

INDUSTRY ANALYSIS - CANADIAN MEDICAL DOCTORAL UNIVERSITIES

by

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ABSTRACT

Most public sector and non-profit entities do not undergo standard business analysis that is typically found in their private sector counterparts, however such approaches may provide administrators with information to better understand their industry. A high-level industry analysis of Canadian medical-doctoral universities, based on Porter's five forces and value chain analysis, combined with an analysis of pertinent issues indicated that universities are greatly affected by strategic decisions imposed by government. Examples of these include movement towards a user-pay environment and increased co-funding research relations with industry. Other influences outside of the control of universities, such as demographic impacts to customer base and human resources, also play a role. Through the use of similar analytic approaches, business administrators in universities can study the decisions and influences for future trends and their impacts and derive an understanding to augment their knowledge in order to compensate, prepare for and possibly eliminate negative impacts.

EXECUTIVE SUMMARY

Conducting a standard industry analysis of the Canadian medical doctoral universities aids in providing a stronger understanding of the environmental framework in which university business administrators must work and, additionally, improves the information and tools available to the decision making process.

This framework was developed by describing the overall sub-sector including descriptions of: the members, the products and services provided, and the political environment of the group. Canadian medical doctoral universities provide their respective provinces with resources for the future by providing advanced teaching to almost half of the nation's enrolled post-secondary students as well as conducting over half of the country's sponsored university based research. Governments have a keen interest in these areas; not only do they supply potential future economic advantages but the cost of doing so is a large portion of the nation's expenses as well as being high profile for current and future constituents. Given that part of the funding does emanate from government, universities must contend with some degree of political influence and even with a governance structure that seeks to prevent undue levels of political influence, between accountability directions and desire to influence the future economic base of the nation, levels of political influence can be significant.

The understanding of the framework was further enhanced with an analysis of the industry and by defining the post secondary market and analysing the dominate players, followed by the application of Porter's five factors analysis methodology, which enables identifying and describing factors that impact the industry and provides a rating of impact. This analysis indicates that the industry will remain fairly constant and will be slow to change as compared to

competitive private sector entities. The environment is likely to remain collaborative, primarily following the mandate of the respective provincial governments that are primarily focused on supplying their provinces with required resources to service future populations as well as providing improvements to the economic environment.

Although these universities are not profit driven, the more cost based and efficiency driven they can be in their secondary and non-core activities, the more funding can be directly applied to their core activities, generating a more valuable end result in research and teaching. An industry value chain and the value chain of a sample university were analysed to provide additional insight by identifying core competencies that could be leveraged for greater efficiency and identifying those processes that do not add value to the universities and consequently could be removed or given less resources. The core activities identified were grant preparation, course work preparation, course offering, research, public relations and fundraising.

Based on an enhanced understanding of the industry as whole, current issues of importance were identified, discussed and recommendations for resolutions were presented. Operating funding was identified as a major issue. Much media focus has been on the reduction of government funding to the universities. This appears to be the result of a shift in funding approach by the federal government to move to a user pay structure.

Enrolment was identified as another key issue. There are two factors that influence this issue: pure demographic changes that must be accommodated; as well as a fundamental shift in the global economy to knowledge based industries, which influences the number, level and style of instruction and research by the universities. Demographics are influencing the need for resources at the universities and are being accommodated by several simultaneous approaches including the elimination of mandatory retirement for professors. Such changes also affect infrastructure, which is being dealt with by the governments in the form of grants such as CFI.

Another issue is that the competition between basic research and private industry funding will likely increase. Lastly, globalisation and technology are discussed to a lesser extent since they have been identified as having less impact.

A trend analysis of these issues helps to identify future attributes that might contribute to the evolution of these issues. A review of each issue as it might appear in 2015 has been provided and suggests that the user pay structure will continue, especially with the use of registered education savings programs. Continued focus on increasing collaboration between government, universities and industry will also continue. Demographics suggest a lull in high school entrances, but it is likely that the shift to a knowledge-based economy will provide additional enrolment. Demand, however, may be for more differentiated products as opposed to the current general undergraduate programs. Infrastructure should be reviewed on an ad hoc basis, since major infrastructure upgrading has already taken place. Current resourcing and basic research versus industry issues are likely to be resolved. Globalisation and technology are unclear as to their future direction.

Business administrators with an in depth understanding of the industry, its issues and trends will have a better ability to make effective decisions. It is recommended that standard business analysis be incorporated into practises by universities as a method to provide additional information and insight. Resolution of issues that were identified should be undertaken, such as addressing the issues surrounding the imminent demographic challenge and ensuring the ability to accommodate inefficiencies in funding requirements resulting from changes in government direction. Increased business skills to increase revenue generations will help to provide these funds, including those in increasing commercialisation of research and facilitating collaborative efforts with other universities in the areas that are not core competencies may prove to be an efficient use of resources.

DEDICATION

This is dedicated to my loved ones - to my husband, Randy, who shared the experience, kept me sane and provided support when I wobbled; to my children, Jason and Lee, who had countless nights and weekends to develop self-sufficiency - (604) 310-0001, and to my friend, Isabell, who kept my life balanced. My love and thanks to all of you.

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GLOSSARY

| | |
|------------------|---|
| Bicameral | Goverance by two separate bodies. |
| GERD | Acronym for Gross Expenditure for Research and Development. |
| R&D | Acronym for Research and Development. |

1 OVERVIEW OF CANADIAN ENVIRONMENT OF MEDICAL DOCTORAL UNIVERSITIES

1.1 Introduction

This paper provides an industry analysis of the Canada medical doctoral university sub sector using a standard analysis approach. It was undertaken to obtain additional insights and perspective for a stronger analysis framework for this industry that may not be typically available as a public sector entity. This paper provides an overview of this public sector group describing the members, the services that they provide, their governance structure and impact of the political economic environment in which they reside. An industry analysis methodology, more typically used with private sector firms, was conducted based on Porter's five forces methodology (Porter, 1979). This was followed by an internal analysis of a sample university to highlight areas of a typical value chain and identify potential core competencies found within this sector, assuming consistent processes between universities. Several key issues that impact this group were identified and discussed, followed by a trend analysis further discussing this selected issues. This paper was concluded with suggestions for business managers based on the results of this analysis.

1.2 Definition of Category

For the purpose of this analysis, the Medical Doctoral category will include those Canadian universities that offer a broad range of Ph.D. programs, provide a medical school and conduct research. This is the general definition used by MacLean's in establishing the categories for its rankings of all Canadian universities. MacLean's assigns universities into categories based on research funding, diversity of offerings and the range of Ph.D. offered and includes all the universities federated and affiliated institutions (MacLean's, 2004). There are three categories:

the medical doctoral category, the comprehensive and the predominately-undergraduate category. Of the over seventy-five universities in Canada, fifteen have been designated Medical Doctoral universities. The currently leading five providers are: University of Toronto, McGill University, University of Western Ontario, University of British Columbia and Queen's University. For a complete list refer to the table of Canadian Medical Doctoral Universities in Appendix A.

1.3 Products and Services

In general, Canadian universities are provincially based public sector institutes that provide post secondary education to students, as well as, providing the infrastructure for the most knowledgeable members of society to pursue the investigation of concepts and theories that expand knowledge within the global community.

Universities are the results of a symbiotic relationship between government and researchers and those who directly or indirectly provide funding for the institute. Governments desire to develop an educated workforce that can service and improve the economic bases of society. The researchers desire an infrastructure where they are reasonably free to pursue research in their field of interest. The direct and indirect suppliers of the funds of these universities want the benefits that accrue from the ongoing operations of world-class universities. It is logical that an agreement naturally develops among these three forces. In return for teaching the masses in the researchers' area of expertise, researchers receive support in the form of salary and infrastructure; and access to funding for their pursuits.

From an operational perspective, there are two basic transformation processes occurring within a university: customer processing, in the form of transforming students into educated beings; and information creation and diffusion in the form of conducting and disseminating research. Controversially, some suggest a third transformation that of commercialising of research. As an aside, it should be noted that it is a recent shift of university perspective to view

students as customers. Prior to this point in time, customer service towards students was not a prime directive. It was more likely that the provincial government was considered the primary customer.

Medical doctoral universities generally provide the same products and services as do those in the other categories of: comprehensive universities, and the undergraduate universities. They grant degrees, provide research facilities and seek to benefit those who fund them. In other industries, where manufacturers and service providers produce similar products and service, there often exists a difference in such product attributes as: quality, complexity, location, reputation and prestige. This is the case with universities. Medical doctoral universities are considered the pre-eminent universities since they are generally larger, older, have stronger reputations and are better funded. Medical doctoral universities obtain their advantages as a result of being designated the medical school in the region. They benefit from such additional items as more funding, as increased probability of being the designated school for other professions, tighter relationships with hospitals and other government institutes, possibly higher calibre of students as the result of the presence of more professional schools, spill-over effects of their medical expertise of their reputation into other science disciplines.

1.3.1 Teaching

1.3.1.1 Undergraduate degrees:

Undergraduate courses are provided for a fee in order for the student to fulfil the requirement of recognized undergraduate degree. This degree is used to signal to society a certain level of comprehension, expertise, and competence. Each degree has a requirement of obtaining a minimum level of proficiency as specified in a grading system. Students who receive grades below a pre-established level are asked either to leave the program or redo the course in order to establish their basic proficiency. Medical doctoral universities usually support the same

course/degree offerings, as do undergraduate and the comprehensive universities. These courses are often higher volume (more students per instructor and/or more offerings per calendar year) and higher variety (more and different offerings of courses and the ability to combine courses into specialized degrees, slight differences in the approach, time or location of courses) than universities in the other categories. Courses can be offered through correspondence; on-line (Internet); videoconferencing; and from classroom instruction, both locally and internationally. Some course offerings include laboratory time or involve access to specialized equipment.

Undergraduate teaching is the requirement of the provincial governments and constitutes the major portion of the fulfilment of the government-professor/researcher partnership. Since research, not teaching is the basis of promotion, tenure and compensation for professors at universities; it is the non-tenure track professors and less accomplished researchers that typically are assigned to teach the bulk of the undergraduate courses. Although quality is difficult to measure; it is generally perceived that the bulk of undergraduate degrees from the Medical doctoral universities are of a higher quality due to: entrance of higher calibre students as a result of higher entrance requirements; and quality of professors due to the ability to recruit higher calibre professors/researchers based on demand for these positions. With regard to academic quality, restricted access and natural demand for these positions results in higher entry qualifications. Higher entry qualifications are perceived as a way of signalling quality of education (University of Western Ontario, 1995, para 3).

1.3.1.2 Post Graduate Degrees:

Post Graduate degrees are an interesting phenomenon. Student in these programs are integral in the success of the medical doctoral universities and play multiple roles: student (customer), professor/researcher, and teaching assistant. They are part of both of the operational transforming processes and can be considered both input (student) and transformation tool

(teacher and researcher). An additional element is the fact that graduate students potentially progress into leadership roles in business, education and research, where they are in positions to influence the universities by providing future industry relationships, research, administration and teaching. In some sense the graduate output can be reabsorbed into the mechanism of the universities themselves, as students become professors and leaders with the potential to act as liaison between the university and the larger society.

Master programs can be divided into two types of programs: course based masters and research based master programs. Both have similar durations, typically about two years. However, the research based masters program requires the undertaking and defending of a thesis as part of the requirement for graduation. Doctoral or Ph.D. programs are typically two to three years, but can take longer depending on full or part time enrolment. These require graduate students to undertake research in their areas of study and to develop new information that furthers the knowledge in their chosen discipline (Association of Universities and Colleges of Canada, 2005a).

The medical doctoral universities provide both similar postgraduate degrees, as do their counterparts in the other categories. However, due to the unique inclusion of medical schools and other professional schools, the medical doctoral universities also provide specialized postgraduate degrees, i.e.: degrees in medicine, life sciences, law.

Outstanding graduate students raise the quality of the degree pursued, the research undertaken and the subject taught. In general terms, the higher the quality of the raw resource the higher the quality of the output. Medical doctoral universities are generally better equipped to provide the facilities, funding and specialized graduate supervisors. This creates a higher demand for their programs and thereby raises the level of student requirements necessary to be admitted,

which in theory, increases the quality of the graduate student. Therefore the perception of the graduate degrees from these institutes may be argued to be of a higher quality.

1.3.1.3 Other courses:

Not all courses taught at universities are for conventional degrees. There are services that create degree offering for unique situations as well as providing certification of knowledge in areas that are: in demand; have dynamic information; or are quickly evolving - for example high technology disciplines like project management, network administration and security.

1.3.1.3.1 Corporate development programs

These programs are custom designed to service the corporate world. Commonly, location plays a role as corporations require the university to provide the teaching at the corporation's location. Everything from one-day courses to full accreditation is being offered as a custom service. Marjo Johne's 2001 article 'Back to Class', stated that tailored corporate courses were taking off as corporations are looking to universities to improve the corporation's leaders by providing common skill levels and language (Johne, 2001).

1.3.1.3.2 Programs and certification

Many universities provide continuing education courses as a service. These can include general interest courses or specific courses for industry, among others. Commonly, these courses and programs are taught by knowledgeable personnel from industry, rather than professors from the university. Originally, focused as additional revenue sources they could be evolving into a more strategic item as continued and life long learning trends become more prevalent.

1.3.2 Research

As part of the symbiotic relationship universities provide facilities and support for research, as well as, aid in applying for funding for their projects. Medical doctoral universities

are considered research intensive. They have a larger component of research in their organization than their counterparts. Due to their medical schools, a large focus of this research is within the life sciences. However, since most also have large schools or faculties in other disciplines they attract additional researchers and funding that require a multiple disciplined environment.

The universities use their research facilities and areas of specialization as part of their tool set to differentiate themselves from other universities. It can be a self-fuelling process. Once a specialty becomes recognized, it attracts students and researchers to the university. This further increases the concentration of expertise and increases the attractiveness to other graduate students; researchers and eventually undergraduates start registering with the university in hopes of working with these experts.

As an information creating and diffusing process, research at medical doctoral institutes is typically higher in volume, variety, visibility and variation than universities in the other categories. The medical doctoral universities generally accommodate larger student bodies, offer more specialized and unique research infrastructure and equipment, garner more media attention and must be more flexible and quicker to respond as their larger number of researcher may have to change direction as new information is developed.

Although Canadian universities in all categories are the primary sponsor of their own research at approximately 50% (Statistics Canada, 2003a, p. xix), external sponsorship is primarily by the federal agencies: the former Medical Research Council (MRC); National Science and Engineering Research Council (NSERC); Social Sciences & Humanities Research Council (SSHRC); and most recently Canada Foundation for Innovation (CFI), followed by provincial funding, and private industry. Similarly in the United States, the funding allocation order is the same: federal; state; and private, however, the U.S. numbers are significantly higher for funding derived from federal sources (Gringras & Robitaille, 1999).

1.4 An Overview of Governance

Over the past century there has been an ebb and flow of responsibility for higher education's governance between the universities' primary players: provincial governments, federal government, academic faculty and administrators.

North American universities are based on the historical Anglo-Saxon model (Mora, 2001), where universities maintain their autonomy from government in order to retain academic freedom. With this as a base, Canadian Universities are further modelled after the government of Ontario's 1906 bicameral university governance structure, where responsibility of operations and planning is delegated to two groups: a board of governors and a separate senate. The board of governors is generally responsible for the financial and administrative operations of the university and consists of provincial government appointees usually from industry and corporate Canada. The senate is primarily responsible for academic decisions and provides support to the board of governors. The senate consists of senior academic faculty, student representatives and board of government members. Canadian universities have varying degrees of interaction between the board and the senate with regard to academic and budgetary matters. In contrast, in the United Kingdom, the senate or academic group is responsible for both the academic and administrative tasks.

In North America the power between the two groups, during the past decades, has swung back and forth. Presently, the board of governors, appointed by the provincial government and with ties to the business environment, appears to have the most influence in strategic and long-term decision-making (Jones, Shanahan & Goyan, 2002).

Externally, Canadian universities have been the jurisdiction of the provincial governments with little direct involvement by the federal government. All universities in the medical doctoral category are public institutes under the control of a provincial ministry

responsible for the higher education activity. As the public became more focused on universities during the 1950's and 1960's, the federal government responded by implementing direct funding to universities to cover 50% of their operating costs. However, after provincial resistance, primarily from the Quebec government, the federal government reversed this trend and provided the funds to the provinces for their distribution.

Canadian universities have enjoyed a relative autonomous existence - very distant from federal government involvement and arms length from provincial political interference. Canada is one of the few countries in the world that does not have a federal office of education.

However, recently, governments have had an increasing influence on the direction of the universities. With the universities' need for increased revenue on top of the funding already received from the provincial governments, competition for research funding has become a new focus. Both federal and provincial governments have the increased ability to influence the direction of research by their funding practises.

1.5 Political and Economic Influence

During the 1970's and 80's, the vast technological improvements achieved in pre 1980 Japan were attributed to research collaboration between industry and post secondary institutes. North American and European countries implemented policies and programs to emulate this. The United State's Bayh-Dole Act of 1980 allowed universities and other government agencies to retain ownership of inventions developed under federal funding and to be directly involved in the commercialisation process. The act is considered a significant enabler in the move towards improving university-industry collaboration and technology transfer (Mowery & Sampat, 2005).

In the 1990's a public and private initiative called SEMATECH (Semiconductor Manufacturing Technology) is frequently referenced as a successful R&D collaboration effort. It

was an experiment to strengthen the US semiconductor industry by collaborating industry and government research to solve manufacturing problems. Based on this approach, Japan modified their collaborative efforts to emulate the US model (Mowery & Sampat, 2005). Some countries have emulated the Bayh-Dole act (Japan, Germany) others have reformed employment laws (Denmark and Norway) and other like Canada and Ireland have put in place policy guidelines and codes of practise (Cervantes, 2003). Undeniably, there has been a government effort to remove obstacles that may have limited the commercialisation of government-funded research.

As mentioned, all universities in the medical doctoral category are public institute under the control of a provincial ministry responsible for the higher education activity. For example, the University of British Columbia is under the control of the Province of British Columbia's Ministry of Advanced Education. This structure could lead to the conclusion that there is no competition amongst the universities and therefore no requirement for a competitive strategy, since universities base their offerings either on servicing a geographic area or efficiently providing specialty curriculum based on the province's needs (e.g. medical, law) as determined by the Ministry. However, as described by the British Columbian Ministry's general responsibilities (British Columbia Ministry of Advanced Education, 2004), its mandate can be categorized into two main directives: to efficiently and effectively address the province's strategic needs of knowledge and skills for future economic and social activities; and secondly, to expand training and skills development and research capabilities.

This mandate has elements of both a need to fulfil the required number of professional positions anticipated based on future population, and, as suggested by the reference to expand knowledge, skills and research capabilities, elements of a desire to increase the economic base. Many of British Columbia's provincial agencies have strategies containing goals to increase the province's prosperity in an increasingly global and competitive world by using knowledge workers or innovative research (British Columbia Innovation Council, 2005, para. 1 & 2). Other

provinces have similar goals as is indicated by Ontario's Ministry of Education; Ministry of Training, Colleges and Universities "A strong economy can only be built with a well-educated and highly skilled workforce... Working together, we can create new opportunities for employee training that will contribute to your company's competitiveness and make our economy stronger" (Ontario Ministry of Education, Ministry of Training, Colleges and Universities, 2005, para. 3).

This suggests that the universities are considered one of the provincial governments' tools to compete in the global economy. They are seen as a way to create a foundational input for the development of a competitive economic environment as outlined in Michael Porter's theory of competition (Porter, 1991). The need for the province and the country to obtain and maintain a global competitive advantage drives the elements of competition in the higher education public sector environment, as it is a key input component to any competitive advantage strategy. A large portion of this competition is in the form of attracting quality researchers and the subsequent funding that they attract.

