raising the resources. While it seems obvious that innovations of such scope could not occur without widespread support of faculty, the Acadia case illustrates that it is possible to allow faculty to participate at whatever level they desire and that large scale support may not occur until the innovation is established. Even now, one senses that, while all students are actively involved in some way, the level of involvement of faculty is widely variable.

The e-learning case study illustrates a different set of factors. In this case, innovation seems to have been fostered by strongly-held beliefs about the new economy, the emerging role of new technologies and particularly the view that these are "transformative" in nature, the value of education for individual and societal development and the need for life-long learning. These beliefs manifest themselves in government policies designed to promote greater access to higher education and for new ways to stimulate this access, especially by those in remote areas and by others who are unable to find their way into conventional classroom-based instruction. Many institutions have responded to these forces with different degrees of intensity. This ranges from whole institutions, such as Athabasca, dedicated to distance education, to those which attempt to develop a judicious mix for a particular target audience, such as Royal Roads, to those for which distance education remains supplementary. Institutions have also responded in different ways, essentially by using different technologies and technology mixes.

While it might be argued that this is a clear example of institutions responding to external forces, the reality is not quite that simple. Expansion of conventional facilities and programs continues to be the main way of increasing access. Only a small number of institutions have made e-learning a focal point of their work and the belief remains prevalent that e-learning should be seen as supplementary and not as replacing conventional learning. It is notable that two new institutions in British Columbia, Thompson Rivers University and Royal Roads University, are establishing themselves at least partially, around e-learning. This seems to be the legacy of the Open Learning Agency in British Columbia, which, itself, was driven by earlier government policies. These now seem to have been superseded by a major program of expansion by changing former community colleges into university colleges and then into universities.

The Contact North Network, the University College of the North and the e-learning thrust at Memorial University are perhaps the best examples of e-learning taking a specific focus on service to rural and remote areas. However, while the first two may arguably have been promoted significantly by government policy, that is by no means the case for Memorial, where there is a long history of internal initiatives in this area. Indeed, in this case, it is clear that government has followed the lead of the university and has capitalized on university expertise and infrastructure in mounting its own initiatives in secondary education.

Most of our interview informants were of the view that their governments are becoming less interventionist in most areas of post-secondary education. However, the emergence of innovation agencies in many provinces and the expansion activities currently evident, particularly in Ontario and British Columbia, suggest that provincial policies are being redirected towards two goals, expanding access and stimulating knowledge mobilization. To the extent that the first manifests itself in expanded conventional facilities, this is not particularly innovative. However, where it is driving a move to e-learning, this is stimulating new thinking about teaching and learning and perhaps even the beginnings of a research agenda in this area. The efforts of provinces to stimulate knowledge mobilization were not studied in any detail here, nor was the impact of the major federal innovation initiatives. While the previous report in this series (Snowdon, 2005) gives a detailed overview of these initiatives, there remains a large gap in our knowledge about their impact.

The most striking point about most of the cases is that substantial effort, over a long period of time, is required to ensure that an innovation can be sustained to the point of being identifiable with an institution. Acadia, McMaster, and Waterloo most strongly exemplify this principle. Innovations of this kind effectively become part of the institutional culture to the point where even a cursory reference to the institution will invoke what it stands for. The Waterloo and McMaster case studies also suggest that it may be significantly easier to set cultures at the outset of an institution's life than it is to try to change the culture of an existing institution, although the Acadia example is perhaps a counterpoint to this.

As noted above, many innovations obviously come about as a result of inspired leadership. However, this is both a strength and a weakness, in the sense that an innovation can live or die depending on whether its inspirer remains at the institution. The cases we have chosen, for the most part, have transcended the original leadership. However, it is not difficult to find examples of the opposite – an innovation disappearing once the original leader is no longer available.

A brief comment is perhaps in order about the current set of government incentives for innovation. The available provincial incentives are mostly small scale and directed mainly towards commercialization of research. Federal initiatives, such as the Canada Foundation for Innovation, the Canada Research Chairs Program and the ongoing refocusing of the three research granting agencies, are more pervasive. However, their impact remains to be assessed. Indeed, a case can be made that this is a key area for further follow-up, using more comprehensive methodology than that available in this study. The Snowdon report certainly suggests that recent funding initiatives have been undertaken without a clear sense of mission and, if anything, have created a climate of uncertainty rather than clarity of purpose.

Overall, our results support the conclusion that innovations are more likely to be driven by internal institutional factors than by external ones. To the extent that external factors are at play, these either act in a negative sense (e.g., funding cuts or rationalization agendas) or establish an over-arching climate (e.g., demographic conditions or economic development imperatives) to which institutions may respond. A couple of our cases are clearly examples of responses to adversity created by external forces. However, the specifics of institutional responses are internal in nature. Clearly, all institutions do not respond, or do not respond in the same way, to the external environment.

