STANDING AT THE CROSSROADS: 
IDENTITY AND RECOGNITION 
OF THE APPLIED SCIENCE TECHNOLOGIST 
IN BRITISH COLUMBIA 

by

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Faculty 
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ABSTRACT

Modern technical education in British Columbia has been affected by two societal trends: in industry, engineering technology evolved as a discipline to bridge the increasing chasm between the process-oriented skill sets of tradespersons/technicians, and the declarative knowledge focus of engineering; in education, the provincial college and institute system was created to address the need for a new post-secondary credential situated between trades certificates and university degrees. The Applied Science Technologist arguably forms the intersection of these two concepts. Almost forty years after its inception, it is timely to ask if the original model has matured into a distinct occupational category in industry, education, and in the public mind.

The thesis proposes three environments, the Formative, Market and Public Domain, respectively. Interviews, surveys and personal experience afforded insights into the dynamics of these domains with respect to a fledgling occupational category, while the socio-philosophical concepts of culture, habitus and social imaginary provide the tools to interpret the findings. The thesis postulates that an emerging occupational category will not only challenge existing cultures and habitus, but that over time it will influence the imaginaries of each domain and society as a whole. Ultimately, the occupational category will be truly successful only when the general public is able to distinguish it from related disciplines.

Charles Taylor’s writings on multiculturalism are used to discuss identity and recognition of the Applied Science Technologist in each domain while Pierre Bourdieu’s perspectives on the existence of habitus and self-proliferating elites form the framework to examine the relationships between technologists and engineers. Taylor’s theory of multiple concurrent social imaginaries guides the comparison of divergent expectations among academic, career and vocational instructors at British Columbia’s colleges.

The thesis concludes with recommendations for the sustainability of the Applied Science Technologist as distinct occupational category.

Keywords: engineering technology; community college; diploma; recognition; identity; social imaginaries
DEDICATION

To my wife Karen.

In the beginning, it was you who convinced me that I should follow my dreams and embark on this journey.

In the end, it was you who kept my back free of those pesky daily chores, and who ensured that my rear would remain firmly planted in that chair upstairs, effectively bringing this dissertation to fruition.

To my dog Pancho.

In the end, it was you who didn’t take no for an answer, and who ensured that my rear would not remain firmly planted in that chair upstairs all day, effectively providing me with those breaks and walks on the beach that proved so vitally important.
ACKNOWLEDGEMENTS

I am truly indebted to my senior supervisor Dr. Milton McClaren who over the length of this project has become a friend and mentor. I will always treasure our frequent morning lattes as a modern version of a walk on the beach with your own personal philosopher. Your wit, your persistence and your encouragement were an inspiration well beyond the scope of this thesis.

I thank the members of my committee, some of whom guided me early on, some of whom agreed to join last minute to complete the roster.

Here is to the 2004 Kamloops EdD cohort. How I miss those sessions and discussions amidst stale sandwich triangles. We tried to keep the spirit alive, but life’s waves washed us onto different shores. Sharon, Heather and Cyndy: Thanks for staying in touch. I will reserve a spot on the shelf for you!

Not to be forgotten, John Leech and ASTTBC, APEGBC and Camosun College. Your support made this dissertation possible.

Last but certainly not least, to Clayton and Helene, who always found it completely normal that I would follow this route.
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Erudition is never worth its full weight
unless it is adorned with elegance
and the scholar is only truly recognized
if she is not trapped within her specialization.

(Pierre Bourdieu, *The State Nobility*)
CHAPTER 1. CONTEXTS

1. Reflections on the Road

Mr Roemer holds a Master’s degree in astrophysics and currently pursues his doctorate! Such was my introduction to the chairperson at a recent arbitration hearing, given by my institution’s lawyer. Mr Arbitrator, you might say, we are looking at the proverbial rocket scientist. Here we go again, I thought. While counsel continued to spool off my curriculum vitae, I had the opportunity to reflect on the road that led to this dissertation.