All universities are currently having to deal with: government desire to use the institutes for national/provincial prominence and economic goals; shifting internal structures; increased competition for researchers, top students and revenue to support their infrastructures; and the changes brought about by other external factors such as: demographic changes, technological changes and funding changes. Medical doctoral universities are no different. This paper provides an overview of the Canadian medical doctoral posts secondary sector in a fairly standard industry analysis and will provide brief discussions on the above-mentioned factors that must be considered in strategic plans for the future.

2 INDUSTRY ANALYSIS

2.1 Canadian Medical Doctoral Post Secondary Market

Post-secondary education is a \$20 billion dollar business (Association of Universities and Colleges of Canada, 2005b). The medical doctoral category of university is the dominant category in this business. They educate just under half of the nations students and conduct over three quarters of its sponsored research. Revenue is attributed to their primary functions of teaching and research, although revenue for supporting sales and services of products provides also contributes substantially. When compared to the other categories of universities, medical doctoral universities are considered research-intensive, however within their category a university could have a focus towards either aspect (teaching or research) or both.

2.1.1 Canadian Post Secondary Teaching Market

The post secondary teaching market is primarily driven by demographics, although trends in: demand for increased levels of education; foreign student attendance; and life long learning have additional impact. Demographics influence the number of students requiring base level education, primarily undergraduate degrees, as well as those desiring higher-level graduate degrees and it also influences the number of researchers (professors), and other professions required to service the expected population. In many cases the number of students admitted follows a general guideline set for individual universities by the provincial government. Since student tuition fees do not completely cover the cost of the education, operating grants that are provided by the provincial government are based on enrolment numbers.

There were 785,000 full-time university students enrolled in Canada in 2004-05, an increase of nearly 130,000 over the last three years (Association of Universities and Colleges of Canada, 2005b). Comparing this figure, for the same period, to the total early-fall enrolment into the medical doctoral universities of 376,000, as shown in Table 2.1.1-1 Medical Doctoral Fall Enrolment – 2004, indicates that medical doctoral universities provided teaching to 47.9% of the full-time enrolled students in Canada. This indicates that there is a relatively high concentration of Canada's overall post secondary teaching undertaken by just fifteen of the over 85 institutes.

Table 2.1.1-1 Medical Doctoral Fall Enrolment – 2004

| University | Fall Enrolment 2004 | | | | | | | Rank on Full time pop. | % of Pop. Grad. Students | Rank on % Grad. |
|--|---------------------|---------------|----------------|-----------------|-----------------|-----------------|--------------------------|------------------------|--------------------------|-----------------|
| | Under-graduate | Graduate | Part time-both | Total Full Time | % of Total Pop. | Total Full Time | % of Pop. Grad. Students | | | |
| University of Toronto, includes colleges | 49,800 | 10,100 | 8,700 | 59,900 | 15.93% | | 1 | 20.28% | 7 | |
| Université de Montréal | 20,340 | 7,320 | 11,810 | 27,660 | 7.35% | | 5 | 35.99% | 1 | |
| University of British Columbia | 23,070 | 6,550 | 12,270 | 29,620 | 7.88% | | 3 | 28.39% | 3 | |
| McGill University | 18,980 | 6,440 | 6,300 | 25,420 | 6.76% | | 6 | 33.93% | 2 | |
| Université Laval | 19,800 | 5,180 | 12,710 | 24,980 | 6.64% | | 9 | 26.16% | 5 | |
| University of Alberta | 28,000 | 4,070 | 3,570 | 32,070 | 8.53% | | 2 | 14.54% | 10 | |
| McMaster University | 17,600 | 2,200 | 3,400 | 19,800 | 5.26% | | 11 | 12.50% | 15 | |
| University of Ottawa | 22,500 | 2,900 | 6,850 | 25,400 | 6.75% | | 7 | 12.89% | 13 | |
| University of Calgary | 20,180 | 3,630 | 3,650 | 23,810 | 6.33% | | 8 | 17.99% | 9 | |
| Queen's University | 14,000 | 2,600 | 4,300 | 16,600 | 4.41% | | 12 | 18.57% | 8 | |
| University of Western Ontario, includes colleges | 25,650 | 3,450 | 4,400 | 29,100 | 7.74% | | 4 | 13.45% | 11 | |
| University of Manitoba | 17,950 | 2,310 | 7,560 | 20,260 | 5.39% | | 10 | 12.87% | 14 | |
| University of Saskatchewan, includes colleges | 13,800 | 1,810 | 3,500 | 15,610 | 4.15% | | 13 | 13.12% | 12 | |
| University of Sherbrooke | 9,550 | 2,700 | 4,980 | 12,250 | 3.26% | | 15 | 28.27% | 4 | |
| Dalhousie University | 10,880 | 2,730 | 2,230 | 13,610 | 3.62% | | 14 | 25.09% | 6 | |
| Totals | 312,100 | 63,990 | 96,230 | 376,090 | | | | 20.50% | | |

Data source: Association of Universities and Colleges of Canada, 2005c – early fall enrolment

Table 2.1.1-1 Medical Doctoral Fall Enrolment – 2004 further provides details of the quantity of teaching undertaken by each of the fifteen medical doctoral universities for full-time undergraduate courses, graduate courses and part-time courses for both undergraduate and graduate courses. Also, included in the table are the percentages of graduate students compared to the total enrolment of full-time students for each of the university. There doesn't appear to be a strong correlation between size of the student population and university focus on graduate programs as indicated by the inconsistency in rankings between the number of full-time students enrolled per university and the percentage of full-time students enrolled in a graduate level program. Distribution of medical doctoral student population between these universities appears to be evenly distributed, with the exception of the University of Toronto, which has 15.8 percent of the student population. The remaining student population is distributed to the other universities between the range of the University of Sherbrooke's 3.2 percent and the University of Alberta's 8.7 percentage.

2.1.2 Canadian Research Market

In 2004-2005 total Canadian Gross Expenditure for Research and Development (GERD) is expected to reach \$24.5 billion. Canada has increased base research funding by \$13 billion since 1999 and has the highest R&D spending per capita in university and research institutes of the G8 nations (Carty, 2005, slide #4). As a nation, Canada spends a greater portion of its R&D funding through higher-education institutes than any of the G8. In 2001, the R&D of higher-education institutes as a percentage of GERD was just short of 30% and is expected to increase to \$9.5 billion, or 35%, by 2004-2005 (Association of Universities and Colleges of Canada, 2005b). Although the dollar amount of higher education research funding had increased over 50% between 1991 and 2000 in constant dollars (McMaster University, 2004a), the distribution of these funds between: the social sciences and humanities; health sciences; and other natural

sciences and engineering did not fluctuate significantly and remained approximately 21, 36, 43 percent respectively (Statistics Canada, 2003b) as indicated in Table 2.1.2-1 University R&D Expenditures Performed by Major Fields of Study. Although, the greatest portion of Canadian university R&D is in the natural sciences and engineering areas, health sciences has had the greatest percentage increase since these figures were published.

Table 2.1.2-1 University R&D Expenditures Performed by Major Fields of Study

| University R&D Expenditures Performed by Major Fields of Study (millions of 2001 constant dollars), Canada and Provinces, 1991, 1995 and 2000 | | | | | | |
|--|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | 1991 | | 1995 | | 2000 | |
| | \$ | % of total | \$ | % of total | \$ | % of total |
| CANADA | 3,821.2 | 100.0 | 4,036.8 | 100.0 | 5,847.8 | 100.0 |
| Social Sciences and Humanities | 799.2 | 20.9 | 792.5 | 19.6 | 1,218.5 | 20.8 |
| Health Sciences | 1,343.4 | 35.2 | 1,562.1 | 38.7 | 2,115.2 | 36.2 |
| Other Natural Sciences and Engineering | 1,678.6 | 43.9 | 1,682.1 | 41.7 | 2,514.1 | 43.0 |

Data source: Statistics Canada, 2003b

As mentioned, universities fund approximately 50% of the research conducted at their institutes, the remaining 50% is sponsored research. Medical doctoral universities account for over 80% of the total sponsored higher educational R&D funding and have increased their research income over 13% in 2004 (Research Infosource Inc., 2004). Table 2.1.2-2 Sponsored Research Funding for 2003 lists the sponsored research funding for the medical doctoral universities. All but two of the top-ranked schools for quantity of sponsored research income are members of the medical doctoral universities.

Table 2.1.2-2 Sponsored Research Funding for 2003

| Sponsored Research Funding for 2003 | |
|--|--------------------|
| University of Toronto | \$534,356 |
| Université de Montréal | \$394,426 |
| University of British Columbia | \$349,101 |
| McGill University | \$342,690 |
| Université Laval | \$287,578 |
| University of Alberta | \$272,853 |
| McMaster University | \$218,183 |
| University of Ottawa | \$186,174 |
| University of Calgary | \$165,622 |
| Queen's University | \$159,136 |
| University of Western Ontario | \$145,831 |
| University of Manitoba | \$130,029 |
| University of Saskatchewan | \$116,789 |
| University of Sherbrooke | Unknown |
| Dalhousie University | Unknown |
| Total of known amounts | \$3,302,768 |

Data source: Research Infosource, 2004

2.1.3 Dominate Players

The University of Toronto tops the list as providing the most teaching to both undergraduate and graduate students having almost 50% more students than the second ranked, University of Alberta. Rounding out the list of universities providing the most teaching is: the University of British Columbia, the University of Western Ontario and the Université de Montréal.

As indicated in Table 2.1.2-2 Sponsored Research Funding for 2003, the top receivers of sponsored research funding are: the University of Toronto; Université de Montréal; University of British Columbia; McGill University; and Université Laval, accounting for over 57% of the medical doctoral research funding. The top five ranked universities by number of graduate students exactly matches that of those universities ranked by sponsored research funding.

Medical doctoral universities can be categorized into two types those that focus more on teaching and those that are more research intensive as compared to medical doctoral universities as a group. Table 2.1.3-1 Estimated Sponsored Research per Full Time Student provides an indication of each university's focus based on sponsored research dollars per full time student. Those universities with a higher dollar value per full time student are receiving more sponsored research funding per student and are therefore assumed to be more researching intensive than their peer universities, everything else being considered equal.

Table 2.1.3-1 Estimated Sponsored Research per Full Time Student

| Sponsored Research per Full Time Student | | | | |
|--|------------------------|---------------------------|-------------------|--|
| University | Total Full Time | Sponsored Research | \$ per FTE | Focus T = Teaching R = research |
| Université de Montréal | 27,660 | \$394,426 | \$14.26 | R |
| McGill University | 25,420 | \$342,690 | \$13.48 | R |
| University of British Columbia | 29,620 | \$349,101 | \$11.79 | R |
| Université Laval | 24,980 | \$287,578 | \$11.51 | R |
| McMaster University | 19,800 | \$218,183 | \$11.02 | R |
| Queen's University | 16,600 | \$159,136 | \$9.59 | R |
| University of Toronto, includes colleges | 59,900 | \$534,356 | \$8.92 | T |
| University of Alberta | 32,070 | \$272,853 | \$8.51 | T |
| University of Saskatchewan, includes colleges | 15,610 | \$116,789 | \$7.48 | T |
| University of Ottawa | 25,400 | \$186,174 | \$7.33 | T |
| University of Calgary | 23,810 | \$165,622 | \$6.96 | T |
| University of Manitoba | 20,260 | \$130,029 | \$6.42 | T |
| University of Western Ontario, includes colleges | 29,100 | \$145,831 | \$5.01 | T |
| University of Sherbrooke | n/a | n/a | n/a | |
| Dalhousie University | n/a | n/a | n/a | |
| Totals | 350,230 | \$3,302,768 | \$9.43 | |

Data sources: Estimated using Association of Universities and Colleges of Canada, 2005c & Research Infosource, 2004

Table 2.1.3-2 provides the financial statements for the medical doctoral universities for fiscal 2004. Two universities, the University of Sherbrooke and the University of Laval, are not included as their details were not available at the time of submission. The universities are sorted by revenue from largest to smallest. As shown in this table, the University of Toronto generated the largest amount of revenue as its position as top ranked university in both sponsored research

and number of students enrolled would suggest. There appears to be a visible grouping of universities by revenue, the top five, the middle tier and then the smaller revenue generators. The top five include the University of Toronto, the University of British Columbia, McGill University, the University of Alberta, and the Université de Montréal. The middle tier appears to be the University of Calgary, the University of Western Ontario, Queens University, followed by McMaster University. The remaining universities appear to be smaller revenue generators.

In general universities can specialize in research or teaching and be strong within their chosen focus. For example the University of Western Ontario appears to be primarily a teaching university as it has a large number of students, but receives a smaller amount of research funding per student. McMaster University appears strong in research compared to teaching as its research dollars per student is higher than average. In addition, there are several universities that show up consistently in each category, including total revenue and are therefore considered the overall leaders in this category. This includes the University of Toronto, McGill University, University of British Columbia, the Université de Montréal and the University of Alberta. Three of these universities rank in the top 100 world universities as ranked by the Shanghai Jiao Tong University Institute of Higher Education (Institute of Higher Education, Shanghai Jiao Tong University, 2004); University of Toronto at 26, University of British Columbia at 36 and McGill university at 61. Incidentally, McMaster University ranked 88th.

Table 2.1.3-2 Financial Statements for Fiscal 2004

| STATEMENT OF REVENUE, EXPENSE FOR THE 2004 FISCAL YEAR (thousands of dollars) | | | | | | | | | | | | |
|---|-----------|-----------|---------|---------|----------|---------|---------|---------|--------------------|-----------------|-----------|----------|
| | Toronto | UBC | McGill | Alberta | Montreal | Calgary | Western | Queens | McMaster Chewan | Saskat - Ottawa | Dalhousie | Manitoba |
| Revenue | | | | | | | | | | | | |
| Provincial government operating grant | 479,800 | 547,197 | 325,087 | 421,723 | 410,753 | 268,692 | 167,472 | 332,088 | 139,594 | 231,655 | 105,627 | 207,864 |
| Other government grants and contracts | 295,200 | | 128,025 | 105,070 | 154,938 | 77,105 | 128,191 | | 71,464 | | 55,480 | 6,482 |
| Non government grants and contracts | | 98,277 | 164,242 | 26,166 | 48,045 | | | | | 4,288 | | |
| Research overhead grants | | | | | | | | | 12,690 | | | |
| Research grants and contracts | 22,000 | | | | | | | | 125,635 | | | |
| Corporations and foundations | | | | | | | | | | 108,411 | | |
| Tuition fees | 433,100 | 200,502 | 67,795 | 153,154 | 61,027 | 113,562 | 191,129 | 103,995 | 106,979 | 82,136 | 150,052 | 83,517 |
| Non-credit and other fees | | | | | | 13,326 | | | | | | 24,119 |
| General | | | | | 34,432 | | 12,142 | 13,786 | 51,313 | 2,381 | 15,774 | 16,266 |
| Gifts | 39,400 | | 46,787 | 16,690 | 22,493 | 63,068 | 17,411 | 23,001 | 15,820 | 48,091 | 8,834 | 8,088 |
| Investment income | 123,900 | 26,926 | 44,038 | 72,756 | 51,800 | 29,688 | 37,851 | 28,280 | 56,554 | 39,650 | 14,370 | 16,664 |
| Ancillary sales and service | 174,700 | 260,651 | 152,844 | 149,423 | 42,294 | 68,425 | 114,731 | 89,854 | 64,405 | 91,219 | 21,036 | 32,563 |
| External cost recoveries | | | | | | | | | | | | 29,203 |
| Recoverable salaries and benefits | | | | | | | 11,426 | | | | | |
| Earned capital contributions | | | | | | | | | 33,243 | | | |
| Amortization of deferred capital contributions | | | | | 6,409 | 57,861 | | 20,035 | | | | 5,735 |
| Total Revenue | 1,568,100 | 1,133,553 | 928,818 | 944,982 | 832,191 | 691,727 | 680,353 | 611,039 | 606,233 | 566,596 | 513,253 | 377,261 |
| Expense | | | | | | | | | | | | |
| Salaries and employee benefits | 907,800 | 715,466 | | 574,477 | 495,222 | 395,106 | 374,204 | 322,654 | 310,747 | 323,171 | 285,327 | 220,984 |
| Employee (future) benefits | | | | | | | | 4,033 | | | | |
| Pension expense adjustment | | | 400,630 | | 82,442 | | | | | | | 7,623 |
| Faculty, academic and support services | | | 34,603 | | 6,984 | | | | | | | |
| Services to community | | | 42,731 | | 7,458 | | | | | | | |
| Student services | | | 40,399 | | 16,793 | | | | | | | |
| Ancillary services | | | 251,836 | | | | | | | | | |
| Research | | | | | | | | | | | | |
| Library acquisitions | | | | | | | | | | | | |
| Laboratory and teaching supplies | 184,200 | 229,628 | | 165,280 | | 101,916 | | 63,704 | | | 3,926 | 13,027 |
| Equipment and service | | | | | | | | | | | 8,890 | |
| Finance/restructuring costs | 19,800 | | 36,870 | 7,201 | 29,765 | 3,665 | 6,285 | 6,913 | 189,240 | 57,165 | 11,113 | |
| Utilities and taxes | 38,200 | | 59,160 | | | 24,517 | 17,950 | 12,037 | 10,221 | 14,363 | 2,532 | |
| Externally contracted services | 15,900 | 15,288 | | | | | | 18,885 | | 18,068 | 9,966 | 6,900 |
| Scholarships, bursaries and prizes | 106,800 | 41,947 | | 56,730 | 31,184 | 22,945 | 43,561 | 38,482 | | 24,123 | 28,156 | |
| Renovations and alterations | 38,300 | | | | 44,108 | 8,998 | 11,457 | 11,724 | | 31,586 | 23,970 | |
| Ancillary cost of sales and service | 70,700 | 43,708 | 0 | | | 18,251 | 32,272 | | | 16,745 | | 28,712 |
| Capital asset | | | 2,189 | | | | | | | 16,566 | | |
| Loss of disposal of assets | | | 162 | | | | | | | | | |
| Travel | 27,700 | | | | | 20,095 | | 14,954 | | 11,206 | 10,239 | 8,738 |
| Amortization of capital assets | 76,800 | 85,552 | 64,556 | 74,531 | 46,524 | 78,151 | 44,141 | 38,253 | 48,094 | 36,706 | 29,494 | 16,277 |
| Bad debt expense | | | | | 914 | | | | | 468 | | |
| Internal costs recoveries | | | | | | | | | | -41,391 | | |
| General operating | 33,300 | | | | 2,851 | 94,805 | 20,719 | 586,945 | 558,302 | 15,563 | 21,657 | 24,418 |
| Total Expense | 1,521,500 | 1,131,589 | 875,976 | 937,379 | 764,245 | 673,644 | 624,675 | 586,945 | 480,551 | 467,860 | 373,305 | 322,710 |

Data source: Individual university's online financial statements for 2004

2.2 Medical Doctoral Universities and Their Environment

Canadian higher education sector is based on revenues obtained by way of provincial funding, student tuition fees, federal research funding, private funding and donations. Provincial funding is itself based on a combination of federal transfer payments and student enrolment. As well, in general student tuition fees are controlled by the province, except in the recent case of British Columbia where the universities and institutes have the power to determine fees.

Unlike the United States, where eight of the top ten universities within the Medical doctoral category are private (USAuniv.com, 2004), all Canadian medical doctoral universities are public sector institutes under the control of the provincial ministry responsible for advanced education. They provide a basic public good to their province.