One of the consequences of all of this is that it is difficult to "export" most of the kinds of innovation being described here. For example, while many applaud the Acadia initiative, we have not been able to find another institution that has adopted a similar approach as a defining feature. It is likely, in this case, that many individuals have integrated ICT into their teaching in much the same way as occurs at Acadia and many institutions have invested heavily in similar technology. However, this does not make the innovation a visible feature of their institutions. Even co-operative learning, a defining feature of Waterloo, has not been widely adopted despite its long standing and its appeal.

One of the key reasons for the failure to export, we believe, is the role of institutional culture in the success of particular innovations. Simply adopting a set of policies is probably not enough to ensure that an innovation will be successful. Policies are necessary, to be sure, but without

widely-shared buy-in within the institution, a general consensus of spirit about the desirability of an innovation, and a set of internal institutions to support an innovation, policies will inevitably be implemented in a less than satisfactory fashion. There are, sadly, no shortcuts to innovation.

Barriers to Innovation

In our interviews and survey, the most widely cited barriers to change were the expected ones; limited resources, limited incentives and opportunities, limited rewards and recognition and resistance to change. Some government respondents were actually unsure how well placed the institutions are to take advantage of the available incentives, while some institutional respondents worried that these incentives are "soft" and unlikely to be sustained.

Our choice of case studies focused on successful innovations and thus sheds less light on barriers than if we had sought out some failed innovations. In the end, we were not able to determine the extent to which the above barriers are having a real impact. The accounts we were given of the selected innovations were not stories of overcoming barriers as much as stories of having and promoting good ideas, While there are indications in the cases of response to adversity, this is not the same as overcoming obstacles.

The e-learning case does not fit the mold of the others. This innovation is much more diffuse and more strongly driven by external conditions, mainly government (and presumably public) concern with access to post-secondary education and preoccupation with the "new economy" and the role of ICT in the economy. The widespread belief that ICT is a "transformative" technology prompts many to jump on the bandwagon. The fact that universities are early adopters, even initiators, of many of the features of these technologies makes it almost inevitable that it will be seen as a way of transforming teaching and learning just as it has done in other sectors.

While it is possible to find evidence of this innovation in a large number of institutions, it is also true to say that it has yet to realize its potential. Existing distance education systems are entrenched and it takes considerable investment to introduce new ways of packaging and delivering programs and courses. The cost-effectiveness of education through ICT is yet to be established. In addition, despite the appeal of the technology in terms of access and flexibility, there remains a strong sense that this cannot replace traditional classroom teaching, any more than other technologies have been able to do so in the past.

The obvious question, of course, is why? Since there is little evidence on the effect of e-learning on access, outcomes or cost, there is perhaps good reason to be cautious. However, our sense is that the cautions are less related to the absence of research than to an abiding belief that there are intangible benefits to classroom-based teaching and learning that cannot be realized by any other mode. The implication is that even if e-learning is found to have advantages in any of the key areas, these intangibles will continue to play a significant part for some time to come. Nevertheless, this is an obvious growth area, which must be seen as at the forefront of innovation in teaching and learning and which demands significant further research and development. If any innovation in teaching and learning has the potential to fundamentally transform the way we think about these processes, this is most likely the one.

Innovation for Differentiation

This study was particularly concerned with the kinds of innovation that could result in institutional differentiation. Indeed, in the end, we selected as case studies mainly innovations that are identifiable with the external image of particular institutions.

Most university respondents noted that their institutions use innovation in teaching and learning and research dissemination to distinguish themselves from other universities in their provinces and regions, further noting that while a good deal of this was driven by internal forces, external forces such as government and industry played a role in differentiation as well. Colleges appear to be more preoccupied with differentiation than universities. While most college respondents stated that innovation was largely driven by external forces, differentiation appears to come primarily from within, and college respondents appeared to take great pride in these innovation generators.

In this sense, it is not surprising that many of the innovations studied are not exportable. To the extent that they are intended as ways of differentiating institutions they are not intended to be exportable and their wide adoption would effectively defeat the original intentions.

Innovation Mechanisms

The specific mechanisms to encourage innovation and differentiation may be divided into five categories: 1) policies, procedures, plans, and philosophies; 2) centres, institutes, programs, and posts; 3) unique learning models, curriculum, and credentials; 4) partnerships and collaborations; and 5) innovation funds.

In some cases, specific forms of innovation or means of differentiation are an inherent part of an institution's strategic direction. Many institutions have established specialized centres for innovation in a particular area. Large institutions often have many such centres. By far the most commonly identified methods of distinguishing innovations are unique learning models, curriculum, and credentials. Nearly all of the respondents indicated that they set themselves apart from others by offering learning experiences that cannot be had elsewhere. Interdisciplinary programs in universities and the move to applied degrees by colleges are common examples of differentiation through programming. Many such programs are offered under partnership and collaborative arrangements, often between universities and colleges. Aside from the innovation funds now available from external agencies, many respondents indicated that they also have established small funds to support innovative approaches to teaching and learning and research.

