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A Conceptual Framework for Research at Canadian Colleges

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A CONCEPTUAL FRAMEWORK FOR RESEARCH
AT CANADIAN COLLEGES

(Spine title: Conceptual Framework for Research at Canadian Colleges)

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By

Roger F. Fisher

Graduate Program in Education

A thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

The School of Graduate and Postdoctoral Studies

The University of Western Ontario

London, Ontario, Canada

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THE UNIVERSITY OF WESTERN ONTARIO
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A Conceptual Framework for Research at Canadian Colleges

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Abstract

With the advent of the post-industrial 21st century knowledge-based economy and the demands of global competitiveness, Canada's community colleges are extending their historical mandates (of career-related education and regional economic development) by incorporating *research* into their traditional programs. However, the recent dramatic growth of research cultures at colleges is occurring in an unsystematic and uncoordinated manner. The purpose of this thesis is to address this issue by proposing a comprehensive, integrated conceptual framework that provides clarity, focus, and direction for building this research culture. A conceptual analysis of research models in higher education is conducted, leading to a working model that is used to analyze the implications of building a research culture at Canadian colleges. The six attributes of the working model (*purpose, forms, governance, personnel, funding, outputs*) are revised accordingly, and a conceptual model is proposed that reflects and accommodates the unique circumstances in which research is evolving at Canadian colleges.

In this proposed Conceptual Framework for Research at Canadian Colleges, the primary *research purpose* is to enhance and extend the core college mission by enriching the student experience and the quality of college graduates, keeping faculty current and engaged, and contributing to the social and economic well being of the communities that colleges serve. *Research forms* such as applied research and the scholarship of teaching and learning embody new opportunities that resonate with core missions. *Research governance* is manifest at colleges in the establishment and implementation of policies and procedures related to ethics, integrity, academic freedom, and conflict of interest, but requires further consideration of faculty participation and intellectual property rights.

With respect to *research personnel*, the lack of faculty release time presents the single greatest barrier to building a sustainable research culture. While colleges are at a severe disadvantage in accessing traditional sources of *research funding*, Québec's model of College Centres for Technology Transfer provides a robust example of cooperative arrangements involving a spectrum of funding sources. As for *research outputs*, colleges are currently developing metrics and models appropriate to their purposes. Consequently, this proposed framework provides a conceptual map to chart more clearly the evolution of research cultures at Canadian colleges.

Keywords: Canadian colleges, research culture, conceptual framework, applied research, scholarship of teaching and learning, faculty release time, teaching/research nexus, College Centres for Technology Transfer, Boyer, Gibbons.

When you set out for Ithaka
ask that your way be long,
full of adventure, full of instruction.

Cavafy

To Dr. Joe Engemann
Advisor, Mentor, and Friend from Day One

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Note:

For the purpose of this thesis, “college” is used as an omnibus term representing the wide range and diversity of publicly funded *non-university* postsecondary institutions in Canada. In practice, these institutions are variously referred to as: community colleges, colleges of applied arts and technology, technical institutes, university-colleges, institutes of technology and advanced learning, polytechnic institutes, and, in Quebec, *collèges d’enseignement général et professionnel* (CEGEPs).

I. INTRODUCTION

Colleges have deep roots in Canada.

As early as 1668, “trade schools” at Quebec City and St. Joachim were providing training in “practical arts and trades” (Phillips, 1957, p. 16) to support the nascent colonial communities in New France. By 1707 Jesuit Colleges in Quebec and Montreal were offering advanced mathematics, surveying, and hydrographic training to pilots, ship-captains, explorers, and surveyors, as well as navigation and fortification training to military officers (Young, 1992). Foreshadowing the purpose and structure of contemporary college certification programs, the previously informal practice of pilotage became restricted to those who were trained and licensed to perform the work as certified professionals. “No person is to act as a pilot,” declared James Murray, Governor of Quebec, “unless he has been properly examined, and is furnished with a certificate thereof by me” (Corporation of Lower St. Lawrence Pilots, 2001). These prototype colleges, therefore, were already demonstrating the two integrally related missions that would become the defining hallmark of Canadian colleges for the next three centuries: (1) employment-related education, and (2) regional economic development (Campbell, 1971; Dennison, 1995; Dennison & Gallagher, 1986; Harlacher, 1969; Levin, 2001; Phillips, 1957; Selman, et al., 1998; Skolnik, 2000; Spencer, 1998; Young, 1992).

With respect to jurisdictional responsibility, the British North America Act (BNA Act) of 1867 clearly delineates the federal/provincial distribution of powers that continue to impact the evolution of Canadian colleges to this day. The BNA Act provides provincial autonomy and responsibility in the field of education, resulting in significant diversity across provincial postsecondary education regimes in terms of legislation,

program offerings, infrastructure, funding, and so forth. At the same time, the BNA Act acknowledges the overlapping role of the federal government in the preparation and disposition of an adequately trained workforce as a fundamental prerequisite for the efficient management and operation of the federal economy (Association of Canadian Community Colleges [ACCC], 2007; Bélanger, Mount, Madgett, & Filion, 2005; Dennison, 2006; Dennison & Gallagher, 1986; Industry Canada, 2007; Ivany, 2000; Levin, 2001; Skolnik, 2002; Young, 1992).

Specifically with respect to Canadian colleges, the most significant large scale federal intrusion into the provincial realm of postsecondary education occurred in response to the dramatic and wide-ranging economic, demographic, and technological changes unfolding in the early 1960s. At that time, the federal government recognized that the “accelerating rate of economic change was making some jobs redundant, changing some, and creating others. . . . Its primary concern was to facilitate economic growth by matching the supply of manpower with the demand – qualitatively, quantitatively, and geographically” (Dept. of Manpower & Immigration, 1969, p. 1). To assist in achieving its goal of converting the nation from a resource-based economy to an industrial-based economy, the federal government enacted the Technical and Vocational Training Assistance Act in 1960, and the subsequent Adult Occupational Training Act in 1967, thereby providing the provinces with the enabling legislation and capital assistance required for the establishment of our uniquely Canadian system of postsecondary *community colleges* (Campbell, 1971; Dennison, 1995; Dennison & Gallagher, 1986; Harlacher, 1969; Selman, et al., 1998; Spencer, 1998; Young, 1992). This “greatest vocational school building program in our history” (Young, 1992, p. 37) heralded the

“golden age of Canadian community colleges” (Dennison & Gallagher, 1986, p. 11), which to this day continue to address, on a pan-Canadian scale, the integrally related dual missions manifest in the earliest prototype colleges: employment-related education, and regional economic development.

With the advent of the post-industrial 21st century knowledge-based economy and the demands of global competitiveness, the federal government is again poised to dramatically influence the evolution of Canada’s community colleges in support of its national goals related to research and innovation (ACCC, 2007; Bélanger, et al., 2005; Corkery, 2002a; Dennison, 1995; Doerm, 2008; Fisher, 2008b; Industry Canada, 2007; Levin, 2001; Parsons, 2007; Quinlan, 2005; Skolnik, 2001). Driven largely by this federal initiative to strengthen the capacity of Canadian colleges to contribute to a “new climate of innovation and discovery in our nation” (Industry Canada, 2007, p. 15), and accelerated by the catalyst of the provincially legislated inclusion of *applied research* in college mandates across the country, Canada’s colleges are currently being challenged to reinvent themselves as “engines of economic growth” (Quinlan, 2005, p. 23) and “catalysts of economic innovation” (Colleges Ontario, 2007, p. 1). Consequently, the potential contribution of Canada’s colleges to the national innovation agenda has emerged as “one of the top advocacy priorities for the college system” (Corkery, 2002a, p. 1).

A metamorphosis of mandates and missions, therefore, is unfolding on college campuses across the nation. In response to federal and provincial government initiatives, and to the imperatives of technological change, Canadian colleges are altering not only their names - to *Institutes of Technology*, *Polytechnic Institutes*, and *University-Colleges*

- but also their missions (ACCC, 2007; Colleges Ontario, 2006; Dennison, 1995; Fédération des cégeps, 2006; Fisher, 2008b; Gallagher, 1990; Levin, 2001; O'Banion, 1997; Province of Quebec, 2006; Rae, 2005; Skolnik, 2002). In this new climate of innovation and change, colleges are espousing a “new emphasis on information technologies, entrepreneurial education, and establishment of centres of specialization, innovation, and transfer of technology to the work place” (Gallagher, 1990, p. 5). In addition to their traditional delivery of certificates and diplomas, many Canadian colleges are now offering applied, collaborative, and articulated baccalaureate *degrees*. Accordingly, in support of these new initiatives, traditional college mandates are being extended through provincially enacted legislation to include *research*, especially *applied research* (ACCC, 2006; Bélanger, et al. 2005; Colleges Ontario, 2004, 2006, 2007; Corkery, 2002a; Fisher, 2008b; Ivany, 2000; Madder, 2005; Parsons, 2007; Polytechnics Canada, 2007; Quinlan, 2005; Skolnik, 2001).

Just as the federal initiatives of the 1960s, in the form of enabling legislation and capital assistance for the establishment of a pan-Canadian system of community colleges, were designed to accelerate Canada's evolution from a resource-based to an industrial-based economy, so too the current federal intrusion into college missions is deemed justified by the need to accelerate the evolution of a national knowledge-based economy in a globally competitive marketplace (ACCC, 2008; Corkery, 2002a; Fisher, 2008b; Gallagher, 1990; Industry Canada, 2007; Ivany, 2000; Levin, 2001; Madder, 2005; Polytechnics Canada, 2007). Certainly, the rhetoric accompanying this transformation conveys a sense of promise and optimism. *Advantage Canada* (2007), the federal government's long-term plan to improve our economic competitiveness, proclaims the

national goals of increasing public/private-sector collaboration in research, expanding the practical applications of Canadian research and innovation, and making Canada a “world leader [in] entrepreneurial innovation and creativity” (p. 1). At a provincial level, Colleges Ontario (2004) asserts that its colleges are “undergoing seismic shifts” (p. 2).

Poised on the threshold of the 21st century, college-based applied research [and] business and industry innovation activities are of ever increasing importance; [through] this new, forward-looking provincial research and innovation policy model, Ontario’s colleges [will] fuel the economy ... [on the] pathway to prosperity. (pp. v, 1)

However, while the rhetoric is stirring, questions remain as to the extent to which Canadian colleges are, in fact, ready, willing, and able to fulfill the goals of this ambitious new research initiative. Several recent studies have attempted to examine the current capacity of colleges to contribute to the innovation agenda in a meaningful and productive way (ACCC, 2007; Bélanger et al., 2005; Colleges Ontario, 2006; Corkery, 2002a, 2002b; Fisher, 2008a, 2008b; Madder, 2005; NSERC, 2007). Describing the recent growth of research capacity primarily in terms of new administrative positions, research offices, updated mission statements, seed grant funds, and so forth, these studies are encouraging, but guarded, in their conclusions. Corkery (2002a), for example, concludes cautiously that “colleges perform more applied research than previously thought [and] are contributing to a more innovative economy” (p. 15). Madder (2005) describes a four-fold typology of *developmental stages* of research capacity, noting that only a small number of Canadian colleges have reached the third and fourth stages of, respectively, “Established” and “Integrated” innovation institutions (pp. 34-35). Bélanger

et al. (2005) note that while Canadian colleges were not originally established to be involved in the systematic production and dissemination of research, some larger colleges are beginning “to carve a more conspicuous and aggressive role . . . within the national research and innovation agenda” (p. 31). Therefore, although Canadian colleges are on the verge of evolutionary changes, an unambiguous picture of their capacity to participate meaningfully in the national research and innovation agenda has not yet emerged.

Beginning in 2006, I embarked upon two national studies designed to address this gap in knowledge by exploring the extent to which colleges, and college faculty, are positioned to participate significantly in this new national research agenda. Through the *Faculty Participation in Research at Canadian Colleges: A National Survey* (Fisher, 2008a), I conducted the first large-scale pan-Canadian (bilingual) survey of college faculty ($n = 2,410$), in order to investigate current levels of college faculty participation in research activities, and to identify their preferred areas of research interest. As such, the national survey provided a unique opportunity to gauge faculty knowledge of, experience with, and attitudes toward research at Canadian colleges, and to give voice to the faculty on whom the success of the college research initiative ultimately depends. This cross-sectional, descriptive survey, funded by the Canadian Council on Learning (CCL) and a consortium of community colleges, employed a web-based questionnaire to collect data over a ten-week period during the winter of 2007. The findings, based on responses from faculty representing 90 publicly funded colleges in all ten provinces and one territory, indicated high levels of faculty interest, three preferred areas of research interest, and specific barriers to greater participation (Fisher, 2008a).

Subsequent to the publication of this national study of faculty participation, I was commissioned by the Higher Education Research and Development Policy Directorate of Industry Canada to conduct a comprehensive pan-Canadian assessment of the role that colleges are currently playing in the overall innovation spectrum, and the extent to which their capacity is being fully utilized. An extensive analysis was conducted of relevant documents, reports, publications, guidelines, policies, research, and conference presentations; resources reviewed included national, regional, provincial, and local (college) documents and websites related to legislation, funding agencies, infrastructure, partnerships, and so forth. In addition, discussions were held with representatives and stakeholders across the country. Published as *The College Advantage: Private Sector Innovation and Highly Qualified Personnel* (2008b), this state-of-the-field report illustrated the form, nature, structure, and scope of current research capacity and innovation activities occurring at Canadian colleges, described a wide array of collaborative partnerships, linkages, and networks in every region of the country, traced the development of indicators and measures of research output and impact, and identified opportunities to unleash the full potential of colleges to participate meaningfully in the national research and innovation agenda.

However, based on the findings of these and other studies, while levels of research interest and examples of research activities are growing noticeably at colleges across the nation, this growth is occurring in an unsystematic and uncoordinated manner. This situation is further complicated by the scale of differentiation in terms of provincial legislation, collective agreements, funding guidelines, areas of specialization, and so forth. In particular, there is no established tradition, no clear organizational structure, no

prevailing vision, and no coherent conceptual framework to guide the development of an effective and productive national research culture at Canadian colleges.

Therefore, the purpose of this thesis is to address this fundamental gap by proposing a comprehensive, integrated conceptual framework that provides clarity, focus, direction and support for the further development of a robust research culture at Canadian colleges. Consequently, the central research question guiding this study is: What might be the best model for building a coordinated, effective national research culture, specifically appropriate for Canadian colleges?

The methodology selected for this study consists of a three-stage conceptual analysis comprising: (1) an extensive review of conceptual models of research in higher education, particularly with respect to universities, leading to a working model of research in higher education; (2) an analysis of the implications of this working model in the context of the current status of research expansion at Canadian colleges; and (3) a proposed Conceptual Framework for Research at Canadian Colleges.

Conceptual analysis is a qualitative research method consisting primarily of breaking down or reducing bodies of knowledge and complex ideas into “understandable, relational concepts” (Sheffield, 2004, p. 763) for the purpose of gaining a better understanding of the phenomenon under investigation. The practical value of conceptual analysis for the present study is realized in the conceptual model arising from such analysis, and in the clarity that such a model can provide to both further research and to improvements in practice. Historically, conceptual models are often characterized as “maps that give coherence to the enterprise” (Shields, 2006, p. 313) and “direct our course to realization of potentialities” (Dewey, 1938, p. 303). “Research paradigms take

their cues from an established tradition to create a vision of what is desired for the future. . . . Without conceptual clarity we can neither see where we want to go nor how to get there” (Sheffield pp. 761, 767). This type of conceptual clarity is precisely what is needed at this time to give intelligibility, coherence, direction, and focus to the emerging research culture at Canadian colleges.

Since conceptual models allow us to “connect backward to the literature [and] forward into the problem to give direction” (Shields, 2006, p. 316), it seems appropriate at this time to examine past and current conceptual models related to research in higher education in order to inform the development of a comprehensive, integrated conceptual framework designed specifically for research at Canadian colleges. Consequently, Chapter II (A Conceptual Model of Research for Higher Education) comprises an extensive review of conceptual models of research in higher education, particularly at universities, identifying six key categorical constructs, leading to a working conceptual model of research in higher education. Chapter III (Application of the Model to Colleges) applies this working model as a lens (augmented by the findings of the author’s (2008a, 2008b) studies in this field) to analyze the implications of incorporating research into contemporary Canadian colleges, and as a benchmark against which this development can be measured. Subsequently, Chapter IV (Toward a Conceptual Framework for Research at Canadian Colleges) synthesizes these analyses, revises the working model accordingly by incorporating the nature of colleges, and proposes a conceptual framework that can provide clarity, focus, and direction in the further development of a coherent, meaningful, and robust research culture at Canadian colleges.

II. A CONCEPTUAL MODEL OF RESEARCH FOR HIGHER EDUCATION

The purpose of this chapter is to conduct a comprehensive review of the literature in order to identify, examine, and synthesize conceptual models related to research in higher education, particularly with respect to research at universities, and to distill these various models into a working model of a single, integrated conceptual framework. This framework subsequently is applied as a lens to investigate, in the following chapters, the implications of incorporating research into the mandates and missions of contemporary Canadian colleges, and as a benchmark against which these developments can be measured.

In order to examine, in a structured and systematic manner, the extensive panorama of pertinent international, North American, and Canadian sources, and to use this material to build a comprehensive, integrated framework for research at colleges, this literature review follows the process described by Miles and Huberman (1994). The construction of a conceptual framework:

relies on a few general constructs that subsume a mountain of particulars.

Categories are the labels we put on intellectual 'bins' containing many discrete events and behaviors. . . . Setting out bins, naming them, and getting clearer about their interrelations lead you to a conceptual framework. A conceptual framework explains, either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables. (p. 18)

This methodological approach, commonly referred to as Grounded Theory (Glaser & Strauss, 1967), follows an inductive method of qualitative analysis in which theory

emerges from, and is therefore grounded in, the data. In this case, the data under analysis comprise the literature on conceptual models of research in higher education. Through the process of *open coding*, data are sorted into relevant categories using codes (identifying anchors) and constant comparison of new data with emerging categories until the categories are saturated. *Axial coding* is also employed to identify relationships and to establish hierarchies. Finally, *selective coding* is used to identify core constructs which form the essential building blocks of the emergent theory. Using the inductive process of grounded theory, researchers “construct hypotheses by mucking around for ideas and hunches in the data” (Schwandt, 2001, p. 175). The validity of the emergent theory is subsequently described in terms of fit (How well do the concepts fit with the data they are representing?) and workability (Does the emergent theory show how a problem may be examined or resolved, with flexibility for variations?).

Consequently, based on a wide-ranging and comprehensive reading in the field, on discussions and communications with relevant participants and thesis committee members, and on my perceptions, analyses, and understanding of the topic arising from an extensive process employing grounded theory approach, six categories were selected which encompass all of the significant themes, models, issues, and factors described in the literature. These categorical constructs are as inclusive as possible, representative of the literature, and encompass, in a structured and systematic manner, the core components of a comprehensive conceptual framework for research in higher education. These six constructs (*research purpose, research forms, research governance, research personnel, research funding, and research outputs*) are described in the following sections.

a. Research Purpose

The purpose of research in higher education traditionally has been described as the generation and dissemination of knowledge (Allen, 1988; Bok, 2006; Bonewits & Soley, 2004; Boyer, 1990; Davenport, 2002; Gibbons, 2003; Hewitt, 2008; Humbolt, 1970; Lipset, 1994; Neave, 2006; Newman, 1853; Rowley, 1999; Tuckman & Hagerman, 1976; Turk, 2000; United Nations Education Social Cultural Organization [UNESCO], 2006; Whitehead, 1929; Williams, 2003). Illustrating this ubiquitous statement of purpose, Turk (2000) unambiguously proclaimed that the “university’s mission is the unqualified pursuit and public dissemination of knowledge and truth” (p. 3). This type of basic, curiosity-driven research in one’s discipline or area of personal interest reflects a “commitment to knowledge for its own sake, to freedom of inquiry and to following, in a disciplined fashion, an investigation wherever it may lead” (Boyer, 1990, p. 17). This lies:

at the very heart of academic life, and the pursuit of knowledge must be assiduously cultivated and defended. The intellectual excitement fueled by this quest enlivens faculty and invigorates higher learning institutions, and in our complicated, vulnerable world, the discovery of new knowledge is absolutely crucial. (p. 18)

However, the purpose of research in higher education can also extend beyond knowledge production to include, as well, the “preparation of the next generation of knowledge users and creators” (A. Weedon, personal communication, Sept. 25, 2008). Neave (2006), for example, noted that “any strategy which seeks to enhance a nation’s research capacity has first of all to turn its attention to that part of the research system

which involves the conversion of graduates into qualified and capable researchers” (p. 3). This perspective extends the purpose of research beyond the discovery of new knowledge to include, as well, the preparation and training of Highly Qualified Personnel (Bok, 2006; Davenport, 2002; Industry Canada, 2007; Lipset, 1994; Neave, 2006; Rowley, 1999; Skolnik, 2000; UNESCO, 2006).

Ultimately, the research enterprise, through its impact on institutional prestige, status, and financial well-being, profoundly affects the conditions required to support and enhance the fundamental mandate of excellence in teaching and research (Breton & Lambert, 2003; Etzkowitz et al., 1998; Hewitt, 2008; Laidler, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Rowley, 1999; Slaughter and Leslie, 1997). In this context Rowley (1999) also included “reputation building” (p. 2) as one of the essential purposes of research in higher education. This purpose was clearly illustrated in the University of Western Ontario’s *Strategic Research Plan* (2008) which:

affirms Western’s objective to maintain and to enhance its stature as a leading Canadian research intensive University through strategic investment in areas of established and emerging research strength. . . . The plan commits to providing the research infrastructure and support required to ensure a strong position among Canada’s leading research universities through facilitating the alignment of people, resources, and space so as to maximize research synergies, [and through] tracking performance and celebrating our research successes. (p. 8)

Such statements of research purpose provide “a sense of vision and direction” (Rowley, p. 2) by aligning the research enterprise with other institutional activities, and by

clarifying relationships among prioritized fields of study, anticipated levels of achievement, and performance indicators.

At this point, it is fitting to discuss the salient issue of *academic capitalism* which permeates much of the literature in this field. Defined as “institutional and professorial market or market-like efforts to secure external moneys” (Slaughter and Leslie, 1997, p. 8), academic capitalism exerts an ever-widening influence on research purposes in higher education (Bok, 2006; Bonewits & Soley, 2004; Breton, 2003; Brooks, 2003; Daniel, 2003; Etzkowitz, et al., 1998; Laidler, 2002; Levin, 2001; Neave, 2002; Powers, 2003; Pratt, 1997; Quinlan, 2005; Rhoades & Slaughter, 2004; Skolnik, 2000; Slaughter & Leslie, 1997; Spencer, 1998; van Ginkle, 2003; Walters, 2004; Webster, & Healey, 1998; Williams, 2003).

A sampling of scholarly titles in this field conveys the pervasiveness of market-like behaviours in research in higher education. Recent scholarly articles include titles such as “Commercializing Academic Research”, “Research and the Bottom Line in Today’s University”, and “Academics as Entrepreneurs”; book titles include: *Leasing the Ivory Tower: The Corporate Takeover of Academia*; *Academic Capitalism: Politics, Policies and the Entrepreneurial University*; *Capitalizing Knowledge: New Intersections of Industry and Academia*; *Renovating the Ivory Tower: Canadian Universities and the Knowledge Economy*; *The Enterprising University*; *Globalizing the Community College*; and *The Corporate Campus: Commercialization and the Dangers to Canada’s Colleges and Universities*. Etzkowitz, Webster, and Healey (1998) referred to the shift toward academic capitalism as a “second academic revolution” (p. 1). Specifically with respect to *research purposes*, Bonewits and Soley (2004) noted that in this environment, “the

missions that become most important are conducting research that attracts corporate sponsors, developing marketable products and technologies, maintaining and cultivating ties with the private sector, and fashioning imaginative partnerships with corporate patrons” (p. 81).

In analyzing the impact of academic capitalism on research purposes, Skolnik’s (2000) continuum of “polarities in postsecondary education” (p. 1) posited a useful distinction between the *humanist* goals of a liberal or general arts education as opposed to the *materialist* goals of a market-driven orientation. Skolnik noted that the polarity of “materialism vs. humanism” (p. 2) could just as easily be characterized in terms of “economic vs. non-economic” (p. 2) purposes. This model also refers to the influence of academic capitalism on educational goals with respect to *critical* versus *service* orientations in higher education. Figure 1 illustrates the relevant dimensions of Skolnik’s continuum of polarities as a guide for analyzing the influence of academic capitalism on research purposes in higher education.

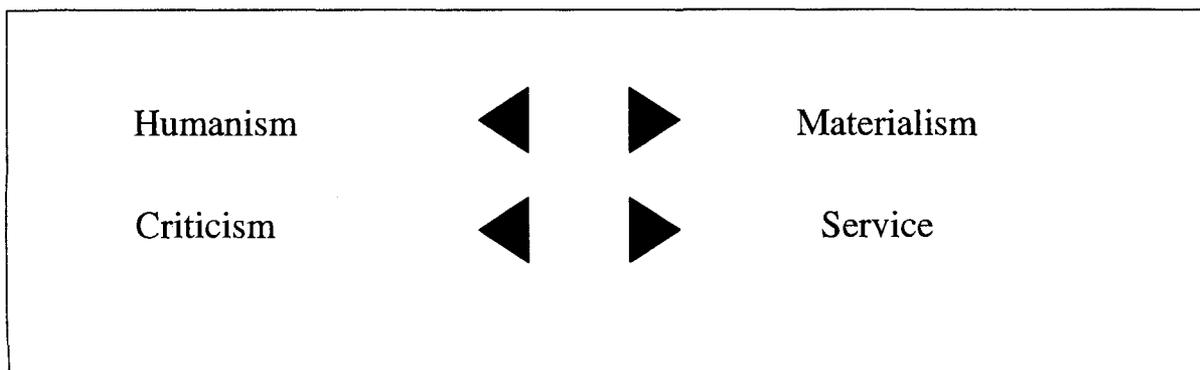


Figure 1. Polarities in postsecondary education (derived from Skolnik, 2000).