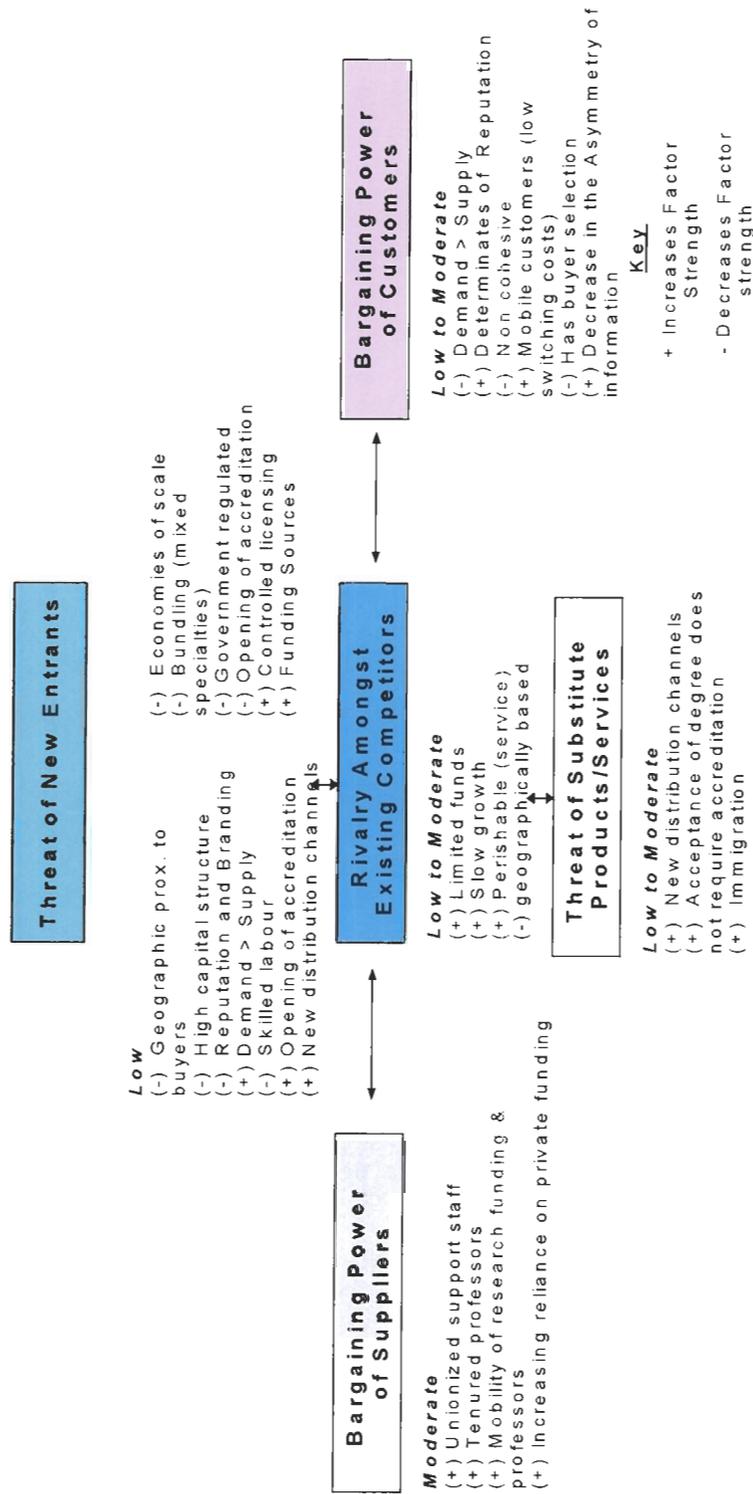
With the recent popularity of Michael Porter's theory of clusters and its impact on national competitiveness, a more central role is evolving for public higher education institutes (Porter, 1998). Universities, and in particular research universities, are key elements as input factors to Porter's theory and can act as the core to a cluster. Combine this with the heightened public interest towards health care (Johnston, 2002) and this puts medical doctoral universities as central players in today's new economy.

Canadian provinces are very autonomous and in areas like higher education act entirely separate from the federal government. This independence, combined with a large increase in public focus on Canadian medical research may create a more competitive environment within the industry than may have existed in the past. Combine this with limited resources available to the industry, as will be further outlined within this paper, and competition is heightened further.

Based on Michael Porter's theory that competitiveness is the key to increasing productivity (Porter, 1991) then the heightened competition in this environment may be beneficial to Canada's future success.

Porter has also developed a model framework to describe and analysis the environmental forces that impact on an industry. Elements, such as the threat of new entry, bargaining power of the suppliers, threat of substitute products or services and the bargaining power of customers, all combine to determine the competitiveness of the environment (Porter, 1985). This sector will provide a discussion of the Canadian Medical Doctoral sub-sector based on Porter's framework. For a pictorial presentation of the discussions of this paper refer to Figure 2.2-1 Factor Diagram for Canadian Medical Doctoral Universities.

Figure 2.2-1 Factor Diagram for Canadian Medical Doctoral Universities



Adapted from Bakszar, 2005, by permission, based on Porter's "Competitive Advantage".

2.2.1 Threat of Entry

Since this industry sub section is within the public sector umbrella, regulatory governance is considered high thereby lowering the threat of entry considerably.

Government entities can control licensing and the number of people eligible for entrance into selected fields, as in the case of medical billing numbers. Even if a private sector institute were to enter the industry, their graduates would require government licensing before they could be employed. As well government entities control accreditation of programs so new entries into the industry require government permission. Finally, the majority of funding to cover operational expenses is provided by the provincial governments based on estimated enrolment. Therefore government has the ability to limit or enlarge capacity and thus revenue and although the universities have a Board of Governors, the budget is approved by the appropriate provincial ministry for each province.

Considerable funding for research is also provided from all levels of government. The federal government, specifically, has increased funding directly related to the medical field and, subsequently, medical doctoral universities are receiving more funding than most other universities. Recently, it appears that the federal funding agencies have increased their involvement in the process and are demanding more monitoring and auditing to ensure compliance to their rules than in the past. The government therefore exerts influences in the research area.

Education is solely the responsibility of the provinces and territories and as such the federal government only indirectly influences the operations of these institutes by way of federal

transfer payments and directly by way of research grant for specific projects. However, most if not all provinces have a guiding legislative document that regulates institutes within their jurisdiction, for instance, Ontario has the 'Ministry of Training and Colleges and Universities act'.

Overall the threat of new entry is low, since long-term profitability would be unlikely. In addition to being a government regulated industry, medical doctoral universities also have a high capital structure and also rely on decades of established reputation and relationships. It is mainly these three factors and their complexity in the environment that carry the weight in the determination of the low level of threat of entry, even in the light of increasing demand.

In the United States eight out of the ten top medical universities are private. As well, many hospitals are privately run, which may influence the acceptance of private medical universities in the United States. However, Canada has maintained a public sector environment in both of these areas. Although recently many provincial governments are increasing the access to students for private institutes by opening of the accreditation to general degree programs, it is unlikely that in the short to medium term the government will allow accreditation of a large number of higher level doctoral and medical programs and therefore unlikely that there would be entrance into this field by the private sector. Especially, considering that in the United States where the environment may be considered more inviting there have been no new entries into this category since the middle last century.

The increased access to accreditation for institutes that are not under the direct control of the province may seem like a leverage point for new entry into this industry. However, it is very limited and is only viable to the lower or standardized level of education. It is most likely an incremental approach used by the provincial governments to address the increased demand based on current demographics for base level education and probably has minimal impact to the existing

establishment. Therefore, it is an unlikely entry point for universities at the medical doctoral level especially when reputation of the education has such a great impact on its usefulness.

For a student who is looking towards the future, the perceived quality of the education that he or she receives is important. Even more so for those student who are anticipating an extensive university program. The expectation is that the higher the reputation of the educational institution the more likely the student is to achieve his or her career goals and income potential. Therefore there is a demand for highly respected universities by these students. A perceived quality education is based heavily on university reputation. There are a number of attributes which can signal quality for a university, such as, large amounts of capital funding and infrastructure, attraction of high profile professors, ability to attract research funding, and quality and profile of the research produced, relationships to resources (hospitals and industry) and a history of successful graduates. These attributes take time to obtain and therefore the development of a quality reputation is a lengthy and costly process. Most existing universities in the medical doctoral category have been established decades ago, have large endowment funds to leverage for capital projects and have established a history and reputation of successful graduates and research. This is an extremely high barrier to entry for any newly established institute. Even if one was established as another public sector entity, it may take years before the reputation was established in order to attract the quality of student, professors and funding required to be a serious threat to the existing institutes and therefore not highly likely to be undertaken.

Relationships to hospitals, governments and industry are extremely important for the entrance into this industry. Without research funding and hosting by these entities, a thorough education cannot be obtained. Whether this is a public sector entity where logistics would create tremendous inefficiencies or a private sector entity where new relationships would have to be forged, successful entry into this category of institute is low.

Influenced by the age of the customers (new adults) and the cost of relocating, most students remain in their geographic location for most of their lower level education and once adult ties are established usually remain in the area for further education. As well, there are restrictions placed on admittance to schools to those who do not show residency in the geographic area. For example, the University of Saskatchewan restricts out of province entrance into its medical school to only 10%. This is most likely due to the need of the province to produce the targeted number of medical professions that will remain in the province to address the needs of the population in the future years. Therefore a new entry into the industry, unless they can provide geographic proximity to students, would have difficulty establishing itself. Since most universities already exist in the areas of dense population the ability for a new entrant is limited.

Some aspects of the universities' product mix, general degree programs and some high demand specialties, may be targeted by private institutes and competitors; however, in general most customers (students) decide on the institute based on a combination of geographic location, institute's reputation and method of delivery of material. The size of the institutes and the range of graduate and doctoral programs offered create a unique opportunity for students to customize their education by combining courses from a wide selection of specialties, therefore allowing for a bundling effort that could not be offered by smaller or more specialized institutes that were representative of new entries. As well the volume of specialized equipment within an institution, either by many programs or by shared resources from relationships (hospitals, etc.) allows for better cost recovery which, in turn, allows for capital to be spent on even more specialized equipment adding an element of economies of scope that again could not be matched by new entries.

Whether new distribution methods of education are considered substitutes for an established physical institute or just another mode of education is of little significance since it has not yet had an impact in this industry. Peter Drucker's expected revolution in education has

not materialized (Johnston, 2003) and distance education, conference lecturing, remote diagnostic technologies, etc. has not had the impact that may have been expected, therefore the threat of entry of new players from other geographic areas using new distribution methods of transferring information has not occurred. Although technically feasible, the social and personal interaction of students and professors has a high degree of desirability that is unlikely to be replaced in the near future.

There is an increase in demand for higher levels of education. This is due to a combination of demographics and a shift in the economy. As a generation flows through their life cycle, their offspring are usually only 20 to 30 years behind. Therefore the progeny of the baby boomers are hitting our education system increasing demand at the same time the baby boomers themselves are leaving the work force and vacating the positions that will be filled by their children, including required skilled labour for the industry (professors and administrators). Combine the demographics with the shift into a knowledge-based economy where increased education is required to be competitive and a demand bubble has been created. This would normally lead to the opportunity for new entrances into an industry. However, due to the lengthy time required to create a functioning institute at the medical doctoral level this demand is not the opportunity that it initially seems. As mention, the undergraduate level and some specialized programs (MBAs) may be seen as an opportunity. However, the majority of the programs, due to the complexity required for their success, are not likely to be targeted for new entry. As well, due to the public sector nature of the industry resulting in a concentration of cost and controls it is more likely that a temporary expansion of the existing institutes would be the long-term solution.

In general the industry is highly complex requiring large amounts of capital and time to establish relationships and reputation. It is also a public sector environment dealing with providing a public good. All of these aspects combined, even with increased demand, open

accreditation and new distributions channels, create a barrier to entry with the likelihood of a threat of new entry being low.

This is a highly regulated industry in all aspects: funding, process and quality of output.

2.2.2 Bargaining Power of Suppliers

The power of the suppliers is moderate. One of the higher power based suppliers, in the short term, is the unionized support staff. Since their unions are provincially based a disagreement with one union could disrupt services for more than the specified area supported by the union. Usually, this power is not industry wide (national), but institute specific; however there are times where provincial wide impacts can be felt.

Faculties also have a legal representative body that negotiates on their behalf. University reputation, and the quantity and quality of research are primarily dependent on faculty therefore they are powerful entities within the industry and have considerable bargaining power. A particular situation occurs in that it is standard practice to have the research funds follow the researcher, therefore there is some potential for universities to woo these candidates in order to retain or attract their presence at the university. In addition, as global competition increases and countries attempt to increase their chances of becoming more productive and competitive the universities will be vying for the most knowledgeable professors in each field. Potential emigration of the faculty members at the same time that large numbers are heading towards retirement increases the scarcity and power of this group of suppliers.

As public sector facilities, medical doctoral universities rely on their relationships with hospitals, law firms, architectural and dentistry practices in order to provide the necessary environment for learning. Without these participants and government entities, such as the Ministry of Agriculture, Food and Fisheries and the Ministry of Education, the universities would

be unable to provide their service to a large portion of their students. However, since these are government-controlled organizations this does not constitute power in the hands of a supplier.

Industry sponsorship and relations are very powerful in that they are not controlled by the same parent (government). Since the motives of the private sector are to increase commercialised research and education, they are sometimes in conflict with the pure-knowledge-based desires of academic education. Changes in private industries' profits, due to economic conditions and changes in research area of focus, have the potential to substantially impact medical and doctoral universities by shifting research funding.

2.2.3 Bargaining Power of Customers

The customers in this industry are predominantly students, although government and spin off companies may also be considered as customers in some aspects. The power, in general, of the student is low to moderate. Currently the demand for higher levels of education is increasing. This puts the control in the hands of the institutes. They have what could be considered buyer selection power and are utilizing this power, at various levels, depending on the demand for the educational area and the supply levels determined by government and industry.

Undergraduate programs are generally based on grades; those who apply with the highest grades given the number of seats available are accepted. The better the reputation of the institute, the more demand for its degree; subsequently, larger numbers of applicants with higher grades apply and are accepted. A higher calibre of students, as perceived by better grades, in turn results in a better reputation for the institute and the cycle is complete. However, undergraduate programs that influence reputation more than the others may have even more buyer selection power associated with them for example, programs from the faculty of commerce. More complex requirements than grades may be required for acceptance into these programs. Personal interviews and separate application processes may be used to select the desired student.

For higher-level programs even more buyer selection can be attributed to the industry. Completed undergraduate degrees, which bring in more funds, may be required before entrance into the next level of education (for example: a bachelor's of science for entrances into the medical schools) as well as a more comprehensive process to bring in the ideal candidates.

Although not resulting in a large impact on the power of the customer, there has been a shift in the information asymmetry associated with these institutes. Previously, students generally went to the institute in their local geographic area, however with more information available on other institutes and their respective specialties, more power is put in the hands of the student in determining their choice of institute.

The availability of this information, the standardization of credit values between institutes and the comparable costs of tuition allows students to be more mobile. Dissatisfaction with an individual institute allows the customer to switch to other institutions within or outside of the medical doctoral universities category. Although the option is there, the overall cost to the student may be more than initially realized when the entire impact of the switch is calculated, especially with respects to intangibles, like social connections. Although there are student unions and liaison relationships between the student and the institutes, cohesiveness amongst the students is weak and limits their power base. Therefore, these attributes are not considered to have a large impact on the overall power of the customer.

The power of the students is primarily in the perception of the reputation of the institute and their ability to represent or impact the reputation of the institute once they graduate. As research becomes more of a focus of these institutes and becomes more visible to the public, students at the higher graduate levels may have increasing influence on the industry, especially in the areas of ethics and public relations.

Graduate attrition and retention rates have influences on the industry, as students are in control of whether they complete their program and, in some cases, how long they take to do so.

However, the behaviour of the students can be monitored and then accommodated or changed by new requirements implemented as quasi-standards by the industry as they see necessary and therefore mitigates the risk.

To conclude, the primary influencing factor of the students in this industry is supply and demand. There are more students than positions and therefore the power remains with the institutes.

Other entities could be considered customers to some extent. New spin off companies and the government itself could be considered customers. Since these are not considered primary customers they will not be addressed in this paper. A more complete analysis would be required to accommodate their interaction in the industry.

2.2.4 Threat of Substitute Product/Service

The influence of the threat of substitution on this industry is low to moderate.

If the industry is categorized as primarily providing a lecture format to the delivery of their products then a threat of substitute service might occur with an increase in the new distribution formats, like Internet education. Although these delivery methods are available and have increased, they are not perceived as a major threat due to their limited volumes and target areas (undergraduate degree) especially with the current increase in demand. As well there is always the ability of the existing institutes to challenge this with their own service, which many have done already.

The other threats of substitute are influenced by government policies as well as industry perception. If industry and government accept immigrants or ex-patriots with degrees from other

jurisdictions, these could be considered a substitute product to a Canadian earned degree.

Currently, industry accepts the validity of degrees from other western countries. For instance, a Harvard business degree carries influence in the Canadian business environment and is readily accepted even though a Harvard degree is not a Canadian earned business degree.

If the government lessens the restrictions on areas of licensing (i.e.: medical, engineering, etc.) it could impact the industry in a more substantial manner, either by lessening demand or requiring new services to accommodate the new policy changes (i.e.: residency for new medical personnel).

With the increased demand of medical and other professional services required in the near future it is not an unlikely scenario that policies could be changed to address the demand, hence the determination of the threat of substitute is higher than low and is rated as low to moderate.

2.2.5 Rivalry Amongst Existing Competitors

This industry is in the public sector and institutes are geographically aligned with most institutes located in proximity to high population areas. This would normally suggest that these institutes would not be in competition with each other; however, due to the limited funds available for distribution from both the federal government and the private sector combined with the increased focus on research and commercialisation, competition within the industry has increased.

Canadian medical doctoral institutes are in a slow growth industry that would typically suggest that there would be competition between entities. However, historically this has not been the case primarily due to the geographic alignment each institute as mentioned above. Although,

as people become more mobile the geographic influence has become less of a factor, and competition has increased in attracting quality professors and students.

Additionally, education and research are services, available and only good for the present time. In other words they are perishable. For example, if a course is not full when it is offered and is cancelled. The service is lost. This would normally increase the rivalry amongst competitors to ensure all student seats are full, however due to the high demand for courses this is of little influence to the rivalry factor of this industry analysis. In the research field, if research is not conducted while it is viable then it too is lost. The high profile of the opportunities or research increases a university's ability to attract and retain quality professors and students, which subsequently increases their reputation and further revenue. This leads to heightened competition in this area since the supply for research funding is limited.

Over the past decade general operating funds from the provinces to all universities have decreased approximately 10% (Canadian Association of University Teachers, 2004, December, para. 3), putting a strain on the system. In 1971, the student-faculty ratio was 23 to 1; in 2001 it was 39 to 1 and expected to increase with an additional 200,000 students over the next ten years. As mentioned by Paul Davenport, the president of the University of Western Ontario, although federal funding has increased it has actually increased the strain on the operating budgets since this type of funding does not cover the full cost of the research and therefore, if the provinces do not make up the difference by increasing the operating budget, the short fall, estimated at 40% of the direct research grant, results in less overall funding (Davenport, 2001) to areas outside of research. This leads the institutes to look elsewhere to find the funds to provide the desired services. In 2002/2003 university revenue has increased by 7%, but the majority of the increase has been from the private sector either through tuition fees or sponsored research (Canadian Association of University Teachers, 2004, December, para. 2).

As the need for additional funding increases, with increased federal research, the need to retain and attract professors, students to maintain reputation, and as the suppliers of these funds remain limited, the negotiable historical competition amongst the competitors has started to increase and will continue to do so. Therefore the rivalry for this public sector industry is currently determined to be low to moderate.

2.2.6 Overall Assessment and Key Success Factors

Historically the Canadian medical doctoral university industry has functioned in an extremely collaborative cultural environment. Joint research, collaborative initiatives and visiting professors all add to the benefit of all institutes involved. It is anticipated that this aspect of the environment will not fundamentally change. The concept of base knowledge being openly discovered, researched and discussed as a benefit to all is a noble concept and not likely challenged.