A Master’s degree. By Jove, an advanced degree, and in such an eclectic subject no less! Little did the arbitrator know, that German universities at the time did not provide two-year or four-year exit points for students of the natural sciences, and that the research project and thesis in Year Six were obligatory, inevitably leading to the Master’s degree equivalent. In fact, I recall the envy I had for my peers during my fourth-year visit at the University of Alberta because at the end of the term most of them would be able to walk through the gate with a coveted certification, while I would have to return to Germany, facing another two years of tensor equations and the phenomena of quantum chromodynamics. In other words, the advanced degree was less of a choice rather than the first attainable exit point. Nevertheless, it has most certainly served me well.

Credentialism has become a part of North American life. Rather than defining the desired outcomes for a particular job, we now often exclude a multitude of potentially well-suited applicants a priori by erecting artificial barriers in the form of academic degrees. Instructors in engineering technology programs at colleges and technical institutes
constitute a good example. While they are increasingly required to hold engineering degrees, it was the very difference between the work of technologists and engineers that gave rise to the new field of engineering technology in the first place. While experienced engineering technology practitioners would be an asset as faculty in a college program, they are often not considered for faculty appointments. On the other hand, students of engineering technology often have more to gain from the field experience of technology practitioners than the academic background of engineers.

In astrophysics! By the time I commenced my Master's thesis my passion for astronomy had long given way to boredom associated with the exclusively theoretical nature of astrophysics. It was at this point that I became more intrigued with failing computer equipment than its use for the advancement of astrophysics. The proverbial rocket scientist had turned into an applied technologist, and had by then decided to abandon the field of astrophysics after graduation. Ironically, rocket science for the most part is a misnomer. Rocket engineering or rocket technology would be more fitting terms. The distinctions among the three implicitly form the core of this dissertation.

Four years after graduating with my (Master's) degree I joined Okanagan University College as a college professor for electronic engineering technology. With delight I watched the aspiring technologists acquire hands-on skills alongside a theoretical foundation. Many of them had become young innovators by Year Two, submitting intriguing devices and small inventions as part of their fourth-semester project courses. Out of this experience grew my passion for the concept of engineering technology. Ten years later I had become a veteran in the field of engineering technology instruction, had designed and chaired the Network and Telecommunications Engineering
Technology program, and had served the Faculty of Engineering Technology at Okanagan University College as Associate and Acting Dean.

During this time I had also become a strong advocate for engineering technology as a discipline. With a variety of skill sets under my belt, I had decided to promote and support the world of engineering technology, as an integrator rather than a field-specific specialist. In fact, it seemed to me that in our highly specialized world integration had become a specialty itself. Bridging the gaps, translating the needs and conveying the messages requires a sophisticated generalist with a broad spectrum of skills rather than the proverbial Fachidiot.¹

The statement that “Mr Roemer is currently pursuing his doctorate” then suddenly becomes an all but logical consequence of the above. Expanding my knowledge spectrum into the domain of educational philosophy and applying this newly gained knowledge to my passion for engineering technology appeared to be a sensible step in my life-long learning. As I reflect on the road leading to this dissertation, I realize that researching the status of engineering technologists in Canada today has very much

¹ Fachidiot: A one-track specialist, so absorbed by his/her area of expertise that he/she has become (a) oblivious to occurrences and events outside his/her field, (b) incapable of non-field-specific communication, and (c) unable to function outside his/her professional comfort zone.

NB: On December 8, 2006, the renowned Goethe-Institut recommended Fachidiot as one of the German loanwords which would most benefit the English language.
removed me from the laws and phenomena of physics I set out to explore more than twenty years ago.

As I left the arbitration hearing it had started to rain. A streetlight was reflected in a puddle as its photons travelled between two media with different refractive indexes. Solving Maxwell's equations for a photon striking a boundary we could derive the Fresnel equations, which would then tell us how much of the light is reflected, how much is refracted and...well, what can I say. Reflections on the road.