The humanist pole in Skolnik's model reflects what Alfred North Whitehead (1929), in *The Aims of Education*, called "activities of thought, and receptiveness to beauty and humane feelings" (p. 13). Today, postsecondary institutions still extol humanist virtues such as "human understanding, democratic advancement, and social justice" (Bonewits & Soley, 2004, p. 89) as primary, almost sacrosanct goals in higher education. The literature is replete with examples of humanist purposes in higher education. Bok (2006) endorsed the humanist goal of educating graduates to "become more ethically discerning, and be more knowledgeable and active in civic affairs" (p. 4). Daniel (2003) emphasized this purpose of higher education in sustaining the "intellectual, cultural, and social life" (p. 40) of nations, while Neave (2002) proclaimed the humanist orientation in his "conviction that the university's purpose lay in preserving and transmitting the nation's heritage – cultural, scientific, historic and literary" (p. 117).

Mission statements at postsecondary institutions routinely exalt the associated humanist goal of *critical thinking*, described by Skolnik (2000) as "the right to raise deeply disturbing questions and provocative challenges to the cherished beliefs of society" (p. 5). The centrality of critical thinking in the humanist tradition finds frequent expression in the literature. Brooks (2003), for example, noted that "most fundamentally, the role of higher education is to equip society and the individuals within it, at all different levels, with the capacity to navigate through, and make intelligent criticism of, an increasingly uncertain world" (p. 50). Van Ginkle (2003) went further, proclaiming the purpose of higher education "to generate an adequate intellectual elite to reflect on and give guidance to the future of humankind" (p. 77).

At the opposite terminal on Skolnik's (2000) continuum, *materialist/economic* goals reflect the extreme form of academic capitalism, especially with respect to the financial needs of institutions, economic needs of industry and governments, and career needs of students. From this materialist orientation, higher education has come to be seen primarily as "a commodity for personal and societal wealth creation" (p. 3). Summarizing these polarities in postsecondary education, Skolnik differentiated between the humanist and materialist goals as follows:

On the one hand we look to education to develop morality, character, taste, and citizenship, and to help individuals comprehend themselves in relation to the society and the cosmos which they inhabit; on the other hand, we want universities and colleges to train people for jobs and make local industry internationally competitive. (p. 2)

The presence of these polarities consequently raises two fundamental questions about the purpose of research in higher education: Is the institutional focus on developing people or developing workers? Is the research purpose to advance knowledge or to advance industry?

Lofty mission statements notwithstanding, the market-driven, materialist/service orientation is becoming increasingly more dominant. Skolnik (2000) suggested that, in actual practice, there is "an asymmetry in rewards and incentives for these two poles" (p. 5), with the service mode ever more prevalent, as "most people find it more comfortable to be compliant than confrontational" (p. 5). This asymmetrical ascendancy of materialist/service goals over humanist/critical goals in higher education significantly influences research funding opportunities as well, since "the extrinsic rewards for

operating in a service mode can be considerable: generous research funding; access to research sites, sponsorship, subjects, and data; large consultation fees and, these days, stock options” (p. 5).

The expanding influence and pervasiveness of academic capitalism and the materialist/service mode in higher education raise alarms in many quarters. In a Canadian context, for example, Laidler (2002) noted that this “vision of universities as primarily handmaids to material growth in a capitalist economy is quite horrifying to many within the Canadian academic community” (p. 8). In an American context, Rhoades and Slaughter (2004) decried the current environment in which “liberal arts colleges are reducing their emphasis on [producing] well-rounded graduates who have learned how to think” (p. 41). Bonewits and Soley (2004) noted the “risk of educational quality taking a back seat” (p. 89), and raised the “danger of focusing more on pleasing student ‘consumers’ than on furthering the liberal arts and intellectual growth” (p. 89). In the same context, Currie (2003) noted that “the search for profits risks the loss of essential university values, developing thoughtful citizens, and creating a scholarly community based on trust” (p. 191), while Breton (2003) expressed a similar fear that “the loss of the immeasurable humanistic and universal values upon which [universities] were founded would constitute an unacceptable setback for higher education and for our societies” (p. 32).

Concern over the escalating influence of academic capitalism on research in higher education cannot be underestimated. Daniel (2003) stated unequivocally that “we are wrong to promote universities by stressing primarily their contributions to economic growth” (p. 40), and subsequently asked the fundamental question: “Are we headed down

the road to mercantilism, or are we moving toward human sustainable development, which acknowledges the world of higher education as having the status of a global public good?" (p. 43).

In summary, by incorporating discussions related to knowledge production and dissemination, to the training of Highly Qualified Personnel, and to the role of prestige in maintaining and enriching the fundamental institutional mandates of teaching and research, the construct of *research purpose* represents a key component with respect to building a comprehensive, integrated framework for research in higher education. Additionally, the increasingly influential, and controversial, role of academic capitalism in the realm of research must also be acknowledged. If our emerging conceptual framework is metaphorically represented by a sailing ship, then *academic capitalism* represents a strong wind increasingly propelling our research model in new directions.

b. Research Forms

With respect to the construct of *research forms*, the traditional form of basic, curiosity-driven research reflects knowledge production in the context of academic interests, and is commonly organized around fixed, hierarchical structures based on subject disciplines and subject specialists (Allen, 1988; Berman, 2000; Boyer, 1990; Dewey, 1938; Gibbons, 2003; Jenkins, 2007; Kaplan, 1964; Lipset, 1994; Morphew, 2002; Neave, 2002; Patrick & Willis, 1998; Pocklington & Tupper, 2002; Rowley, 1999; Skolnik, 2000; Tuckman & Hagemann, 1976; Turk, 2000; Walters, 2004; Whitehead, 1929; Williams, 2003). The critical role of *disciplines* as coherent centres of research activity is underscored by Neave (2002), who noted metaphorically that “disciplines are the Mint where the prime currency of academia and its public creditworthiness are smelted and struck” (p. 3).

This traditional curiosity-based, discipline-centred form of knowledge production has both a cognitive aspect and a social aspect. The cognitive aspect provides guidelines about “what the important problems are, how they should be tackled, who should tackle them, and what should be regarded as a contribution to the solution” (Gibbons, 2003, p. 109), while the social aspect “prescribes the rules for training and accrediting new researchers, procedures for selecting new university faculty, and criteria for their advancement” (p. 109). In terms of quality control, this traditional form of basic research is primarily accountable through a ubiquitous peer review process that permeates all facets of knowledge production and dissemination (Bok, 2006; Boyer, 1990; Chant & Gibson, 2002; Davenport, 2002; Finnie & Usher, 2005; Gibbons, 2003; Laidler, 2002;

Top American Research Universities Survey, 2006; UNESCO, 2006; World University Rankings, 2007).

The literature suggests, however, that some variations on this traditional model are now increasingly recognized as legitimate forms of research in higher education. Boyer (1990), for example, in his seminal work *Scholarship Reconsidered: Priorities of the Professoriate*, proposed a four-fold typology that extends the definition of research to “a broader, more capacious meaning, one that brings legitimacy to the full scope of academic work” (p. 16). “What we urgently need today,” Boyer wrote, “is a more inclusive view of what it means to be a scholar” (p. 24). Berman (2000) noted that the greatest contribution of this model may lie in the potential released by the decision to “jettison the term *research* in favor of the term *scholarship*” (p. 4).

Boyer (1990) proposed that “by enlarging our perspective of what constitutes the legitimate knowledge-generating work of faculty – whether we call it scholarship or research – we will do much not only to benefit individual scholars, but also to benefit society as a whole” (p. 11). His four-fold typology of scholarship (*discovery, teaching, application, and integration*), therefore, contributes to the development of a comprehensive, integrated conceptual model by expanding the range of legitimate research forms in the context of higher education.

In addition to the traditional form of curiosity-based, disciplined-centred research (referred to as the *scholarship of discovery*), Boyer (1990) advocated for inclusion of the *scholarship of teaching* as a legitimate form of research.

The work of the professor becomes consequential only as it is understood by others. Yet today, teaching is often viewed as a routine function, tacked on,

something almost anyone can do. When defined as *scholarship*, however, teaching both educates and entices future scholars. Teaching, at its best, means not only transmitting knowledge, but *transforming and extending* it as well. . . . In the end, inspired teaching keeps the flame of scholarship alive. (pp. 23, 24)

Boyer (1990) also proposed a *scholarship of application*, noting that “the work of the academy must relate to the world beyond the campus, [and] linkages between the campus and contemporary life must be strengthened” (pp. 75-76). Boyer noted that the “application of knowledge moves toward engagement as the scholar asks: How can knowledge be responsibly applied to consequential problems?” (p. 21). Citing Handlin (1986), Boyer noted that “scholarship has to prove its worth not on its own terms but by service to the nation and the world” (p. 23).

Finally, Boyer (1990) proposed a *scholarship of integration* which pertained to “making connections across the disciplines, placing the specialties in a larger context, [and] forcing new topologies of knowledge” (pp. 18-19). This form of scholarship involves “fitting one’s own research – or the research of others – into larger intellectual patterns [to] provide a larger, more comprehensive understanding” (p. 19). As such it is “interdisciplinary, interpretive, integrative” (p. 21), focusing on broader, cross-disciplinary themes.

In summary, Boyer (1990) extended the orbit of research to “the full range of scholarly endeavors” (p. 79) in which all four forms of scholarship (*discovery, teaching, application, and integration*) are “fully acknowledged and placed on a more equal footing” (p. 75). As such, Boyer’s model contributes to the current discussion by providing a framework for aligning an expanding range of institutional *purposes* with an

equally expanding range of research *forms*. Table 1 summarizes Boyer's four-fold typology of scholarship in higher education.

Table 1

Four-fold Typology of Scholarship (derived from Boyer, 1990).

Forms of Scholarship	Characteristics
Scholarship of Discovery	<ul style="list-style-type: none"> • Basic research • Subject area/Discipline-based • Commitment to knowledge for its own sake
Scholarship of Teaching	<ul style="list-style-type: none"> • Central mission of colleges • Renews and revitalizes institution • Scholars as learners • Particularly appropriate for community colleges
Scholarship of Application	<ul style="list-style-type: none"> • Applied Research • Relate to the world beyond the campus • Serve the interest of the larger community • Where theory and practice vitally interact • Service to the nation
Scholarship of Integration	<ul style="list-style-type: none"> • Connections across disciplines • Interdisciplinary, interpretive, integrative

Further extending the definition of *research forms*, Gibbons (2003) described “the emergence of a *new mode of knowledge production* [italics added]” (p. 110). The basic constructs of this model are differentiated by Mode One and Mode Two forms of research, in which the attributes of traditional (Mode One) forms of research are no longer adequate to describe the full range and complexity of research activities conducted

in contemporary higher education. Gibbons et al. (1994) noted that the “relevant contrast here is between [Mode One] problem solving which is carried out following the codes of practice relevant to a particular discipline, and [Mode Two] problem solving which is organized around a particular application” (p. 3). For Gibbons, knowledge production “has spread from the Academy to many different types of institutions [and] has become a socially distributed process” (p. 111) through which researchers “join networks, enter alliances, and form partnerships of various kinds” (113). Mode Two research is, therefore, “transdisciplinary” (p. 110) as opposed to disciplinary; organizationally it is “transient” (p. 110) and “socially distributed” (p. 111) as opposed to fixed and hierarchical; professionally, it is characterized by heterogeneous rather than homogeneous skill sets.

At the heart of Gibbons’ (2003) Mode Two research model is the concept of “socially distributed knowledge production” (p. 111) which is characterized by five principal attributes:

1. There are an increasing number of places where recognizably competent research is being carried out.
2. These sites communicate with one another and thereby broaden the base of effective interaction; knowledge is thus derived from an increasing number of tributarial flows that both contribute to and draw from the stock of knowledge.
3. The dynamics of socially distributed knowledge lie in the flows of knowledge and in the shifting patterns of connectivity.
4. The number of interconnections is accelerating; the ebb and flow of connections follow the paths of problem interest, which are no longer determined by the disciplinary structure of research.

5. Knowledge production exhibits heterogeneous rather homogeneous growth, providing new points of intellectual departure for further combinations and configurations of researchers. (pp. 111-112)

Finally, in terms of quality control, while peer review still pertains, Mode Two extends its scope and context to “a wider, more temporary and heterogeneous set of practitioners, collaborating on a problem defined in a specific and localized context” (p. 110). As such, Mode Two involves a much-expanded system of quality control. Table 2 summarizes the basic attributes of Gibbons’ model of Mode One and Mode Two forms of research.

Table 2

‘Mode One’ and ‘Mode Two’ Forms of Research (derived from Gibbons, 2003).

Mode One	Mode Two
<ul style="list-style-type: none"> • Knowledge production in the context of academic interests • Homogeneity of skills • Discipline-based knowledge production • Fixed, hierarchical organizational structures • Peer review 	<ul style="list-style-type: none"> • Knowledge production in the context of application • Heterogeneity of skills • Transdisciplinary knowledge production • Horizontal, transient organizational structures • Extended, collaborative, socially distributed quality control

In summary, by incorporating discussions related not only to traditional forms of curiosity-based, discipline-centred research, but related also to a wider range of scholarly activities (Boyer, 1990) and new modes of socially distributed research (Gibbons, 2003), the construct of *research forms* constitutes a second essential component with respect to building a comprehensive, integrated framework for research in higher education.

c. Research Governance

Research governance refers to the organizational arrangements for conducting research, including issues of management, leadership, authority, and coordination of the various components within the research system. This construct relates primarily to the manner in which a research system is structured, how and by whom it is organized, the role and makeup of advisory boards, as well as the establishment of institutional policies and procedures related to, among others, academic freedom, research integrity, ethics, conflicts of interest, and intellectual property rights (Bonewits & Soley, 2004; Breton & Lambert, 2003; Clark, 1983; Currie, 2003; Daniel, 2003; Davenport, 2002; Jenkins, 2007; Kyvik & Skodvin, 2003; Laidler, 2002; Neave, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Rowley, 1999; Shattock, 1983; Turk, 2000; UNESCO, 2006).

An example of *research governance* employed as a construct in an integrated conceptual framework is found in UNESCO's (2006) *Comparative Analysis of National Research Systems*. In this model, governance involves questions related to strategic research planning, financial management, infrastructure, capacity building, and quality assurance, and pertains to the "systemic and institutional arrangements under which research is performed; more specifically, it focuses on the questions about how and with whose participation decisions about research are reached" (p. 9).

The ascendant power of academic capitalism, previously discussed in the context of research purposes, is also manifest through its influence on *research governance*, especially with respect to what Rhoades and Slaughter (2004) called the "corporate management revolution" (p. 48) in higher education. Increasingly, decision making with respect to research in higher education reflects a corporate style of governance that seeks

to connect more closely with external markets while moving internally toward market-based criteria in allocating research resources (Bonewits & Soley, 2004; Breton, 2003; Currie, 2003; Daniel, 2003; Neave, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Rowley, 1999; Turk, 2000). Breton, for example, warned of “a serious trend towards the commercialization and privatization of higher education via the importing of an entrepreneurial management and culture into the universities” (p. 31), while Rhoades and Slaughter described how the key factors in this shift are directly connected to an “increasingly corporatized, top-down style of decision making” (p. 38) exercising strategic control over the direction of research in higher education.

This corporate influence on research governance is increasingly realized through membership on governing bodies such as Boards of Trustees, Governing Councils, and Advisory Boards. While corporate involvement on such bodies is not a new phenomenon, “a new crop of corporate leaders has proven to be more assertive in directing university research in a business-oriented direction” (Bonewits & Soley, 2004, p. 88). Through their increasing presence on advisory boards, representatives of industry and commerce amplify their “degree of reinforced oversight and intervention to steer research” (Neave, 2002, p. 12) toward corporate goals. In this context, Rhoades and Slaughter (2004) noted that, increasingly, “part of the calculus [is] the consideration of how decisions will play in the corporate marketplace and whether they will generate new revenue in the short term” (p. 43). Furthermore, this management revolution often involves engaging new participants who take on “embedded entrepreneurial values” (p. 53). The expanding influence of these embedded entrepreneurial values on key players in the governance process was described by Bonewits and Soley:

Many higher education observers have noted the increasing tendency of boards of trustees to pick university presidents and administrators with a business background, often in place of an academic background. It is commonplace today to hear university presidents referred to as CEOs. . . . Inevitably, this mindset is affecting the way in which universities are managed. (p. 89)

This tendency was further illustrated in a feature article in the *American Association of Higher Education Bulletin* (October, 2000) under the headline “Leading Colleges and Universities as Business Enterprises: Six CEO Lessons for Success” (p. 6).

A related issue involves the role and extent of *faculty participation* in research governance. The fundamental questions with respect to participation in research governance are: Who controls and what criteria shape academic work? How do we conceive of and reconfigure the production of academic work by professionals? Should academics engage in the commercial marketplace, and to what extent? (Rhoades & Slaughter, 2004, p. 53). Rhoades and Slaughter identified the challenges that academic capitalism presents to faculty, concentrating in particular on the corporate influence over research directions, professional employment, and “the stratification of academic fields and educational functions” (p. 39). They concluded that professional roles are changing “in ways that move faculty away from the centre of academic decision making and unbundle the involvement of full time faculty” (p. 47).

In this context, Currie (2003) asked “whether universities risk losing important values that served them well for centuries when they develop a corporate ethos that sits uneasily with scholarly, professional values” (p. 180). Currie noted that faculty are often “repulsed by the corporatization of universities” (p. 191), and decried the number of

academics leaving Australian universities who specifically cited the increasing commercialization of their institutions. One such academic émigré in Currie's study noted that "the pressure to make money for universities has almost become the overriding part of the academic's brief. As a result, the intellectual life at Australian universities has been significantly weakened" (p. 191).

Increasingly, faculty are being bypassed in the decision making process as business models of management proliferate in the field of research governance (Bonewits & Soley, 2004; Breton, 2003; Currie, 2003; Daniel, 2003; Neave, 2002; Rhoades & Slaughter, 2004; Rowley, 1999; Turk, 2000). Countering this trend, Bonewits and Soley (2004) highlighted the "need for openness and faculty participation in the grant-seeking and chair-endowment process" (p. 86). One way to accomplish greater faculty participation is the establishment of professor-dominated oversight boards that scrutinize contracts, prohibit restrictions on the dissemination of research findings, and establish policies concerning the securing of research funding (Rowley, 1999). Neave (2002) supported this development, noting that "management without an appropriately qualified – and continually renewed – body of researchers is little more than an exercise in re-arranging the symbolic" (p. 3). "Most important of all," noted Bonewits and Soley, "every element of the university community must mobilize to convince the public that higher education is more than an economic machine that should be ruled entirely by the laws of the market" (p. 90).

Yet another aspect of the expanding influence of academic capitalism on research governance appears in new interpretations of *intellectual property rights*, highlighting the "tension between knowledge as a common good and knowledge as private property"

(Daniel, 2003, p. 37). Rhoades and Slaughter (2004) asserted that in the emerging globalized information economy, new knowledge has become a “critical raw material to be mined and extracted from any unprotected site; patented, copyrighted, trademarked, or held as a trade secret; then sold in the marketplace for a profit” (p. 4). In this environment, corporate-driven research governance has sponsored “a rewriting of marketplace ‘rules’ to facilitate the entry of academic institutions into the private-sector marketplace . . . seeking to commercialize and capitalize on the intellectual products of individual faculty” (pp 45, 47).

Traditionally it has been typical for individual academics to make their own connections to control the commercial use of their products, such as books and articles. However, under an academic capitalism regime, institutional policies are created to give colleges and universities, rather than individual academics, ownership and royalty claims relative to the intellectual products of faculty and employees. (p 45)

In this context, there is cause for concern that the corporate approach to appropriating economically useful knowledge in a proprietary way could ultimately challenge the academic practice of keeping information open, available, and subject to challenge. With respect to public versus private dissemination of new knowledge, the *New England Journal of Medicine* reported, for example, that the majority of companies signing research agreements with universities “require that findings be kept confidential to protect their proprietary value beyond the time required to file a patent” (p. 87). Powers (2003) similarly noted that technology transfer rights such as patents, licenses, and

royalties, which “represent a tangible and valuable asset with legal protections” (p. 30), increasingly embody the results of research in an environment of academic capitalism.

In summary, Rowley (1999) stressed the *integrative* function of governance in managing the “interface and balance between research and other institutional activities” (p. 4), as well as its *developmental* function in creating a research culture in which “research comes to be viewed as an integral component, . . . not just a ‘bolt on’ which can be discarded when times get tough” (pp. 3-4). Therefore, in addition to *research purpose* and *research forms*, the construct of *research governance* provides a third key component to be included in our emerging conceptual framework for research in higher education.

d. Research Personnel

The literature related to *research personnel* in higher education focuses primarily on the human resource aspects related to employment opportunities, recruitment practices, terms of employment (compensation, benefits, mobility, job security), promotion and tenure, training, incentives, status, teaching workloads, and so forth (Bok, 2006; Chant & Gibson, 2002; Gibbons, 2003; Krause, 2007; Powers, 2003; Rowley, 1999; Sykes, 1988; Tuckman & Hagemann, 1976; UNESCO, 2006). For example, in UNESCO’s matrix for comparative analysis of national research systems, the category of *research personnel* focused specifically on “the human resources for research, and specifically on both the initiation of new researchers into the world of research (selection, recruitment, training, mentoring), and on the terms of employment of those working in the research system” (p. 10). The personnel questions in UNESCO’s comparative matrix

essentially asked “what is the status of researchers, and how does this impact upon a career in research?” (p. 10).

In addition, a considerable body of pertinent literature addresses the salient issue of tensions that lie at the intersection of teaching and research in higher education. These *teaching/research tensions*, whether described as a conflict between types of scholars or types of scholarship, have long been a contentious issue for faculty in higher education (Angell, 1928; Badali, 2004; Bok, 2006; Bonewits & Soley, 2004; Boyer, 1999; Chant & Gibson, 2002; Jenkins, 2007; Krause, 2007; Newman, 1853; Pocklington & Tupper, 2002; Powers, 2003; Rowley, 1999; Sykes, 1988; Tuckman & Hagemann, 1976; UNESCO, 2006). For example, over a century and a half ago, Newman (1853), in *The Idea of a University*, noted that:

to discover and to teach are distinct functions: they are also distinct gifts, and are not commonly found united in the same person. He who spends his day in dispensing his existing knowledge to all comers is unlikely to have either leisure or energy to acquire new. (p. 10)

In another historical example, Angell (1928) commented that “professors are interested in their fields of study, but . . . frequently they have little ability in, or enthusiasm for, imparting their knowledge and interest to immature undergraduates” (p. 36). Though dated, these references nevertheless reflect the current debate. Bok (2006), for example, in referring to Angell’s quotation, noted that “a perusal of student evaluations today at most major universities would tell much the same story” (p. 29). Bok further noted that “the most frequent [student] complaint is that professors are so preoccupied with research and outside consulting that they neglect their teaching and

ignore their students” (p. 31). This concern over the potential conflict between teaching commitment and research expectations is widespread. A meta-analysis of research on this topic concluded that “most studies actually suggest an inverse relationship between research productivity and teaching quality – at least as this is measured by student satisfaction surveys” (Pascarella & Terenzini, 2005, cited in Baldwin, 2008, p. 3). In a Canadian context, Chant and Gibson (2002) similarly noted “an inverse relation among professors between their effectiveness as researchers and the amount of their time devoted to teaching undergraduates” (p. 126).

This debate, which often centres on the issues of employment and tenure, and the concomitant imperative to *publish or perish*, at times has become acrimonious. Sykes (1988), for example, denounced what he called “absentee professor[s]” (p. 36) who “insist that their obligations to research justify their flight from the college classroom” (p. 6). With respect to employment and tenure, Sykes claimed that universities regularly “hire highly qualified academic specialists, who know their subjects well and do distinguished research. But few of these specialists know how to teach well, and many seem not to care” (p. 55). Further to the relationship of teaching and research in the promotion process, Sykes noted that it:

is almost an article of faith that teaching is simply something that cannot be judged. What can be judged – because they can be measured, counted, weighed, and occasionally even read – are the candidate’s published articles and books. Inevitably, they dominate the process. (p. 57)

For Sykes, research represented “above all, the ticket to academic riches – publications, tenure, promotion, research grants, sabbaticals, consultantships, and lately even a piece of the action in related businesses” (p. 104).

The differential effects of research vis-à-vis teaching are recognized on a global scale. In the United Kingdom, where a significant component of institutional funding is linked to research outcomes based on the Research Assessment Exercise (RAE), Jenkins (2007) noted that “whatever the benefits the RAE might have brought to the organization of research, . . . the RAE result[ed] in institutions devaluing teaching; and structurally, to a growing separation between the research worlds of the university and student learning” (p. 1). Similarly, Krause (2007) noted that Australia’s national policy framework for research in higher education “serves to perpetuate the notion of research and teaching as mutually exclusive endeavours, addressed by distinctly separate policies and funding arrangements” (p. 2). In a Canadian context, Pocklington and Tupper (2002) stated that “our view is that university research often detracts from the quality of teaching. We regret the continuing elevation of research and systematic neglect of the quality of instruction” (p. 7).

In the American context, Bonewits and Soley (2004) noted that “as research at the university is thriving on outside funding, there seems to be a decline in the priority placed on instruction at the institution” (p. 84). “Plainly,” they continued, “we can see that there are winners and losers in a university increasingly dependent on outside sources of funding – research faculty who bring in corporate dollars are the winners while the teaching function has lower priority” (p. 85).

The implication is that research is severed from teaching. The message is that teaching is about a direct transfer of skills and not about discovery and engagement with ideas. As such, faculty have little recourse other than to find ways to define who they are and what they do in terms of the corporate vocabulary of outputs and quantitative measurements. (p. 90)

The tensions arising from competing demands at the intersection of teaching and research often reflect a situation in which research and the concomitant professional rewards associated with publishing represent the dominant imperative for faculty who are understandably concerned about employment, promotion, and tenure.

In spite of the ubiquitous mantra of *publish or perish*, however, the professional preference often tilts toward teaching rather than research. Badali (2004), for example, provided evidence to suggest that for many professors, conducting research is not an escape from the classroom, as suggested by Sykes (1988), but rather an obstacle to their true passion, their “delight in teaching” (p. 273). Badali’s study of professors at two Canadian faculties of education concluded that “although professors view their work as highly positive, there are significant observable tensions in their professional lives” (p. 268). While their primary source of satisfaction was “working with students” (p. 273), their major sources of frustration involved “workload and time pressure issues” (p. 275) related to expectations of conducting research, which was recognized as their “ticket to tenure and promotion” (p. 275). Badali noted that:

the message is often to focus on publications and grant writing and to minimize time spent on other activities. While most institutions expect faculty members to

engage in a variety of activities, it is scholarship (e.g., publication, grants) that counts most towards tenure and promotion. (p. 282)

In this context, Badali reported that “research-related activities are the single greatest source of stress reported by these professors” (p. 278). Participants acknowledged that “competition for research dollars is fierce” (p. 278), and decried the “unfair expectations for their scholarly output” (p. 278) and “excessively narrow focus” (p. 279) of major funding agencies.