Response to accommodate the directive of most provincial ministries of advanced education to provide geographically based education to support future provincial needs will continue to be the primary focus. Therefore, this industry is extremely stable and is primarily impacted by demographics of the current population more than any other attribute.

It is anticipated that the administrative areas may become more competitive and innovative since vying for the research funds, top professors and students will become more challenging and more necessary due to demographics and globalisation, even though, most industry analysis factors are still determined to be within the low or low to moderate range. It is likely that funding deficits resulting from higher salaries and less-than-full funding will be compensated for by government in some manner; although there is likely to be lag time between the initial need for increased funding and governments' response.

A shift towards applied knowledge research or commercialisation from basic research could be detrimental to future discoveries and is a conflict issue within the industry. It is thought that the low level of R&D undertaken by the Canadian private sector hurts Canada's competitiveness. Governments and indirectly universities are currently faced with the problem of determining how much of this should be taken on by the public sector. In recent times, universities have taking on more of applied research to supplement funding and as a response to demand from researchers. It is anticipated that this trend will continue in the short and probably the long term.

Key success factors for this industry rely on government direction and consistency between provincial ministries. If the federal government has determined that medical research is desired and more funding is available then the industry will move in the direction of increased medical research. This is true for any government-focused initiative.

Reputation and relationships are other key success factors. An effort to build and maintain both of these factors is important to the industry and each institute in general in order to foster public support and funding. Global recognition is also becoming increasingly important in order to attract research funds and top personnel.

3 INTERNAL ANALYSIS

In the recent global shift to a knowledge-based economy, post secondary education became a key component to competitive advantage strategies for most nations. This view of higher education, coupled with the limited amount of funds available from private and public sector sources, establishes the necessity for universities to be strategically aware of their position provincially, nationally and globally. However, unlike a competitive private sector corporation where the understanding of the need for a strategy to obtain or maintain market share and profits is straightforward, obvious and entrenched in history, the need for a strategic plan is not as clear, maybe less understood and a relatively new phenomenon in the higher education public sector.

It should be noted that as public sector institutes, strategic documents are publicly available. However, in addition to outlining strategy, they are also public communication vehicles that may serve as an opportunity for conveying additional messages. In reviewing published strategic documents from the research-intensive medical doctorate universities of UBC, University of Toronto (U of T) and McGill University there is a striking contrast. McGill's information is difficult to find and dwells mostly on concerns regarding below average funding rather than actions and goals, U of T is very business oriented and focused on educational aspects and service provision and UBC's appears to be very politically correct and generally focused on softer aspects like community and work environment. What can be taken away from these public forum documents is an impression of their projected public image or their strategic differentiation message. McGill is provincial and self focused, U of T is professional, focused and down to business and UBC projects elements of quality of life and lifestyle. Similarly to private institutes, not all strategic items may be openly available. Some items may be hidden such as political

motivation and influence. However it is assumed that these documents provide the overall direction of the university as it is understood by each university's respective general administrators and faculty members.

3.1 Strategic Fit Analysis in Public Sector Entities

Since universities must address provincial mandates and as such have limited control over strategic categories, they are not free to focus solely on maximizing profit and must accommodate all aspects of their mandate therefore creating a blended strategy that can be interpreted as weak and inconsistent by those who are accustomed to profit centred strategies. In the medical doctorate provider category, strategic fit appears to be fairly consistent with expectations of a blended strategy, which accommodates multiple ministry directives and to a lesser extent, the additional expectations from other funding sources such as donors and alumni. As a tool, strategic fit analysis on the entire public sector entity may not be useful, since public sector entities usually have both a public service (provider of a public good) and a strategic competitive component to their mandate (self-generated funding). For instance, universities address multiple directives from government: provide efficient and effective base teaching; increase research capability; and generate increased funding to self-support the institute. Most universities have taken the approach to treat the undergraduate teaching with a cost based strategy and have reduced costs for their teaching and administrative efforts while actively seeking increasing research funding and self-funding programs. This muddles or creates an inconsistency in an institute wide strategic analysis, which eliminates the value of the process since the strategy for one component may be cost based and the other differentiated. It is suggested that a separate analysis of each major component may be informative and beneficial by identifying areas that are inconsistent with the major strategic focus for the component.

Based on the facts that government funding per student has been reduced and the increased usage of part time faculty, it is assumed that the medical doctoral universities, like most universities, follow a cost based strategy for their undergraduate teaching initiatives. As public sector entities addressing these cost based components, medical doctoral universities have the rare opportunity to leverage the non-competitive environment of the public sector and the collaborative nature of Canadian universities by sharing resources to deliver cost effective solutions, as in the case of administration applications. In the areas of research initiatives and self-funded or revenue-generating programs (e.g. Master of Business Administration), it is assumed that most medical doctoral universities follow a differentiated strategy. This is due to the recent increase in focus on research that has increased the competition for quality researchers and high technological infrastructure. From a competitive perspective, there is a perception by the author that most universities, although providing considerable funding for infrastructure, may be under funding their R&D investment for their differentiated strategy. This research investment should not to be confused with the investment of undertaking of research in response to contracts and grants, but refers to research investment in the business of running the university and determining strategic plans that are innovative and can differentiate the university from other similar universities, such as new programs or developing a marketing plan. The perception of low R&D is based on the recent late introduction to the higher education sector of marketing initiatives like university branding (Harris, 2004) and the limited size of the universities' industry liaison offices when considering its potential increase to revenue. If universities were considered as private sector competitive institutions, this would be a strategic flaw and one that should require attention. However, initiatives that result in the universities competing for the same resources such as students may not be perceived by those providing the funding, such as governments, private donors or alumni, as an effective use of funds. Increasing research and development efforts is an appropriate strategy in areas of new revenue generation, such as research commercialisation, private research sponsorship, new services or an overall increase to

student population. To sustain this advantage the R&D efforts would need to be continual as new initiatives would most likely be copied. This strategy could also generate a long-term increase in reputation capital by attributing characteristics of innovation and leading edge.

Irrespective of how a university is perceived, it could become more efficient or produce better results by understanding how and where value is created in the education of a student or the production of research results. Once this understanding is known, an institution can then leverage this knowledge by improving in areas where value is created and/or eliminating or reducing those processes that have limited or negative ability to create value. Leveraging this knowledge can result in a more efficient use of funds and a stronger final product.

This paper will discuss the value chain of a sample competitor; the University of British Columbia (UBC). Information is taken from publicly available references, and should not open UBC to any strategic exposure. Some areas of competency have been reduced to general descriptive comments to further generalize the sample. As mentioned, UBC is the third largest university within Canada. It is consistently ranked in the top five medical doctoral universities within Canada and is currently ranked 36 amongst all universities in the world by the European Commission and ranked by the Shanghai Jiao Tong University Institute of Higher Education (Institute of Higher Education, Shanghai Jiao Tong University, 2004). From a research perspective, UBC is first among the top research-intensive institutions for securing overall funding from the Canada Foundation for Innovation (CFI). It routinely is ranked among the top ten universities in North America in creating spin-off companies and has been the top university in Canada in filing patents (University of British Columbia, 2004c).

The UBC undertakes two main functions: academic teaching and research. The university's academic undergraduate program is geared more towards a cost based strategy than is their graduate/post graduate degree programs and specialty schools. When compared to the

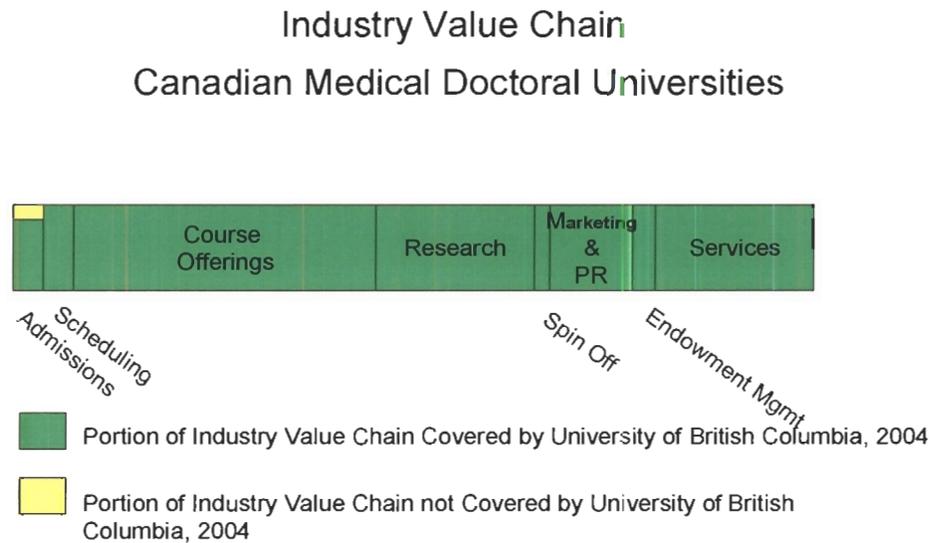
entire university sector UBC is a more differentiated and costly institute, however, within its category, UBC is a low or competitively priced institute for most academic programs as indicated in the Statistics Canada cost of Canadian University Tuition and Living Accommodations survey for 2000/01 (Manitoba Council of Post-Secondary Education, 2003).

Like all research-intensive medical doctorate universities, UBC focuses on obtaining prominent researchers, research funding and the commercialisation of research products. This is evident by their successful rankings in these areas and the promotional material published by the public affairs department. In this area, similar to most universities in its category, UBC attempts to be innovative and differentiated.

In both the academic and research areas, future changes will drive the need for more efficient use of funds and better quality end results. Demographics will push the demand for more efficient ways to enhance the students' learning experience and as global competition for research intensifies, the ability to produce quality results will become a competitive advantage.

3.1.1 Industrial Value Chain for Medical Doctoral Universities

Figure 3.1.1-1 Industry Value Chain Diagram for Canadian Medical Doctoral Universities including UBC's Footprint



Adapted from Bukszar, 2005, by permission, based on Porter's "Competitive Advantage".

The industry value chain for Canadian medical doctoral universities can be easily viewed as the progression of a student through his or her academic lifecycle. Although this is a generalization and there are nuances that create differences between students, this should provide a logical and straightforward method of understanding the general industrial value chain.

For a pictorial representation of the industry value refer to Figure 3.1.1-1 Industry Value Chain Diagram for Canadian Medical Doctoral Universities including UBC's Footprint. It should be noted that the size of the each block is representative of high-level estimates of revenue generation, with the exception of admissions and scheduling, based on using UBC as

representative of this category. See Appendix B - UBC Revenue Areas – March, 2004 for representative numbers (University of British Columbia, 2004a).

While still in high school, students analyse the reputation and offerings of each institute, assessing which satisfies their individual requirements. Generally, most undergraduate students remain in their local geographic region. Students apply for admission to their top candidate universities. Universities receive the admissions either directly from individuals or through a provincial central clearing process. Universities then provide feed back of acceptance based generally on student grades and available space funded for the program. Some programs require a more comprehensive process for admission such as interviews or follow up documents. Universities then solidify the program's schedule for classes, dependent on anticipated numbers of students and available resources (faculty, equipment, space and funding). The student whose qualifications match the entrance requirements for the program must confirm acceptance and register for individual courses based on the program's schedule and their individual preferences. Most courses are filled on a first come first served basis within grade categories (i.e.: those with the better grades get primary consideration).

Admissions and scheduling, although important processes, are mostly logistical endeavours and have been improved by the use of computer technologies to become extremely efficient. Computer program logic has turned what may have taken months to complete into hours or even minutes. These processes are usually run multiple times over the admission time period to provide results as continual adjustments are made.

The next process in the idealized industry value chain is course offerings. This is a primary operational process of the university and involves the preparation of the course and its instruction and support. Student tuition fees, fees for services utilized and government grants provide the bulk of revenue for universities and are based on the students registered and attending

course offerings. For the undergraduate programs the course offerings are focused on providing the fundamental basic knowledge elements of the subject matter. A balance between processing a high volume of students and the effectiveness of the knowledge transfer is required. For the graduate programs the total volume of students is usually less than 10% of those in undergraduate courses. The course offerings are focused on subject matter at a more advanced level. Due to the complexity and relative newness of the subject matter, increased individual instructor time must be given for discussion, application and support, as well as access to specialized equipment and environments (e.g. hospitals). For medical doctoral universities this is an area of strategic importance. Higher-level government funding and increased tuition fees are provided at this level, as is the opportunity to develop the environment and infrastructure for research and research support.

During course offerings at the graduate level, much knowledge transfer occurs when compared to undergraduate courses. Experience and knowledge transfer also occurs during research. Research funding provides opportunities for graduate students, researchers and the researching faculty member. It is another of the large processes that creates revenue or value within the industry. Having had to establish the environment to offer graduate level programs, the medical doctoral universities are now in the situation to have the opportunity to expand the use of the faculty members, graduate students and faculties into other research areas. Grant proposals are developed by researching faculty members and, if approved, provide additional funding and opportunity for recognition and promotion.

Some research outputs are commercially viable which leads to spin off companies. Universities usually have a department associated with aiding the researcher in this aspect. Many universities receive royalties and on going research support from equity positions in companies spun off as a result of successful research. This is a relatively new source of income for many universities. Although currently spin offs do not produce large volumes of additional revenues,

the income is not insignificant since the revenue from spin offs are expected to continue to increase in the future.

Universities depend on their reputations and relationships to attract quality students, researchers and faculty members, whose efforts generate quality research proposals and results which, in turn, contribute to a stronger reputation for each university. Besides federal and provincial research funding, reputation and relationships also contribute to additional private research funding and donations. Marketing and Public Relations (see Figure 3.1.1-1) management is important to medical and doctoral universities. It aids in the communication of reputation and the building of relationships that ultimately result in increased revenue. The function can attract considerable revenue for an institution.

Related to reputation and relationships, which may be enhanced by marketing and public relations, is endowments. Universities are given donations by some alumni and other local citizens or corporations to help support the university's activities. Some of these donations have specific obligations concerning their uses and management. Research, capital projects, and special activities can be funded by the endowment funds either directly or with proceeds derived from investment of the endowment. The endowment funds can be considerable in size and require professional management.

Lastly, universities receive additional revenue by providing services to the student, faculty member, researcher, staff and community. These range from the revenue on books sold in the bookstore, computer time, housing, parking, food services, recreation, dental and psychological services and many others. This is a significant portion of revenue to the universities.

UBC, like all the top 5 universities in this category, participates in all processes of the medical doctoral universities' value chain and therefore has a footprint that covers the industry

value chain from start to finish. There is one area in which UBC does not fully participate. The admission process for those students who enter directly from secondary school has been outsourced to a central organization called the Post-Secondary Application Service of British Columbia (PASBC), which is used by most universities and colleges in British Columbia. Its purpose is to facilitate the forms input and transcript movement between organizations and provides a one stop shopping experience to the graduating high school student. This does not eliminate the process from UBC's value chain. Not all students are received directly from British Columbia's secondary schools and some programs (e.g. business) have additional admission requirements.

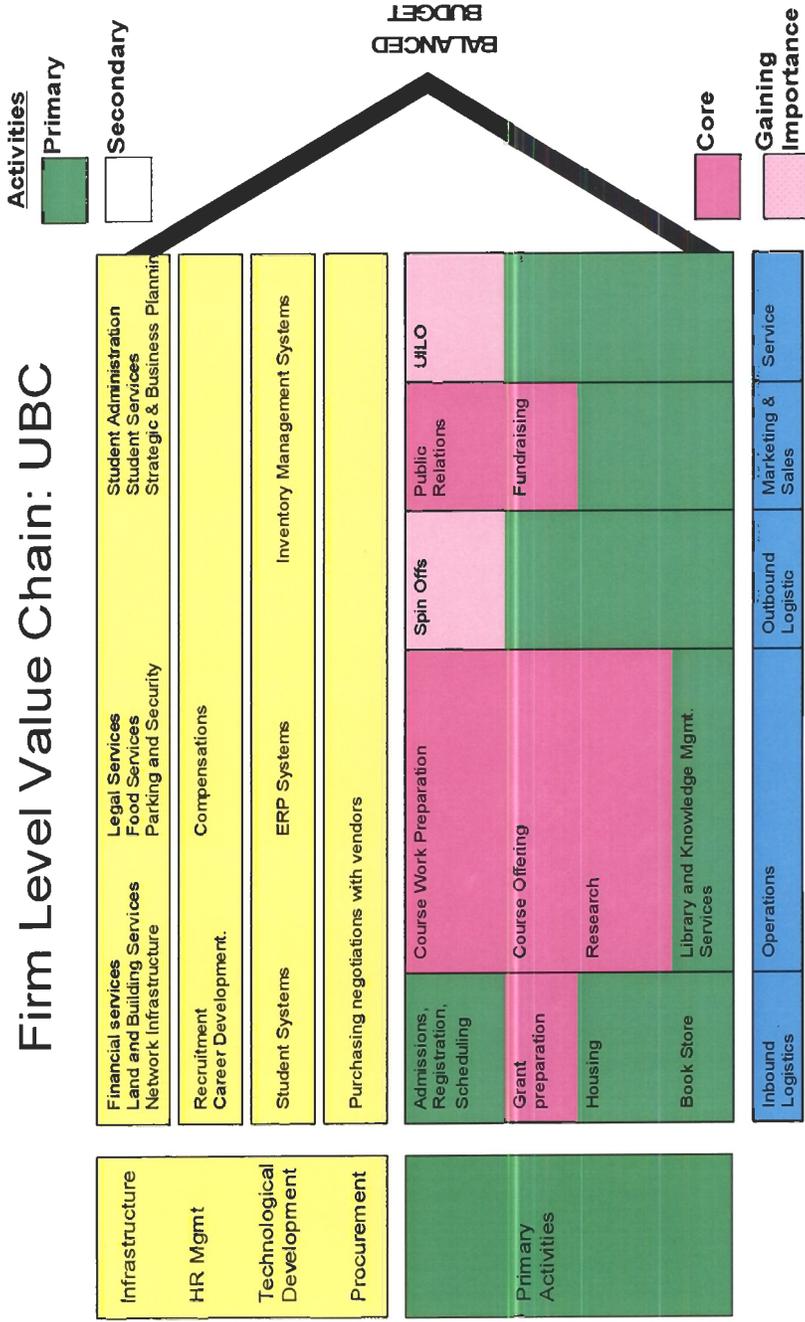
By their very nature spin offs are entities outside of the universities – they are newly formed companies. The block in the industry value chain, although full size, only presents the processes undertaken directly by universities not, the full activities of the spin off company.

This is similar with endowment funds management. Funds must be contractually managed by independent third parties and therefore the industrial value chain block only represents the activities of the universities, not the entire process.

3.1.2 Firm Level Value Chain Example

Most activities performed by UBC are fundamental activities that are undertaken by all members within the medical doctoral category. Although UBC is one of the larger universities both in research and student population, it is not seen as a unique institute that provides additional activities. They are public sector entities using public funding and therefore are not in an environment where undue risk is promoted. Although structurally similar to others in its member group, UBC appears to excel in areas of creating spin off companies and attracting research funding.

Figure 3.1.2-1 Firm Value Chain Diagram for the University of British Columbia - 2004



Adapted from Bukazar, 2005, by permission, based on Porter's "Competitive Advantage".

UBC creates most of its value, 88%, in course offerings, research and services to students, staff and faculty. The other 12% is created from a combination of spin off revenue and the results of promotional activities in the way of donations and investment revenue from these funds (University of British Columbia, 2004a). These activities are a combination of primary and secondary activities.