2. Definitions and Nomenclature

This dissertation draws on a terminology that is used both colloquially as well as in specialized contexts. Because this can lead to inaccuracies and confusion, it is imperative to provide definitions that clearly delineate these terms. Following is a series of succinct definitions and an introduction to the nomenclature that will be used within the framework of this thesis. Greater detail on the origin, definition and organization of occupational categories and terms is provided in Chapter 2.

Geographical Context

American shall be the adjective used for the United States of America, while North American shall denote an Anglo-American context, i.e. Canada and the United States, but not Mexico or the Caribbean islands. Western shall be used as the aggregate term for the United States of America, Canada, Western Europe, as well as Australia and New Zealand.
Knowledge and Skill

I refer here to the understanding of abstract, conceptual and theoretical contexts as theoretical or declarative knowledge. Conversely, a set of practical skills is referred to as procedural or process knowledge. The spectrum between these two poles is continuous. In the context of post-secondary education, trades and technician programs are located predominately on the process end of the spectrum while fundamental science programs form the theoretical extremity (I will not discuss the somewhat unique position of mathematics here). I will refer to the continuum from process to declarative knowledge as it applies to technical education as the technical knowledge spectrum. Multi-faceted disciplines such as engineering will occupy a range within this spectrum rather than a discrete point.

Disciplines

While this thesis is obviously anchored in the technical domain, the distinctions between science, engineering and technology are not always clear. In this dissertation I will define technology (from Greek τέχνη (techne): craft, skill) as the knowledge and application of tools and skills by humankind. It can be described as "...the current state of our knowledge of how to combine resources to produce desired products, to solve problems, fulfill needs, or satisfy wants. Technology in this sense includes technical methods, skills, processes, techniques, tools and raw materials" (Technology, 2006).

Unfortunately a concise yet universally accepted definition for engineering and engineering technology remains similarly elusive, although practitioners in their respective areas of work can usually point out the differences and boundaries between the
two. The American Accreditation Board for Engineering and Technology (ABET) has suggested the following definitions, which I will adopt for this document:

**Engineering** is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.

**Engineering technology** is that part of the technological field, which requires the application of scientific and engineering knowledge and methods, combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer. (ABET, as cited in National Research Council, 1985, p.7)

**Training and Certification**

Engineering and engineering technology are separate yet intimately related professions. Of course, the differences extend beyond generic definitions of the professions and affect the associated educational programs as well. In general,

- Engineering undergraduate programs discuss underlying mathematical and scientific frameworks to a greater extent than technology programs.
- Engineering undergraduate programs often concentrate on theory (declarative knowledge), while technology programs focus on application (procedural knowledge).
- Engineering faculty normally carry a post-graduate degree and pursue research and publication, whereas engineering technology faculty are often industry practitioners with extensive practical experience, although some may have advanced degrees.
- In the workforce, engineering graduates typically engage in planning, design, and project management, while engineering technology graduates put plans...
into practice and supervise their implementation.

In North America, the spectrum of occupations involved with technology ranges from those that emphasize procedural knowledge to those that focus more on declarative knowledge. The technical knowledge spectrum includes craftsmen, tradespeople, technicians, technologists, engineers, applied scientists and theoretical scientists. Table 1.1 gives a brief overview of the designations central to this thesis, while greater detail is provided in Chapter 2.

Table 1.1

<table>
<thead>
<tr>
<th>Designation</th>
<th>Length of post-secondary program</th>
<th>Credential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technician</td>
<td>8 – 12 months (approx. 1000 hours)</td>
<td>Certificate of Technology</td>
</tr>
<tr>
<td>Technologist</td>
<td>2 – 3 years (approx. 2000 hours)</td>
<td>Diploma of Technology</td>
</tr>
<tr>
<td>Engineer</td>
<td>4 – 5 years</td>
<td>Baccalaureate degree</td>
</tr>
</tbody>
</table>

Traditionally, technician programs show a significant focus on practical hands-on skills (procedural knowledge) and much less on theory, while engineering technologists effectively bridge the realms of the technician certificate and the engineering degree. In the literature, engineering technology is often abbreviated ET.