New faculty, in particular, felt obligated to “structure their work and allocate their time in congruence with the reward structure of their institution” (Badali, 2004, p. 281). They pointed out that “too much emphasis is currently placed on research at the expense of undergraduate programs” (p. 275), and that “by engaging in research and scholarly activities, it takes them away from what they perceive as their primary role, teaching” (p. 279). This comment from one participant encapsulates the tension felt by many professors interviewed in Badali’s study: “There is a tremendous expectation to conduct research, but I spend most of my professional life in teaching-related activities. How am I supposed to accomplish the multiple tasks of being a professor, given the competing demands on my time?” (p. 275). In marked contrast to Sykes’ (1988) denunciation of the professoriate’s “obsession with research [and] disdain for their students” (p. 228), Badali’s study draws attention to the teaching/research tensions actually experienced by faculty when they are, to repeat Boyer’s (1990) memorable phrase, “caught in the crossfire of these competing goals” (p. xi).

Boyer (1990), in *Scholarship Reconsidered*, addressed the same issue of tensions arising from the imbalance of priority afforded research over teaching, acknowledging

that “while young faculty were hired as teachers, they were evaluated primarily as researchers” (p. 11). In response to these “shifting priorities both within the academy and beyond” (p. xi), Boyer proposed that “the most important obligation now confronting the nation’s colleges and universities is to break out of the tired old teaching versus research debate and define, in more creative ways, what it means to be a scholar” (p. xii). For Boyer, “research *per se* was not the problem. The problem was that the research mission, which was appropriate for *some* institutions, created a shadow over the entire higher learning enterprise” (p. 12). Echoing the faculty members’ comments from Badali’s study of these competing demands, Boyer noted that “at the very heart of the debate – the single concern around which all others pivot – is the issue of faculty time” (p. xi).

In summary, therefore, the construct of *research personnel* incorporates a wide range of considerations and discussions in the literature, and provides, along with *research purpose, forms, and governance*, a fourth component for building a comprehensive, integrated conceptual framework for research in higher education.

e. Research Funding

Discussions of *research funding* in the literature predominantly revolve around processes and procedures related to resource allocation, infrastructure, and utilization, research costs, financial management, and reporting processes, as well as issues pertaining to funding *sources* and *influences* (Berdahl, 1985; Bonewits & Soley, 2004; Breton & Lambert, 2003; Clark, 1983; Currie, 2003; Daniel, 2003; Davenport, 2003; Etzkowitz et al., 1998; Haveman, 1993; Industry Canada, 2007; Kyvik & Skodvin, 2003;

Laidler, 2002; Meek, 2003; Neave, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Rowley, 1999; Slaughter & Leslie, 1997; UNESCO, 2006; Williams, 2003).

With respect to the role of *funding* as a critical construct in a conceptual model of research in higher education, Neave (2002) noted, for example, that since “funding provides leverage, . . . the key to capacity building seems to lie there. If one is to have the option of considering what alternatives are most appropriate to raise the capacity of evolving research systems, we need to group the ways in which funding is allocated” (p. 12). Consequently Neave proposed a funding model that identified “three money streams [that determine] how research is supported and under what conditions” (p. 13). The first money stream, “institutional support” (p. 11), funds the institution, equipment, staff, and teaching in terms of a “gift relationship through which Academia was granted the freedom of inquiry – that is, to pursue knowledge wheresoever it led without hindrance” (p. 11). This money may be allocated as a lump sum with research element included, with research separate, or with no research element.

The second money stream, “research funding” (p. 13), specifically supports research on a competitive basis and is usually channeled through governmental research agencies or granting councils such as, in Canada, the Social Sciences and Humanities Research Council of Canada [SSHRC], Natural Sciences and Engineering Research Council of Canada [NSERC], Canadian Institutes of Health Research [CIHR], Canadian Council on Learning [CCL], and so forth. This stream of funding, competitive by merit, makes research more directly dependent on performance and output criteria elaborated by government and injected through research councils.

The third money stream, “sale of service” (p. 13), conceives of research “as a service, as a vehicle to ensure income” (p. 12). Table 3 summarizes Neave’s “typology of allocation systems for research in higher education” (p. 13), identifying three money streams and related methods of resource allocation.

Table 3

Typology of Allocation Systems for Research in Higher Education (derived from Neave, 2002)

Money Stream	Allocation
<i>1st Money Stream</i> Institutional Support	<ul style="list-style-type: none"> • Research element included • Research element separate • No research element
<i>2nd Money Stream</i> Research Funding (competitive by merit)	<ul style="list-style-type: none"> • Research programs • Research projects
<i>3rd Money Stream</i> Sale of Services (competitive by tendering)	<ul style="list-style-type: none"> • Contract research • Contract teaching • Sale of services

Beyond describing the money streams, allocations, and processes through which funding sustains and enhances the research enterprise in higher education, the ultimate purpose of Neave’s (2002) “exploratory typology [was] to provide a coherent model for the gathering of data appropriate to increasing our understanding of the current workings of research and research training systems, ... [and] to suggest a developmental path, trajectory, or dynamic development” (p. 1) of research systems. In this regard Neave’s classification of research systems ultimately “turns around the relationship and degree of

organizational separation from the higher education system itself” (p. 4). Neave subsequently examined three variations of research funding, referred to as the Soviet, the French, and the American models.

In the Soviet or “state co-ordinated model . . . research is carried out in the appropriate academy, effectively separate from the higher education system” (p. 4). In the French model, research is organized around and funded by a central national agency, but located physically in universities; in this “parallel model” (p. 5), staff are full time researchers employed by the national agency. In the American “market model” (p. 5), research is funded through multiple sources, public as well as private. While researchers in the market model are faculty members at universities with formal responsibilities for teaching, the “admixture of public and private financing as well as its multiple ties with the private sector place this type of research fairly in the realm of being market driven” (p. 5).

Therefore, beyond the administrative processes of resource allocation in higher education, the key concerns for Neave (2002) with respect to research funding arose from the critical questions: “What are the forces that co-ordinate a particular system? What are their relative influences?” (p. 5). When co-ordinated by the State, the orientation is to undertake research “as defined in national plans or in relation to government demands” (p. 6); when co-ordinated solely within Academia, the orientation is “determined by the internal dynamic of disciplines” (p. 6); when co-ordinated by market forces, the orientation is “in keeping with direct demands coming from the economy, more particularly from the private sector” (p. 6). Figure 2 illustrates Neave’s triangular model of research funding coordination, orientation, and influence.

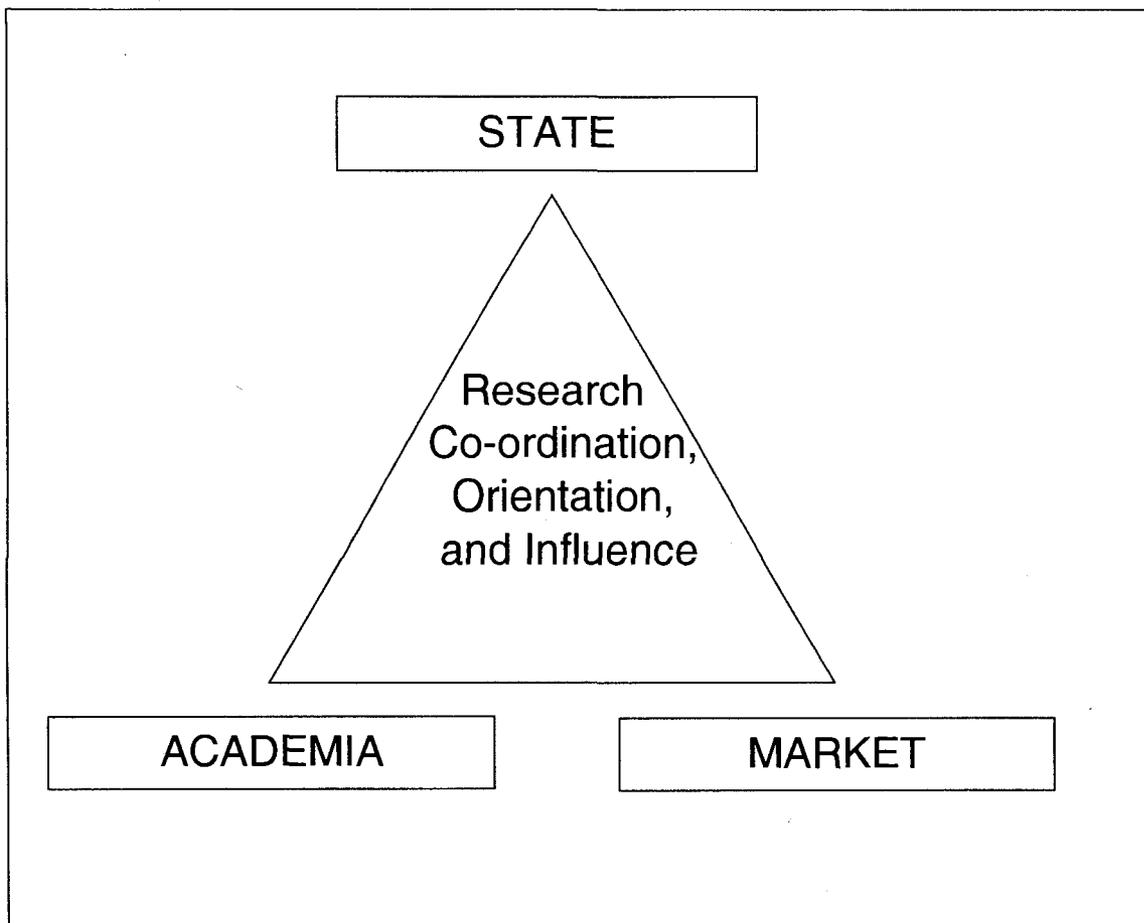


Figure 2. Triangle of research coordination, orientation, and influence (derived from Neave, 2002, and Clark, 1983).

The influence of academic capitalism as a significant issue in our emerging conceptual framework also raises widespread concern with *research funding* (Bonewits & Soley, 2004; Breton & Lambert, 2003; Daniel, 2003; Etzkowitz, et al., 1998; Gibbons, 2003; Knight, 2003; Laidler, 2002; Neave, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Slaughter & Leslie, 1997). As noted earlier, funding sources, whether arising from the State, from within Academia, or from external Market sources, inevitably exert profound influence on all aspects of research in higher education. Slaughter and Leslie

(1997) chronicled the rise of academic capitalism as a response to conditions of financial uncertainty that increasingly encouraged faculty and institutions “to direct their efforts toward programs and research that intersected with the market” (p. 8).

To maintain or expand resources, faculty had to compete increasingly for external dollars that were tied to market-related research, which was referred to variously as applied, commercial, strategic, and targeted research, whether these moneys were in the form of research grants and contracts, service contracts, partnerships with industry and government, [or] technology transfer. (p. 8)

The increasingly dominant imperative to obtain external dollars is a pervasive concern. Bonewits and Soley (2004) described how easily university research could be swayed by hefty grants and contracts, and decried this pattern of “taking on research that seems based less on a scholarly agenda than on promoting their funder’s agendas” (p. 83).

Research institutions are becoming permeated with corporate involvement – involvement which is likely to shape the research conducted on campus, the content of the academic curriculum, the university’s staffing patterns, and the way it makes decisions. We perceive a growing ‘bottom line’ mentality. (p. 82)

Consequently, Bonewits and Soley expressed concern about research “based more on furthering the benefactor’s ideological agenda or achieving a profitable outcome for the funding source, rather than furthering sound scholarship” (p. 89). This cautionary note was echoed by Rhoades and Slaughter (2004), who warned of:

fundamental change in the interconnections between states, their higher education institutions, and private-sector organizations to support such activities, blurring

the boundaries between the for-profit and not-for-profit sectors, and a basic change in academy practices – changes that prioritize potential revenue generation, rather than the unfettered expansion of knowledge. (p. 38)

Knight (2003) similarly expressed “deep concern about the increased emphasis on commercialization and commodification of the production of knowledge” (p. 98), as did Daniel (2003), who noted how “this funding often includes tight restrictions, either on the publication of research results or, more generally, on the research activities of the department in receipt of the funds” (p. 39).

The breadth and depth of concern regarding the increasingly disproportionate influence of market-based funding on all aspects of research was encapsulated by Gibbons (2003), who warned of:

profound implications [as] universities are being drawn ineluctably closer to industry. In doing this, or allowing it to happen, they are in fact also changing the basis of their relationship with the wider society. Can universities enter into this new, closer, relationship with industry and still maintain their status as independent, autonomous institutions dedicated to the public good? (p. 115)

In summary, the relationship between academic capitalism and funding sources, and their concomitant power to influence the direction of research in higher education, represent a critical issue to be addressed in a conceptual framework for research in higher education.

f. Research Output

Traditional indicators of *research output* primarily reflect measures such as the number and quality of faculty publications, public and private research dollars, and faculty awards (Academic Ranking of World Universities, 2008; Badali, 2004; Bok, 2006; Bonewits & Soley, 2004; Chant & Currie, 2003; Davenport, 2002; Finnie and Usher, 2005; Gibbons, 2003; Gibson, 2002; Hewitt, 2008; Huber, 1998; Jenkins, 2007; Kyvik & Skodvin, 2003; Laidler, 2002; London Times Higher Education World University Rankings, 2007; Neave, 2002; Parsons, 2007; Rowley, 1999; Slaughter & Leslie, 1997; Sykes, 1988; Top American Research Universities Survey, 2006; UNESCO, 2006). Certainly, publications and citations provide a common indicator of research output, reflecting the ubiquitous mantra of *publish or perish* in higher education. “Published research,” noted Bok (1986), “emerges as the common currency of academic achievement, a currency that can be weighed and evaluated across institutional and even national boundaries” (p. 77). Chant and Gibson (2002) illustrated the pervasiveness of this measure by identifying indicators of research performance *exclusively* in terms of the “number of papers published and the number of citations per paper – the ‘paper impact’ The number of papers, in our view, is a measure of research *quantity*, or the level of research activity at an institution. The ‘paper impact’ measures the recognition that the research gains from other scholars on a paper-by-paper basis, which to us is a measure of research *quality*” (p. 127).

In addition to Chant and Gibson’s (2002) exclusive focus on the numbers of papers and citations per paper, Finnie and Usher’s (2005) model for “measuring institutional research quality” (p. 39) reflected other common measures of research

output. In their examination of output indicators drawn from a range of sources (from Alberta, Ohio, Florida, Germany, Texas, New York, Shanghai, and London), Finnie and Usher focused not only on publications, but also on public research dollars received, private research dollars received, and faculty awards. With respect to indicators such as *public research dollars received*, Finnie and Usher noted that the ability to attract this kind of competitive money was used by virtually all the research assessment instruments surveyed in their study. This output indicator may be reported as raw total dollars received, dollars per faculty, or even dollars per student. In some cases, “controls for type of institution” (p. 39) were used to more accurately differentiate research performance at various levels of institutional focus (i.e., undergraduate, graduate, research intensive, emergent, established). Most research rankings also stressed the importance of the related measure of *private research dollars*, expressed as raw dollars, dollars per faculty, or as percentage of public dollars, indicating that “the creators of many research indicators consider the *balance* of public-private to be as important as the actual amount of private funds attracted” (p. 40).

Faculty awards provided another measure of research output in Finnie and Usher’s (2005) model, with particular emphasis on prestigious awards such as Nobel Prizes, Fields Awards, or, in Canada, Killam Fellowships and Canada Research Chairs. Similar indicators of research output formed the basis for national and international comparisons of universities in instruments such as *The Top American Research Universities Survey* (2006), *Academic Ranking of World Universities* (2008), and the *London Times Higher Education World University Rankings* (2007).

However, Finnie and Usher's (2005) model also extended the criteria for measuring research output beyond these traditional indicators. In addition to publications, research dollars, and awards, Finnie and Usher included measures of *technology transfer*, *research networks*, and *student performance* as further means of gauging the quality, relevance, or impact of research activities in higher education. For example, technology transfer was recognized in their model as a form of research output measured through indicators such as the number of patent applications, patent awards, spin-off companies, and value of equity partnerships, royalties, and licenses. Similar recognition of technology transfer as research output was found in Powers' (2003) analysis of new entrepreneurial tendencies related to commercializing academic research, where research outputs are "operationalized [as] patents held, licenses executed, and licensing income realized" (p. 30).

Finnie and Usher (2005) also measured the extent of participation and leadership in *collaborative research networks* as further indicators of research output. Their recognition of institutions "that appear 'central' to research networks" (p. 40), and their observations about the "internationalization of research" (p. 40), provided additional "measures of research intensiveness" (p. 40). This attention "to mapping research networks" (p. 40) as an indicator of research output reflects a growing acknowledgment and legitimization of Gibbons' (2003) Mode Two form of socially distributed research. Similarly, Neave (2002) noted "a strategic development of the highest importance [in] the emergence of research networks that reach out beyond the confines of the individual discipline – inter or transdisciplinarity – and beyond the individual institution" (p. 3).

Finally, Finnie and Usher (2005) included measures of *student performance* as further indicators of research output, using data sources such as median undergraduate student entrance GPAs, number of graduate and doctoral students, and graduate student performance in terms of publications, grants, and awards as “correlates of academic prestige” (p. 40). This inclusion of student performance was also promoted by Neave (2002), who stressed the “training of new researchers” (p. 4) as a critical indicator of research output in higher education, noting that “the elaboration of research management strategies that focus only on research without attending to research *training* . . . at best involve only a tactical reform rather than a strategic innovation. They attend to the immediate situation rather than to its outcome in the long or medium term” (p. 4). Table 4 summarizes Finnie and Ushers’s extended model of evaluative criteria for measuring research output in higher education.

Table 4.

Measuring Research Outputs in Higher Education (derived from Finnie & Usher, 2005)

Criteria for Assessment	Indicators of Quality
Public Research Dollars Received	<ul style="list-style-type: none"> • raw dollars • dollars/faculty • adjusted for “type of institution”
Private Research Dollars Received	<ul style="list-style-type: none"> • % of public dollars • public-private balance
Publications	<ul style="list-style-type: none"> • quantity • quality
Faculty Awards	<ul style="list-style-type: none"> • prestige (Nobel, Fields, Killam, Canada Research Chair)
Technology Transfer	<ul style="list-style-type: none"> • patents • royalties • equity partnerships
Student Performance	<ul style="list-style-type: none"> • median undergraduate entering GPA • number of doctoral and postdoctoral students
Research Networks	<ul style="list-style-type: none"> • centrality of institution in mapped networks • internationalization of research

An example of the full application of this wider range of indicators is illustrated by the University of Western Ontario’s *Strategic Research Plan (2008)*, which included not only traditional output measures (such as total journal publication, grants awarded as percentage of national share, participation in conferences, and involvement in the scholarly community), but extended also to non-traditional indicators reflecting

technology transfer, faculty participation in collaborative research networks, and graduate student performance. In summary, therefore, the construct of *research outputs*, incorporating both traditional and non-traditional measures and indicators of research activities in higher education, provides the sixth key component in our working model of a conceptual framework for research in higher education.

SUMMARY: A Conceptual Model of Research in Higher Education

The purpose of this chapter was to examine and synthesize conceptual frameworks and critical constructs found in the literature related to research in higher education, especially with respect to universities, and to distill these frameworks and constructs into a working model of a conceptual framework that can be used as a lens to analyze the implications of the current efforts to build a research culture at Canadian colleges, and as a benchmark against which those efforts can be compared. Following the process of categorization delineated by Miles and Huberman (1994), six key constructs (*research purpose, research forms, research governance, research personnel, research funding, and research outputs*) were employed in this literature review in order to describe, in a structured and systematic manner, “the main things to be studied” (p. 18) in constructing a single, comprehensive, integrated conceptual framework for research in higher education. These six constructs, and their associated issues, can be described as follows:

- a. *Research Purpose*. The traditional purpose of research at universities, to generate and disseminate new knowledge, is being extended to include as well the preparation of the next generation of knowledge users and creators, often referred to as Highly Qualified Personnel. The influence of *academic capitalism* is also an

issue to be considered, especially with respect to situating research purposes within the broader goals of higher education.

- b. *Research Forms*. The traditional form of basic, curiosity-driven, discipline-centred research is also being extended to include “a broader, more capacious” model of research and scholarship (Boyer, 1990, p. 16), in recognition that traditional forms are no longer adequate to describe the full range and complexity of research activities conducted in contemporary higher education. Noteworthy are Boyer’s four-fold model of scholarship (discovery, teaching, application, and integration) and Gibbons (2003) Mode Two (trans-disciplinary, transient, socially distributed) research.
- c. *Research Governance*. This construct refers to the organizational arrangements for conducting research, and focuses on questions of how and with whose participation decisions about research are reached. Related issues reflect concerns about the increasing pervasiveness of corporate values, minor participatory role of faculty, and reconsiderations of intellectual property rights with respect to the output of faculty researchers.
- d. *Research Personnel*. This construct focuses primarily on human resources concerns related to employment, promotion, tenure, and so forth. Associated issues relate to teaching/research tensions arising from differential incentives and rewards for these functions, pressures to publish or perish, and the pivotal issue of faculty time.
- e. *Research Funding*. This construct refers to the various money streams and funding sources that support research in higher education (institution, state, market), and the relative influence of those sources in terms of coordination, orientation, and direction of research activities and outputs.
- f. *Research Outputs*. Traditional indicators of research output (publications, citations, presentations, grants, awards) are increasingly augmented with non-traditional measures related to technology transfer, student performance, and faculty participation in research networks.

Figure 3, A Conceptual Model of Research in Higher Education, provides a schematic representation of the working model, which can now be deployed in Chapter III (Application of the Model to Colleges) as a lens to analyze the implications of developing a research culture at contemporary Canadian colleges, and as a benchmark against which these developments can be measured.

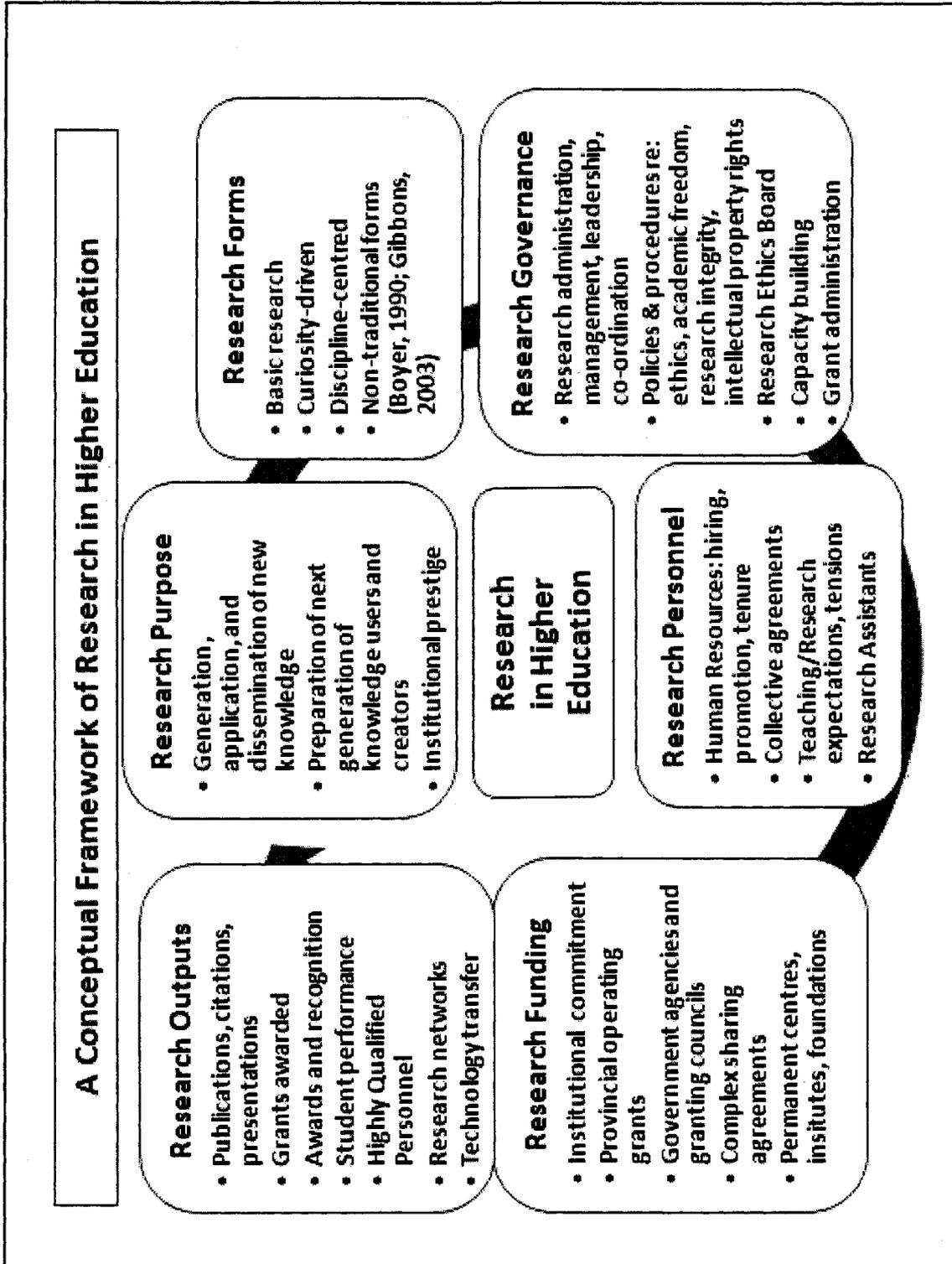


Figure 3 A Conceptual Framework for Research in Higher Education.

III. APPLICATION OF THE MODEL TO COLLEGES

The traditional dual-mission of Canadian colleges (to provide career-related education in support of regional economic development) is undergoing a remarkable metamorphosis in the first decade of the 21st century, and the recent rapid growth of research infrastructure at Canadian colleges has been well documented (ACCC, 2006; Bélanger, 2005; Colleges Ontario, 2006; Corkery, 2002a, 2002b; Dennison, 1995; Doern, 2008; Education Policy Institute, 2008; Fisher, 2008a, 2008b; Industry Canada, 2007; Levin, 2001; Madder, 2005; NSERC, 2007).