3.1.2.1 Primary Activity

The primary business of medical doctoral universities is teaching and research, as well as providing supporting services that directly facilitate these two activities. Looking towards the future, commercialisation of research results is taking on more importance as a result of the view that equity ownership could be a direct method of increasing revenue. Secondly, spinning off new companies is an avenue to potentially attract and retain those top quality researchers who have hopes of commercialisation as well as to increase private donations and additional research revenue. All research universities have a form of University Industrial Liaison Office (UILO) that provides services to work with researchers and industry in the area of potential spin off companies.

The categorization of these activities can be viewed by referring to Figure 3.1.2-1 Firm Value Chain Diagram for the University of British Columbia - 2004.

3.1.2.1.1 Inbound Logistics

If a student who is applying to a university for post secondary education is analogous to the raw resource of a manufacturing operation, then the inbound logistics processes would be admissions, registration and scheduling. As stated, these are mostly logistical processes and UBC has been very effective in this area by leveraging the efficiency of information systems to enable quality processes with the appropriate communication to the student and UBC personnel.

As well, for the student to successfully complete the course offerings, textbooks, supplies and lab equipment must be purchased prior to the courses being undertaken. This process is managed by the university bookstore. It charges additional fees to cover overhead and cost. At UBC, the revenue from this area is the second leading contributor to UBC's large service revenue; it is 23% of UBC's total generated revenue (University of British Columbia, 2004a), although it is not a core activity, it has added value as demonstrated by its contribution to revenue.

Once registered, the student that lives on campus is 'warehoused' in on-campus locations, residences. This is a complementary activity, but not a core one. Many students successfully complete their degrees while living off campus. However, housing is another revenue generator for universities like UBC, which has recently increased capacity for housing.

Another logistical activity that is core for universities is grant preparation. Researching faculty prepare proposals to granting agencies for funding to support their initiatives. Large universities conduct thousands of research projects annually. UBC conducts over 4000 research projects and is the top research-intensive institution for securing overall funding from the Canada Foundation for Innovation (CFI) and top funding for new research infrastructure. UBC is ranked very high in overall grant funding compared to its peer universities (University of British Columbia, 2004c). Assuming that grant preparation is instrumental in obtaining grant funding, this would indicate that UBC is highly competent at this core activity.

3.1.2.1.2 Operations

Categorized as an operational activity, research contributes 23% to UBC's revenue figures.

UBC has moved from placing fifth place in 2002 for dollars of research funding obtained to third place in 2003 (McMaster University, 2004b) as compared to all Canadian universities,

including those within the medical doctoral category. UBC's faculty also ranks second in Fellowships of the Royal Society of Canada; an honour bestowed on senior Canadian academics whose work and research have had a profound impact on the Sciences and Humanities in Canada (University of British Columbia, 2004c). This would suggest that UBC is able to support quality personnel in providing outstanding results. These facts demonstrate that research is one of UBC's core competencies.

Since most faculty members are also researchers, this calibre of research and researcher blends and enhances two other core competencies of UBC: course work preparation and course offerings. Courses are proposed by the curriculum management committee and approved by the senate. Once approved the faculty member has considerable autonomy on the method of presentation. This assures faculty the ability to take advantage of the most recent research and knowledge available and present it in the style most appropriate for the material. Teaching support is provided through the faculty member's department or school. Faculty members have access to use the services of the TAG program, Teaching and Academic Growth. A teaching certification programme is available for faculty members. Since UBC offers teachings in many disciplines, students are able to blend courses to create unique degrees specific to their area of interest. More granularly, due to the extensive disciplines at UBC many programmes have curricula that are blended to take advantage of equipment and resources and knowledge of other complementary disciplines that universities with less broad or narrower offerings could not provide.

University-wide guidelines set out to ensure a student graduates with a wide level of exposure to varying knowledge bases. For instance, one guideline calls for all undergraduate programmes to provide some element of international exposure to various knowledge bases. Another guideline that blends two core competencies together and provides leverage to both is the requirement to have a research based learning experience for all students in their undergraduate

degree. This could take many forms, including research seminars, research assistantships, research projects, or research based inquiry and problem solving.

A key process of UBC's primary activities of teaching and research is information gathering. The student, faculty and researcher's ability to obtain information for understanding of concepts and further expansion of knowledge is imperative to quality education. UBC has extensive library resources both physical and virtual. The University of British Columbia Library is the second largest research library in Canada and has 14 locations, which supports the core activities of teaching and research across disciplines. These libraries house over 4 million books and journals, 4.9 million microforms, and more than 1.5 million other items such as maps, sound recordings, videos, manuscripts, and documents (University of British Columbia, 2005b).

3.1.2.1.3 Outbound Logistics

Spin off companies provide value to UBC in four main ways: potential future revenue streams from royalty payments as the companies become profitable; investment revenue from the equity portion of company; additional research opportunities and promotional opportunities to keep UBC in the media in a positive way which aids in maintaining UBC's reputation. It is expected that spin off activity will increase in the near future and therefore the value of maintaining an equity portion of new companies will also increase as potential new revenues may be realized. Although, only contributing one percent to the total revenue stream of UBC (University of British Columbia, 2004a), licensing is becoming a high profile activity and is likely to become a more core activity in the future. UBC excels in this area, routinely ranked among the top ten universities in North America in creating spin-off companies and has been the top university in Canada in filing patents (University of British Columbia, 2004c).

3.1.2.1.4 Marketing & Sales

UBC's reputation is used to attract private donations and research grants, as well as, quality faculty and students. UBC's public affairs department, development office and advancement offices all contribute to private fundraising and reputation management. Non-Government Grants, Contracts and Donations contribute 9% to UBC's revenue (University of British Columbia, 2004a). As well, if cumulative grade point averages (CGPA) are a measurement of quality, UBC has been successful at attracting quality students (raw resources). UBC has done well to promote itself, as is evident in its ability to attract students and funding and it has done well identifying and leveraging areas where it can differentiate itself. One of the areas that is unique to UBC is its spectacular location which is visually attractive and promotes an active and natural lifestyle. UBC has marketed this well and has leveraged this natural asset further in utilization of its infrastructure funding. Receiving the largest portion of the Canadian Foundation of Innovation's research infrastructure grants also feeds into UBC's strategic advantage as building requirements focus greatly on attractive and sustainable design. By focusing on building designs that are environmentally sustainable and aesthetically appealing UBC has made very good use of both in its marketing promotion of environmental beauty and lifestyle options and its funding.

3.1.2.1.5 Services

As mentioned previously, licensing of research results is becoming more desirable and potentially more important to UBC in the future. Having a University-Industry Liaison Office (UILO) which is experienced in licensing, contracts and support, as is UBC's, adds value in the following ways: attracts potential researchers with a mindset of commercialization and a desire to make the most of the opportunity; and provides economical efficiencies; and potential risk management during negotiations. As more licensing agreements are created, an efficient and experienced department will provide increasing value to UBC.

3.1.2.2 Secondary Activities

UBC's secondary activities are largely the responsibility of the Vice President of Administration and Finance, with the exception of student administration, program planning, network infrastructure and legal services. UBC is a large city-like institute that requires an extensive physical infrastructure as well as administrative structures to support its primary activities.

A large number of secondary activities heavily rely on the computer systems to facilitate and process information required as part of the administrative structure of the university. These systems are decentralized and are the responsibility of their respective administrative units.

3.1.2.2.1 Infrastructure

There are operational and strategic planning elements that are necessary prior to the admissions process. It is within these planning functions that UBC's direction, programs and student volumes are determined. These components are then finally approved at the appropriate level of faculty administration, board of governors and provincial government. These are necessary activities that can add value to the organization if they are done more efficiently and effectively than in other institutes. This would rely on the effectiveness of the planning process and on the effectiveness of the leader and quality of the participants. Although not confirmed, it is anticipated that all universities within this category are reasonably competent in the area.

Although education could be presented from a virtual institute (as was the structure of the failed Technical University of British Columbia), this approach has not become popular. Personal interactions and the full experience of being a campus student have a perceived value to the student. As well, there is an inability in a virtual institute to provide most research and advanced learning without experiential exposure. These facts necessitate the need for medical doctoral universities to have a physical infrastructure and the ability to support and maintain (Land and

Building Services), build and rebuild as necessary. UBC has done well at reducing cost by exceptional building preservation and is obtaining approximately twice the building and roofing life expectancies compared to local building norms. Although not confirmed, it is generally perceived that total in-house labour costs are high compared with outsourced labour. However, this perception may be based on internal charge back rates rather than actual cost to the university. As well, the on-demand availability of skilled trade workers may be an intangible that could add to the value of in-house labour.

Due to the distance of the campus to the urban centre, UBC historically required its own power generation. Although natural gas, electricity, water and telephone are purchased by contract directly from large-scale vendors, UBC still maintains its steam power generator that can efficiently be used to heat numerous buildings. Although not a core activity by any means it is still economical and incrementally reduces over all cost therefore generating value.

Two activities that directly affect the students are student administration and network infrastructure; both areas are implemented well at UBC. Student administration utilized information systems as much as possible and is further discussed in the technology subsection of this document. UBC's Wireless Network is one of the largest Campus Wi-Fi Networks in the world having almost 1400 access points deployed in over 150 buildings covering most of the 1000-acre campus (University of British Columbia, 2004b). The new wireless and existing hardwired networks provide access for faculty, students and staff to communicate, work cooperatively and transfer learning material. The ability to communicate is necessary within a learning environment; therefore networks that facilitate quicker and easier channels add tremendous value for the student and researcher by reducing time spent with less efficient methods of communication.

Although most infrastructure items can be considered the cost of doing business (e.g. legal services, financial services), some costs are offset by charging back for services rendered (e.g. food services, conference centre, parking and security, child care centre and computer time and access). These fees contribute to the overall revenue of UBC; however this revenue in most cases is expected to cover operating costs and contribute to debt payment and future capital costs in order to maintain the service over the long term.

UBC's ability to obtain additional sources of revenue by charging back to the customer or employee is unusual compared to most industries, but not in the university environment. This is common practice and is used to help manage demand as well as offset expenses. Due to this unique ability most secondary activities can be considered to add value to the overall process.

3.1.2.2 Human Resources:

Human Resources Management is divided into two groups - Faculty Relations for faculty members and Human Resources for staff. Both groups negotiate on behalf of UBC with their respective member associations or unions. Although UBC is not a provincial government department, it is aligned closely enough that it uses the provincial wage restrictions to its advantage.

Compensation for Faculty and unionised staff appear to be in line with norms; however, there is a considerable differential between salaries for management between university and external managers. Newly hired employees must be paid market wages if quality employees are required and can result in situation where recent hires are entering at slightly higher wage or position than existing management. This sometimes leaves a gap in the salary ranges between newly hired employees and existing employees. This underpayment of existing staff tends to create resentment in long-term staff and turn over for the more mobile. Both scenarios create an unmotivating environment and a large risk of tacit knowledge leakage as long term and newly

trained energetic management leave for better salaries elsewhere. Current compensation management practices for management personnel are not seen as adding value to UBC.

The Human Resources and Faculty Relations departments of UBC are small. Employee/Faculty position and benefit information and processing have been outsourced to another department in order to take advantage of efficiencies by combining payroll and HR handling in to one area. This approach does seem to provide the cost saving originally anticipated.

The philosophy of the Human Resource department is to mentor and guide administrative resources in other departments to undertake the Human Resources activities. This is a very cost effective approach to Human Resource management. However, due to the lack of experience and professional expertise; diffused focus (they are not dedicated resources) and lack of peer contact of these administrative resources their effectiveness as a resource to employees is limited. As well, the advantages to UBC that could be realized from centralized knowledge of staff movement, desires and issues are also limited. Functions like career counselling have been outsourced. Training has been outsourced to other areas within the university and career development is non-existent. Although cost effective, these practices may increase risk to UBC as untrained resources may be involved in sensitive situations with staff.

The Faculty Relations Office is the human resource department for the faculty members. It controls hiring and promotion policies. Faculty members use their Curriculum Vitae as an important tool for promotion, tenure and departmental reviews.

Demographics will cause a two-pronged issue for UBC over the next 5-10 years. As the echo boom generation flows through the educational system demanding increased access to universities, faculty members will be retiring. A balance must be found between faculty numbers to handle the echo boomers' higher volumes and the subsequent lull after they have graduated.

This is a global problem facing most universities and therefore recruitment and retention of quality faculty will be a primary concern for UBC and other universities in the future.

Competition will be heightened in this area. Whether the university currently handles this area well is not known. What is known is that it will be an important process to add value in the future.

3.1.2.2.3 Technical Development:

As mentioned, UBC's information systems are decentralized. This makes it difficult to get an understanding of how well UBC has been able to leverage technology to enhance its environment. However some individual areas can be accessed.

UBC's student systems are custom developed by UBC and have been trend setting and revolutionary in many aspects. They are extremely efficient and comprehensive and continue to evolve to take advantage of business processing opportunities wherever possible. UBC was the first institute to accept bank withdrawals as a payment method for various student billings as part of their implementation of a consolidated billing system for students.

However, in other administrative areas UBC has been pioneering and has implemented large ERP (Enterprise Resource Planning) systems. Unfortunately, in many cases their follow up has not matched their initial thrust and as a result they have not been able to maintain their advantage and leverage these systems to more advanced levels. As well these ERP systems are operationally under the department of finance and as a result the focus of the systems has been towards internal processing and reporting and less on the needs of the campus community.

Other large business areas like land and building services, bookstore and library also have large systems in place to take advantage of cost savings over time and knowledge management. These systems are constantly being reviewed for areas of improvement. However, no information is available on the value and efficiencies of these systems.

Although UBC is the original home of WEBCT, its course management systems are dated and in the process of review. In 2003-04, there were over 107,000 registered WEBCT 'seats' in over 700 courses (University of British Columbia, 2005c).

From a theoretical perspective UBC has the correct approach in place for information technologies. For example UBC has their e-strategy initiative that aligns their information technology strategy with the university's strategic goals. (University of British Columbia, 2005a). However, since most of the information systems are decentralized this initiative is having difficulties gaining momentum.

It is observed that since information systems are decentralized, it is increasingly difficult and less likely that information interaction between departments will occur. This means that as the world moves towards more integrated information and analysis, UBC is moving in the other direction and is less able to undertake institutional wide initiatives like e-strategy, corporate dashboards and is limited in its ability to view solutions that are not sub-optimized.

3.1.2.2.4 Procurement:

Most of UBC's procurement is decentralized with the exception of large items. The use of procurement cards and blanket orders (direct contracts with specific vendors) for smaller purchases and the practice of utilizing personal reimbursement and Accounts Payable cash advances for travel expenses reduces the need for central processing of smaller purchases. As well, purchases of office supplies and small computer hardware and software are handled centrally through the campus bookstore and use internal journal vouchers to transfer payment between departments. Most transactions do not flow through the centralized Supply Management department. The department's prime direction is to manage the processes and procedures, review for adherence to policies, contract creation and negotiation of volume discounts. As well, receiving is decentralized and the responsibility of the department ordering the items.

This appears to be an effective approach to handling procurement.

Overall UBC correctly focuses mostly on their primary activities where the most value can be achieved. They provide secondary activities that, in most cases, directly support their primary activities. Since UBC is not in the profit making business, the more cost based and efficient they can be in their secondary and non core activities the more funding can be directly applied to their core primary activities resulting, if done effectively, in a more valuable end result.

UBC's approach to non-core activities is cost based. In some areas, this has been successful and has resulted in efficiencies (e.g. Student administration) and in some they have been able to turn it into a revenue-generating centre (e.g. food services). In other areas this approach has limited the ability to leverage these initial investments to achieve the anticipated results (e.g. ERP systems). Due to UBC's history and longevity some areas of secondary activities are not directly related to their core activities, for example power generation. Although unusual, these activities still provide overall cost savings and add indirect value to the educational and research experience by allowing more dollars to go directly towards teaching and research.

UBC has been successful at its core activities as demonstrated by its various rankings within the industry. It has proper focus on its customers and has developed core competencies in the areas where the greatest value is generated. Currently, the medical-doctoral industry level value chain is changing. The spin off process is expanding. Institutes are undertaking downstream vertical movement in the value chain as the importance of commercialisation (spin offs) to revenue increases. UBC is set up to take advantage of its experience and success in this area as it has already developing a core competency in this area. As the future unfolds, it is anticipated that UBC's core activities will remain as the primarily important activities with the inclusion of commercialisation.

Canadian universities, like most public sector entities, are new to the competitive environment. Recent events, like the shift in federal funding approach have resulted in a need to have a strategy in place to increase the likelihood of success, as measured by increased revenues. However, to be able to develop a successful strategy, universities must understand the new competitive environment in which they reside.

4 ISSUES

4.1 Introduction

The Canadian medical doctoral universities are large and complex institutes and have areas of concern that can be multi faceted or appear to be relatively straightforward. This section will identify several areas of concern for the Canadian medical doctoral universities and describe and comment on related issues within each of these areas. The areas of concern that are highlighted within this sections are: operating funding, enrolment, infrastructure, resources, basic research versus industry, globalisation - competition and technology.

4.2 Operating Funding

Based on 55 Canadian universities surveyed, which included the 15 medical doctoral universities, overall operating revenue increased by 28% between 1986 and 2001 using a constant 2001-dollar (Robertson, 2003). As provincial funding formula based on enrolment would suggest, government support for operating revenue appears to have followed the demographic peaks and declines. The peak of government support during the 1990's coincided with the peak in student enrolment. It reached an apex in 1992-1993 (Robertson, 2003) and declined with enrolment during the mid to latter part of the 1990's. During this time, a secondary funding shift occurred. As government funding decreased at a slightly higher rate per student than enrolment, private funding increased. Student fees carried the bulk of the dollar value of the increase, but had the least percentage increase compared to other non student-fee private revenue sources such as donations, investments and other miscellaneous sources. Although larger universities, assumed to be primarily the medical doctoral universities, showed a slightly higher per student decrease of government funding and a slightly higher per student increase in private funding, they were

consistent with the overall pattern (Robertson, 2003) as is indicated in Table 4.2-1. It should be noted that Robertson's data relates to operating revenue and does not include government sponsored research and revenue generated from the sale of products and services (Robertson, 2003).

The more rapid decrease in government funding than decline in student enrolment is thought to be the result of at least two forces: an overall change in funding approach by governments towards becoming more user pay based; and a large scale change in focus by the federal government towards deficit reduction. This new focus impacted provincial governments in the quantity of transfer payments received and additionally it created an atmosphere of restraint within the provincial governments.

To minimize the negative impact of the shift in funding sources with the increase of student fees, universities used the funds to significantly increase scholarships, bursaries and awards (394%), as well as increase operating expenditures (37%) and other expenditures such as furniture and equipment purchases, professional fees, land and building services, etc. (80%). Salary and benefits kept pace with the approximately 18% increase in enrolment that occurred in the later portion of 1990's and 2000-2001. The increase in scholarships was primarily a large university phenomenon, as was a heavy increase in other expenditures (Robertson, 2003).

Table 4.2-1 Canadian University Operating Revenue by Source per FTE

| Canadian University Operating Revenue by Source per FTE, 1986-1987 and 2000-2001 | | | |
|---|-------------------------------|------------------|---------------|
| | 1986-1987 | 2000-2001 | Change |
| | \$ constant 2000-2001 per FTE | | |
| Large universities | | | |
| Government | 10,590 | 8,616 | -1,974 |
| Student fees | 1,970 | 4,558 | 2,588 |
| Bequests, etc. | 46 | 164 | 117 |
| Investment | 180 | 449 | 269 |
| Miscellaneous | 80 | 235 | 155 |
| Total private revenue | 2,275 | 5,404 | 3,129 |
| Total operating revenue | 12,865 | 14,020 | 1,155 |
| All universities | | | |
| Government | 10,091 | 8,190 | -1,902 |
| Student fees | 2,029 | 4,525 | 2,497 |
| Bequests, etc. | 47 | 135 | 88 |
| Investment | 156 | 343 | 187 |
| Miscellaneous | 83 | 251 | 168 |
| Total private revenue | 2,315 | 5,255 | 2,940 |
| Total operating revenue | 12,406 | 13,444 | 1,038 |

Data source: Robertson, 2003 based on Statistics Canada, Centre for Education Statistics, Financial Information of Universities and Colleges Survey and the University Student Information System. Comment – does not include government sponsored research and sales and services revenue.