Policy Implications

It is difficult to generalize from six individual case studies of innovation from amongst 250-plus public institutions spread over 10 separate systems of higher education. That said, there are some features of these cases that suggest lessons for public policy. First, and probably most importantly, is that serious and successful innovation is a slow-acting process, based as much on culture change as on policy change. Outside actors – be they governments or philanthropists – expecting major innovations to bear fruit in anything much less than a decade are likely to be

disappointed. On a related note, it should be remarked that the process of culture change at PSE institutions in Canada is not something that has received much in the way of scholarly attention in the past. A great deal of this kind of research on educational leadership and education change has, however, been done in the K-12 system, at least in the US. One or more of these kinds of studies is probably worth conducting in Canada in the near future, given the apparent centrality of culture to the issues at hand in this survey.

We have not seen any government interventions that seem to make much difference in terms of innovation in teaching and learning, at least in the traditional settings; that said, this is in no small measure due to the fact that no government appears to have any ambition to play a role in fostering such innovation, preferring instead to leave such matters to campuses. Even if governments did harbour such ambitions, though, we think it unlikely that they would be successful in provoking positive change at a campus level. As we have seen, such wide buy-in is required to effect lasting change so that any attempt to steer change from the outside would likely doom an initiative from the outset.

Governments obviously have some legitimate steering role at the system level; they can play a key role in laying down institutional missions and in driving innovations that are linked to wider access to learning (notably e-learning). However, while some of our case studies involve government steering, none of them are easy to evaluate as having been "successes" or "failures". We can note that change has certainly occurred in the college sector and in the distance learning sector, but there is little in the way of conclusive evidence that the change has been for the good.

At the institutional level, one of the obvious external drivers that we have encountered on several occasions has been lack of funding. In several cases, we have observed that institutions that are squeezed for funds occasionally come up with some radical new ways of doing business (e.g., Acadia, NSCC). (In Acadia's case, flexibility on tuition-setting likely helped.) Arguably, what this teaches is that "necessity is the mother of invention". However, this does not necessarily mean that squeezing institutional funding is an essential condition of innovation, and it certainly does not mean that the negatives of funding restraint are outweighed by the occasional positive result. It does suggest at the least, however, that restraint provokes change, and it may well be that institutional culture is what distinguishes those institutions that turn crisis into opportunity from those which just manage to avert crises.

Post-Script: Thoughts on Improving the Innovation Environment in Post-secondary Education

In our paper we have examined the evidence with respect to innovation in post-secondary education on the basis of evidence gathered through surveys and interviews. Necessarily, our methodology, which focussed on a few key cases, has limited our ability to draw wider, evidence-based conclusions with respect to innovation. Nevertheless, we wish to conclude our look at this subject with some more general thoughts about both the state of, and the prospects for, innovation in post-secondary education in Canada.

First of all, it needs to be recognized that innovation within institutions is wide-spread – much more so than we were able to portray here in this document which dealt with a few specific case studies. That said, it is also obvious that experiments in teaching and learning are not especially high on the list of priorities of most institutions. For this to change – and change it must if Canada is to maintain an edge in human capital over countries with fast-growing PSE systems such as China – the correct policy environment and incentives need to be in place.

The current public policy environment in terms of innovation in post-secondary education – particularly in respect of teaching and learning – could variously be described as "passive", or one of benign neglect. We have already described how provincial governments simply do not view innovation in this area as any of their business. In one sense this is entirely proper; there is no advantage to provincial governments micromanaging what goes on in university and college classrooms. Moreover, as we noted in our conclusion, much of the success of individual innovations in teaching and learning come from strong leadership from a small group of committed individuals in institutions with little or no government support.

In another sense, however, this policy void is deeply discouraging, because it means that universities and colleges have few external policy incentives to experiment in this area. As we have seen in our survey, universities and colleges do indeed respond to external policy incentives. One need only look at the expansion of the research mission of universities (and to a lesser extent colleges) to see the extent to which internal priorities can shift when the rewards are made sufficiently enticing. Given the increased emphasis on improving access to post-secondary education and on encouraging life-long learning, that are part of emerging government policies, it is surprising that greater support for teaching and learning innovations that contribute to these goals had not been forthcoming. While there is some evidence from the e-learning case study of institutional response to external policy thrusts, this seems to be the exception rather than the rule. Even here, the innovation is more internally than externally driven.