However, while these studies indicated the high levels of faculty interest, widespread activities, and strong receptor capacity for the future growth of research cultures, they also drew attention to a fundamental systemic problem: Canadian colleges are attempting to incorporate research into their mandates *without a comprehensive conceptual framework* to enable an appropriate fit with the transformed college missions. Such a model is required at this time to map the critical determinants and to provide a coherent focus for the further development of effective policies and processes where none existed to any great extent. Consequently, this chapter uses the six key constructs (research purpose, research forms, research governance, research personnel, research funding, and research outputs) of the working conceptual model developed in the previous chapter, augmented by examples and illustrations drawn from the author's (2008a) national survey and (2008b) national study. These constructs will act as lenses to analyze the current state of the research cultures emerging at contemporary Canadian colleges, and as benchmarks against which these developments can be measured. These six constructs were found to be reliably comprehensive since, based on the previous

comprehensive analysis of university models, no other significant constructs were identified that warranted inclusion in the emerging conceptual framework for colleges.

a. Research Purpose

While the *purpose* of research at universities is focused primarily on “the unqualified pursuit and dissemination of knowledge” (Turk, 2000, p. 3), this is not the case with community colleges. Rather, the primary purpose of research in the college context is to extend and enhance the two integrally related college missions of employment-related education and regional economic development (ACCC, 2006; Dennison, 1995; Dennison & Gallagher, 1986; Fisher, 2008b, Ivany, 2000; Levin, 2001; Madder, 2005; Skolnik, 2000; Young, 1992). Whereas at universities the preparation and training of Highly Qualified Personnel is acknowledged as an important but secondary purpose for conducting research, at Canadian colleges the *primary purpose* of building research cultures is to support the instructional/economic mandate by producing graduates who are *more highly qualified* through their participation in research activities (ACCC, 2007; Belanger, 2005; Colleges Ontario, 2007; Corkery, 2002a; Dennison, 1995; Doern, 2008; Fisher, 2008b; Industry Canada, 2007; Ivany, 2000; Levin, 2001; Madder, 2005; NSERC, 2007; Skolnik, 2000; Weedon, 2008). This multidimensional research purpose was encapsulated, for example, in Fanshawe College’s (2008) strategic plan:

The long-term goal is to integrate applied research and innovation activity into programs and daily activities in order to enrich the student experience and the quality of graduates, help keep faculty current and engaged, contribute to the

economic well being of our community, and enhance the reputation of the College. (p.16)

At the provincial level, Alberta's (2007) *Policy Framework for Advanced Education* likewise acknowledged college research as "a priority [which] recognizes that significant benefits arise from strong linkages between colleges and regional economic drivers, including producing skilled workers in alignment with the needs of the regional labour market, and the importance of applied research in community and economic development" (p. 5). Similarly, just as varying degrees of involvement in collaborative partnerships, applied research, commercialization, and technology transfer activities represent *secondary* purposes of research at universities, these same activities, in the context of the instructional/economic mandate of colleges, constitute a primary purpose for integrating research into college programs. These types of collaborative research activities complement the college mandate to produce current, well prepared, highly qualified personnel by providing rich learning activities, real world challenges, hands-on-training with leading edge technologies, industry contacts, and advanced skills training in all sectors of the economy (ACCC, 2007; Bélanger, 2005; Colleges Ontario, 2007; Corkery, 2002a; Dennison, 1995; Dennison & Gallagher, 1986; Doern, 2008; Fisher, 2008b; Industry Canada, 2007; Ivany, 2000; Levin, 2001; Madder, 2005; NSERC, 2007).

The manifestation of this primary purpose for college research (enhanced instruction and economic development through collaborative partnerships) can be illustrated through the following representative examples, selected from the author's (2008b) national study of research capacity at Canadian colleges:

- **Infant Incubator Project.** Engineering Technology students at Nova Scotia Community College (NSCC) partnered with the medical technology industry in hands-on research in the development of a neonatal incubator for use in the IWK Health Center's Magnetic Resonance Imaging (MRI) scanner. Their challenge was to build an MRI-compatible neonatal incubator for premature neonates who were vulnerable to hypothermia because of their low body mass and, therefore, cannot maintain a safe body temperature for the duration of a MRI scan. A design proposed by NSCC students, now at the animal testing stage, is developing into a marketable solution to a real world problem, in partnership with Innovacorp, a leader in the medical manufacturing field.
- **Sobeys/GBC Compliments Culinary Centre.** Ontario's first comprehensive applied research partnership with a major Canadian grocery chain (Sobeys Inc. and its Compliments brand) is integrated into the George Brown College (GBC) Hospitality and Culinary Arts Program. Students in the Compliments Culinary Centre conduct literature reviews, conceptualize, design, and develop innovative nutritional and cost-effective recipes, and conduct multisensory product evaluations and trend research for Sobeys Inc. This \$5.2 million partnership not only supports private sector innovation, but provides opportunities for GBC students to develop specialized research skills in their area of professional training.
- **Visualization Design Institute (VDI).** Sheridan College's VDI was established in 1998 with private sector funding from Silicon Graphics Inc., Immersion Studios, and Northern Digital Inc. Dedicated to innovation in the field of computer visualization in 3D environments, VDI focuses on scientific, medical, engineering, educational, and cultural applications, and has participated in over 40 industry-driven research projects for private sector clients totaling \$10 million. VDI students gain valuable real-world research experience in critical thinking, technological innovation, and problem-solving for industry. To date, in recognition of their innovative achievements, six students from Sheridan's VDI program have been nominated for, and two have won, Academy Awards.

These representative samples, drawn from scores of similar examples in the author's (2008b) survey, characterize the wide range and scale of research and innovation activities currently occurring at Canadian colleges, and underline the *primary purpose* of college research in extending and enhancing the traditional college mission of preparing Highly Qualified Personnel through rich learning activities in collaborative, real world partnerships with business and industry.

With respect to the influence of *academic capitalism* on research purposes, which has been framed as a tension between the polarities of humanistic/critical goals versus materialistic/service goals in higher education, in the college setting the emphasis is clearly situated toward the materialistic/service pole in the form of applied research, business partnerships, commercialization, and career training. Whether one agrees that this state of affairs "risks the loss of essential values" (Currie, 2003, p. 191), or that the "loss of the immeasurable humanistic and universal values upon which [higher education] was founded would constitute an unacceptable setback for higher education and for our societies" (Breton, 2003, p.32), the relationship between research purpose and academic capitalism does, in fact, merit further consideration. For example, Parsons (2007) posited that the "intrusion of commercial values" (p. 5) into college mandates undermined the "academic agenda of social processes, and alters the very nature of colleges pursuing truth, rational discourse, and community service" (p. 6).

A preoccupation with economic relevance and commercial application signals that the kind of scholarship being advanced will lead to inevitably accepting, without debate or resistance, the further corporatization and privatization of higher education. It ultimately distracts from focusing on real social issues that

would require alternative social, economic, and political forms of organization to produce solutions in terms of social justice. (pp. 6-7)

Parsons' (2007) concern was not with college research *per se*, but rather with the emphasis on corporatization inherent in the new research agenda, warning that "it is imperative that colleges move away from the economic model that redefines the purpose of research by conflating it with the commercialization and privatization of knowledge" (p. 7). Quinlan (2005) similarly noted that "today's mission is moving community colleges away from a 'community' focus and toward a 'market' focus [with] a more pronounced economic role in serving the economy versus the community" (p. 17).

However, applied research activities do not necessarily have to be conflated with commercialization and privatization, and many examples exist of college research programs that do, in fact, focus on resolving real social issues. Some representative examples of college-generated research activities with non-commercial, social benefits, drawn from the author's (2008b) study, include: development of sustainable models of health care education for inter-professional teams in patient-centred practice (New Brunswick Community College); 3-D virtual reality phobia treatment (Algonquin College); parent-delivered massage programs for paediatric oncology (Centennial College); state-of-the-art environmental monitoring for COPD patients (Fanshawe College); child car safety testing (George Brown College); occupational injury reduction (Selkirk College); reducing violence in the lives of sexually exploited youth and adult sex workers (Justice Institute of BC); improvement of aboriginal health (Yukon College); and coordination of International Year of the Polar Bear (Nunavut Arctic College). Two

projects from the Saskatchewan Institute of Applied Science and Technology (SIAST) further illustrate the social benefits arising from college-generated applied research:

- **Home Energy Efficiency Project (Share the Warmth)** was initiated by a SIAST instructor in Architectural Building and Interior Technologies as an applied research project on energy efficiency in small buildings. Students analyzed a number of low income houses in Moose Jaw for energy efficiency, collecting data on the state of furnaces, filters, windows (gaps), walls, and lighting (bulbs). Once the needs analysis was completed, students developed an inexpensive (\$150) kit to upgrade home energy efficiency. With the help of local Salvation Army volunteers, students identified 100 low income households and upgraded them using the low-cost energy kits. The provincial energy provider, SaskEnergy, joined the project to analyze energy savings, which approximated more than \$150 annual savings per home. Based on this successful applied research project, SaskEnergy allocated \$500,000 to a 5-year expansion of this project across the province to retrofit 500 low income homes per year in 8-12 communities, resulting in multi-million dollar savings in reduced energy loss, and improved living conditions for Saskatchewan residents. SIAST students described their experience and its outcome as “unforgettable”.
- **Integration of GPS and Emergency Response for Rural Communities.** SIAST faculty and students were instrumental in addressing the problem of inadequate fire truck guidance systems in rural communities of Saskatchewan. After a guidance system failure that resulted in the loss of life and property, a GIS instructor proposed a research project in which SIAST students developed a comprehensive mapping system for rural communities and integrated the system with a database to facilitate the most-direct-routing of emergency personnel to critical locations. In 2007, students collected and recorded the field coordinates of 1,400 households in rural communities. Subsequently, the emergency response centre at Prince Albert acquired the digital mapping system; faculty and students then loaded the up-to-date coordinate data into the customized GPS unit, and trained the emergency personnel in its use. This college-driven transfer and application of new technologies has the potential for significant impact in saving lives and property.

Certainly, these examples illustrate the non-commercial and social benefits that can accrue to communities through college-generated applied research activities.

Nevertheless, the emphasis on corporatization inherent in the new research agenda is a concern recognized by many stakeholders and decision makers in the college system, and efforts are made in most college programs to include mandatory non-specialized electives for the purpose of producing more well-rounded graduates (Dennison, 1995; Doern, 2008; Levin, 2001; Parsons, 2007; Quinlan, 2005; Rae, 2005; Skolnik, 2000). Ultimately, however, what is clear is that, within the traditional parameters of Canadian college mandates, the primary purpose of incorporating research is to extend and enhance the core college mission by producing graduates who are *more* highly qualified because of their research experiences, and therefore, better prepared to contribute to real-world problem-solving and innovation for the economic and social benefit of all Canadians.

For colleges, of more immediate concern than *academic capitalism* is the issue of *academic drift*, commonly found among smaller or emergent universities. Academic drift is defined as the tendency of some institutions to emulate the roles and missions of more prestigious institutions, driven primarily by “a quest for prestige” (Morphew and Huisman, 2002, p. 494). For example, a study of changes in institutional status at small American colleges, based on the Carnegie classification system in the United States, concluded that “most institutions that had changed category had done so in an ‘upward’ direction” (Aldersley, 1995, p. 50), a tendency reflected in Schultz and Stickler’s (1965) term “vertical extension” (p. 235) and in McConnell’s (1962) reference to institutional “attempt[s] to move up in the ‘pecking order’” (p. 743).

In Britain, the influence of academic drift on institutional identity is particularly evident. Pratt's (1997) study of transformations within the British postsecondary system noted that the incorporation of research activity at British polytechnics was primarily perceived as "necessary to sustain academic reputation" (p. 73). Lipset (1994) provided another perspective on academic drift, noting how some less prestigious and teaching-oriented colleges in Britain accommodate research, not to compete with the research elite, but rather "to secure a small group of scholarly distinction to give their campus national visibility, so as to compete with others at levels similar to their own" (p. 222).

Incorporating research into institutional missions for competitive marketing purposes is increasingly prevalent in North America as well (Aldersley, 1995; Doern, 2008; Morphew & Huisman, 2002; Hazelkorn 2002). Loyola College's recent decision to change their name to Loyola University was, according to its president, "based on situating ourselves and marketing ourselves properly" (cited by Moltz, 2008, p. 1). Not surprisingly, two-thirds of Loyola students approved, saying "it was more prestigious to attend a 'university' than a 'college'" (p. 2). In this context, academic drift illustrates the increasingly prominent imperative of incorporating research for the purposes of increasing enrolment and expanding access to funding opportunities. Another study of new research initiatives at small American colleges concluded that "the overwhelming majority of institutions cited competitive advantage as the most important factor influencing their research agenda" (Hazelkorn, 2002, p. 77).

The influence of academic drift on institutional identity can be profound and even counter-productive. Morphew and Huisman (2002) noted how institutions could "drift away from their original missions toward norms of prestige and status typical of more

elite institutions” (p. 492), and were unequivocal in their contention that “academic drift is solely the product of a *quest for prestige* [italics added]” (p. 494), concluding that these “mimetic processes” (p. 496) often stem from “ambiguous goals” (p. 496). Aldersley (1995) warned that ambitious institutions can be too easily “beguiled by the promise of prestige” (p. 56), leading to situations in which institutional “missions no longer corresponded to the original dimensions” (Morphew and Huisman, p. 493). Consequently, Hazelkorn (2002) advised institutions “that were not traditionally resourced for research . . . to attune their research ambitions to institutional reality” (pp. 73, 75).

This issue of *academic drift* seems particularly germane in the context of a growing trend by some Canadian colleges to pursue *institute of technology*, *polytechnic*, *university-college*, and in some cases, *university* status (Bélanger, et al., 2005; Doern, 2008; Miller, 2008; Polytechnics Canada, 2007; Skolnik, 2004). Statistics Canada (2003) noted that the “grey zone” (p. 9) between universities and colleges was expanding as “the classic typology of universities and colleges no longer captures the complexity of higher education” (Orton, 2003, p. 9). While there is no explicit system or typology for the delineation of polytechnic institutions in Canada, three provinces (New Brunswick, Alberta, British Columbia) currently employ the designation of *polytechnic institution* in their legislation, but provide no clear descriptions of the criteria on which these designations are based. Polytechnics Canada, a recently formed lobby group, illustrated this trend to re-designation in its representation of seven Canadian *polytechnics* and *institutes of technology* with “strong applied research capacity” (Polytechnics Canada,

2007). However, Doern (2008) posited that many colleges use research as a type of “branding strategy [as they] seek to be more ‘university-like’” (p. 5).

In a recent dramatic example of this trend, five community colleges in British Columbia were re-designated as *universities* (Miller, 2008). In the end, however, apart from perceived advantages in marketing and access to funding, the research purposes of Canada’s emerging polytechnic institutions are essentially *undifferentiated* from those of traditional community colleges, namely, to enhance “the overall development of highly qualified personnel [through] training experiences of students linked directly to immediate employment” (Doern, p. 14). Ultimately, terms like *polytechnic* and *institute of technology* raise significant questions as to whether the debate should be framed around the “type of education, or type of institution” (p. 3) serving college students. In the context of Canadian colleges, therefore, academic drift primarily reflects the institutional purpose of increasing revenues and enrolments through the promotion of research as a marketing tool rather than as a tool of discovery, application, or skill development (Aldersley, 1995; Bélanger, et al., 2005; Berdahl, 1985; Birnbaum, 1983; Doern, 2008; Haveman, 1993; Hazelkorn, 2003; Huisman, 1998; Lipset, 1994; McConnell, 1962; Moltz, 2008; Mophew & Huisman, 2002; Neaves, 2002; Pratt, 1997; Rhoades, 1990; Schultz & Stickler, 1965).

In summary, the construct of *research purpose*, when applied to Canadian colleges, draws attention to the integration of applied research into the college environment in order to enrich the student experience and the quality of graduates, to keep faculty current and engaged, and to contribute to the social and economic well being of the communities they serve.

b. Research Forms

In our working model of research in higher education, the construct of *research forms* extends beyond the traditional form of basic, curiosity-driven research, to include also a widening range of scholarly activities (Boyer, 1990) and new modes of socially distributed research (Gibbons, 2003). In the context of Canadian colleges, which lack the tradition of basic research so embedded in the university environment, the emphasis shifts clearly toward the emergent, non-traditional forms of research. Certain aspects of Boyer's and Gibbons' models seem particularly well suited for developing a robust research culture at Canadian colleges, where the primary purpose of research is to enhance the core missions of career-related training and economic development.

Any form of research or scholarship that contributes to an improvement in teaching and learning will complement the fundamental goals of Canadian colleges to the betterment of their students and their communities. In this regard, Boyer (1990) was unambiguous in acknowledging that community colleges, in particular, "have teaching as the central mission" (p. 60):

At the centre of building communities there is teaching. Teaching is the heartbeat of the education enterprise and, when it is successful, energy is pumped into the community, continuously renewing and revitalizing the institution. Therefore, excellence in teaching is the means by which the vitality of the college is extended. (p. 60)

Boyer further emphasized that the *scholarship of teaching*:

is particularly appropriate for community colleges. We still have much to understand about how students learn, especially those from less advantaged

backgrounds, and faculty in community colleges should be authorities on this task. . . . If the concept of ‘teacher-researcher’ proves to be a field of research in which community college professionals engage, then this approach to research may well emerge as the most important facet of their scholarship. (p. 61)

In recent years, a recognition of the value of conducting research related to teaching and learning has taken root at many Canadian colleges (Dick, 2006; Enerson, 2001; Ferguson, 2005; Fisher, 2006; Healey, 2002; Herteis, 2006; Rae, 2005; Skolnik, 2000), allowing for “faculty participation in scholarship in a way that is inclusive, meaningful, and pertinent to the individual faculty member” (Dick, 2006, p. 2). A sampling of Canadian college studies in this area includes explorations, for example, of the effectiveness of college teaching methods, of the training of beginning college teachers, and of re-conceptualizations of professional development programs (Fisher, 2006), college mentorship programs (Fisher & Engemann, 2005; Hargreaves & Fullan, 2000), constructivist approaches to college teaching (Ferguson, 2005), as well as research into student demographics, first-year experiences, and factors affecting retention and attrition at Canadian colleges (Bussière, 2006; Dietsche, 2005; Drea, 2004; Fisher, 2009; Grayson & Grayson, 2003; Lambert et al., 2004; Usher & Potter, 2006; Wignall, 2005).

Another non-traditional form of research in Boyer’s (1990) expanded model, the *scholarship of application*, also appears to be particularly pertinent and applicable to the emerging research culture at Canadian colleges. Citing Handlin (1986), Boyer suggested that “scholarship has to prove its worth not on its own terms but by service to the nation and the world” (p. 23), and observed that “the work of the academy must relate to the world beyond the campus, [and] linkages between the campus and contemporary life

must be strengthened” (pp. 75-76). This form of knowledge application, commonly referred to as *applied research*, represents a natural extension of college mandates which have always been linked closely to the needs of the communities they serve. The research initiative currently evolving at Canada’s colleges clearly reflects the precept that higher education must serve the interests of the larger community, and applied research provides a relevant form where “theory and practice vitally interact” (p. 23).

Boyer noted that the application of knowledge “moves toward engagement as the scholar asks: How can knowledge be responsibly applied to consequential problems?” (p. 21). Certainly, Canadian colleges are well situated to conduct this form of applied research, especially in relation to the national research and innovation agenda which seeks to “increase the practical applications of research in Canada . . . [and to] turn knowledge into the products, services, and production technologies that will improve our wealth, wellness, and well-being” (Industry Canada, 2007, p. 9). Since the core mission of colleges is to provide “a key transformational advantage for Canadian business, industry, and individuals alike” (ACCC, 2006, p. 6), the adoption of applied research, which tends to focus on practical solutions and lends itself readily to private sector participation, assists colleges in their mission of helping businesses to survive and thrive by employing new technologies and by adopting new and improved products and services.

The following representative samples from the author’s (2008b) study specifically illustrate how well *applied research* aligns with, reflects, and synthesizes college purposes by providing faculty with renewed currency in their fields and students with enhanced opportunities to develop research skills in the context of real world, collaborative partnerships:

- **Development of Flour Silo Inventory Control System.** A Toronto bakery with three flour silos approached Humber College with problems related to management and storage of their flour inventory. Addressing this real world, small-business problem, faculty and students in Humber's School of Applied Technology engaged in a research project to conceptualize, design, and field-test a low-cost, effective method to determine the amount of flour present in an enclosed silo for inventory control and re-ordering purposes. This applied research project provided research skills training for Applied Technology students, increased the currency of faculty in state-of-the-art monitoring methods and technologies, and provided cost savings to a local small enterprise lacking sufficient resources to research this problem.
- **Frost damage assessment for vineyards.** Almost all wineries in the Niagara Region experience winter injury to vineyards, affecting a local industry in which over 100 wineries play a significant role in the economic health of the region. Addressing this frost damage problem, viticulture faculty and students at Niagara College's Teaching Winery surveyed and analyzed vineyards in the region using high resolution GPS, GIS, Triangulated Irregular Network (TIN), and Slope and Contour analyses. Through collaborative partnerships with Huebel Winery and Seeger Farms Winery, this applied research project provided students with real world problem solving challenges and advanced research skills training, while providing critical support to the regional economy.
- **Bio-Ethanol Production from Potato Waste.** The Community College of New Brunswick's Centre of Excellence in Agricultural and Biotechnological Sciences partnered with McCain Foods, the New Brunswick Department of Agriculture, and Canada Fisheries & Aquaculture in an applied research project to determine the suitability of using potato waste from steam peel and potato culls for the production of bio-ethanol fuels. The outcomes not only provided companies interested in building an ethanol facility with information required to make strategic investment decisions, but also provided the local potato industry with a cost-effective process to dispose of their waste in a non-polluting method that produces a value-added energy resource product.

Within our working model of research, Gibbons' (2003) closely related Mode Two form of research is characterized by collaborative partnerships and professional linkages organized around particular applications situated beyond the confines of discipline-centred university environments. For Gibbons, research "has spread from the Academy to many different types of institutions . . . [where researchers] join networks, enter alliances, and form partnerships of various kinds" (pp. 111, 113). Mode Two extends the form, scope, and context of research to "a wider, more temporary and heterogeneous set of practitioners, collaborating on a problem defined in a specific and localized context" (p. 110). Like Boyer's (1990) scholarship of application, Mode Two reflects the contemporary circumstances and environments in which research is emerging at Canadian colleges.

To date, an extensive array of college-initiated cooperative partnerships and professional linkages has established a base for Mode Two collaborative approaches to specific research problems and applications. This wide range of regional and national college networks includes, among others: Association of Canadian Community Colleges' Applied Research Network, Polytechnics Canada, Atlantic Provinces Community College Consortium, Springboard Atlantic, Quebec's Réseau Trans-tech network and L'Association pour la recherche au collégial (ARC), Ontario's Heads of Applied Research (HAR) and the Colleges Ontario Network for Industry Innovation (CONII), the Alberta Association of Colleges and Technical Institutes' Communities of Practice (CoP), the Westlink Innovation Network, the Great Plains Applied Research Network, the British Columbia and Alberta Colleges and Technical Institutes Network, the Canadian Climate Impacts and Adaptation Research Network (C-CIARN), and the Social

Economy Research Network of Northern Canada (SERNNNoCa). These last two examples from Northern Canada illustrate how Canadian colleges are participating in socially distributed Mode Two research through professional linkages and collaborative approaches to addressing specific research problems.

- Social Economy Research Network of Northern Canada (SERNNNoCa) is a collaborative network of the three Northern territorial colleges and their respective research institutions (Nunavut College's Nunavut Research Institute, Aurora College's Aurora Research Institute, and Yukon College's Northern Research Institute), linking researchers working in the North with students, community organizations, and educational institutions seeking to conceptualize and inventory the social economy in the North, and to investigate the particular relationships that exist between social economy and indigenous cultures and resource regimes.
- Canadian Climate Impacts and Adaptation Research Network (C-CIARN) is a national research network established to facilitate the generation of new climate change knowledge by bringing researchers together with decision makers from industry, governments, and non-government organizations to address critical issues of climate change. Since 2002, C-CIARN has supported more than 40 climate impact and adaptation research projects involving upwards of 200 international researchers.

In summary, non-traditional forms of research, such as those proposed by Boyer (1990) and Gibbons (2003), seem admirably suited to extend and enhance the core missions of Canadian colleges as they incorporate research into their strategic plans.

However, the success of the emerging research enterprise will ultimately depend on *the extent to which college faculty engage* with these various forms of research activity and integrate research into their instructional programs. Therefore, at this point, it may be instructive to review the findings of the author's (2008a) *National Survey of Faculty Participation in Research*, which examines the levels and areas of research

interest reported by faculty at Canadian colleges. Participants ($n = 2,410$) were asked to respond to a range of statements regarding their attitudes and preferred areas of research interest. Responses were obtained using 5-point Likert Scale ratings ranging from strongly disagree (1) to strongly agree (5). In order to facilitate comparison of means among and between the response variables (faculty attitudes, and areas of interest) and the seven demographic variables (gender, age, employment status, years of teaching, credentials, subject areas, and home province), clusters of response items with high internal consistency reliability (as measured by Cronbach's coefficient *alpha*) were consolidated into four composite indices. All four indices achieved alpha ratings exceeding the level required to support internal consistency reliability ($\alpha > .700$), thereby validating the use of these indices in this analysis (Babbie, 1992; Cronback, 1984; Dillman, 2007; Huck, 2004; Norusis, 2006).

To summarize the findings, faculty reported strong or very strong interest in three preferred areas: (1) curiosity-driven research (85%), (2) research related to teaching and learning (80%), and (3) applied research (57%), as measured by their respective Composite Indices. When these composite indices were subsequently used to compare means across demographic variables, the relative ranking of the respondents' three preferred areas of interest was constant across all seven variables (gender, age, employment status, years of teaching experience, credentials, subject area, and province) measured in the study. Figure 4 illustrates the combined positive and strongly positive responses associated with each composite index.