It has been identified as a high profile issue that there has been reduced government funding for post secondary education over the 15 years between 1986 and 2001, suggesting that Canada's post secondary education is deteriorating due to lack of funding and restricting access for students from lower income families. Although it is true that government funding has declined during this period, it is not true that total per student funding is less in 2001 than 1986. In constant dollars, total funding per full time equivalent student increased \$1,038 from an average

of \$12,406 to \$13,444 (Robertson, 2003) as indicated in Table 4.2-1. Therefore, the increased funds, if used efficiently and effectively should have provided an improvement in post secondary education as compared to the past. According to the conclusion of Marie Drolet's 2005 research paper, there has been very little change in the relationship between university participation and family income between 1993 and 2001 (Drolet, 2005, p. 26), suggesting that the increased student fees so far have not had a negative impact, possibly due to the offsetting increase in scholarships and financial aid compensation. Canadian scholarships and needs-based aid for 2003-2004 is now 550 percent larger than in 1990 and exceeds \$800 million (Association of Universities and Colleges of Canada, 2005b). Scholarships have increased from 5.4% of student fee revenue, in 1986, to 10.1% in 2001 (Robertson, 2003).

Although this compensation appears to be generally successful overall, it may not have been as successful in the professional schools found largely in the medical doctoral universities. The percentage increase of tuition fees for the professional schools was much larger. This was thought to be based on the belief that future salaries would handle higher debt loads and in the case of business schools, corporate sponsorship would absorb the increased costs. However, a recent review of Ontario medical school students saw a sharp increase in the average family income of students after the increase in tuition fees, as well as a decrease in enrolment in the lower income medical specialities (Canadian Association of University Teachers, 2003, p. 11). This suggests either accessibility issues or an apprehension of lower income students to increase their debt load and a heightened desire for increased revenue potentially to repay larger loans. A further evaluation is required to determine if the shift from public to private funding is indeed working in the professional schools.

The greatest impact of the shift from public to private funding has been on the universities themselves, especially for those universities that had a tuition freeze in place during a portion of this timeframe. Based on the Statistics Canada information in Robertson's article,

increased student fees, reduced by the increases for student aid, more than compensated for the government funding decrease on average and was especially true for the larger universities however, there may have been problems related to timing lags between the reduction of government funding and the new increase in private funding. Additional fund raising, costs cutting measures as well as reallocation of funds based on revenue source may all have been necessary to accommodate reductions before newly found revenue materialized. It appears that not only did most provinces pass through the federal transfer payment decreases directly to the universities, some provinces, such as Ontario (Robertson, McGrane & Shaker, 2003), adopted the methodology further for their own initiatives and projects further straining the universities to find new revenue sources. This scenario, combined with the threat of even further government funding reductions, may have been the start of increased modern business practices and may have signalled the need for more strategic analysis and planning to determine new revenue streams. It has also repositioned fund raising into a higher profile skill set.

The Federal government typically follows an approach where it focuses heavily on a few high priority areas for example the government focus on deficit reduction and post secondary education. It tries to restructure funding and establish controls until a level of stabilization is obtained. Then the federal government typically moves on to other issues with escalating priorities. There are signals that post-secondary research is now at this juncture. Discussions of reducing the research agencies funding levels by 5% surfaced in January of 2005 in an attempt to reallocate a billion dollars in current funding to other areas (Lawes, 2005). Regardless of whether this reallocation occurs now or not, it should be taken as a clear signal that the future funding in these areas is not likely to increase and is most likely to see decreasing funding allocations. Although this is likely to have a larger impact on medical doctoral universities that comprise the larger share of this type of funding, it may be strategically good timing as an anticipated increase in enrolment will necessitate an increase in undergraduate teaching.

4.3 Enrolment

In 2000, Canada had the highest proportion of its working-age population with college or university credentials among OECD countries. We are an educated nation and this is not likely to change, in fact with the global shift to a knowledge based economy, with its faster pace in knowledge change, even more people will likely head for university and perhaps more frequently.

Demographic figures for 19-24 year olds is a base variable in predicting university enrolment. Peaks in demographic numbers for this age group drive the need for increased infrastructure, professors and government funding. A review of enrolment of the kindergarten to grade seven category should provide an insight to the university enrolment demand in the next five to twelve years. Canada is currently experiencing closures of elementary schools due to reduced enrolment; this should correspond to similar decreases in university enrolment demand in a few years. However, increased desirability for post secondary education appears to influence the actual demand. Changes in demography for 20-24 year olds over the past three years shows an increase in population of 126,200 from an estimated count of 2,097,000 in 2001 (Statistics Canada, 2005a) to an estimated count of 2,223,200 for 2004 (Statistics Canada, 2005b). During this time span full time university enrolment increased by 130,000 students to 785,000 (Association of Universities and Colleges of Canada, 2005b). These enrolment numbers would suggest an increase in participation rate, perhaps higher than expected since the 2001 prediction called for a 20 to 25% increase in enrolment by 2010 (Giroux, 2001) and the lower limit of this forecast was already reached by 2004. The question remains, is enrolment expected to stabilize or is there a further increase to come? The increased participation rate would suggest that there is more to come.

Since increased enrolment drives the need for increased infrastructure, professors and funding, the concern will be the ability to handle this large increase in student population, if it does materialize. As there is also a greater increase in the enrolment in graduate degrees than in

the past, the medical doctoral universities may be impacted even further since they service both the undergraduate levels and the more advanced degrees. The graduate degrees are more costly to service, requiring higher-level supervision and lower student professor ratios and possibly specialized equipment and facilities.

4.4 Infrastructure

Infrastructure consists of the equipment, buildings, laboratories, and databases required to teach and conduct research. Recently, most universities have been undergoing a campus facelift. Reconstruction and reequipping of existing building and the erection of new facilities are under way on campuses across Canada. The previous university system building boom was 30 years ago and a general rule of thumb in capital budgeting estimating is the typical life expectancy of constructed buildings is approximately 30 years, implying that the infrastructure is nearing its demise. Add to this implied fact, an increase in enrolment, a build up of demand for many infrastructure projects, a change in emphasis to increased research, changes in research facilities design, a change in funding format and control on the federal deficit and a surge in infrastructure at this point in time is a natural conclusion.

The decrease in provincial university funding during the 1990s was a flow through of the decrease in federal cash transfer payments to the provinces for post secondary education. Although viewed as a means of federal deficit control by some, it constituted a shift to a user pay model where students provided more of the operating funding than in the past as well as a shift from generic funding of operating budgets to more direct funding based under the federal government's direction with more control and presumably more efficiency since the federal government could now prevent duplicate facilities from being developed. A consequence of this situation was a shift by the universities towards becoming more efficient and self-reliant, partly as

a result of the time lag between the decrease in revenue from government and the renewal of revenue from student fees.

The shift in funding has come about by the removal of cash transfers and to the addition of funding like the Canadian Foundation of Innovation (CFI) grants. Still in the mode of promoting efficiency and self-reliance of universities the CFI grants only provide 40% of the required funding for the projects that are accepted.

“The CFI has a budget of \$3.65 billion and funds up to 40 percent of a project’s infrastructure costs. These funds are invested in partnership with eligible institutions and their funding partners from the public, private, and voluntary sectors who provide the remaining 60 percent of a project’s cost. Based on this formula, the total capital investment by the CFI, the research institutions, and their partners, will exceed \$10 billion by 2010.” (Canadian Foundation for Innovation, 2005a, Budget and Funding section, para. 1).

Generally, it is typical to have the 40% matched by the province with the university having to fund the remaining 20%. The CFI grants are adjusted over time to make up for shortcomings in the strategy. For instance, additional funds were added to operating budgets for research facilities in 2002 (Canadian Foundation for Innovation, 2005b, para. 6).

This new shift is more favourable to the larger medical doctoral universities than the other category universities, since their focus on research is in alignment with the direction of the federal government. As well, they have the size, and industry contacts to better provide the additional 20% funding required. For example, one method of obtaining the additional funding is to negotiate additional discounts from industry on the products and services provided for each project. Generally speaking, the larger the institute and the better the relationship with industry, the higher bargaining power and chance of success in these negotiations.

All universities must struggle with the balance between new construction, renewal and maintenance. It is interesting that the 3.65 billion CFI fund is a similar value as the reported 3.58 billion deficits in deferred maintenance (Association of Universities and Colleges of Canada,

2001, p. 3). The concern is that research focused infrastructure does not necessarily map to those projects identified as deferred maintenance and especially those considered urgent. Several provinces have recognized this and have put funding together for the urgent maintenance items. As well, CFI grants did not provide funding for teaching facilities, only research. The older classrooms still require upkeep and as they too hit their life expectancy will also require large renewal efforts.

Some universities have been successful at acquiring private donations to accommodate non-research areas such as the Sauders School of business at the University of British Columbia and Dalhousie's business school donations from Kenneth Rowe, Ceo of IMP Group. Again, the larger medical doctoral universities are in better position to use their size and reputation to obtain these private funds, as suggested by the 254 percentage increase in bequests to the larger universities versus the 1.2 percentage increase in the smaller universities per full time student (Robertson, 2003).

Smaller issues come to light in that these infrastructure grants are given to academics that, although highly qualified as researchers, may not necessarily have the required project management skills to handle infrastructure projects. As a result the universities are in the position of ensuring that appropriate estimates and capital budget processes have been undertaken to mitigate any unnecessary risk. Requiring the universities to provide 20% of the funding of the CFI Grants and the responsibility for cost over runs and maintenance ensures a vested interest in proper planning and cost control. In some cases, projects are increased in size by additional money provided by the university with the expectation of capital payback over a contracted period of time. This further evolves the universities into more business-like entities.

It is apparent that universities are in the middle of a transition to a new funding paradigm and it is difficult to see how this shift in funding will play out in terms of ensuring that all the

requirements are aligned with appropriate funding although it is encouraging to see updates to the funding plan where issues have occurred as suggested by the increase in the operating budget funding within CFI. There still appears to be a shortcoming between maintenance and upkeep and new construction. It is likely that the provincial and federal governments will address the issues although not likely in a timely manner; therefore, universities must use their business skills to meet the most urgent problems.

4.5 Resources

Resources are definitely a case of supply and demand and are complicated by tenure and fluctuating demographics. Starting with a demand for professors and an undersupply, Canadian universities offered tenure to attract professors to support the increased demand in the 1960s and 1970s. As Canada produced more Ph.D.s, the original professions remained in place. Gradually, an oversupply of Ph.D.s, unable to find tenure track positions evolved. Universities, being cautious not to repeat the problems of the past, initiated the practise of hiring new Ph.D.s to instruct the lower level courses without engaging them in full time employment. Currently this group has become more demanding of recognition and compensation and, since they now represent a large percent of the teaching course load, are becoming increasingly powerful.

As current estimates for the demand of new professors are reaching figures of 30,000 to 40,000 over the next 10 years as a result of retirement and increased demand (Association of Universities and Colleges of Canada, 2005b), Canada may be in a similar situation as it has been in the 1960's and 1970's, especially since enrolment is expected to slow or decline in 2015. However, unlike the 60's and 70's, Canada does not have a shortage of Ph.D.s, although many of these Ph.D.s may have lost their research and publication skills by remaining in low paying sessional lecturer status (Mullens, 2001). It is possible that if demand again exceeds supply,

opportunities will be made available for these personnel to move into the full time ranks of academia.

The above situation is more likely within arts and humanities where a larger percentage of part time instructors are found. However, in science and engineering there is more likelihood that the sessional Ph.D.s have retained research skills by augmenting their income with related contracts. There are pocket areas where demand for new professors is likely to be an issue, such as business. Recently, Canada has come upon a fortuitous situation where the United States has increased their visa process effort making it easier for Canada to attract quality foreign academics (Holloway, 2004).

Overall, it appears that Canadian Universities are using a multiple prong approach addressing this issue. Although, tenure and Canadian Research Chairs are being offered to attract and retain key personnel, it is not to the levels that occurred in the 60s and 70s. It is likely that salary offers will be used as a primary enticement wherever possible in order to provide more flexibility for both parties involved in the negotiations. Increased recruitment from areas that are not experiencing an echo boom such as Europe are likely. Additionally, Canadian universities are buying time to get new Ph.D.s into position, having federally increased scholarship support for 4,000 new graduate studies positions, by offering enticements to existing professors who are reaching retirement. Negotiations of increased salaries to retiring professors to continue to teach courses on a part time basis, abolishment of mandatory retirement, as is the recent case with the University of Toronto (Whiteside, 2005), (note: Manitoba, Quebec, Alberta, Prince Edward Island, Yukon and Northwest Territories have already removed mandatory retirement) are all being used to extend the length of existing professors for the next few years. Therefore, it is likely that Canadian universities will solve the professor supply problem and not put themselves into the same situation as in the past.

4.6 Basic Research versus Industry

Genome Canada, which has 600 million dollars of federal one-time funding for genome research, has sparked a controversy. The issue is the requirement to obtain matching funding from other sources, which is the case for both Genome projects and CFI grants. The argument by the scientific community is that the funding formula is restrictive to scientific research and rewards those scientists that are good fundraisers or have ties to industry partners rather than the merit of the science itself. The final straw was the latest awarding of projects, is perceived to be based, not on merit, but on the stability of the co-funding (Schmidt, 2005).

Genome Canada appears to be a project that follows the methodology of the previously mentioned SEMATECH project. The purpose is to bring together government, universities and industry in an attempt to create efficiencies and a higher chance of success. This appears to be a federal attempt to: create cluster formations; increase the chances of commercialisation; increase private sector contributions to R&D; and to provide an economic catalyst. This brings to light the basic economist's question, what is the purpose of public support for post secondary research? Is it a public good and, if so, to what degree? As a public good it would suggest that research is undertaken because it benefits society as a whole, but no private group would be willing to undertake it. The genome project appears to be a different public good than base knowledge research if its purpose is to initiate the collaboration between the government, universities and research or even if its purpose is to take on a research subject of this magnitude. So if Genome Canada is assessed as an experiment in a different form of government public good servicing, is the original public good research of base knowledge still being addressed?

Universities still fund 50% of their own research (Statistics Canada, 2003a, p. xix) and external research funding from the traditional agencies does not have the co-funding requirement. The research funding has increased 50% in constant dollars between 1991 and 2002 (Statistics Canada, 2003a, Table D4.6) and has continued to increase since then. Canadian universities were

expected to perform a total of \$9.3 billion of research in 2003-2004 (Association of Universities and Colleges of Canada, 2005b). This would generally suggest that basic knowledge research, excluding CFI and genome project funding, is being funded at increased rates compared to the past although this may not be the situation with specific areas of research that compete in the same fields as funding like genome Canada.

4.7 Globalisation – competition

Many of the smaller medical doctoral universities are not overly impacted by globalisation since their primary focus is serving local needs. This is thought to be especially true for those universities that are the only service provider in smaller populated provinces. The larger medical doctoral universities also service their province, however being larger they also take on a national focus as well, by competing for federal research funds with other universities. Since 13 of the 15 medical universities undertook 80% of the sponsored research in Canada, it is an indication of their increased national role. Like the smaller universities primarily servicing their provinces, the larger universities service to the nation is primarily internal.

Since quality and reputation is a prime marketing tool to attract top researchers, students and funding, international focus, reputation, position and quality are valuable marketing assets. Top students and researchers are more globally visible than ever before and as such are attracting the attention of universities in other countries. Lower compensation for graduate students services and comparative lower wages for researchers make them susceptible to offers. However, it is still likely that Canadian students and researchers will stay at home, but the higher quality ones may be tempted. Canadian universities should review its competitiveness in compensation to ensure that it is comparative.

Although a small impact, technology is playing a role in globalisation. Since the Internet has no national borders, it is providing access to global universities for Canadian students.

Business degrees from the United Kingdom and general undergraduate degrees from the United States are being offered without the imposition and cost of the student having to move. This is enticing to students who have an increased global view than they may have had 10 or 15 years ago. Currently, these offers suffer the disadvantages of other internet education; students must be self motivated, they lack social connection, etc., however, as people become more accustomed to this form of communication and the methods become more attuned with human learning and social needs (interactive, group secures, etc.) they will become even more enticing.

The concept that students have a more global view of their career than perhaps 10 to 15 years ago has created an area of differentiation among universities. Canada is seeing the introduction of co-sponsored degrees between Canadian universities and those in the United States, more commonly in the business areas where international exposure is highly marketable. Although primarily a strategy tool for specialized programs at the present moment, it is anticipated that this trend is to continue as a result of the shift to the knowledge economy and the increased mobility of people in general. Students will be seeking the highest value for their educational dollar as it is their ticket to the future and will be more willing to move to other parts of the globe in order to obtain an advantage over others. Exposure to international research, access to research and professors in other countries that may have a speciality not found in Canada will be increasingly attractive.

4.8 Technology

Technology is influencing universities in many ways including using it to provide teaching and requiring it in their infrastructure for both communications and research; therefore, the rapid changes in technology have considerable impact on universities. The CFI grants have addressed this for the immediate future by bringing Canada's aging high technology infrastructure into a competitive position, although there will be concerns for maintaining this

competitive position in the future without ongoing infusions of infrastructure funding. Infusions of infrastructure funding are most likely to be addressed by the universities and their province in one off situations as new technologies become available. It is unlikely that another large-scale infrastructure renewal program will be undertaken in the immediate future, although, it is probably be required in a shorter time than currently expected.

5 TREND ANALYSIS– 2015

5.1 Introduction

This sections uses the same areas of concern that were highlighted in the previous section on issues: operating funding, enrolment, infrastructure, resources, basic research versus industry, globalisation - competition and technology and provides an analysis of recent trends within each of these areas and suggests potential outcomes as may result by the year 2015.

5.2 Operating Funding

As Canada comes to the end of its federal focus on post secondary education and its imposed shift in funding format, an assessment of its success will be undertaken. Although minor adjustments are expected, it is thought that the federal government will move on to other items on its agenda. Triggered by the government of Canada's goal of being ranked number five in the OECD with regard to R&D funding by 2010, it is anticipated that by 2015, or a few years prior, another full-scale review of the Canadian post secondary system will likely be carried out.

During the transition to the new funding structure, the time lag that occurred between government funding decreases and new student funding increases forced the universities to become more efficient and to utilize their resources for revenue generation. Additional practises of co-funding grants (CFI and Genome), possibly designed to increase private sector involvement in R&D as an objective of the OECD R&D goal, may at this point be overtaxing the private sector's willingness to pay. Private sector contributions, in addition to being inconsistent, align with attributes other than need, and have limits to their depth. It is thought that this form of

funding may reach its limit even before 2015 at which point an increase, although limited, of cash transfer payments from the federal to the provinces might occur.

Discussions during federal budget times highlight society's desire to restore post-secondary transfer payments to past levels, however, the federal government has at this point refrained from any significant increases and, since overall university operating revenue has actually increased by 28% since 1986, will likely only provide incremental amounts as appeasements as elections draw closer and to offset any reduction in private funding. It is thought that the federal government will keep transfer payments as a last resort mechanism and use only on an as-needed bases. Whether the government will be willing to turn control back to the provinces for allocation of this funding or find a new method of distribution is unknown but it is considered likely that they will want to remain in control as much as possible and will likely strike a balance between efficiency and control.