What kinds of policy environments might stimulate more innovation? Funding is probably a key issue. The absolute amount of funding is probably not relevant to innovation – indeed, as we have seen, innovation can flourish in response to fiscal restraint. However, as Snowdon (2005) has pointed out, some base level of *stable* funding (whether high or low) is probably key to the well-functioning of any institution. Another likely key to innovation is for institutions to have strategic investment funds that will allow the development of new educational technologies and pedagogies. Provincial policy environments need to permit and even encourage the development

of these kinds of funds at institutions. Donors and philanthropists could also be encouraged to sponsor these kinds of funds

We have noted the very strong role that institutional culture or "climate" seems to have on innovation. The state of research on what comprises institutional culture, how it forms and how it can be changed, is weak to non-existent; more work in this area is therefore urgently needed before clear policy advice can be given here. However, as noted above, institutional priorities (and hence, in part, culture) can and do change in response to appropriate incentives.

There is, presumably, some merit therefore in provinces developing policies to reward good teaching just as many find ways to reward good research. Yet this type of policy has repeatedly been recommended since at least the days of the Smith Commission in 1991, and for reasons that are somewhat unclear, no government appears to have been willing to implement such a set of rewards.

Part of the problem, presumably, is that we know very little about "what works" in terms of teaching and learning in post-secondary education. Very little research has been done comparing the effects of various pedagogies or programs on learning outcomes. Yet without this, it is difficult to imagine how exactly institutions, or indeed instructors, are meant to learn from one another. Given general societal pressures that demand value for money in public expenditures, one would think that a strong case could be made that institutions should be constantly searching for ways to improve these outcomes. Institutions have plenty of intellectual capacity to set up and evaluate pilot programs for teaching and learning innovations; what they lack is the incentive to do so. While there is evidence of such research in elementary and secondary education, little of this is applicable to the post-secondary level and there is little comparable effort at this level.

A strong argument can be made that governments, as representatives of taxpayers, should in fact be demanding that institutions perform this kind of evaluation research on a regular basis. Money for this kind of research can and should come from various sources. Provincial governments themselves are an obvious source of funds, either directly or through an intermediary body such as Ontario's new Higher Education Quality Council. Federal granting councils, too, could play their part, with each of the three granting councils sponsoring funds to evaluate teaching and learning innovations within their own areas of expertise.

Recent proclamations from provincial governments about the importance of post-secondary education are indeed welcome. However, an increased focus on post-secondary education needs to be about more than simply funnelling more money into existing structures. As noted in an earlier CPRN publication (Finnie and Usher, 2005), it is important to understand what inputs and pedagogies are actually linked to particular sets of learning outputs and final outcomes. Government investments in setting up and evaluating teaching and learning experiments would not only spur institutional innovation – it would also improve our knowledge of "what works" and by extension, improve the overall efficiency of teaching and learning in post-secondary education.

The latter point, along with the earlier one on e-learning, leads us to make two specific suggestions for policy development and for research on post-secondary teaching and learning.

First, both governments and institutions should have strong reason to support research on how to properly define and measure post-secondary outputs. We know a great deal about the economic impact of post-secondary education, but not nearly enough about what specific knowledge and skill contributes most to this impact, about how to maximize this impact or about the cost-effectiveness of particular teaching and learning strategies. More specifically, given the increasing demands for postsecondary access and for life-long learning it is recommended that e-learning and other innovative approaches to achieving these goals be given greater impetus through support for both the development of practices, and the conduct of research around these practices.

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Peer Assessment

UBC – Institute for Scholarship in Teaching and Learning
http://www.tag.ubc.ca/about/institute/ISoTL.php

UBC – e-portfolio project - teaching
http://weblogs.elearning.ubc.ca/e-portfolios/

Waterloo – Teaching Based Research Group/Learning and Teaching Through Technology Centre - teaching
http://www.learning.uwaterloo.ca/research
VP Associate Tom Carey and Vivian Schoner Tel: 519-888-4567, ext 6054

Waterloo – intellectual property policy – research dissemination
http://www.research.uwaterloo.ca/forms/ttlo/ttlo-guidepatents.pdf
http://www.research.uwaterloo.ca/ethics/integrity/policy73.pdf
Comments:
"research dissemination via the UW's IPP (i.e. faculty own) has given rise to the significant statistic that approximately 1/5th of Canadian start-ups are spawned by this institution"

University of Toronto, Mississauga – Healthy City Stewardship Centre

http://www.mississauga.ca/portal/cityhall/stewardship
http://www.utm.utoronto.ca/biocc.0.html#2788
contact: Ulli Krull, Vice-Principal, Research Tel: 905-828-5437 e-mail ukrull @ utm.utoronto.ca

A partnership of the UTM and the City of Missassauga, the project focuses on creating a framework for healthy communities and bridging the gap between research and policy in health and environment in the municipal context. The results of this effort have been shared with the World Health Organization.

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