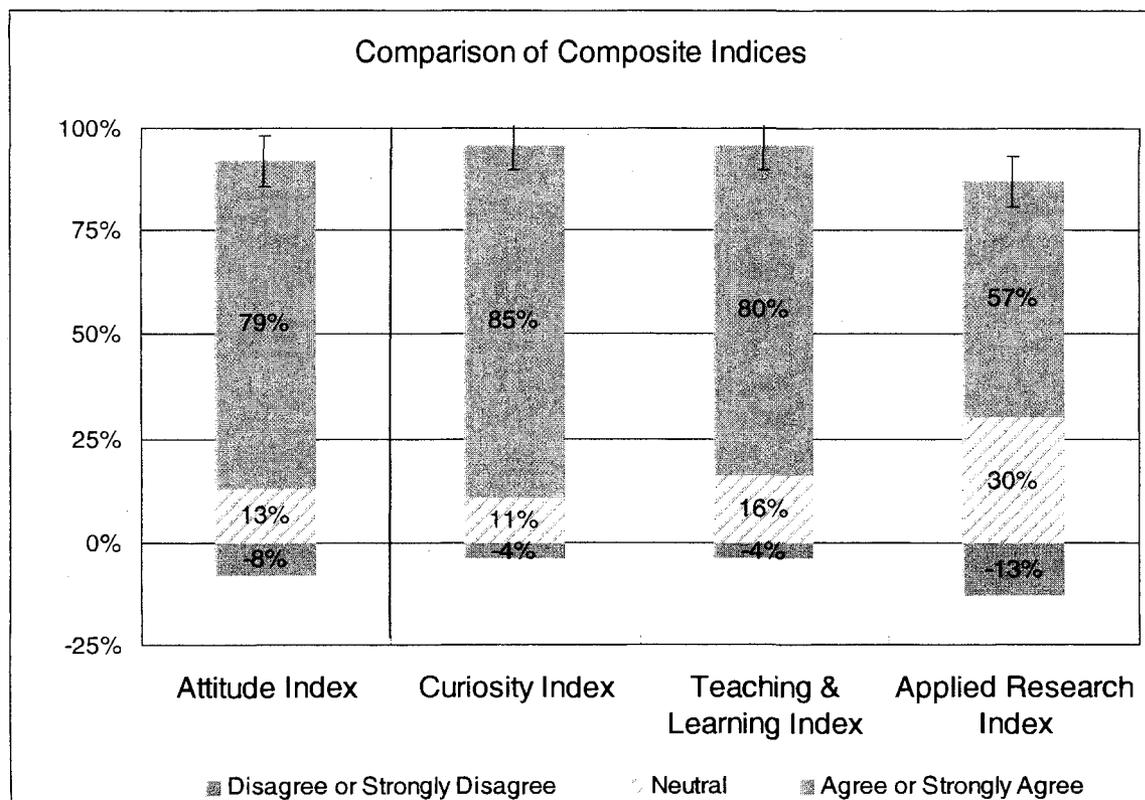


Figure 4. Comparison of composite indices representing faculty attitudes and areas of research interest (Fisher, 2008a).

With respect to individual statements concerning *research related to teaching and learning*, an overwhelming majority of respondents consistently reported strong or very strong interest in research related to improving their teaching skills (87%), student success (71%), curriculum development (76%), and student involvement in research (83%). When asked directly, the majority of faculty (82%) agreed or strongly agreed that they were specifically interested in research related to teaching and learning. Figure 5 represents a comparison of reported levels of interest in various aspects of *research related to teaching and learning*.

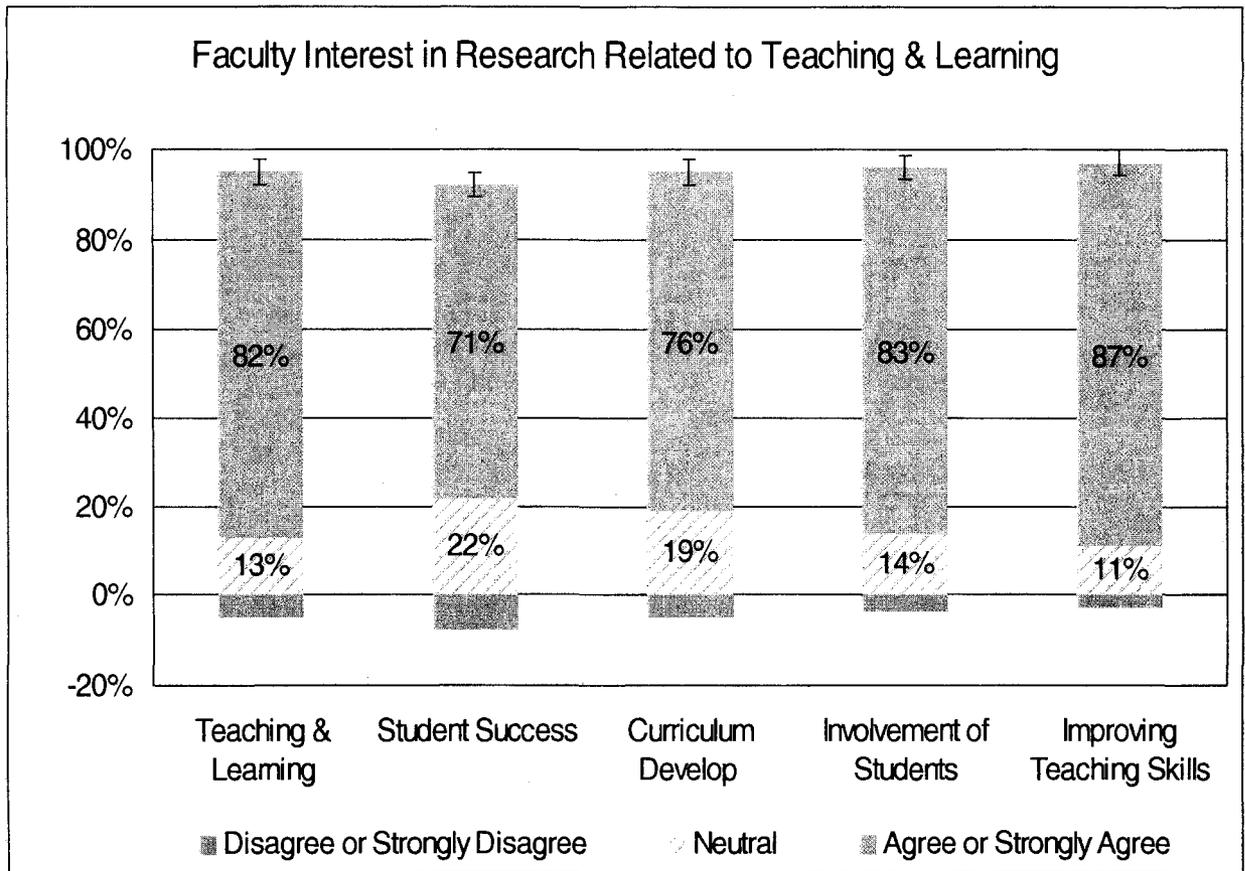


Figure 5. Faculty attitudes toward research related to teaching and learning (Fisher, 2008a).

Faculty interest in research related to teaching and learning was echoed in remarks submitted in response to an open-ended invitation for further comment. The following list constitutes a sampling of faculty comments on this topic:

- I believe that there is not enough emphasis on the importance of teaching and pedagogy at my college.
- Our institution is primarily a teaching-focused school and as such, research that pertains to teaching and learning is valuable.
- If our primary mandate is "student learning first," then any opportunity to learn more about how and why we teach--and more about who we teach--can only have a positive effect on our institution overall.
- Research into best teaching practices can only enhance the learning experience of our students.

- I am primarily interested in doing educational research to find better ways of helping our students to learn what they need to learn.
- If the research that is conducted is directly related to student success, I cannot see anything but good coming from this initiative.
- If by doing research we could improve teaching methods and materials, then we would be fulfilling the primary mandate of providing students with quality education.

In the context of Boyer's (1990) *scholarship of application* and Gibbons' (2003) Mode Two research, a lesser but significant group of faculty (57%) also reported strong or very strong interest in the area of *applied research*, as measured by the Applied Research Composite Index. With respect to specific statements related to *applied research*, respondents reported strong or very strong levels of interest in research related to working with business/community partners (74%), research leading to technological advances or processes (66%), problem solving for industry (52%), and commercialization (38%). Compared to all other forms, faculty reported the highest levels of "Neutral" responses to statements related to applied research. However, these relatively high percentages of "Neutral" responses may be more reflective of uncertainty regarding the *terminology* used in the survey than with a lack of interest in applied research *per se*. Nevertheless, despite the uncertainty associated with terminology, more than half of respondents (57%) agreed or strongly agreed that they were interested in participating in applied research activities, suggesting strong receptor capacity for further growth in this form of research. Figure 6 represents a comparison of faculty attitudes toward various aspects of *applied research*.

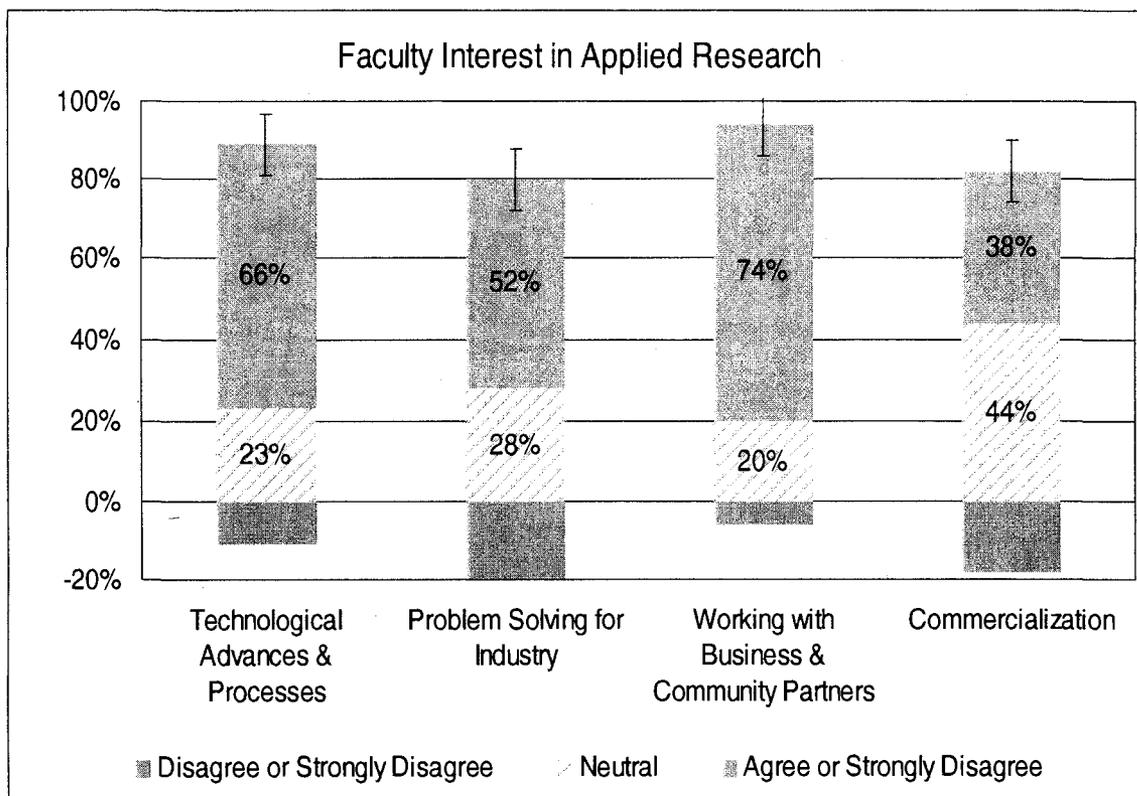


Figure 6. Faculty interest in applied research (Fisher, 2008a).

Faculty interest in applied research was also echoed in remarks contributed in response to an open-ended invitation for comments. The following list comprises a sampling of faculty comments on this topic:

- The future of preserving Canadian advancement in technologies depends on supporting and succeeding in applied research projects in Colleges.
- Applied Research is the springboard for new and more effective technology. Participating in applied research develops analytic skills which are useful in any industrial development or commercial context.
- The output of applied research goes without saying. It links to curriculum, builds ties to industry, and utilizes valuable expertise.
- Engaging in applied research would indicate to both students and the professional community that the college places a priority on improving its technical capabilities and responds to the demands of a changing society.

- Colleges should be seen to be actively pushing forward knowledge boundaries at an applied level, and to be contributing positively to the development of improved technologies in health, environment, energy, etc.

Therefore, based on the quantitative and qualitative data collected in the author's (2008a) national survey, the preferred areas of research interest reported by college faculty bear a striking similarity to aspects of Boyer's (1990) typology of research forms. Faculty preference for curiosity-driven research echoed Boyer's scholarship of discovery; interest in research related to teaching and learning reflected Boyer's scholarship of teaching; faculty interest in applied research corresponded to the scholarship of application. This finding suggests that in order to increase faculty participation in research activities at Canadian colleges, a broader and more inclusive research paradigm, acknowledging a wide range of research forms, might not only address the goals of the national innovation agenda but also incorporate the varied research interests of the college faculty on whom the success of the initiative ultimately depends.

In summary, expanding forms of research (Boyer, 1990; Gibbons, 2003) embody new opportunities for research and scholarship that resonate with core college missions, reflect the preferred forms of research reported by college faculty (Fisher, 2008a), and represent suitable constructs for inclusion in a conceptual framework for research at Canadian colleges in the 21st century.

c. Research Governance

In our working model of research at universities, the construct of *research governance* refers to how and with whose participation decisions are made related to research planning, financial management, infrastructure, and capacity building, as well as responsibility for the development and administration of policies and processes related to research ethics, academic freedom, conflict of interests, and intellectual property rights. (Bonewits & Soley, 2004; Breton & Lambert, 2003; Clark, 1983; Currie, 2003; Daniel, 2003; Davenport, 2002; Jenkins, 2007; Kyvik & Skodvin, 2003; Laidler, 2002; Neave, 2002; Powers, 2003; Rhoades & Slaughter, 2004; Rowley, 1999; Shattock, 1983; Turk, 2000; UNESCO, 2006).

In the context of Canadian colleges, great strides have been taken in research governance through the establishment of research offices, assignment of research responsibilities, and implementation of policies and procedures (Corkery, 2002a; Fisher, 2008b; Madder, 2005; NSERC, 2007). Research offices and administrative positions have proliferated under a plethora of titles. For example, a sampling of recently created administrative positions includes: Chair, Office of Applied Research (College of the North Atlantic), Director, Research and Innovation (Niagara College), Dean, Applied Research, Innovation and University Partnerships (Fanshawe College), and Associate Vice President, Research and Innovation (Seneca College).

In this rapidly expanding environment, college engagement with regional, provincial, and national granting councils and funding agencies has been instrumental in accelerating the development of policies related to research governance. For example, eligibility to apply for funding from the National Science and Engineering Research

Council of Canada (NSERC) includes the requirement for institutional policies regarding financial management, academic freedom, research integrity, conflicts of interest, intellectual property rights, environmental assessment, peer review, and research ethics. To date, 35 colleges have earned NSERC-eligibility, with another 19 formally engaged in the application/eligibility process (NSERC, 2008). Engagement with other federal funding agencies, such as Canada Foundation for Innovation, Atlantic Canada Opportunities Agency, FedNor, and Western Economic Diversification Canada, has further stimulated the development of governance policies and processes to meet rigorous standards.

The accelerating growth of college Research Ethics Boards, and their adoption of and adherence to the Tri-Council Policy Statement (TCPS, 2008), has been the subject of numerous conferences, symposia, and workshops delivered at provincial and national college conferences. Further illustrating the increasing implementation of research ethics boards and policies, it should be noted that in the administration of the author's (2008a) national faculty survey, 37 colleges required the submission and approval of research ethics protocols as a condition of participation.

However, while colleges are actively developing and implementing policies and procedures related to ethics, academic freedom, and research integrity, other complex issues related to intellectual property rights, financial management, and faculty participation in governance are still being resolved. With respect to the concern that a "corporate management revolution" (Rhoades & Slaughter, 2004, p. 48) is increasingly pervading research governance bodies, the resolution of this issue appears more manageable in the context of Canadian colleges, where partnerships with business and

industry have long been a hallmark of college governance. Since college instructional programs are premised on employment-related relevance and business/community needs, corporate membership on college governing bodies contributes to strategic planning decisions that reinforce and enhance the core mission for all stakeholders. Nevertheless, many faculty in the author's (2008a) national survey expressed concerns over the questionable extent of commitment and preparedness of some college administrators with respect to research governance. A sampling of comments on the extent to which faculty had to rely on their own resources included the following observations:

- I had to negotiate the process myself. No assistance from my employer, the college.
- Managers are not sufficiently interested/engaged to look into, or invest in, AR.
- I would like to see a workshop aimed at college administrators to help them with developing useful, supportive policy, and procedures.
- On the ground we are moving forward, but although research is part of the college's mandate, the resources, infrastructure, and knowledgeable institutional administration is lacking.
- There has been a serious lack of direction from management.
- No members of senior management are scholars. When non-scholars are put in charge of scholarly activity, don't expect much.

Since the fundamental questions with respect to research governance involve who and what criteria shape the research agenda, and since the success of the research enterprise ultimately depends on the participation and engagement of the college faculty who will conduct and incorporate research in the context of their instructional programs, it seems not unreasonable to suggest that *more faculty participation on research governing bodies* would contribute to a more productive college research culture and better informed faculty. In this context, Rowley (1999) stressed the critical importance of

involving college faculty researchers as full participants in all stages of research governance. Emphasizing the concept of “ownership” (p. 1) with respect to research governance, Rowley noted that:

resources to support research activities, while useful, are not sufficient. Any research plan needs to be owned by those who will contribute to its achievement. A participative planning and monitoring process in which group members jointly develop, and monitor, their progress towards achieving the objectives of a research plan is essential. Ownership can only be achieved if all researchers (from research students to professors) have involvement in the planning process. (p. 2)

The implications of Rowley’s concept of participatory “ownership” (p. 1) were echoed in several comments contributed by respondents in the author’s (2008a) national survey.

- If we are to be an innovative organization in the business and public service of higher education, then faculty need to *take ownership* [italics added] in being responsible for and contributing to that innovation.
- Without faculty participation, assessment of the quality of the research will be flawed - corrupted by politics and cronyism.
- I want to get involved in active applied research at my institute, but I have not seen evidence of availability of financial or administrative resources that would realistically support such initiatives. So I wait.
- The applied research agenda presents an overwhelming opportunity to unlock the potential residing in the faculty expertise residing within our respective institutions throughout Canada. However, success will require some significant commitment at the strategic policy and operational levels within the Colleges, and must necessarily involve faculty at all levels in the process.

In addition to issues of administrative preparedness and faculty participation, another governance concern relates to the need for a clear delineation of *intellectual*

property rights in the college context of entrepreneurial collaborations and corporate partnerships, an issue depicted in the university context as a “tension between knowledge as a common good and knowledge as private property” (Daniel, 2003, p. 37). Research in the college setting is commonly conducted through collaborative partnerships where the benefits that accrue to corporate partners, often in the form of increased sales or productivity, are not necessarily shared with the college or the faculty researcher. Results from college research activities are increasingly embodied in technology transfer rights such as patents, licenses, and royalties, which “represent a tangible and valuable asset with legal protections” (Powers, 2003, p. 30), but the allocation of benefits arising from these assets remains negotiable. This issue is also relevant in relation to the intellectual property policies of federal granting agencies. For example, NSERC (2008) “does not participate in funding projects that involve a contractual arrangement with an industrial partner who expects total control of the project results” (p. 1). However, NSERC’s policy also noted that, “within the constraints imposed by the desirability of facilitating eventual commercial benefits, . . . researchers must be free to use the research results for academic purposes” (p. 1). Therefore, in developing policies on intellectual property rights for research at Canadian colleges, governance bodies must clearly delineate policies and processes that accommodate and synthesize the commercial needs of business/industrial partners, the economic goals of funding agencies, the instructional objectives of the colleges, and the rights, academic, remunerative, and otherwise, of faculty researchers.

Finally, since research is a relatively recent phenomenon at Canadian colleges, further development of policies and procedures is also required at many institutions regarding the administration of research grants, the employment of research personnel,

the integration of research activities into collective agreements, and the further development of faculty proficiency in all aspects of the research enterprise. For example, contributions to overhead costs may be expected from college researchers who obtain grants, although these costs are considered ineligible expenses by most funders. Similarly, while *research assistants* at universities are commonly recruited from graduate students, colleges do not have an adequate supply of graduate students to fulfill these roles, and the consequent need to engage college support staff and part-time employees in research-related activities becomes problematic in terms of collective agreements, job descriptions, pay scales, etc. Models must be established to facilitate the processing of external research grants within the parameters of established financial, accounting, and human resources departments that are traditionally not structured to administer these types of arrangements.

In summary, whereas universities have well-established governance structures in place, colleges face unique challenges in this area. However, because of their lack of established models in this field, colleges also enjoy an exceptional opportunity to develop research governance regimes expressly designed to address the issues and circumstances specific to the college environment. Therefore, while great strides have been taken in developing administrative offices, policies, and procedures to support a rigorous and productive research culture at Canadian colleges, further development is required to resolve the external and internal challenges naturally accompanying this period of accelerating growth and transition. In our working model of research in higher education, the construct of research governance can play a critical *integrative* function in managing the “interface and balance between research and other institutional activities” (Rowley,

1999, p. 4), as well as a *developmental* function in supporting and enriching an evolving culture in which “research comes to be viewed as an integral component” (pp. 3-4) of all aspects of the college experience.

d. Research Personnel

In our working model of research in higher education, the construct of *research personnel* focuses primarily on human resource aspects related to employment opportunities, recruitment practices, terms of employment (compensation, benefits, mobility, job security), promotion and tenure, training, incentives, status, teaching loads, and so forth. At universities, policies and processes are well established, with a commonly held expectation that faculty assignments and responsibilities be divided into teaching (40%), research (40%), and service to the institution and community (20%). While tensions experienced by faculty at the intersection of teaching and research represent a salient issue in the literature, especially with respect to the asymmetrical influence of research on promotion and tenure decisions, this ubiquitous 40-40-20 arrangement is almost universally recognized and implemented in faculty contractual arrangements (Angell, 1928; Badali, 2004; Baldwin, 2008; Bok, 2006; Bonewits & Soley, 2004; Boyer, 1999; Chant & Gibson, 2002; Jenkins, 2007; Krause, 2007; Pocklington & Tupper, 2002; Powers, 2003; Rowley, 1999; Sykes, 1988; Tuckman & Hagemann, 1976; UNESCO, 2006).

However, the construct of *research personnel* presents many unresolved issues in the evolving context of research at Canadian colleges. Unlike university professors, college faculty are employed as full time *teachers*, with no expectation, remuneration, employment, or promotion specifically related to conducting research. Provincially

negotiated collective agreements are predominantly silent on the issue of research-related activities, with only two provinces (Newfoundland & Labrador, and Alberta) specifically allocating funding for college faculty to conduct research within the scope of their employment. Even at the local (college) level, allocation of ever-scarcer resources for internally funded research is a challenge even for the most committed institutions (ACCC, 2008; Bélanger, et al., 2005; Corkery, 2002a; Fisher, 2008b; Ivany, 2000; Madder, 2005; Skolnik, 2000).

However, the overwhelming majority of respondents in the author's (2008a) national faculty survey agreed or strongly agreed that research would have a positive effect on their college (86%) and on their current duties and responsibilities as teachers (77%). The majority also agreed or strongly agreed that research should be a high priority at their college (78%), and that release time should be provided for faculty interested in participating (78%). Significantly, the majority of respondents (81%) agreed or strongly agreed that *lack of funding for release time* was the primary barrier to their participation, a finding corroborated by previous research on this topic (ACCC, 2006; Bélanger, et al., 2005; Corkery, 2002a; Madder, 2005). Corkery (2002a) specifically identified "lack of faculty release time [as the] primary barrier to maximizing institutions' potential to stimulate innovation in Canada through applied research" (p. 15). Madder (2005) also identified the lack of funding for faculty release time as "the primary limiting factor for innovation activities at colleges" (p. 32). Similarly, the ACCC's (2006) National Research Advisory Committee identified significant teaching loads and lack of funding for research release time as the key barriers to unleashing the full potential of colleges, and recommended "new funding mechanisms . . . for faculty release time" (p. 2).

The critical issue here again arises from the *teaching/research tensions* experienced by faculty “caught in the crossfire” (Boyer, 1990, p. xi) of conflicting demands, time pressures, workloads, and professional expectations. Echoing the findings of Badali’s (2004) study, the following sample of comments drawn from the author’s (2008a) national survey provides examples of the frustrations felt by faculty identified the problem of “time constraints and workload issues”. For example, many expressed concern about using their own time and resources to conduct research:

- I am currently performing my own research, mainly at my own expense.
- My research was self initiated and self directed; I received no support from the college.
- Something that I have been doing "off a corner of my desk".
- I love doing research, but not solely at my cost, on my time, while the college uses it for their gain!!!!
- This was done almost entirely on my own time, and use of college facilities risks censure from superiors.

Many faculty comments specifically highlighted the paramount need for release time as a prerequisite for building a sustainable research culture at Canadian colleges:

- Exciting to do, but I have had no release time, no support at an institutional level which pays lip service to the ideal of research but does not back that up with incentives or support.
- We're really busy. Without reassigned time for applied research, such research would negatively impact all the other things I have to do here. I'd just need time, time, time!
- Incentives and recognition within the institution are needed to help catalyze a vibrant culture of enquiry.
- Release time is a must, for quality of research project and honest reflective/creative thinking.
- College teachers have so much to contribute to research; we just need the time, support, and financial backing to conduct studies that will enhance our institutions.

While a preponderance of respondents expressed frustration with the lack of release time, they left little doubt as to the benefits that accrue to students, faculty, colleges, and society when research cultures are effectively incorporated into college environments.

The benefits of positive teaching/ research interactions, commonly referred to as the *teaching/research nexus*, are well documented in the literature (Baldwin, 2008; Doern, 2008; Felt, 2005; Halliwell, 2008; Hattie & Marsh, 1996; Krause, 2007; Patrick & Willis, 1998; Wuetherick, 2007), and there is a growing international consensus that contemporary postsecondary students need to graduate with the higher order skills and research experiences that prepare them for “today’s increasingly super-complex society and economy” (Wuetherick, 2007, p. 1).

Canada’s colleges are frontline players in addressing the changing technological and skills requirements of the 21st century Canadian marketplace, and the *teaching/research nexus* is a particularly appropriate paradigm to achieve these goals in the college environment. From this perspective, applied research and innovation activities extend and enhance the college mandate to produce highly qualified personnel while contributing to economic development. Within the *teaching/research nexus*, faculty increase their currency while students learn advanced research skills related to a wealth of “new economy” industries, such as: oceanography, geomatics, bio-receptors, “intelligent” textiles, disaster/emergency preparedness, wind power, advanced visualization, tribology, energy efficient materials prototyping, low-cost fuel reduction, integrated GPS emergency response, desalinization, nutraceuticals, weather-controlled sports training, membrane spectrometry, solar-photovoltaic applications, cold weather

inter-connectivity, neutron monitoring, and arctic geo-spatial transformations, to name a few (Fisher, 2008b).