Alternatively, for the larger medical doctoral universities private sector arrangements may become larger and more international. The viability of this approach would depend on the reputation of the university and the success of its researchers as well as the acceptability of the concept to international industry. A larger and more international private funding arrangement has the same problem with inconsistency in cash flow as other private sector contributions, limiting the university's ability to plan for the future. It is likely that a collaborative funding arrangement similar to Genome Canada will be made with the federal government and will potentially be combined with increased transfer payments to smooth the inconsistency of the private sector funding. Longer-term contracts and commitments will be desired by universities in order to accommodate planning initiatives.

These funding arrangements will also bring into the spotlight the argument surrounding university commercialisation versus being a provider of a public good. Even now, institutes such

as the Canadian Centre for Policy Alternatives are denouncing the private sector ties as a destruction of the basic principles of the universities (Robertson, McGrane & Shaker, 2003). Governments in effect, have found a way around the principles of the bicameral agreements that protect universities from political influence. The introduction of private public partnerships in the form of co-funded infrastructure and research grants, which are quite prevalent in Ontario and some other provinces, have the ability to steer the universities into commercially influenced pursuits rather than the pursuit of basic knowledge and intellectual research. Although the arguments persist and in some cases may be valid, especially in the high tech and health sciences where equipment costs are consistently high, the general figures indicate a general trend more towards student self funding than industry. Higher revenue generating formats will likely be pursued with a philosophy of 'what ever the market will bear'.

As well, a university education that once was a sign of expanded thinking for social leadership is now considered a set of tools for financial self-advancement (Robertson, McGrane & Shaker, 2003). In some ways, universities are turning into technical colleges of a higher order. This trend is likely to continue as the user pay philosophy stays in place. Although currently above 40% of enrolment is in the arts and humanities, the higher intellectual pursuit of knowledge may be lost as the higher costs of student fees erode the once sustainable lifestyle of being a long-term student especially when combined with the 'what the market will bear' funding format. It is suggested, therefore, that enrolment in less applied areas of knowledge will decrease over time unless clear job connections can be identified in areas such as the arts and humanities and primary and secondary educators.

Additionally, there has been some concern that the move to more private sector funding is creating an inequity in the post secondary system between the softer areas of arts, humanities and social sciences and the areas of science and business. Private funding is increasing to the latter disciplines and very little is allocated towards arts, humanities and social sciences. This is

playing out in two ways, one by differentiating between the medical doctoral universities and the other categories as well as between the two academic areas (Robertson, McGrane & Shaker, 2003). The numbers from the Robertson, McGrane and Shaker article, as shown in

Table 5.2-1 Ontario Distribution of SuperBuild and Private Funding to Post Secondary by Subject, indicate that in Ontario, arts, humanities and social sciences received little private funding compared to the other disciplines, a trend which is suggestive of the others provinces. As well, the article further suggested that, in Ontario, a large funding gap will be generated between larger research-intensive universities and the smaller predominately undergraduate universities based on the premise that the larger Ontario universities are receiving 92% of the government sponsored research and that the trend tying private funding to the public sponsored research will result by developing have and have-not universities. Although these numbers demonstrate the facts to be true, they do not providing evidence of impact. In general, arts, humanities and social sciences do not require heavy capital in their research facilities; therefore current emphasis on funding designated for increasing and updating research infrastructure could logically explain the lower allocations to this areas. Additionally, enrolment in engineering, business and computer science have increased faster than arts, humanities and social science (Statistics Canada, 2003b) creating a demand for new infrastructure in these areas, which further logically supports the allocation of funding to the faster growing areas. Increased private funding following public sponsored research funding to the larger universities is most likely valid, due to the level of high profile research supported at these universities versus the smaller universities. Although some of the current funding differences appear to be explainable, it is likely that multiple funding aspects, such as job availability for graduates and research profiles, will combine to further separate arts, humanities and social sciences from science and business, as well as separate medical doctoral universities from the other categories. If student costs continue to rise, it is likely that students

will attempt to receive the most value for their money and will remain close to home for undergraduate degrees and transfer to the larger universities as they seek more advanced degrees.

Table 5.2-1 Ontario Distribution of SuperBuild and Private Funding to Post Secondary by Subject

| Percentage of SuperBuild and Private Sector Funding, By Subject Area, Compared to Enrolment | | | |
|--|--|---|--|
| Project by discipline/subject area | Application of Superbuild funds | Allocation of private sector funds | Student enrolment in 1999-2000 by discipline/subject area |
| Engineering, Computer science and Business | 51% | 62% | 24% |
| Multipurpose | 15% | 10% | - |
| Natural and Health Sciences | 28% | 25% | 18% |
| Humanities and Social Sciences | 3% | 0.80% | 40% |
| Fine Arts | 2% | 1.80% | 3% |
| Education | 0% | 0% | 9% |
| Library | 0.14% | 0.19% | - |

Data source: Robertson, McGrant & Shaker, 2003.

Provinces will continue to experiment with different options to find funding and capacity efficiencies as they have been doing with such things as the merging of Okanagan University College and the University of British Columbia, the privatisation of the business schools initiated with Queens University, speciality schools like the ill fated TechBC, corporate customized business programs and lower levels courses of professional schools such as medicine or engineering being offered at other category universities.

With the 1998 introduction of the federal Canada Education Savings Grant (CESG), which increases each yearly registered educational savings plans (RESP) contribution to a maximum of \$400, and the removal of restrictions from the pre-existing registered educational savings plans there has been an increase in the pool of money saved by parents for post secondary

education. This pool of money will facilitate the continuance of the user pay and 'what the market will bear' format with the likely augmentation from universities, the provinces and the federal government in areas where the format is not working as well.

5.3 Enrolment

Natural secondary to post-secondary progression follows demographics, which indicate a peak of high school students entering first year undergraduate courses in 2008-2009 (Foote, 2001). Enrolment declines from this point onward; therefore in 2015, Canada should be in a trough or bust between the echo boom, the children of the boomers, and the echo-echo boom, the grandchildren of the boomers.

With the move to a knowledge based economy, the need for renewed education and more advanced education will likely increase from the current levels, a trend that is already evident in graduate program enrolments with a 7% increase between 1997-1998 to 2000-2001 (Statistics Canada, 2003b); however, it is expected that the increase in participation rates will have stabilized by 2015, albeit at a higher participation rate than the current level. The stabilization is likely since it is anticipated that the pre echo boomers and echo boomers will have already filled the majority of the gap in graduate demand by this point in time. With the decrease in natural participation due to demographics, the larger medical doctoral universities will likely see a decrease in enrolment or a lowering of the entrance requirement levels from the peak of 2008-2009.

Since 1986 onward there has been a consistent increase in participation even during times where eligibility numbers dropped. It is expected that this increase in participation will continue even through 2015 when the eligibility numbers drop once more. It is more likely that entrance requirements will shift to accommodate entry into the universities to fully utilize existing resources and capacity.

With knowledge as the primary focus of the economy, the more applied or faster turnover areas of knowledge, such as high technology, will likely have an increased demand for lifetime learning, certification or re-certification programs. The trend that we are currently experiencing with certification being offered by the university level from the continuing education department will likely continue.

5.4 Infrastructure

It is likely that infrastructure will not be as high profile or as large scale as it is in the current construction boom. Canada will not be ramping up facilities to accommodate an increased demographic peak, as is the case now. Life expectancies for buildings are greater than ten years, however, today's construction projects are mostly research infrastructure facilities that may or may not have the same life expectancy as regular classrooms or other types of buildings. Although the perception is that it is likely the structures will still be in use, the high technology equipment housed within these structures may require retrofitting or replacement in ten years. Such rejuvenation is likely to take place as ad hoc needs are met by individual universities rather than on the large-scale infrastructure renewal approach of the past few years. Most of the rejuvenation will be at the medical doctoral universities where the bulk of the research infrastructure is currently being constructed. It is possible that in ten years time, after the lengthy focus on universities generating revenue from the small Canadian private sector, the large private donations may be exhausted. In other category universities, and in most other areas within the medical doctoral universities, maintenance issues will likely be on the agenda more than new infrastructure.

5.5 Resources

As mentioned prior, Canadian universities have a similar scenario playing out in the next ten years as they did with the baby boomer phenomenon. The universities have a potential supply

shortage in resources, namely professors. By 2015 the professor supply and retirement renewal planning issues will be resolved. Canadian universities will have a younger complement of professors who have had the advantage of working alongside senior professors who were at the top of their academic career and who had the opportunity to continue to research in a more relaxed environment. Universities may be dealing with some related issues of elderly professors, having banned mandatory retirement, but it is likely that they will have resolved this in an equitable manner over the next ten years.

With the peak of the echo boomers through the system by 2015, universities will attempt to keep their revenues intact by taking advantage of the capacity they have, lowering academic entry requirements to keep demand high, or by making up revenue reductions by raising student fees for tuition or services. Such approaches will be necessary to maintain revenue levels, having moved to a user pay format, and given a desire to take full advantage of affluent students who have had an entire life of RESP contributions.

It is likely that specialized course offerings, potentially reduced student-professor ratios, and lifestyle considerations will be used as differentiated marketing elements to attract students and professors alike. Medical doctoral universities will be in the best position to offer differentiated programs since they are already focused in this direction. Differentiated marketing will translate into professors who potentially have more varied work environments and course material than when the masses were being educated. With international and research requirements in most medical doctoral universities undergraduate programs currently in place, this trend is expected to continue and becoming more prevalent; consequently, professors with good international ties, high profile or interesting research and even entertainment value are likely to be in more demand. As well, because populations are not evenly disbursed across Canada, using visiting professors to help with peak enrolments could also be employed.

Due to combination of RESP-provided student affluence and the economic demand for higher-level academic degrees, professors will have more research opportunities as graduate students will be more plentiful. This is especially advantageous for the medical doctoral universities where a large percentage of the research is undertaken. This opportunity might foster a return of the “knowledge for knowledge’s sake” attributes into the research environment that may have been eroded as the push for private funding increased in the 2000s.

5.6 Basic research verse industry

The focus on research infrastructure and the increase in graduate students positions were federal initiatives to increase the number of skilled researchers in Canada to meet government, universities and the private sector demand presumably in anticipation of professor retirements, echo boomers enrolment and a need for increased global competitiveness. By 2010, the results of these initiatives will have been a steady stream of fully skilled researchers entering the research community since the mid 2000s. This should have gone along way towards Canada meeting its 2010 goal of being 3rd in OCED R&D. It will be interesting to see how Canada fares on its self-imposed challenge, having had to deal with a demographic challenge and a global shift in economic base.

The view of 2015 in research and industry will be based on whether Canada has generated enough skilled researchers to supply industry or have they only generated enough to take care of the universities’ needs. If researchers are primarily employed by universities then the university industry liaison will continue as a strong collaborative effort. Universities, primarily the medical doctoral universities will be highly skilled at partnership arrangements, patenting, licensing and supporting industry government initiatives. If more researchers have been developed than required by the universities, the universities will still be competent in the above

areas, but will be competing in a more complex environment where industry will have its own facilities to compete for government and private sector funds as well as innovation coming from the individual private sector with smaller self funded initiatives looking for venture capital and government grants.

Currently, Innovation Canada has an objective of focusing on specialized or niche research to create specialization and expertise within Canada. It is hoped that they have specialized in the right areas and not in the same areas as everyone else. Canada does not have the population to go head to head with the United States or China in the future; however, the bottom line with research is that one cannot predict where the successes will be. This fact makes it difficult to accurately predict where Canada will be in 2015 or what the research university industrial relationship will be. It is safe to say that Canada has put in place many key elements to help the situation develop successfully.

One area that they will have to strengthen is the quality of the universities' commercialisation. Medical doctoral universities have become increasingly competent at creating new entities, however, the success rate of these entities is below that of the United States. This is not surprising as these commercialised ventures are primarily headed by academics that have not had the business experience to the same level as their U.S. counterparts. Unfortunately, due to the environment, where providing education and the replacement of professors will be the primary focus, this weakness will be difficult to overcome and may continue to be an issue even as late as 2015.

The university industry relations, from a philosophical perspective, may still have opposition with arguments regarding the deterioration of the public expectation that it can turn to the universities for a perspective that is not corrupted by commercial interests. Hopefully,

enough duplication of research will be conducted within Canada and abroad that can provide a counterbalance to any particular response that may be influenced by corporate objectives.

There is no clear evidence from experience that the investment which is socially advantageous coincides with that which is the most profitable. (Keynes, 1936).

Currently, there is the start of a backlash against commercialization and industry relationships with universities (Schmidt, 2005) arguing that research is being conducted based on stability of private funding. Over time this is likely to flow into discussions similar to the corruptions concern above. Unfortunately, the federal government attempts to initiate SEMATECH-like collaboration projects with industry with Genome Canada and CFI grants are bumping into similar projects initiated by governments such as Ontario at the same time as universities had to go to private sources to make up the difference in revenue due to the time lag between federal funding and user pay. As a result researchers are seeing tremendous reliance in project funding coming from industry with industry mandates. Although, this should be on the decrease now that the student tuition fees have risen, it is not likely to be reduced as long as universities can still obtain additional revenue in that manner. By 2015, it is likely that this issue will have reached a climax; most infrastructure projects of this kind will have completed, leaving only those that are research orientated, individual in nature and large scale and as stated prior, private funding might be less available.

5.7 Globalisation – competition

Although there will likely be competition for students, professors and global recognition, the collaborative nature of universities will remain unchanged. It is likely that research will be more global and partnerships will be international. The concept that students have a more global view of their career than perhaps 10 to 15 years ago has created an area of differentiation among universities. We are currently seeing the introduction of co-sponsored degrees between Canadian universities and those in the United States, although this is presently occurring in the business

faculty where international exposure is highly marketable, it is likely to continue to expand into other areas and it is possible to see many degrees offered with joint accreditation.

Currently, universities are following a similar progression, as did international corporations when they first started to enter developing countries. First they began by exporting productions, then by creating joint initiatives and finally by having facilities in the developing country (Mazzarol, Soutar & Seng, 2003). Originally, foreign students came to developed countries for education, then programs were developed in the undeveloped nation by recognized universities as joint initiatives and now universities are creating campus in these countries. Canada is not at this advanced level; we are still at the joint initiative stage. Branch campuses, may be more practical for universities from other countries in areas such as Europe or individual states from the United States where the echo boomers phenomenon does not exist. Therefore, is not likely that we will see a branch campus of a Canadian medical doctoral university in a developing country in the near future. However, Canada appears to be more advanced at reviewing courses and degrees from other countries to grant transfer credits for entrance into Canadian universities. This makes Canada a more sought after destination than many other countries where it is more difficult to identify and evaluate standing. It is likely that Canada will continue to focus more on bring in foreign students than taking our universities abroad. Canada, with other countries as Australia, New Zealand, the United States and the United Kingdom, is one of the larger nations focusing on revenue generation by providing accessibility to foreign students (Mazzarol, Soutar & Seng, 2003). Since attracting foreign students is becoming more competitive as other countries look to increase revenue in this manner and foreign countries increasing desire their students to keep their fees at home, Canada may have difficulty maintaining an increasing foreign student population, especially as countries such as Malaysian and Singapore attempt to become the primary education destinations for much of Asian (Mazzarol, Soutar & Seng, 2003). Global comparison of courses for global transfer and quality backlash in developing countries

will result in a refocus on reputable universities. Many entrepreneurial initiatives that do not have the reputation to achieve course transfer status will lose their market positions. Countries such as Canada, which will have had experience in foreign credit evaluation, may be involved in establishing recognizable standards of quality.

China is an unknown factor. There is great demand and many countries are vying for position to take advantage of the opportunities that China could offer. However, it is possible that China will not commit overly to one nation or allow their education system to be overly influenced by western nations and may elect to provide as much education as possible, itself. The Chinese government has implemented compulsory base education accessible to 91% of population and in 1999 China had 1,942 institutes offering junior college, post secondary, graduate and doctoral programs (Travelchinaguide.com, 2005) with a 5 year plan for expansion. Cities like Shanghai, are doubling their education budget over the next two to three years to four percent of the cities GDP (Marketnewzealand.com, 2004).

By 2015 the masses will have been through the system and Canadian universities will have taken care of their own. Canada would now be in a favourable place to provide administrative and infrastructure knowledge to developing countries. It will likely be too late to provide such services to most of Asia; however, individual Asian pockets and perhaps South America would still be requiring these services.

5.8 Technology

Technology influences universities in many areas, such as how to deliver teaching, and is required in their infrastructure for both communications and research; therefore, the rapid changes typical of technology have had and will continue to have considerable impact on universities. The CFI grants are currently used to bring Canada's aging high technology infrastructure into a competitive position, however, maintenance will need to be undertaken at an

accelerating rate. The high technology equipment was discussed within section 5.4 Infrastructure, where it was stated that high technology equipment will likely have a short life expectancy and will require replacement in an ad hoc manner over time. Although universities, and especially the medical doctoral universities, will take advantage of all new innovations as they evolve, innovation in teaching technology is still not likely to draw the students out of the classroom and off of campuses by 2015.

Innovations developed in developing countries, such as China where teaching demand is extraordinary, may have an impact on available technologies. In Canada, where the majority of students have primarily experienced instructor led training in primary and secondary schools, students may not be receptive to large changes in course delivery formats.

The biggest impact for universities in the years to come will likely be seen at the libraries. It is not unrealistic, given the current use of the Internet and the quality of material formats, that students will be using virtual libraries, course copyrighted material and electronic librarians. Most students may even finish their degrees without ever setting foot inside a brick and mortar library.

6 CONCLUSION

Conducting an industry analysis within a public sector is a useful exercise as it provides a standardized methodology for describing, investigating and analysing the sector and it also provides a perspective that may be different than those traditionally found within this environment. It is not the intention of this paper to suggest that an industry analysis is a substitute for other forms of analysis already utilized; however, it may provide an additional source of information and perspective that would increase the knowledge and tools for the decision makers in the industry. For example, the identification of the university's core activities, such as grant preparation and course offerings, may identify areas where differentiation or efficiencies can be developed that would provide the largest benefit to the university in either revenue or reputational capital.

Over all, it is concluded that Canadian medical doctoral universities will remain primarily unchanged in their mandate to supply their respective provinces with future educated resources that will service future populations and generate economic improvement. Political influence to accommodate increased efficiencies and potential economic improvements will continue (i.e.: genome project and other co-funded initiatives). It is in the best interest, then, of the universities, government and society in general, that university administrations continue to improve business knowledge and flexibility in order to accommodate these influences as quickly and as effectively as possible. This paper has identified several areas of concern and has provided suggestions for possible improvement for the business administrators of Canadian medical doctoral universities.

Due to the long lead time required for implementation, the most pressing issue for the Canadian medical doctoral universities is the resolution of the resourcing issues resulting from

demographics and the global shift to a knowledge based economy; large numbers of professors move towards retirement at the same time as demand for research and teaching intensifies. This can be accomplished by a blend of hiring both temporary and permanent professors.

The temporary augmentation or increase of resources can be accomplished in three ways. Universities can look to recruit visiting professors from areas that are not as affected by the echo boomer phenomenon, such as Europe, and perhaps other provinces. The second is to incorporate retirement planning that sees current professors remaining in the teaching and researching environment longer than initially anticipated, either in a full time or part time capacity, which could provide a win-win situation for both the universities and the professors. The third resource augmentation option is for universities to hire additional sessional lecturers to teach the undergraduate courses; this may be difficult due to the increasing resistance of this group to be treated as temporary help.

When hiring permanent faculty to fill the currently vacant, as well as the newly created, positions, caution is suggested here as to not repeat earlier problems of offering tenure to a large number of professors that may result in another wave of professors retiring at the same time. It is recommended that non-tenure compensation be considered first, such as increased salaries or a modified work environment. A source for new professors could be the current ranks of sessional lecturers, with a focus on those who have not lost the required research skills while teaching or those who could obtain these skills in a specialized process. Additionally, recruitment from regions that are not experiencing demographic increases may also be appropriate.