The following sample of faculty comments drawn from the author's (2008a) national survey illustrates how faculty clearly recognized the benefits of the teaching/research nexus at Canadian colleges. Many comments specifically reflected the many benefits accruing to *faculty*:

- Participation will ensure that the faculty is versed with frontline issues.
- Faculty involved in research are empowered by further knowledge and interaction with the industry.
- Learning is contagious, and by learning and conducting research as faculty, we set an example of academic excellence and professional commitment.
- I believe applied research opportunities will allow faculty who choose to do this the chance to refresh their connection with their work and with their industry in many necessary and beneficial ways.
- Conducting research and sharing information with colleagues in my field revitalizes my teaching and keeps it current.
- It would make me a better professor to be current and updated and the students would appreciate receiving "cutting edge" information.
- Connection of faculty with applied research should lead to faculty acquiring and/or updating leading-edge knowledge in their fields; this should lead to faculty influencing students so that their education marries academic theory with the business/work world.
- Without ongoing research, we run the risk of becoming stagnant and/or antiquated in our curriculum and delivery methods, not to mention the lack of personal growth.
- I suspect that any engagement in research will stimulate the intellectual life of the college.
- How can we graduate students without a research skill set? To give them a skill set we have to be doing it ourselves.

- We need to keep our industry knowledge current in order to be effective in the classroom. Moving from theory to actual applications in industry helps faculty and students meet the needs of employers/industry.
- Giving faculty challenging research projects in their field of study would broaden their experience base, provide them experience with the technology in use, and allow them to create more complex exercises for their students.
- Interested researchers make interesting and engaged teachers.
- Teaching informs research and research informs teaching - absolute synergistic relationship.

Other faculty comments reflected more specifically the value of research for *students*:

- In our culture and economy driven by information, it is essential for graduates to have sound research, critical, analytical, and evaluative skills.
- Our institution wants to be seen as training the leaders of tomorrow - and what better way to see what 'tomorrow' looks like?
- Our graduates should have training comparable to corresponding education in other countries to make them globally competitive.
- Use applied research to positively impact society by bringing practical solutions to problems we are aware of from pure research. Students will see seamless practical applications of otherwise abstract scientific facts/principles.
- I would love it if my college could offer our best students a chance to experience applied research, here at school. With the right facilities, or even in partnership with industries and the university, we could lead and supervise students while carrying out applied research. I think it validates the student to contribute in a small way to the scientific community. It gives them some experience of research before they need to choose their options, and that gives them an edge.
- I think the College's work - educating people for employment - would be enhanced by research. The increased credibility would make us better able to fulfill the mandate.
- Research will create and enhance a culture of discovery at the college. This excitement of discovery and kindling of curiosity among faculty will be detected by

students (especially as they become involved in research projects) and will in turn fire their curiosity and enthusiasm for science and other disciplines.

Other faculty comments captured the multidimensional range of benefits accruing to *all participants* when research is incorporated into college programs:

- There must be a three-way benefit: Students, community and me. When I see the students share my excitement over new knowledge it is so gratifying. When I see the community benefit from the work my students and I accomplish, it is amazing. This gives me the energy and enthusiasm to carry on doing the research.
- Applied research integrates faculty, students and industry in a manner that benefits student learning, industry productivity and faculty training. It reinforces connectivity and relevance to industry while inspiring thought in students.
- As part of our mandate is to act within the community, it is necessary to do just that! We need to be working with our community partners to help them better meet the needs of their clients, while also ensuring that our curriculum remains current and relevant to the workforce.
- To me the benefits are obvious. Applied Research goes a long way to support our Academic Strategy in providing excellence in teaching and innovations in learning. It offers learning opportunities and environments to students previously only enjoyed at the University Level. It would distinguish the college from other colleges in terms of opportunity and incentive to apply. Increases the participation of community partners in the learning community of our students.
- I believe in the positive effect of all forms of scholarly activity in helping to create an atmosphere of vibrant, constructive curiosity in any post-secondary institution.
- If the college puts the mechanisms and support system in place to truly encourage, support, and celebrate applied research as part of its core function, then I do believe that applied research has the potential to have far-reaching positive effects for the students, the staff/faculty, the institution, and the broader community.
- I think the College would be viewed as more progressive, innovative and "keeping up with the times". Providing research opportunities would be a draw to students who are interested in research themselves and a higher quality of teachers. Opportunities

to grow professionally, while still providing a quality education to students seems like a good business move. Times are changing.

- Such an investment is an obvious win-win-win scenario for the marketplace (businesses and government agencies), the academic institutions, and the researchers involved. Research is essential to the health, vigour, and credibility of any college.
- Will have a positive effect on enrollment if our faculty and course content is current and "cutting edge." Also add to the reputation of the college both for potential students and to employers.
- "Education without Boundaries". Need I say more; to participate in applied research speaks volumes to our mandate.

These representative comments clearly reflected a recognition and celebration of the many benefits of incorporating research into college environments, especially in terms of a teaching/research nexus that situates research at the heart of the college mission to the benefit of students, faculty, and community partners.

In summary, with respect to the construct of *research personnel*, while research training and experienced personnel are necessary for the further development of college research cultures, the lack of faculty release time, especially in the context of competing demands for ever-scarcer resources, represents the greatest single barrier to building a sustainable research culture at Canadian colleges. Any resolution of this issue will require renewed sense of commitment from key strategic decision makers at all levels to renegotiate provincial collective agreements across the nation in order to recognize and incorporate research as a legitimate, though voluntary, activity for faculty at Canadian colleges. Framing the positive outcomes of research within the context of a *teaching/research nexus* highlights the benefits accruing to all stakeholders, and provides a strong rationale for including research activities in collective agreements.

e. Research Funding

In our working model of research in higher education, the construct of *research funding* refers to the sources and allocations of financial resources that support research activities, and also to the influence of those funding sources on research-related decisions and directions. Neave (2002) described three traditional “money streams” (p. 13) (institution, government, market) that support research in higher education, and subsequently presented a conceptual “triangle of research coordination and orientation” (p. 1) that assists in plotting the *influence* of these money streams on research decisions, drawing attention to the conditions attached to funding sources and allocation processes.

Colleges, unfortunately, are at a severe disadvantage in at least two of Neave’s (2002) three money streams, namely, institutional research funding and governmental research funding. With respect to institutional support, which Neave described as a “gift relationship” (p. 11), colleges receive minimal to zero support in provincial operating grants to pursue research activities, and, therefore, those colleges that do allocate scarce internal resources to research and scholarship, do so at a cost to other programs and activities (Bélanger, et al., 2005; Corkery, 2002b; Fisher, 2008b; Madder, 2005). Improvements in institutional support of research at colleges will require deliberate and concerted advocacy by stakeholders at all levels to achieve the necessary revisions to provincial funding formulas, operating grants, collective agreements, and local (college) strategic plans.

With regard to the second money stream, government funding councils, colleges are again at a disadvantage, especially vis-à-vis universities, in their limited ability to access research funding from competitive sources such as Canada Foundation for

Innovation (CFI), NSERC, Social Sciences and Humanities Council of Canada (SSHRC), and other sources. Nationally, regionally, and provincially, Canada's colleges are constrained in the growth of their applied research and innovation activities by systemic bias in favour of universities (Bélanger, 2005; Fisher, 2008b; Madder, 2005), a situation perpetuated by the view that "universities have a proprietary and unassailable role" (Bélanger, 2005, p. 36) in the research establishment. This perception is reinforced by the composition of review panels, selection criteria, restrictions on eligible expenses (especially related to faculty release time), anticipated outcomes, and so forth. While colleges are ostensibly able to apply for funding competitions, the university-centric nature of these competitions precludes equitable access for colleges, or requires that they participate as 'junior partners' with universities. For example, to date, *less than 1% of CFI* research grants, and *less than one-half of 1% of NSERC* research grants have been awarded to colleges (Fisher, 2008b). The discontinuation of CFI's College Research Development Fund has only aggravated the situation. While the recent expansion of NSERC's college-specific College and Community Innovation (CCI) program demonstrates a recognition of the research conditions and constraints unique to colleges, even this expanded opportunity for the college sector represents less than 1% of NSERC's annual funding for research programs. Clearly, the competitive bias against colleges in university-centric funding competitions and the lack of sufficient college-specific funding opportunities constitute significant inhibitors of future growth for research cultures at Canadian colleges.

Notwithstanding their limited access to research funds, however, colleges have achieved notable results. To date, for example, 30 colleges have completed 68 projects

worth \$29 million in CFI funding; the Atlantic Canada Opportunities Agency has funded over \$10 million in research activity by Atlantic colleges; FedNor has provided over \$13 million in support of 70 projects at northern Ontario colleges; and Western Economic Diversification Canada has funded over \$6 million in college research activity at colleges in western Canada. Nevertheless, greater and more equitable access to funding from government research councils and granting agencies is a prerequisite to building a more robust, productive, and sustainable research culture at Canadian colleges (ACCC, 2006; Bélanger, et al., 2005; Fisher, 2008b; Ivany, 2000; Madder, 2005).

However, with respect to the *influence* of government funding sources on research decisions and directions, Neave's (2002) triangle of coordination, orientation, and influence is particularly relevant in the context of college research. Clearly, research sponsored by government agencies and granting councils (such as NSERC, SSHRC, and CFI), though limited, is nevertheless influenced by the respective mandates and agendas of those sources. For example, the newly expanded NSERC CCI program, specifically dedicated to funding college research, includes eligibility criteria, application processes, and anticipated impacts that are heavily oriented toward commercial partnerships and economic development. While providing expanded opportunities for applied research projects, this focus is incongruent with the majority of responses in Fisher's (2008a) national survey, where faculty reported much stronger levels of interest in research related to teaching and learning, an area that does not pertain directly to the CCI program mandate and goals. At this time, only one federally sponsored body, the Canadian Council on Learning (CCL), actively supports research related to teaching and learning at

colleges, but that organization is limited in its available resources and there, too, colleges must compete with university-sector applicants for scarce resources.

As to the third money stream in Neave's (2002) model, *sale of services*, colleges are naturally engaged in providing employment-related training, technical support, and applied research services to support regional economic development, and, therefore, appear ideally suited to benefit from this source of research funding through their close association with business and industry, especially with small-to-medium size enterprises (SMEs). With respect to the *influence* of market-based funding sources, while there is some concern over the extent of corporatization and privatization (Bélanger, 2005; Parsons, 2007; Quinlan, 2005; Skolnik, 2000), the overall benefits of corporate collaborations in support of applied research activities at colleges are essentially positive for all stakeholders. In this respect, the countless situations in which colleges are providing a wide range of applied research services to local SMEs are illustrated by the following samples drawn from the author's (2008b) study:

- Newfoundland's Marine Institute provides marine related training, consulting, and applied research services for hundreds of international maritime companies in the fields of aquaculture, simulated shipboard environments, offshore safety and survival, fisheries conservation, seabed mapping, marine data transmission, and underwater acoustics.
- Nova Scotia Community College provides research, training, and consulting services to regional SMEs in the fields of coastal disaster management, wireless networks for environmental monitoring, and applications of AJAX and LiDAR remote sensing technologies to provide practical solutions for regional businesses ranging from blueberry farmers, to internet providers, to gravel operators.

- Prince Edward Island's Holland College, in partnership with the Canadian Police Knowledge Network, designs, develops, and applies innovative e-learning security training environments for law enforcement and correctional services across Canada.
- Ontario's community colleges work with SMEs in a range of fields, including: permeable pavements, waterproof coaxial connectors, tele-health homecare networks, catastrophic loss reduction for insurers, process control for petrochemical companies, ecosystem restoration, inter-professional disaster planning, in-mold plastic temperature measurement, industrial safety glove assembly automation, vertical axis wind turbines, integrated in-suite ventilators, and so forth.
- Manitoba's Red River College provides infrastructure, training, and testing facilities for major North American manufacturers related to energy efficient building materials, hybrid hydrogen engine technology, and advanced manufacturing practices.
- Northern Alberta Institute of Technology, in partnership with Shell Oil, provides over \$12 million per year in state-of-the art manufacturing, mechanical engineering, electronics engineering, and applied information system services to a diversified spectrum of major North American industries.
- Olds College provides research, training, technology development, environmental impact, and scale-up services for Alberta's nutraceutical foods, biofuels, and biolubricants industries.
- British Columbia's colleges and institutes provide services to find alternative uses for decommissioned shipyards, to reduce occupational injury among forest workers, to find holistic production processes for the Pacific shellfish industry, and to commercialize blood infusion systems with medical product developers.
- Across the North, college research institutes are developing marketable cold weather tools, gas hydrate production technology, and arctic internet connectivity.

Particularly noteworthy in this context are Québec's *College Centres for Technology Transfer (CCTTs)*, which represent a unique model of college research funding that effectively integrates all three funding streams (colleges, provincial

government, and the market) in a collaborative partnership. CCTTs are incorporated by their respective CEGEP (college) Governing Board, with the mission of providing technical assistance, applied research, and training services to support regional economic development. Through these distinctive arrangements, CCTTs transfer knowledge and innovations to SME clients, while providing renewed currency for college faculty and otherwise inaccessible research skills development for college students.

Currently there are 40 CCTTs, each associated with a particular CEGEP, and each operating within its own area of specialization. Province-wide, CCTTs are staffed by over 500 professional and experts in their fields, with a mandated 20% of positions filled by college faculty through a provincially funded faculty release program. The Quebec government allocates \$8.8 million in annual funding to support CCTTs, and has recently announced an additional \$12.6 million over 3 years to establish new CCTTs and to broaden the networking between CCTTs and other stakeholders in the innovation spectrum. Significantly, the funding of CCTTs involves a high degree of cooperation between provincial ministries; MELS (Ministry of Education), MDEIE (Ministry of Economic Development), and other ministries share capital costs on a 54/33/13 basis, while operating costs are shared on a 60 (MDEIE)/40(MELS) basis. Further funding support is also available for SMEs working with CCTTs in the form of federal R&D tax credits from the Scientific Research and Experimental Development Tax Credit Program (SR&ED), 40% provincial tax credit refunds, and additional provincial refund programs returning up to 50% of project-related expenses (to a maximum of \$50K). All CCTTs must submit to periodic evaluation, and submit an annual audit report to the provincial government; significantly, a single report has been designed that meets the requirements

of both sponsoring ministries. To date, economic results from CCTT investment, as reported by the Province of Québec (2005), can be illustrated by the following outcomes:

- CCTTs provided services to over 3000 clients, of which 65% were SMEs, 17% large private sector companies, 16% public sector partnerships.
- Revenues from clients exceeded \$30 million.
- Provincial infrastructure grants awarded exceeded \$23 million.
- 435 new employment positions were created (88% in client companies, 12% in CCTTs).
- Between 1999 and 2003, 11 new enterprises were launched.
- Over 200 faculty and 1,500 students were involved in CCTT research activities.

According to the Québec government's (2005) financial statement, the CCTT system has generated \$3.1 in revenues for each \$1 in base funding from the province (p. 9).

Of particular relevance for our emerging conceptual framework for research at Canadian colleges, research funding specifically allocated to faculty release time at CCTTs is provided through the research technology branch of MELS. In *An Innovative and Prosperous Quebec: Quebec Research and Innovation Strategy* (2007), the Quebec government stipulates that "releasing CEGEP lecturers from their teaching duties is an essential condition to ensure the survival and consolidation of CEGEP research" (p.59). To this end Quebec has dedicated over \$18 million dollars for the "enhancement of the CCTT program through expanded release of more CEGEP teachers to participate in research activities at CCTTs" (p. 59).

The successful integration of a research culture into the college environment, through this uniquely effective collaborative funding model, is illustrated by two samples drawn from the 40 CCTTs currently operating in Quebec:

- TransBioTech - CEGEP Levis-Lauzon, Levis. This CCTT is one of Quebec's major biotechnology transfer enterprises, providing access to innovative bio-receptor technologies used by food and pharmaceutical companies. Transbiotech's laboratories meet Health Canada bio-confinement level 2 standards, and are accredited by the Canadian Council on Animal Care. Located within the technology complex of CEGEP Levis-Lauzon, Transbiotech actively involves a complement of 5 teachers and successive cohorts of students who complete research projects or engage in remunerated training through co-op positions. Government and commercial funding partners include the Society for Economic Development, Canadian Forest Service, Bioxel Pharma, and an international veterinary pharmaceutical company. TransBiotech is a member of the Canadian Technology Network and the AgBioCentre Business Incubator Network. TransBiotech develops and transfers an innovative platform of bio-receptor technology to food and pharmaceutical companies throughout the province, improving their competitiveness in the global biotechnology market. Simultaneously, the TransBiotech CCTT at Levis-Lauzon CEGEP provides continuous improvement for college faculty, and research skills training for the next generation of science and technology workers.
- Centre for Textile and Geosynthetic Technologies (CTT Group) - CEGEP St. Hyacinthe. Founded in 1987, this CCTT has grown to a workforce of 45, with a customer base of more than 300 companies in the textile, geosynthetics, and polymer sectors. In collaboration with Canadian and international universities and research centres, CTT Group develops and tests innovative "intelligent" textile-based products such as geotextiles, nonwovens, geosynthetics, and protective clothing. Their Commercial Development Services (CDS) division helps companies increase their competitive capabilities and seek out new business opportunities. The CTT Group is also a key source of information for its members and clients through publication of its industry-standard *Textile Journal*, and through networked access to a database of thirty specialized journals. Governmental and institutional partners include: Féd. Textile du Canada, Hydro-Québec, Fédération des syndicats textiles et vêtements (CSD), Comité sectoriel de main-d'œuvre de l'industrie textile du Québec, École des

Technologies Supérieures, and Industry Canada. Again, students from the associated CEQEP at St. Hyacinthe develop specialized research skills through on-site research programs, while a revolving complement of faculty constantly renew their currency in this critical sector of Quebec's new economy.

In summary, colleges are at a severe disadvantage vis-à-vis universities in terms of accessing traditional funding sources such as provincial/institutional support and government granting councils. Provincial operating grants, for the most part, do not include resources for conducting research at colleges; consequently, colleges that wish to build research cultures must allocate scarce internal resources at a cost to other programs. Colleges face similar disadvantages in accessing research funding from governmental granting councils, where university-centric eligibility criteria create inequitable competitive barriers for college faculty. However, with respect to research funding drawn from market sources, colleges have a well-established tradition of collaborative arrangements with businesses and industries to provide specialized skill training, consulting, and applied research services. In particular, Québec's model of CCTTs provides a robust example of the benefits that can accrue through multidimensional, cooperative funding arrangements involving a spectrum of stakeholders.

f. Research Outputs

In our working model of research in higher education, traditional indicators of *research output* such as publications, citations, research dollars, and faculty awards, are being supplemented by additional indicators of output related to technology transfer (patents, royalties, equity partnerships, spinoff companies), participation in research networks, and measures of student performance and training (Finnie & Usher, 2005; Fisher, 2008b; Gibbons, 2003; Neave, 2002; Rowley, 1999; UNESCO, 2006). However, in the context of Canadian colleges, the situation is commonly reversed; in this case, non-traditional measures appear to be more prevalent than traditional measures as indicators of research output at colleges.

For example, while publications, research grants, and faculty awards have long been the primary indicators of faculty output in the university setting (Badali, 2005; Bok, 2006; Chant & Gibson, 2002; Sykes, 1988), in the college setting these measures are infrequently used to portray research activity, and play little to no role in personnel decisions related to employment or promotion. College faculty have neither a time component in their workload formula, nor any explicit expectation, to participate in activities related to research, and consequently the traditional measures of research output such as publications, grants, and awards, are not embedded in the college cultures or contracts. In fact, for those college faculty who choose to engage in scholarly activities, there are few avenues for publication of college-related research findings. While college-generated or college-related studies are occasionally published in Canadian scholarly journals such as, for example, the *Journal of Teaching and Learning*, *Canadian Journal of Higher Education*, or *Journal of Applied Research in Learning*, only one peer-

reviewed scholarly journal, *College Quarterly*, is specifically dedicated to publishing research arising from, and related to, Canadian colleges. With respect to research *grants* as traditional indicators of research output, again, few college-specific funding programs exist, and few release time or buy-out opportunities are available for college faculty interested in participating. Consequently, college faculty, who are expected to teach full time and who have no release time to conduct research, publish results, or present findings at conferences, are again at a severe disadvantage when competing for research grants against university-based researchers whose CVs often reflect extensive histories of publications and grant awards. Furthermore, only 12% of respondents to the author's (2008a) national survey had earned the Doctoral credentials which are a prerequisite for eligibility at most granting councils. Therefore, the traditional indicators employed to gauge university faculty research output (publications, grants, awards) are not valid measures of research activity in the college setting.

However, with respect to the growing legitimacy of non-traditional measures of research activity, such as technology transfer, network participation, and student training, these indicators seem particularly well suited to the college environment (Bonewits & Soley, 2004; Davenport, 2002; Finnie & Usher, 2005; Gibbons, 2003; Laidler, 2002; Neave, 2002; Rowley, 1999; UNESCO, 2006). Considering the nature of research activity at colleges, especially with respect to applied research, these output measures more accurately reflect actual college mandates and research activities, such as: assisting in product and process development, building awareness of new and best practice technologies, assisting with market and product feasibility assessments, supplying input to business development, providing consultancy/mentoring/brokerage services,

disseminating research results through technology transfer, and so forth (ACCC, 2006; Bélanger, et al., 2005; Corkery, 2002a; Fisher, 2002b; Madder, 2005; Powers, 2003; Province of Quebec, 2005). Corkery's (2002a) seminal study of research and innovation activity at colleges, for example, reported college research outputs in terms of the realization of 515 industrial and private sector projects, development of 90 prototypes, approval of 6 patents and 5 licenses, and creation of 14 spin-off companies.

This focus on the role of colleges as instruments of research development and commercialization was graphically illustrated by a conceptual model developed by the Association of Canadian Community Colleges (2006) which reflected research outputs measured progressively across the innovation spectrum in terms of patents, licenses, improved products or processes, adoption of new technologies, technical solutions, enhanced business capacity, technology diffusion, increased number of jobs, and ultimately, economic impact (ACCC, 2006). Figure 7 illustrates the ACCC model for measuring the outputs of research development and commercialization at Canadian colleges.

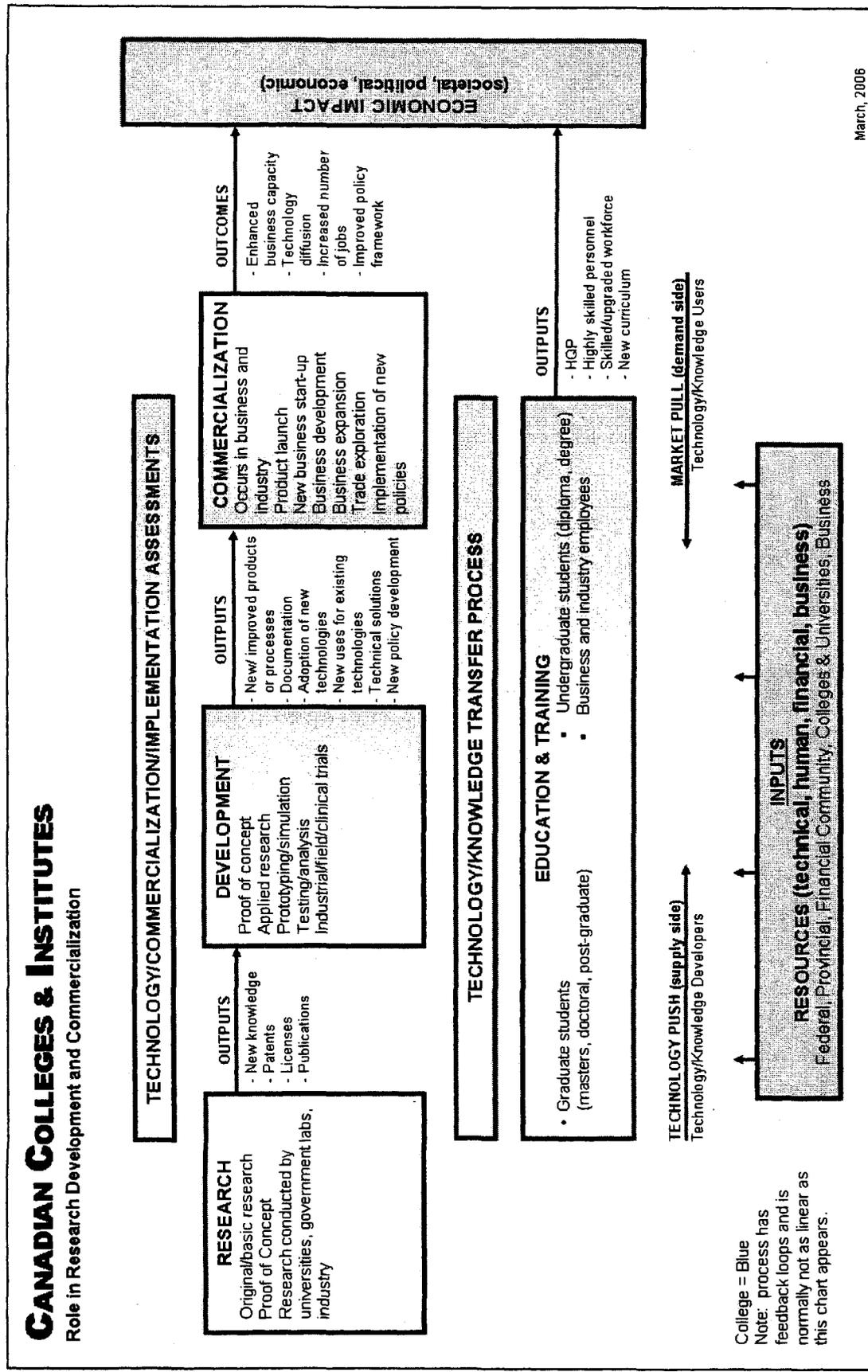


Figure 7. ACCC model for research development and commercialization (© ACCC, 2006. Used by permission).