Another important issue to address is funding. Although not fully identified through the media there has been a change in the approach to funding by the provincial and federal governments, to a user pay mechanism. It is likely that this approach will remain in place and it is presumed in this paper that most business administrators have recognized this shift to the point of

lobbying for tuition increases and even control over setting tuition schedules. Control over the tuition schedule is important as it allows for the greatest flexibility in maintaining revenue.

Situations such as the need for increased scholarship funding, as part of the user pay approach, as well as, the initial lag time between the termination of the old source of revenue and the new revenue during the shift itself, and co-funding initiatives for research between government, industry and the universities have set the stage for the need of universities to have increasing revenue generation that allows for flexibility in its allocation.

In 2001 universities on average obtained 28 percent more revenue, in constant dollar amounts, than in 1991. This suggests that universities have accommodated the changes, although it may have been a painful process. Although this shift was dramatic and not likely to reoccur, a number of suggestions can be derived from analysing this shift. The revenue shift does demonstrate the significance of universities being dynamic and flexible so as to respond to such changes as quickly as possible and with the least amount of discomfort. It is important to develop a strong knowledge of the industry to facilitate these attributes in response to future directional shifts and to establish a capital reserve to weather over situations where there may be a lag before the revenue streams are restored. Although, it is likely that some revenue payments will be restored between the federal and provincial governments, it is clear that it is now the user or student that holds the funding. Approaches must be developed that best transfer this funding from the user to the university without appearing to be overly aggressive and damaging the reputation capital of the university. Increasing skills in market analysis should be beneficial to this situation, particularly for highly differentiated products or services such as Master of Business Administration program offerings, joint and international degrees, global competition, foreign students and technology.

Increased overall business analysis skills would contribute to resolving or accommodating the funding issue by developing solutions such as collaborative efforts towards

cost reductions programs between universities for areas that are not core competencies. There may be a large advantage to those universities that leverage their own business faculty's expertise to provide analysis for future directions.

Currently upgrades to research infrastructure and technology are being address through grants from federal and provincial sources but universities should review any imbalance in physical infrastructure upgrades and develop a plan for future support.

The user pay approach could create a real or perceived accessibility issue for those students who are from lower income or unsupported backgrounds. Even for those students from higher income backgrounds, the user pay approach could recreate an obstacle or reluctance for participation in higher fee programs or leave the students with unmanageable debt after graduation. The transition in funding approach to user pay also shifts the perceived responsibility of accessibility from government to the universities directly. Universities will need to manage both the actual accessibility issues, by way of scholarships and monitoring student enrolment and debt loads, and the perception of these issues through the media.

There has been an increase in private sector donations to the universities and federal and some provincial governments have incorporated a granting approach that increases the collaborative efforts of the universities with industry. University administrators may want to monitor the perception and reality of these liaisons and correct any potential negative impacts with informative communication and balancing research funding through their own initiatives. As well, policies, guidelines and ethics reviews should be in place to monitor and prevent any negative situation.

Overall the conclusions strongly point administrators to becoming more business oriented while remaining sensitive to those issues that are related to providing a public good, such as accessibility, providing pure research results, and quality instruction.

APPENDICES

Appendix A - List of Canadian Medical Doctoral Universities

| Medical Doctoral Universities |
|--------------------------------|
| Dalhousie University |
| Laval University |
| McGill University |
| McMaster University |
| Queen's University |
| Sherbrooke University |
| University of Alberta |
| University of British Columbia |
| University of Calgary |
| University of Manitoba |
| University of Montreal |
| University of Ottawa |
| University of Saskatchewan |
| University of Toronto |
| University of Western Ontario |

Data source: MacLeans, 2004

Appendix B - UBC Revenue Areas – March 2004

| Revenue (in Millions) as Interpreted from Fiscal 2004 Annual Report | | | | | | | | |
|---|--------------|--|---------------------------|--|----------|------------------|--|----|
| Total | Student Fees | Investment Management (Includes Endowment revenue) | Sales, Services and Other | Government Grants to Support Students and Other Activities | Spin Off | Research Funding | Non Government Grants, Contracts and Donations | |
| \$1,134 | \$129 | \$27 | \$261 | \$383 | \$14 | \$222 | \$98 | |
| % | 100% | 11% | 2% | 23% | 34% | 1% | 20% | 9% |

Note: student fees and government grants to support students and other activities were included in course offerings (11% + 34% = 45%). Non Government Grants, Contracts and Donations were attributed to Marketing and PR and included deferred contribution amortization for current year.

| Students | |
|---------------|---------|
| Graduates | > 8,854 |
| International | 4,054 |
| Enrolled-FTE | 32,998 |

| | |
|---------------------|---------|
| Plant and Equipment | \$1,211 |
|---------------------|---------|

| Sources of Funding | |
|--------------------|---------|
| gpcf | \$526 |
| spf | \$265 |
| srf | \$236 |
| ancillaries | \$107 |
| Total | \$1,134 |

Data source: University of British Columbia Financial Statement for Fiscal 2004

Reference List

- Association of Universities and Colleges of Canada. (2001). *Addressing Accumulated Deferred Maintenance on Canadian University Campuses*. Retrieved June 25, 2005 from http://www.aucc.ca/pdf/english/reports/2001/deipro_09_25_e.pdf.
- Association of Universities and Colleges of Canada. (2005a). *An Overview of Graduate Studies in Canada*. Retrieved June 25, 2005 from http://www.aucc.ca/can_uni/student_info/can_student/grad_studies_e.html.
- Association of Universities and Colleges of Canada. (2005b). *Quick Facts*. Retrieved June 25, 2005 from http://www.aucc.ca/publications/research/quick_facts_e.html.
- Association of Universities and Colleges of Canada. (2005c). *Publication and Resources - Research and Statistics*. Retrieved June 25, 2005 from http://www.aucc.ca/publications/research/enrol_e.html.
- British Columbia Innovation Council. (2005). *Strategy*. Retrieved June 13, 2005 from http://www.scbc.org/about_bcic/strategy.php.
- British Columbia Ministry of Advanced Education. (2004). *General Responsibilities*. Retrieved January 14, 2005 from http://www.gov.bc.ca/bvprd/bc/content.do?brwId=%4020YH%7C0YQtuW&navId=NAV_ID_8376&levelFlag=1&crumb=B.C.+Home**Advanced+Education&crumburl=%2Fhome.do*%2Fchannel.do%3Faction%3DgovOrg%26channelID%3D*%2Fchannel.do%3Faction%3Dministry%26channelID%3D-8376.
- Bukszar, E. (2005). Class notes. Simon Fraser University. Vancouver.
- Canadian Association of University Teachers. (2003). *Statement to the House of Commons Standing Committee on Finance Regarding the 2004 Federal Budget*. September 2003. Retrieved June 23, 2005 from <http://www.caut.ca/en/publications/briefs/2003FedBudgetBrief.pdf>.
- Canadian Association of University Teachers. (2004, December). Report warns universities becoming more private: with too little public money to work with, universities are increasingly turning to private revenue sources. *CAUT Bulletin*, p. A4. Retrieved February 11, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=3&did=770564301&SrchMode=1&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1108247195&clientId=3667>.
- Canadian Foundation for Innovation. (2005a). *CFI Overview*. Retrieved June 30, 2005 from <http://www.innovation.ca/about/index.cfm?websiteid=5>.
- Canadian Foundation for Innovation. (2005b). *Media*. Retrieved June 30, 2005 from <http://www.innovation.ca/media/index.cfm?websiteid=232>.
- Carty, A. (2005). *Current and Future Directions for the Canadian Research System*. (Power point presentation). Office of the National Science Advisor. Retrieved June 25, 2005 from www.rverson.ca/ORS/news_main_page/CARTY-Rverson.05.18.05.ppt.
- Cervantes, M. (2003). *Academic Patenting in OECD Countries*. 2nd EPIP Conference in November. Maastricht.

- Dalhousie University. (2004). *2004 Annual Financial Report*. Retrieved June 13, 2005 from <http://senioradministration.dal.ca/files/annualreport2004.pdf>.
- Davenport, P. (2001). Universities and the Knowledge Economy. *Ivey Business Journal*, 65 (5), 64-69. Retrieved February 11, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=12&did=74106098&SrchMode=1&sid=9&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1108240598&clientId=3667>.
- Drolet, M. (2005). *Participation in Post-secondary education in Canada: Has the Role of Parental Income and Education Changed over the 1990's?* Analytical Studies Branch Research Paper Series. Statistics Canada. Catalogue no. 11F0019MIE — No. 243 [Electronic version].
- Foote, D. (2001). Canadian Education: Demographic Change and Future Challenges. *Education Canada*. Canadian Education Association. Spring. Retrieved July 8, 2005 from <http://www.footwork.com/edcan.html>.
- Gingras, Y. & Robitaille, J. (1999). *The Level of Funding for University Research in Canada and the United States: Comparative Study*. Association of Universities and Colleges of Canada. Research File. May 1999 Volume 3, No. 1. Retrieved June 25, 2005 from http://www.aucc.ca/can_uni/student_info/can_student/grad_studies_e.html
- Giroux, R. J. (2001). AUCC: *Notes for Remarks to the House of Commons Standing Committee on Human Resources Development and the Status of Persons with Disabilities: Round table on access to postsecondary education (financing and mobility)*. May 29. Retrieved June 30, 2005 from http://www.aucc.ca/publications/reports/2001/hrdcpse_e.html.
- Harris, R. (2004, November). Brand U. *Marketing*, 19 (35), 5. Retrieved June 13, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=13&did=735630711&SrchMode=1&sid=26&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1116119805&clientId=3667>.
- Holloway, A. (2004, October 25). The Brian Game. *Canadian Business*, 77 (21), 91-92. Retrieved June 23, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=8&did=732963441&SrchMode=1&sid=9&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1118359517&clientId=3667>.
- Institute of Higher Education, Shanghai Jiao Tong University. (2004). *Top 500 world universities*. Retrieved January 14, 2005 from <http://ed.sjtu.edu.cn/rank/2004/top500list.htm>.
- Johne, M. (2001). Back to Class. *CMA Management*, 75 (5), 26-31. Retrieved June 25, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=3&did=74677701&SrchMode=3&sid=1&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1119722114&clientId=3667&aid=1>.
- Johnston, A. D. (2002, May). A Lament for Quality. *MacLean's*, 115 (18), 64. Retrieved February 11, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=5&did=117882701&SrchMode=1&sid=9&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1108238475&clientId=3667>.

- Johnston, A. D. (2003, November). Measuring Excellence: With the largest incoming class ever, and more students on the way, universities face unprecedented demand to deliver. *MacLean's*, 116 (46), 2. Retrieved February 11, 2005 from <http://proquest.umi.com.proxy.lib.sfu.ca/pqdweb?index=0&did=631812021&SrchMode=1&sid=9&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1108238475&clientId=3667>.
- Jones, G., Shanahan & T. Goyan, P. (2002). Traditional Governance Structure – Current Policy Pressures: The Academic Senate and Canadian Universities. *Tertiary Education and Management*, 8, 29.
- Keynes, J.M. (1936). *The General Theory of Employment, Interest and Money, The Collected Writings of J. M. Keynes*. Volume VII, London: Macmillan Press and Cambridge University Press.
- Lawes, D. (2005, January). University News. Research Spending put under a Microscope. *University Affairs*. Retrieved June 23, 2005 from http://www.universityaffairs.ca/issues/2005/jan/research_spending_01.html.
- McGill University. (2004). *Audited Financial Statements for the year ending May 2004*. Retrieved June 13, 2005 from http://upload.mcgill.ca/vpadmin/English_May_2004_from_Deloitte.pdf.
- McMaster University. (2004a). *Research @ McMaster. Growth in Research Funding*. Retrieved March 16, 2005 from <http://www.mcmaster.ca/research/facts/facts1.htm>.
- McMaster University. (2004b). *Research @ McMaster. Canada's Top 10 Research Universities*. Retrieved March 16, 2005 from <http://www.mcmaster.ca/research/facts/facts8.htm>.
- McMaster University. (2004c). *Financial Statements of McMaster University – Year ended April 30, 2004*. Retrieved June 13, 2005 <http://www.mcmaster.ca/bms/finance/>.
- MacLean's. (2004, November). *2004 Overall Rankings Chart: Medical Doctoral*. Retrieved January 14, 2005 from http://www.macleans.ca/universities/article.jsp?content=20041104_163511_5512.
- Marketnewzealand.com. (2004, September). *Education and Training Global Updates*. Retrieved July 29, 2005 from <http://www.marketnewzealand.com/MNZ/news/story/13572/11417.aspx>.
- Manitoba Council of Post-secondary Education. (2003). *Statistical Compendium for the Academic Years ending April 2001*. Retrieved June 13, 2005 from http://www.copse.mb.ca/en/documents/statistics/TP_ES.pdf.
- Mazzarol, T., Soutar, G., & Seng, M. (2003). The Third Wave: Future Trends in International Education. *The International Journal of Educational Management*, 17(2/3), 90.
- Mora J. (2001). Governance and Management in the New University. *Tertiary Education and Management*, 7, 95-110.
- Mowery, D. & Sampat, B. (2005). The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: A model for Other OECD Governments? *Journal of Technology Transfer*, 30 (1-2), 115.
- Mullens, A. (2001). The Sessional Dilemma. *University Affairs*. May 2001. Retrieved June 23, 2005 from <http://www.universityaffairs.ca/issues/2001/may/sessional2.pdf>.

- Ontario Ministry of Education, Ministry of Training, Colleges and Universities. (2005). *Opening doors to strengthen your company's performance*. Retrieved June 13, 2005 from <http://www.edu.gov.on.ca/eng/general/postsec/openingdoors/employers/>.
- Porter, M. (1979). How Competitive Forces Shape Strategy. *Harvard Business Review*, March/April 1979.
- Porter, M. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York, NY: Free Press.
- Porter M. & Monitor Company. (1991). *Canada at the Crossroads: The Reality of a New Competitive Environment*, Ottawa, Canada: Business Council on National Issues and Minister of Supply and Services.
- Porter, M. (1998). Clusters and the New Economics of Competition. *Harvard Business Review*, Nov/Dec 1998. p. 77-90.
- Queens University. (2004). *Annual Financial Report 2003-2004*. Retrieved June 16, 2005 from <http://www.queensu.ca/fins/annualreport/2004/statements.html>.
- Research Infosource Inc. (2004). *Canada's Top 50 Research Universities List 2004 Analysis*. Retrieved June 13, 2005 from <http://www.researchinfosource.com/media/2004-top50-article.pdf>.
- Robertson, H., McGrane, D. & Shaker, E. (2003). *For Cash and Future Considerations: Ontario Universities and Public-Private Partnerships*. The Canadian Centre of Policy Alternatives. Retrieved July 8, 2005 from http://www.policyalternatives.ca/documents/National_Office_Pubs/universities_p3s.pdf.
- Robertson, T. (2003). Changing Patterns in University Finance. *Education Quarterly Review*, 9 (2).
- Robitaille, J. (1999, May). The Level of Funding for University Research in Canada and the United States: Comparative Study. *Association of Universities and Colleges of Canada*, 3 (1). (Research File). Retrieved June 25, 2005 from http://www.aucc.ca/can_uni/student_info/can_student/grad_studies_e.html.
- Schmidt, S. (2005, June 25). Canada's Top Scientists Attack Ottawa's Funding Strategy. *The Vancouver Sun*, A8.
- Statistics Canada. (2003a). *Report on the Pan-Canadian Education Indicators Program 2003*. [Electronic version]. (Catalogue number 81-582-XPE). Canadian Education Statistics Council.
- Statistics Canada. (2003b, March). University Enrolment by Field of Study. *The Daily*. Retrieved July 8, 2005 from <http://www.statcan.ca/Daily/English/030331/d030331b.htm>.
- Statistics Canada. (2005a). *Projected population for 2001, 2006, 2011, 2016, 2021 and 2026, at July 1, 2001*. Retrieved June 30, 2005 from <http://www40.statcan.ca/101/cst01/demo23a.htm>.
- Statistics Canada. (2005b). *Population by sex and age group 2004*. Retrieved June 30, 2005 from <http://www40.statcan.ca/101/cst01/demo10a.htm?sdi=population%20sex%20age%20group>.
- University of Alberta. (2004). *Statement of Operations for 2003-2004*. [Electronic version]. Retrieved June 13, 2005 from <http://www.financial.ualberta.ca/pdf/StatementofOperations0304.pdf>.

- University of British Columbia. (2004a). *Financial Statements March 31, 2004*. Retrieved March 08, 2005 from Financial Services web site:
http://www.finance.ubc.ca/documents/financial_statements/2003-04/vp_report_2004.pdf.
- University of British Columbia. (2004b). *Welcome to UBC wireless*. Information Technology Services website. Retrieved March 15, 2005 from <http://www.wireless.ubc.ca/main.html>.
- University of British Columbia. (2004c). *UBC Facts & Figures 2002 / 2003*. Retrieved January 11, 2005 from the Department of Public Affairs website:
<http://www.publicaffairs.ubc.ca/ubcfacts/index.html#patents>.
- University of British Columbia. (2005a). *E-strategy*. Retrieved March 08, 2005 from Information Technology Services website: <http://www.e-strategy.ubc.ca/about.html>.
- University of British Columbia. (2005b). *Guide to Campus Libraries*. Retrieved March 20, 2005 from University of British Columbia Library website:
<http://www.library.ubc.ca/home/about/branches/map.html>.
- University of British Columbia. (2005c). *UBC's E-strategy Blog*. Retrieved March 08, 2005 from <http://careo.elearning.ubc.ca/weblogs/estategy/archives/009231.html>.
- University of Calgary. (2004). *University of Calgary Consolidated Financial Statements from the year ended march 31, 2004*. [Electronic version]. Retrieved June 13, 2005 from <http://www.fp.ucalgary.ca/financial/statements/yr04.pdf>.
- University of Manitoba (2004). *University of Manitoba Annual Report*. [Electronic version]. Retrieved June 13, 2005 from http://www.umanitoba.ca/admin/financial_services/annualreports/2004/cover_2004.pdf.
- University of Montreal (2004). *Communications and Student Recruitment Office*. Retrieved June 13, 2005 from http://www.umontreal.ca/infogen/pub_officielles/rapports_annuels/rap_an2004en.pdf.
- University of Montreal (2005). *Etats Financiers*. Direction des Finances. Informations Generales. [Electronic version]. Retrieved July 31, 2005 from http://www.fin.umontreal.ca/info_financier.htm#haut.
- University of Saskatchewan (2004). *University of Saskatchewan Annual Report 2003-2004*. Retrieved June 13, 2005 from <http://www.usask.ca/uofs/annual-report2004/>.
- University of Toronto (2004). *University of Toronto Condensed Annual Report 2003 -2004*. [Electronic version]. Business Affairs. Retrieved June 13, 2005 from http://www.finance.utoronto.ca/userfiles/page_attachments/Library/4/778244_Financial_Statements.pdf.
- University of Ottawa (2004). *Facts and Figures – Financial Statement*. [Electronic version]. Financial Services. Retrieved June 13, 2005 from http://www.report.uottawa.ca/en/facts_figures/financial_statement/.
- University of Western Ontario. (1995). *Leadership in Learning – Westerns Strategic Plan 1995. Undergraduate Students and Programs*. [Electronic version]. Retrieved June 23, 2005 from <http://www.uwo.ca/pvp/stratplan/ugrad.html>.
- USAuniv.com. (2004). *US Universities - Top Ranks of Medical Schools*. Retrieved February 11, 2005 from <http://topmedicalschoools.usauniv.com/6.html>.
- Whiteside, J. (2005, March 14). End of Mandatory Retirement in Sight for Faculty and Librarians. University of Toronto. *News@UoT*. Retrieved July 7, 2005 from <http://www.news.utoronto.ca/bin6/050314-1116.asp>.