Additionally, indicators of research output in the university setting are expanding to include measures of *student performance and research training*. In the college setting, where the primary purpose of incorporating research is to complement the core mission by producing graduates who are *more* highly qualified, innovative measures related to student performance are increasingly relevant as indicators of research output at colleges (ACCC, 2006; Bélanger, et al., 2005; Bok, 2006; Finnie & Usher, 2005; Fisher, 2008b; Neave, 2002; Rowley, 1999). While student performance at universities focuses primarily on *graduate* students, and is measured with traditional indicators of research output such as publications, grants, and awards, student performance and training in the college system, which could be more accurately described as *undergraduate* in nature, is necessarily measured by different indicators, such as participation in real world research projects, involvement in immediate applications of instructional knowledge, contributions to innovative designs and applications, feedback from employers, and so forth. Merging these two types of research output, Ivany (2000) described how the dual college missions of employment education and economic development are synthesized in research activities that (1) involve college students, and (2) “extend beyond the relatively straightforward provision of training. . . . Since the impetus for training is often the adoption of a new technology, the college is immediately drawn into the more complex role of supporting technology transfer and diffusion” (p. 11). Ultimately, the impact of college research, in terms of *more highly qualified* and *differently qualified* college graduates, will be signified through their long-term contributions to innovation and productivity in the “new economy” (ACCC, 2006; Bélanger, et al., 2005; Fisher, 2008b; Ivany, 2000; Skolnik, 2000).

Therefore, with respect to our emerging conceptual framework for research at Canadian colleges, significant strides have been taken by Canada's colleges to enhance accountability by developing appropriate sets of measures and performance indicators that can be used to gauge the multidimensional impact of their applied research and innovation activities (College Centres for Technology Transfer, 2005; Colleges Ontario Network for Industry Innovation, 2007, Madder, 2005, NSERC, 2008; Polytechnics Canada, 2008; Vista, 2007). The plethora of indicators arising from these various attempts can be condensed into a more manageable and cohesive set of measures to gauge the extent and quality of research output at Canadian colleges.

Reflecting the purposes for which research is conducted, this set of indicators reflects two overarching categories. First, a cohesive set of indicators reflects *institutional output* in terms of expansion of student participation in research and scholarship, enhancement of faculty currency, knowledge transfer and dissemination, growth of institutional research capacity, research networks, and a spirit of discovery, and, ultimately, production of college graduates who are qualitatively *more highly qualified* than they would have been without the research experience. The second major category reflects *regional social and economic output* in terms of business development, employment, real world problem solving, collaborative partnerships, technology transfer and IP benefits such as patents, licenses, and royalties, and demonstrable contributions to the social and economic improvement of the communities served by each college. Table 5 summarizes these indicators in a proposed set of Indicators of College Research Output.

Table 5
Indicators of College Research Output.

Output Category	Indicator	Metric
Institutional Outputs	Student involvement	<ul style="list-style-type: none"> • Number of students • Number of student projects
	Faculty involvement	<ul style="list-style-type: none"> • Number of engaged faculty • Number of faculty projects
	Enhanced educational experience	<ul style="list-style-type: none"> • Learning objectives met through project-based delivery • Research integrated into curriculum • Real-world problem-solving activities
	Highly Qualified Personnel	<ul style="list-style-type: none"> • Graduates in the workforce using research-related skills • Satisfaction of employers
	College investment in research infrastructure	<ul style="list-style-type: none"> • Budget allocations • Administrative positions • Research training
	Enhanced reputation	<ul style="list-style-type: none"> • Recruitment of research-oriented students and faculty • Dissemination activities (publications, workshops, conference presentations) • Recognition and awards
	Spirit of discovery	<ul style="list-style-type: none"> • Levels of interest and participation • Recognition of student/faculty achievement • Critical mass for future growth
Social and Economic Outputs	Awareness of college research capacity	<ul style="list-style-type: none"> • Approaches from industry and community organizations • Industry and community problems addressed
	Collaborative partnerships	<ul style="list-style-type: none"> • Linkages and partnerships with other stakeholders • Increased R&D investment • Revenue sharing
	Commercialization and Technology Transfer	<ul style="list-style-type: none"> • Improved products, services • Adoption of new technologies • Increased productivity, sales, competitiveness • Patents, licenses, royalties
	Client Satisfaction	<ul style="list-style-type: none"> • Increased client capacity • Satisfaction surveys • KPIs

Appropriate indicators can enhance accountability and provide important insights. However, while the proposed Indicators of College Research Output condenses a wide range of measures into a manageable and coherent metrics model, no single set of metrics is entirely satisfactory or appropriate in all cases of college research activities. Further collaboration on the development of local, regional, provincial, and pan-Canadian measures of research output and impact will prove fruitful as colleges expand their collaborative activities in applied research and innovation.

In conclusion, the following example dramatically illustrates how applied research activities at Canadian colleges can synthesize the benefits of college/private sector partnerships by producing economic expansion while simultaneously training highly qualified graduates who are ready and eager to participate in the spirit of innovation characterizing Canada's applied research agenda:

- Red River Raycer. One of the goals of the national research and innovation initiative is "getting Canadians excited about science and technology" (Industry Canada, 2007, p. 80). A clear example of the role of colleges in achieving this and other national research goals is illustrated by Red River College's (RRC) Red River Raycer project. Developed at RRC's Aviation and Aerospace Training Centre in a collaborative partnership with the Province of Manitoba, Western Diversification Fund, Boeing Aerospace, Standard Aero, and Bristol Aerospace, this student-run venture produced Manitoba's first solar-powered vehicle, which travels up to 100km/hour without using a single drop of gasoline. RRC students designed and implemented research protocols that increased the car's efficiency through the testing and application of lightweight composite materials, aerodynamic design, and innovative solar-array technology. Building this solar-powered car from the ground up, students acquired hands-on experience in large scale multi-disciplinary planning, budgeting, design, manufacturing, product testing, and real-time maintenance using leading edge resources, culminating in their successful completion of the 11-day, 4,000 km Texas-

to-Calgary North American Solar Challenge. Successive cohorts of students in this program continue to “Make History/Drive the Future” through their ongoing improvements to innovative solar-power designs and materials. Figure 8 illustrates the Red River Raycer.

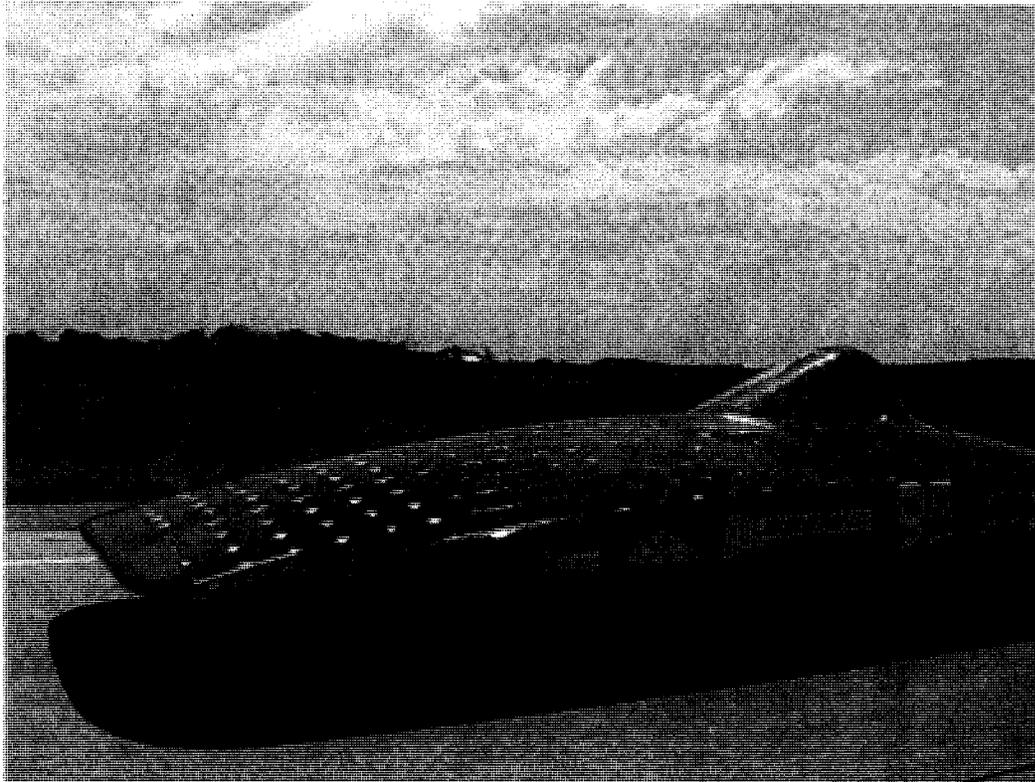


Figure 8. Red River Raycer (© Bob Mai, 2005. Reproduced with permission.)

SUMMARY: Application of the Model to Colleges

The purpose of this chapter was to apply the working model of research in higher education, developed in the previous chapter, as a lens to investigate the implications of building a research culture at Canadian colleges, and as a benchmark against which the progress of this initiative can be measured. Augmented by a review of the literature specifically related to research in the college setting, and by examples drawn from the

author's (2008a) national survey of college faculty and (2008b) national study of college research capacity, the six constructs comprising the working model (*research purpose, research forms, research governance, research personnel, research funding, and research outputs*) were employed to analyze, in a structured and systematic manner, the current state of development of the national college research initiative.

- a. *Research Purpose.* In contrast to research at universities, where the primary purpose is the generation and dissemination of new knowledge, research at colleges serves a different purpose. Since colleges historically have been focused on the integrally related core missions of employment-related education and regional economic development, the primary purpose of incorporating research into college mandates is to enhance these core missions by enriching the student experience and the quality of college graduates, keeping faculty current and engaged, and contributing to the social and economic well being of the communities they serve.
- b. *Research Forms.* The university model of basic, curiosity-driven, discipline-centred research does not reflect the research forms most applicable to colleges. In the college setting, non-traditional forms such as the *scholarship of teaching and learning, applied research, and Mode Two research* embody new forms of research and scholarship that resonate with core college missions, reflect the preferred areas of interest reported by college faculty (Fisher, 2008a), and represent particularly appropriate opportunities for building a robust and sustainable research culture at Canadian colleges.
- c. *Research Governance.* Great strides have been taken in research governance at colleges, as illustrated by the establishment of research offices, assignment of research responsibilities, and implementation of policies and procedures. However, concerns remain about the increasing pervasiveness of corporate values, minor participatory role of faculty, reconsiderations of intellectual property rights with respect to the output of faculty researchers, engagement of non-faculty in research activities, and facilitation of processing external grants within the parameters of

established college structures. Since colleges do not have a well-established history or mandate with respect to research governance, they have an opportunity to develop policies and processes appropriate to their needs.

- d. *Research Personnel.* Colleges face distinct challenges with respect to faculty employment arrangements. College faculty are employed as full time *teachers*, with no remuneration, employment, or promotion related to conducting research, and no accommodation in collective agreements for faculty release time to conduct research. The *lack of faculty release time*, especially in the context of competing demands for ever-scarcer resources, presents the single greatest barrier to building a sustainable research culture at Canadian colleges. Framing the positive outcomes of college research within the paradigm of a *teaching/research nexus* highlights the benefits to all stakeholders, and provides a strong rationale for integrating research into college programs.
- e. *Research Funding.* Provincial operating grants, for the most part, do not include resources for conducting research at colleges, and colleges that wish to build research cultures must allocate scarce internal resources at a cost to other programs. Colleges also face disadvantages in accessing research funding from government granting councils, where university-centric eligibility criteria create inequitable competitive barriers for college faculty. With respect to research funding drawn from market sources, however, colleges have a well-established tradition of collaborative arrangements with businesses and industries to provide specialized skill training, consulting, and applied research services. Québec's model of CCTTs provides a robust example of the benefits that can accrue through multidimensional, cooperative arrangements involving a spectrum of stakeholders.
- f. *Research Outputs.* Colleges are making progress in purposefully examining and developing appropriate metrics, models, and measures of research output to gauge the impact of their applied research and innovation activities. Two recurrent general categories of outputs include (1) enhanced skills training for college graduates who, as future highly qualified employees, can contribute on a long-term basis to Canada's economic and social goals, and (2) increased capacity for ongoing innovation tailored

to the needs of the local and regional economy. Appropriate indicators can enhance accountability and provide important insights, but, currently, no single set of metrics represents satisfactorily all cases of college research activities.

Consequently, based on this wide-ranging analysis of the implications of incorporating research into Canadian colleges, the working model of research in higher education, developed in Chapter II, provides a benchmark for making revisions to more accurately reflect and accommodate the unique challenges, opportunities, and circumstances at Canadian colleges. Chapter IV subsequently synthesizes the results of these analyses, revises the working model accordingly, and proposes a single, integrated, comprehensive conceptual framework to provide clarity, focus, and direction for the further development of a coherent, robust, productive research culture for Canadian colleges.

IV. TOWARD A CONCEPTUAL FRAMEWORK FOR RESEARCH AT CANADIAN COLLEGES

Colleges are unique postsecondary educational institutions, and our working model of research in higher education can provide a useful, coherent conceptual framework for college research if the attributes of the model's six constructs are tailored appropriately to fit the college environment. The purpose of the previous chapter was to apply the working model as a lens to analyze the implications of developing a research culture at Canadian colleges, and as a benchmark against which to measure those developments. The six constructs comprising that working model were found to be reliably comprehensive since, based on a comprehensive analysis of university models, and on the subsequent extensive analysis of the implications of the model in the college context, no other significant constructs were identified that contributed further insights or warranted inclusion in the emergent conceptual model.

Consequently, the purpose of this chapter is to revise the six constructs of the working model accordingly, and to propose a single, comprehensive, integrated conceptual framework for research that accurately reflects and accommodates the research culture emerging at Canadian colleges. In subsequently delineating the attributes of the six key constructs in the context of college research, some critical questions are appended to each construct in order to further elucidate and illuminate the model proposed in this chapter. Figure 9, A Conceptual Framework for Research at Canadian Colleges, provides a schematic representation of the final framework, which can now be deployed to describe the attributes of a research model designed specifically for Canada's 21st century colleges.

A Conceptual Framework for Research at Canadian Colleges

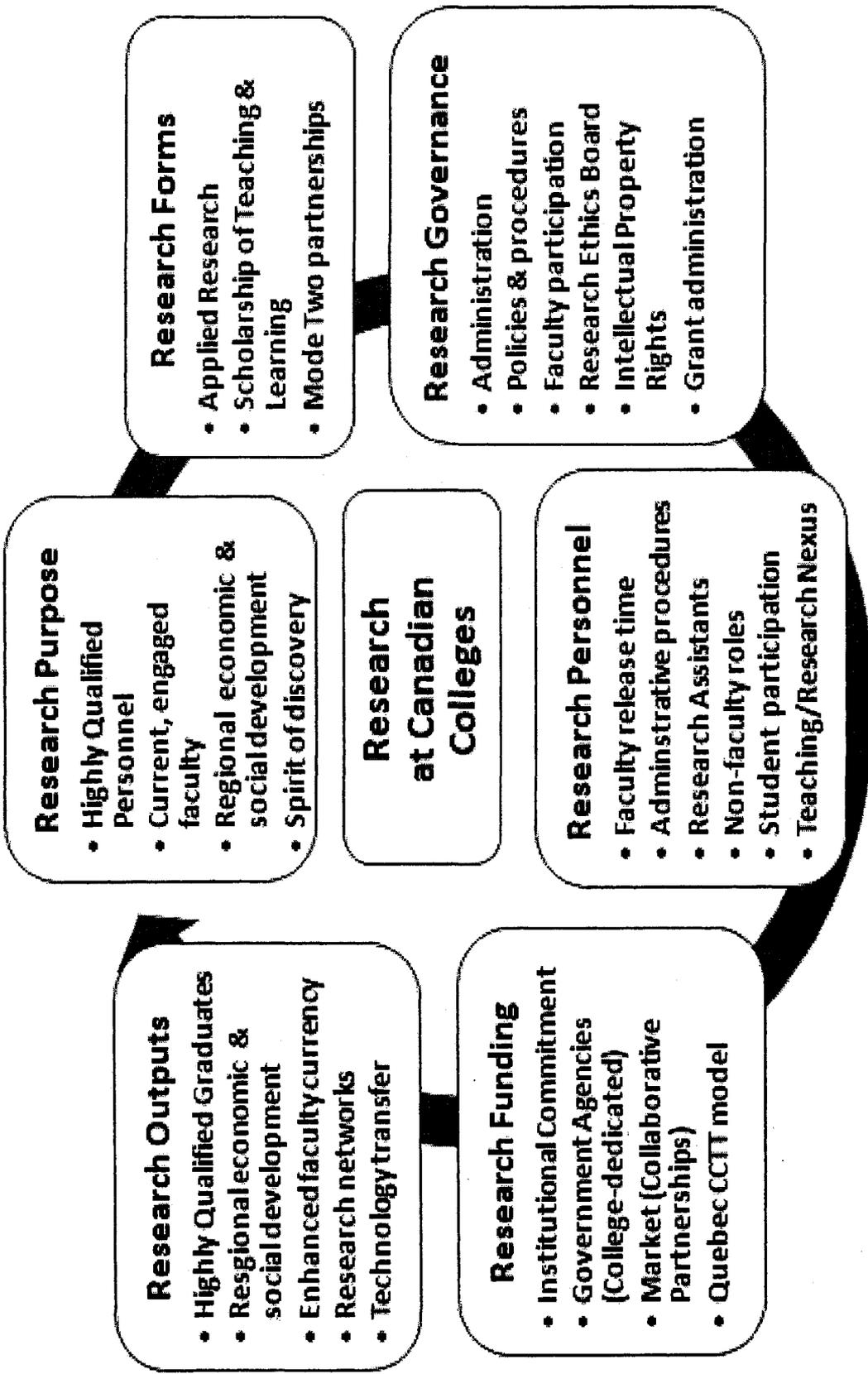


Figure 9. A Conceptual Framework for Research at Canadian Colleges.

a. Research Purpose.

Since their inception, colleges have had the integrally related core missions of employment-related education and regional economic development. Therefore, the primary purpose of incorporating research into college mandates is to enhance and extend these core missions by enriching the student experience and the quality of the preparation of college graduates, by keeping faculty current and engaged in their fields of expertise, and by contributing to the social and economic well being of the communities they serve. In this light, research is recognized and pursued as an adjunct to, rather than a diversion from, the core college missions (ACCC, 2006; Bélanger, et al., 2005; Corkery, 2002a; Dennison, 1995; Doern, 2008; Fisher, 2002b; Industry Canada, 2007; Ivany, 2000; Levin, 2001; Madder, 2005; NSERC, 2007; Skolnik, 2000; Weedon, 2008).

In terms of enhancing student learning, research activities provide real world challenges, hands-on training with leading-edge technologies, and advanced training in specialized skills. Furthermore, research activities expose students to the higher order thinking skills increasingly required in the new knowledge-based economy. One fundamental characteristic of the new knowledge economy is that it not only “creates new job categories requiring unique skill sets, but it also drives up the *knowledge intensity* of existing occupations” (Ivany, 2000, p. 11). Consequently, college graduates who have been exposed to and have participated productively in research and scholarship activities, should be qualitatively *more* highly qualified than previously to contribute to the social and economic well-being of their communities.

College research activities also should support the related core mission of economic development by assisting local/regional businesses, especially SMEs that lack

the requisite internal resources, in product and process development, building awareness of new and best practices and technologies, assisting with market and product feasibility assessments, supplying input to business development, providing consultancy/mentoring/brokerage services, and disseminating research results through technology transfer (ACCC, 2006; Bélanger, et al., 2005; Colleges Ontario, 2008; Corkery, 2002a; Fisher, 2008b; Ivany, 2000; Madder, 2005; Powers, 2003; Province of Alberta, 2008; Province of Quebec, 2005). With respect to role of college faculty in this process, “there is little question that the match between the skill sets of college faculty and the practical hands-on nature of applied commercialization stage research is strong and dynamic” (Ivany, 2000, p. 12). By expanding the opportunities to participate in collaborative research activities with regional businesses and industries, the currency of college faculty will be augmented in their areas of professional expertise, and further enhance the core college mission.

However, colleges should be mindful of the growing trend toward *academic drift*, that is, the tendency of some institutions to emulate the roles and missions of universities. In Canada, this tendency is manifest in the transformations of some colleges toward *Institute of Technology, Polytechnic Institute, University-College*, or full *University* status, a movement often accompanied by increased attention to and promotion of applied research activities. However, since there is little to no differentiation in legislative mandates or actual delivery of college programs, these re-designations often reflect little more than changes in name only, and are related primarily to market branding for competitive advantage in pursuit of higher enrolments, or for perceived advantages in access to research funding (Doern, 2008; Skolnik, 2002). Since the attributes of

polytechnic programs essentially parallel those of traditional college programs, the question is whether colleges would best serve their students and their communities by acquiring *polytechnic status*, or by expanding *polytechnic programs* within their existing status as community colleges.

Mindful of the potential for academic drift, colleges should consider incorporating research into their programs and activities only for the purpose of enhancing and extending their core missions of: (1) developing a well-prepared base of graduates who are highly qualified in the requisite higher order skills for productive employment in the 21st century; and (2) enhancing their contribution to the economic and social well-being of the communities they serve. As they consider the purpose of incorporating research into their mandates, colleges need to keep these questions in the forefront:

- Does the institution have a clearly articulated purpose for incorporating research and scholarship activities?
- To what extent does the research purpose reflect and align with institutional goals and strategic directions?
- To what extent does academic drift influence the decision to incorporate research in the institutional plan?
- To what extent does the research purpose pertain to Highly Qualified Personnel, regional economic development, renewed faculty currency, and a spirit of discovery and innovation at the college?

b. Research Forms.

The traditional form of basic, curiosity-driven, discipline-centred research is no longer an adequate description of the range of research activities conducted in contemporary higher education. Especially in the college setting, forms such as the *scholarship of teaching and learning*, *applied research*, and *Mode Two* research

(organized around particular applications) embody new opportunities for research and scholarship that resonate with core college missions, reflect the preferred areas of interest reported by college faculty (Fisher, 2008a), and represent timely and appropriate opportunities for building a robust and sustainable research culture at Canadian colleges (Boyer, 1990; Fisher, 2008b; Gibbons, 2003).

Specifically with respect to the career-related training of Highly Qualified Personnel, the enhancement of instruction through the *scholarship of teaching and learning* will have to produce college graduates who are qualitatively *more* highly and differently qualified to meet the challenges of the 21st century. Any research or scholarship that contributes to an improvement in teaching and learning will complement the fundamental goals of Canadian colleges to the betterment of their students and their communities.

Teaching is the heartbeat of the education enterprise and, when it is successful, energy is pumped into the community, continuously renewing and revitalizing the institution. Therefore, excellence in teaching is the means by which the vitality of the college is extended. (Boyer, 1990, p. 60)

Boyer further emphasized that the scholarship of teaching and learning:

is particularly appropriate for community colleges. We still have much to understand about how students learn, especially those from less advantaged backgrounds, and faculty in community colleges should be authorities on this task. . . . If the concept of 'teacher-researcher' proves to be a field of research in which community college professionals engage, then this approach to research may well emerge as the most important facet of their scholarship. (p. 61)

Faculty respondents to the author's (2008a) national survey also reported a very strong interest in pursuing this form of research. In the context of building a research culture at Canadian colleges, therefore, inclusion of the scholarship of teaching and learning in our conceptual framework would encourage "faculty participation in scholarship in a way that is inclusive, meaningful, and pertinent to the individual faculty member" (Dick, 2006, p. 2), thereby enhancing the quality of instruction received by contemporary college students.

Boyer's (1990) model also recognized the *scholarship of application*, commonly referred to as *applied research*. This form of research represents a natural extension of college mandates, which have always had the precept that higher education must serve the interest of the larger community. Applied research provides a relevant form where "theory and practice vitally interact . . . as the scholar asks: How can knowledge be responsibly applied to consequential problems?" (Boyer, pp. 21, 23). Based on their historical mandates, colleges are well situated to engage in this form of applied research and to contribute substantially to the national research and innovation agenda, which seeks to "increase the practical applications of research in Canada . . . [and to] turn knowledge into the products, services, and production technologies that will improve our wealth, wellness, and well-being" (Industry Canada, 2007, p. 9). Another natural extension of college activity is reflected in the emerging *Mode Two* form of research, where faculty "join networks, enter alliances, and form partnerships of various kinds, . . . [and where] problem solving is organized around a particular application" (Gibbons, 2003, p. 113).

Therefore, *research forms* in our conceptual model of research at Canadian colleges includes the relevant and applicable attributes of the *scholarship of teaching and learning*, *applied research*, and *Mode Two* forms of research. Some critical questions related to *research forms* might include:

- To what extent does the institution support and implement *applied research*?
- To what extent does the institution support and implement the *scholarship of teaching and learning*?
- To what extent does the institution support and implement Gibbons' (2003) Mode Two form of collaborative knowledge application?
- What is the balance among these various forms of research?
- On what form of research do colleges wish to focus?

c. Research Governance

Research governance pertains to the “systemic and institutional arrangements under which research is performed; more specifically, it focuses on the questions about how and with whose participation decisions about research are reached” (UNESCO, 2006, p. 9). In our conceptual framework for college, the attributes of research governance include administrative functions such as establishment of research offices, assignment of research responsibilities, strategic research planning, financial management, capacity building, quality assurance, and implementation of the appropriate policies and procedures required to support a research culture. Colleges may need to shift the place of research such that they will consider including faculty researchers as members of governing bodies, and ensuring their participation at all stages of the research enterprise.

Any research plan needs to be owned by those who will contribute to its achievement. A participative planning and monitoring process in which group members jointly develop, and monitor, their progress towards achieving the objectives of a research plan is essential. Ownership can only be achieved if all researchers (from research students to professors) have involvement in the planning process. (Rowley, 1999, p. 2)

Colleges engaging in research need to develop and implement rigorous *governance policies* related to, among others things, ethics protocols, academic freedom provisions, research integrity, conflict of interest guidelines, peer review, and intellectual property rights. Colleges are expected to establish Research Ethics Boards and to implement ethics policies consistent with the Tri-Council Policy Statement (2008). Policies regarding Intellectual Property Rights must also be carefully delineated, especially in the context of collaborative applied research projects with corporate partners, which will result in a range of benefits in the form of increased sales, productivity, and marketability, or embodied in technology transfer rights such as patents, licenses, royalties, and so forth. Such policies must accommodate and synthesize the commercial needs of corporate partners, the economic goals of funding agencies, the instructional objectives of the college, and the rights, academic, remunerative, and otherwise, of faculty researchers. Clear policies also must be developed to facilitate the administration of grants from external funding agencies, within the parameters of established financial, accounting, and human resources departments not historically structured for such contingencies.

In summary, changes in governance should fulfill a *developmental* function in creating a research culture in which “research comes to be viewed as an integral component” (Rowley, 1999, p. 3), as well as an *integrative* function in managing the “interface and balance between research and other institutional activities” (p. 4). At this point in time, colleges have a unique opportunity to develop and implement governance structures, policies, and processes specifically adapted to facilitate and nurture the growth of research cultures in the college environment. Some critical questions related to *research governance* might include:

- Does the nature of sponsorship (public, private) affect research governance?
- Are institutional mechanisms in place for the support of research?
 - Have specific advisory bodies been established to facilitate research governance?
 - Is the membership of research governance bodies representative of a wide range of stakeholders and participants?
 - To what extent are faculty/researchers represented on governance bodies?
- Are policies in place regarding ethics, academic freedom, research integrity, conflict of interest, intellectual property rights?
 - Has a Research Ethics Board been established?
 - Does the institutional policy on Intellectual Property Rights clearly delineate and fairly balance the rights of all stakeholders and participants?
 - Are quality assurance mechanisms in place with respect to effective research governance?
 - Have models been established to facilitate the administration of grants from external research funding agencies?

d. Research Personnel

Colleges face distinctly different challenges than universities with respect to faculty employment arrangements related to conducting research. College faculty are employed as full time *teachers*, with no expectation to conduct research, and, with rare exception, no accommodation in provincially negotiated collective agreements for faculty release time to conduct research. This *lack of faculty release time*, especially in the current context of competing demands for ever-scarcer resources, presents the single greatest barrier to building a sustainable research culture at Canadian colleges (ACCC, 2006; Bélanger, et al., 2005; Boyer, 1999; Colleges Ontario, 2008; Corkery, 2002a, 2002b; Fisher, 2008a, 2008b; Madder, 2005; Skolnik, 2002). Among the many challenges to building a sustainable research culture at Canadian colleges and a re-conceptualization of the tension between teaching and research “is the issue of faculty time” (Boyer, p. xi). Resolution of this issue will require a renewed, concerted effort by advocates and strategic decision makers at all levels to re-negotiate collective agreements in order to recognize, incorporate, and *fund* research and scholarship as legitimate (though voluntary) activities for faculty at Canadian colleges.

In addition, *research personnel* in our model also relates to policies and procedures related to *non-faculty* participants (part-time employees, support staff, etc.) engaged as Research Assistants or in other research-related roles (such as Technology Transfer or Industrial Liaison Officers), within the established parameters and constraints related to current collective agreements, job descriptions, pay scales, and so forth. Considering the need to produce highly qualified graduates for the 21st century knowledge economy, opportunities should also be developed for college students to

participate as Research Assistants. Within the paradigm of a *teaching/research nexus*, positive outcomes of incorporating research can highlight the benefits accruing to all stakeholders, thus providing a strong rationale for including research activities as part of workload models and in collective agreements. Some critical questions related to *research personnel* might include:

- To what extent are decisions regarding employment, promotion, tenure, etc. influenced by prior experience, current participation, or future research intentions of faculty?
 - How are faculty researchers recruited to engage in research activities?
 - How are faculty researchers compensated for their research participation?
 - How is faculty release time for research negotiated/funded at the local (college) level?
 - To what extent are faculty supported in pursuing new and alternative research forms?
 - What systems are in place to mentor, advise, and assess faculty engaged in research activities?
- How are outstanding accomplishments in research rewarded and/or publicly recognized? By whom?
- What is the status of researchers at colleges, and how does this impact on faculty careers?
- To what extent are non-faculty (part-time, support staff, etc.) engaged for participation in research-related activities?
- What models have been established to facilitate the participation of non-faculty, part-time employees, or support staff in research-related activities?
- How is the role of Research Assistant facilitated? Do students have opportunities to participate as Research Assistants?
- To what extent are the benefits of the *Teaching/Research Nexus* recognized and supported as a paradigm for supporting research in the college setting?

e. Research Funding.

Colleges are at a severe disadvantage vis-à-vis universities in terms of access to traditional research funding sources such as provincial/institutional operating budgets and government granting councils. Provincial operating grants, for the most part, do not include resources for conducting research at colleges, and colleges that wish to build research cultures must allocate scarce internal resources for research at a cost to other programs. Colleges face similar disadvantages in accessing research funding from governmental granting councils, where university-centric eligibility criteria create inequitable competitive barriers for college faculty. Improvements in institutional and governmental support of research at colleges will require deliberate and concerted advocacy by stakeholders at all levels to achieve the necessary revisions to granting council eligibility criteria, provincial funding formulas, collective agreements, and local (college) strategic plans. Extension and expansion of NSERC's college-dedicated College and Community Innovation (CCI) program could establish a long-term, sustainable base upon which to build a significant research funding council to assist colleges in contributing more effectively to the national research and innovation agenda. Revisions to provincial operating grants could similarly assist in unleashing the full potential of college research capacity.

However, with respect to research funding drawn primarily from market sources, colleges already have a well-established tradition of collaborative arrangements with businesses and industries to provide specialized skill training, consulting, and applied research services. Countless examples drawn from colleges across the country illustrate the benefits and productivity unleashed through such private/public sector partnerships.

In particular, Québec's College Centres for Technology Transfer (CCTTs) provide a robust example of the benefits that can accrue through cooperative, multi-dimensional arrangements involving a spectrum of stakeholders. This unique model of cooperative funding merits further study and may provide instructive direction for similar arrangements in other provinces. Some critical questions related to *research funding* might include:

- What are the principal sources of research funding at the college?
- What is the internal allocation of institutional resources for research and scholarship, expressed as a percentage of overall college expenditures?
- What is the relative balance between government, market, and institutional sources of research funding?
- To what extent do specific research funding sources influence research decisions and directions?
- Do research sources cover only the direct costs of research or indirect costs (for example, overhead costs) as well? How are indirect costs determined and remunerated?
- How is the use of research funds monitored and evaluated? By whom? Using what criteria?

f. Research Output

Colleges are making progress in purposefully examining and developing appropriate metrics, models, and measures of research output to gauge the impact of their applied research and innovation activities in the context of their own missions and mandates. Two recurrent general categories of outputs emerging within the college research culture include measurements of: (1) enhanced skills training for college graduates who, as future highly qualified employees, can contribute on a long-term basis

to the national social and economic goals; and (2) increased capacity for ongoing innovation tailored to the needs of the local and regional economy.

Since the primary purpose of college research includes the training of highly qualified personnel who are well equipped to contribute productively in the new knowledge economy, the inclusion of *enhanced student skills* is a relevant and critical indicator of research output at Canadian colleges. Research outputs “that focus only on research without attending to research *training* . . . at best involve only a tactical reform rather than a strategic innovation. They attend to the immediate situation rather than to its outcome in the long or medium term” (Neave, 2002, p. 4). Colleges can measure the extent of student involvement in research, the extent to which research projects are integrated into the curriculum, the number of learning objectives met through increased project-based delivery, the extent of student exposure to and participation in real world problem-solving environments, and the number of graduates in the workforce using research related skills. In this sense, “college research is about putting knowledge to work, and about helping people learn, be aware of, understand, use, and ultimately contribute to our society’s body of knowledge. . . . At colleges, we teach people how to find, understand, assimilate, and apply knowledge” (Weiler, 2008, p. 26).

In addition, considering the core role of colleges in contributing to the economic development of their communities, and the function of research in enhancing and extending this mission, the economic impact of college research can be measured through indicators of client satisfaction, increased corporate sales, productivity, marketability, and new employment, or through technology transfer measures such as patent applications, patent awards, spin-off companies, and the value of equity partnerships, royalties, and

licenses. Faculty participation in Mode Two collaborative networks, linkages, and alliances represents another college-appropriate indicator of research output. Since research is an emerging phenomenon at Canadian colleges, further measures of research output could include indicators of both internal capacity building and external knowledge transfer through faculty engagement in research and scholarship activities, delivery of workshops, seminars, and conferences, and increased capacity for scientific and technological problem solving.

Development of appropriate indicators can enhance accountability for the college research initiative and provide important insights for future direction and improvement. While there is, as yet, no single set of metrics that is entirely satisfactory in all cases of college research activities, the proposed *Indicators of College Research Output* (p. 102) provides a condensed and manageable metric model that synthesizes a plethora of measures and indicators currently under consideration by a range of stakeholders. Further collaboration on the development of local, regional, provincial, and pan-Canadian measures of research output and impact will prove fruitful as colleges expand their collaborative activities in applied research, scholarship, and innovation. Some critical questions related to *research outputs* might include:

- Do the institutional measures of research output accurately reflect and align with the institution's articulated research purposes?
- What mechanisms or governing bodies are in place to evaluate research output? How is research output assessed? Who is responsible for evaluating research output?
- To what extent does participation in research and scholarly activities influence expectations with respect to personnel decisions (hiring, promotion, and tenure)?
- To what extent do publications, grants, and awards influence expectations with respect to personnel decisions (hiring, promotion, and tenure)?

- To what extent are alternative indicators of research output (faculty participation in networking, technology transfer, student performance) recognized and rewarded with respect to personnel decisions (hiring, promotion, and tenure)?
- Are policies in place to clearly delineate Intellectual Property rights related to college outputs such as technology transfer (royalties, patents, and partnerships)?
- Who is responsible for the reporting and dissemination of research outputs?
- What institutional plans are in place to enhance the quantity and quality of research output?

In summary, the proposed *Conceptual Framework for Research at Canadian Colleges* employs the six constructs comprising the working model of research in higher education developed in Chapter II, but delineates the attributes of these constructs specifically in the context of the college environment. This conceptual framework, and the knowledge base that undergirds it, can fulfill many purposes in the evolution of research cultures at Canadian colleges. The proposed conceptual framework will, hopefully, provide coherence, clarity, and focus to discussions about the emerging research enterprise, bring increasing consensus and shared direction among stakeholders both within the college community and within the larger communities they serve, and, ultimately, enable us to chart more clearly the future dimensions and directions of the research cultures emerging on contemporary Canadian college campuses.

Figure 10 provides a schematic summary of questions relevant to the proposed conceptual framework for research at Canadian Colleges.

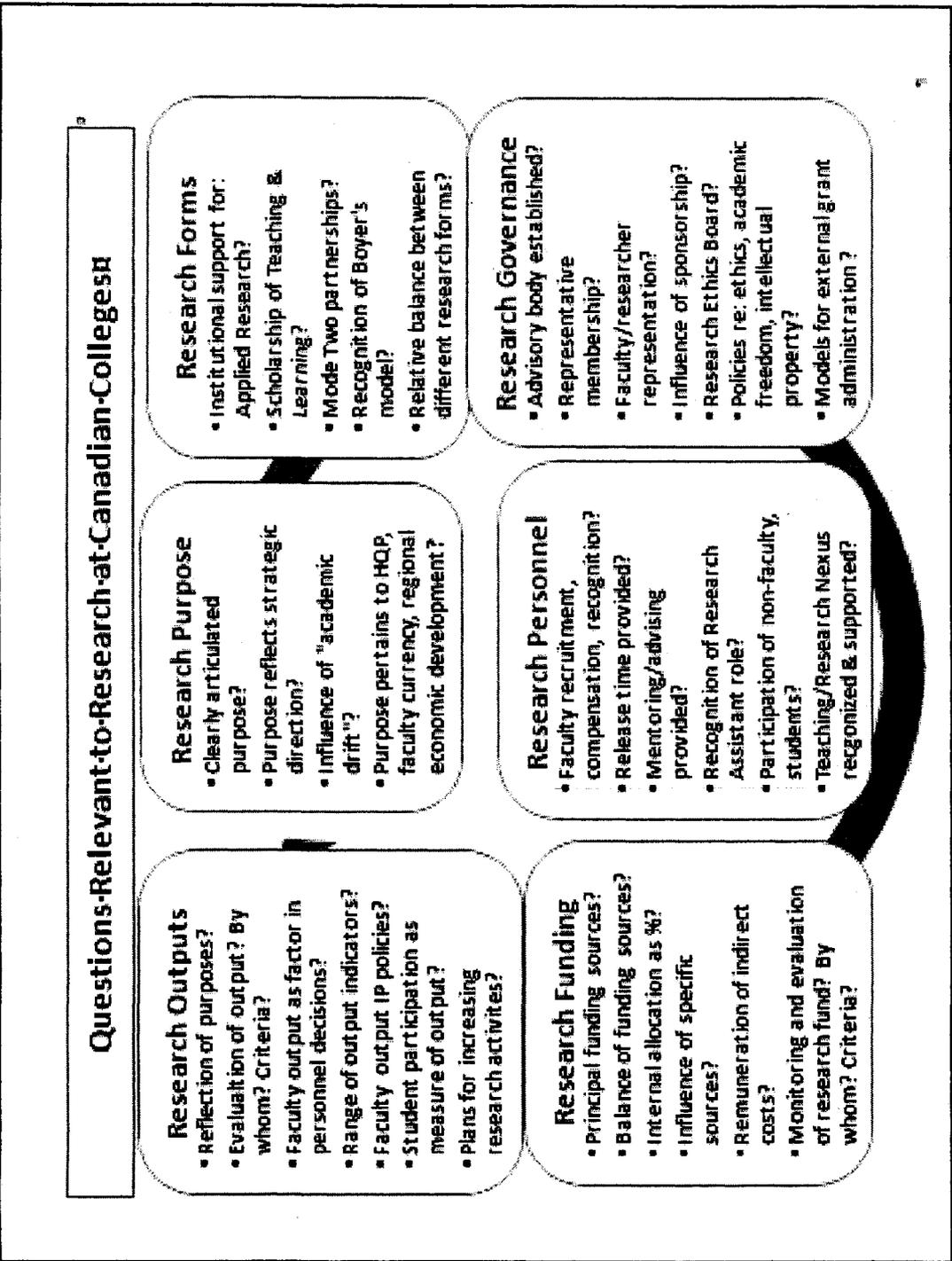


Figure 10. Questions related to research at Canadian colleges.

V. CONCLUSION

In alignment with a national initiative to increase our capacity for innovation and to prepare a new generation of postsecondary graduates to contribute productively in the new knowledge economy, many Canadian colleges are actively engaged in developing research cultures. Several recent studies of the current capacity of colleges to contribute to the innovation agenda in a meaningful way have been encouraging, but guarded, in their conclusions (ACCC, 2006; Bélanger, 2005; Corkery, 2002a, 2002b; Fisher, 2008a, 2008b; Madder, 2005; NSERC, 2007). Based on the findings of these and other studies, it is increasingly apparent that, while levels of research interest and examples of research activities are clearly increasing at colleges across the nation, this growth is occurring in an unsystematic and uncoordinated manner. This situation is further complicated by the scale of differentiation with respect to provincial legislation, collective agreements, operating budgets, funding guidelines, and areas of specialization. In particular, these studies draw attention to the fact that there is no established tradition, no clear organizational structure, no prevailing vision, and no coherent conceptual framework to guide the development of an effective and productive research culture at Canadian colleges.

Therefore, the purpose of this thesis is to address this fundamental gap by proposing a single, comprehensive, integrated conceptual framework that begins to provide clarity, focus, direction, and support for the further development of a robust research culture at Canadian colleges. Consequently, the central research question

guiding this study is: What might be the best model for building a coordinated, effective national research culture, specifically appropriate for Canadian colleges?

The methodology selected for this study has consisted of a three-stage conceptual analysis comprising: (1) an extensive review of conceptual models of research in higher education, particularly at universities, leading to a working model of research in higher education; (2) an analysis of the implications of this working model in the context of the current status of research expansion at Canadian colleges; and (3) a proposed Conceptual Framework for Research at Canadian Colleges. The resultant conceptual framework for colleges arises from the basic constructs of the model of research in higher education, but adapts the attributes of those constructs to reflect the specific characteristics, conditions, and circumstances of the evolving research culture at Canadian colleges.

Certain *limitations* in the execution of this study, and in the potential value of the conceptual framework arising from this study, need to be acknowledged. For example, the current embryonic stage of the college research initiative was reflected in a somewhat narrow range of sources and studies specifically related to research at Canadian colleges. Another constraint experienced in developing this college-specific framework arises from the spectrum of diversity that characterizes the pan-Canadian system of colleges, and the resultant lack of consistency in form, function, structure, and terminology with respect to research and scholarly activities. Furthermore, many businesses and industries involved with colleges in collaborative funding arrangements are reluctant to share information or to report benefits arising from those partnerships for fear of losing the competitive edge inherent in those collaborations.

A related limitation of this study, in the context of the goals of the national research and innovation agenda, is the emphasis on world-beating new knowledge and applications. While “promoting world-class excellence” (Industry Canada, 2007, p. 11) is one of the core principles guiding the national research agenda, and underlies many of the eligibility criteria and anticipated outcomes of relevant funding programs, the reality of college/industry collaborations occurs primarily on a much smaller scale. Most partnerships involve SMEs (Small and Medium Enterprises), and in particular, “small” enterprises, usually with fewer than 10 employees. These small local companies often approach colleges with issues related to economic *survival*, where adoption of new technologies helps companies not only to grow their business, but sometimes simply to *stay* in business, and where world-beating applications are not priorities. The Humber College flour silo project, the Niagara College frost damaged grape assessment, and the Saskatchewan Institute of Applied Science GPS/emergency response data-base, provide three examples that illustrate the inherently “small” and local nature of these commendable, value-added college/business research projects.

Similarly, in terms of outputs, the ubiquitous measures of publications, citations, grants, and awards that typify the traditional measurement of research output in the university setting do not seem appropriate in the context of the evolving college research culture. At colleges, the long-term impacts of producing highly qualified graduates, of increasing faculty currency, of encouraging a spirit of discovery, and of contributing to the social and economic development of the communities they serve, represent outputs that are much more difficult to measure than traditional university indicators of research output.

While the adoption of this model can contribute to a more coherent and systematized approach to research that is highly contextualized and viable within the college context, it also raises questions in terms of the *potential impact* of incorporating research into college environments. Initially, such a framework could assist administrative decision-making with respect to the critical question of whether or not to participate in the college research agenda. However, those colleges that choose to participate must subsequently consider the potential impact of implementing a research model, especially in terms of the requisite shifts in strategic plans, allocations of resources, modifications in collective agreements, changes in faculty expectations and workloads, and other impacts.

For example, the transformation of a community college from a *teaching-only* institution to *teaching-and-research* institution will necessarily entail adjustments and modifications related to, among other considerations, the research experience and expertise of both the institution and its faculty. In this context, while college faculty expressed very high levels of interest in participating in research activities (Fisher, 2008a), only a minority (29%) reported research-related degrees at the masters level, with even fewer (12%) reporting doctoral degrees. Colleges Ontario (2006) similarly found that approximately 20% of college faculty held research-based masters or doctoral degrees (p. 3). The development of research cultures at colleges, therefore, will require the provision of professional development activities to enhance the quality of faculty research skills, as well as institutional accommodations in hiring practices, faculty support and training, and legitimization of faculty release time for research-related activities.

Further potential impacts should be considered in the context of an evolutionary process of research development that unfolds across several “dimensions of maturity in research systems” (Neave, 2002, p. 8). The initial decision by some colleges to incorporate research into their mandate will necessitate a range of changes related to the formalization of governance and accountability, resourcing and funding of research activities, and re-negotiation of collective agreements, operating grants, and institutional strategic plans. Neave’s delineation of a maturation process in research systems highlights the need for colleges to consider potential impacts and challenges of incorporating research into their mandates. For example, since mature research enterprises exhibit “the concomitant developments of a research *training* system” (p. 14), colleges, which do not offer graduate programs comparable to the research training programs offered by university graduate schools, will be required to define and customize certain aspects and dimensions of research maturity in terms of their own purposes, student and faculty characteristics, and available resources. Table 6 summarizes Neave’s dimensions of maturity and complexity in research systems in higher education.

Table 6

Dimensions of Maturity and Complexity in Research Systems in Higher Education (based on Neave, 2002)

Attribute	Embryonic Stage	Developmental Stage	Mature, Complex Stage
Formal Purpose, Responsibility	Ad hoc		Training of future researchers
Resourcing, Funding	Ad hoc		Sharing agreements among multiple stakeholders (Sectoral, Private, Public);
Intermediary Bodies	Personal negotiation		Councils, Foundations
Structural research units	Ad hoc, discipline-based		Permanent units, Centres, Institutes, Cross-disciplinary

While the forward-looking dimensions of maturity and complexity may be daunting in the current context of evolving research cultures Canadian colleges, Quebec's College Centres for Technology Transfer (CCTTs) do in fact illustrate many of the attributes that are indicative of mature, complex research systems, such as permanent research centres, complex sharing agreements among multiple stakeholders, and training of future researchers at a level appropriate to the educational mandates of the participating colleges. Therefore, while some constraints, such as the lack of research-intensive graduate programs, preclude maturity across all dimensions of Neave's (2002) model, colleges are nevertheless able, within our proposed conceptual framework, to

aspire to appropriately customized levels of research maturity within the parameters of contemporary college realities.

While the model provides a coherent, systematized framework for considering the processes and impacts related to the development of research cultures at Canadian colleges, the findings of this study also suggest several *areas for further research*. Certainly, the potential of Quebec's unique model of CCTTs merits further study regarding its applicability in other provinces, and perhaps as a template for revisions to national funding programs specifically designed for the college sector. Another area for further study is the applicability of the *teaching/research nexus* paradigm, especially in enhancing both research instruction and research advocacy. In concert with a commitment to the *scholarship of teaching and learning*, further research could lead to the development and implementation of college-specific research programs and activities that further enhance student learning and produce graduates who are, compared to previous graduates, better prepared, more highly qualified, and more imbued with the spirit of discovery and innovation that may be a critical determinant of Canada's future social and economic prosperity.

Finally, any systemic change, such as the currently unfolding integration of research into the traditional college mandate, will inevitably generate some degree of resistance and concern from a range of stakeholders. However, a coherent framework can provide a common perspective for considering and articulating the extent to which research activities can enrich the educational experience of college students and faculty and contribute to the economic and social well being of Canadian communities,

especially in the context of the evolving knowledge-based economy and the concomitant skills increasingly required by contemporary college graduates.

The most fundamental characteristic of the community college may be its capacity to reinvent itself as the needs and problems that it is asked to address change. Such plasticity is very difficult for any human organization to achieve, and at every point in the evolution of the community college there have been strong voices declaring the final destination has been reached and further change would destroy it. Yet the evolution goes on, because that is the essence of the institution. (Skolnik, 2004, p. 44)

Canada's prosperity in the 21st century will depend increasingly on our ability to innovate, and colleges "can contribute to this prosperity, not by changing our mission, but by adhering to our founding principles and revitalizing our approaches" (Ivany, 2000, p. 13). The increasing integration of research activities into college programs, and the continued growth of college research cultures on a national scale, can play a critical role in revitalizing our approaches, while still adhering to our founding principles and fulfilling our core mandates. The purpose of this study has been to contribute to this evolution of college missions by synthesizing and systematizing the existing bodies of knowledge on this topic, and by proposing a comprehensive, integrated conceptual framework that begins to provide clarity, focus, and direction for the further development of a coherent, robust, and productive research culture at Canadian colleges.

It should be noted, however, that this proposed framework is tentative and exploratory, and that the preceding conclusions are to be viewed with some caution. Nevertheless, it is hoped that this initial model will start a new conversation and lead to

future improvements. To that end, this proposed conceptual framework invites and challenges all stakeholders to participate in further delineating the landscape of college research.

Three centuries ago, in establishing a prototype college offering a certification program for river pilots, the legislation enacted by the Governor of Quebec also included a mandate (and funding) to conduct hydrographical surveys and studies in order to produce practical maps of the waterways extending into the wilderness beyond the fledgling colony. This proposed conceptual framework is offered in the same spirit, that is, as a tentative but practical map for those who wish to further extend this fledgling research culture across the unexplored continent of Canadian colleges.

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VITA

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Postsecondary Education and Degrees	University of Western Ontario, London, Ontario	B.A.	1969
	University of Western Ontario, London, Ontario	M.A.	1973
	University of Western Ontario, London, Ontario	B.Ed.	1977
	Brock University, St. Catharines, Ontario	B.Ed.	1984
	University of Western Ontario, London, Ontario	Ph.D.	2009
Honours and Awards	Brock University Internal SSHRC Grant	\$1,500	2004
	Fanshawe College Research Initiatives Grant	\$5,575	2006
	Fanshawe College Research Initiatives Grant	\$15,600	2006
	Brock University Research Fellowship	\$7,000	2006
	Brock University Graduate Fellowship	\$4,667	2006
	Ontario Consortium of Colleges Research Grant	\$17,800	2006
	Canadian Council on Learning Research Grant	\$25,172	2006
	Fanshawe College Research Initiatives Grant	\$27,000	2007
	Canadian Council on Learning Research Grant	\$70,000	2007
	Industry Canada Higher Education Policy Directorate	\$24,255	2008
	Fanshawe College Research Initiatives Grant	<u>\$13,800</u>	2008
	Total Grants (2004-2009)	\$212,369	
Related Work Experience	Teaching Assistant		
	University of Western Ontario		1973-1976
	Secondary School Teacher, Guidance Counsellor, Administrator		
	School Board Resource Teacher		
	District School Board of Niagara		1977-2001
	Teacher Trainer		
	Education Quality and Accountability Office (EQAO)		2000-2003
	Professor/Researcher		
	Fanshawe College		2003-present
Appointments	Research Ethics Board, Fanshawe College		2006
	Advisor, Industry Canada, Higher Education Policy Directorate		2008
	Research Consultant, College of the North Atlantic		2008
Publications	Fisher, Roger F. (2006). The Scholarship of Teaching: Research Opportunities in the New Millennium. <i>Journal of Teaching and Learning</i> , 4(1), 57-71.		
	Fisher, Roger F. (2008). <i>Faculty Participation in Research at Canadian Colleges: A National Survey</i> . Report prepared for Canadian Council on Learning. Ottawa, Canada.		
	Fisher, Roger F. (2008). <i>The College Advantage: Private Sector Innovation and Highly Qualified Personnel</i> . Report prepared for the Higher Education Research and Development Policy Directorate, Industry Canada. Ottawa, Canada.		
	Fisher, Roger F. (in press). <i>Factors Affecting Attrition at a Canadian College</i> . Report prepared for Canadian Council on Learning. Ottawa, Canada.		