In the United States, most engineering technology programs confer an Associate Degree after two years of study, but they may also extend to the Baccalaureate and even
Master's level. The technical content of Canadian engineering technology programs is located between that of the American Associate and Bachelor's degree in engineering technology, respectively.

Generally, in both Canada and the United States occupational bodies oversee the **accreditation** of post-secondary programs and the **certification** of individuals. Chapter 2 introduces history, purpose and jurisdiction of these professional associations in greater detail.

**Professions, Vocations and Occupations**

Within the contexts of career and employment, I will refer to **occupation** as a person's regular business activity and source of income. Although **vocation** is sometimes interpreted as an occupation “carried out more for its altruistic benefit than for income” *(Vocation, 2007)*, I will use **vocational training** as a synonym for trades education, i.e. training within the structures of formal apprenticeship leading toward a journeyman certification.

The term **profession** is generally defined as “occupations that involve prolonged academic training and a formal qualification” *(Profession, 2007, ¶1)*, however, a more concise definition involves “regulation enforced by statute [which] distinguishes a profession from other occupations” *(Profession, 2007, ¶4)* and the possession of some form of a monopoly. In British Columbia, Professional Engineers are recognized as professionals while Applied Science Technologists are not. I will therefore refer to technology practitioners as an **occupational category**.
3. Personal Background, Interest and Competency

Personal Background

Born and raised in Germany, I grew up in a modern Western technological society that promotes academic excellence and technological leadership, while maintaining a strong, deeply-rooted respect for the trades and their system of guilds. This dualism is supported through a highly polarized educational system: Three distinct school types, to be chosen as early as the fourth grade, effectively predetermine the available range of future careers. After four years of common elementary school, tradespeople by default will have graduated from five-year Hauptschule, while most mid-level business administrators will have attended seven-year Realschule. University access is usually restricted to graduates of eight or nine-year university-prep school (Gymnasium). In the second half of the 20th century, movement between the individual pathways was inhibited by stiff entrance requirements, insufficient articulation and prior learning assessment, as well as the complexity of the school system.

At the time, a Diplom constituted the first credential and, consequently, exit point for most academic studies of the natural sciences. Comprising approximately six years of study and a research thesis, the Diplom thus maps to the Canadian equivalent of a Master’s degree. As of late, attempts to consolidate education systems across the European Union such as the Bologna Process (European Community, 2005), combined with increased immigration and unsatisfactory student results in international educational outcome comparisons such as the Programme for International Student Assessment
(PISA) Report (Organisation for Economic Co-operation and Development, 2005) have brought about a review of the German education system.

The above description of the situation in Germany will later assist in the comparison of social rank and status between Germany and Canada and thus aid in a direct comparison of their different approaches to technical education.

Having attended both the University of Munich and the University of Alberta, I became acquainted with the particulars of two significantly different secondary and post-secondary systems. However, despite obtaining a Master’s degree at the former institutions, I am also familiar with vocational paradigms because of two years of military service in a technical platoon, and through direct contact with tradespersons within my family and circle of friends.

Interest and Competency

I first encountered the Canadian technical post-secondary education system during my enrolment as a visiting student at the University of Alberta in 1989/90. In the spring of 1990 a provocative statement in the student paper triggered a heated discussion among science and engineering students.
At the time, I was not aware of the definition and role of technical institutes in Canada and was intrigued by the perception that they might constitute a superior educational pathway compared to the renowned University of Alberta.

Having moved to Canada in the early 1990s, I began to explore an education system that, among other differences, offered more tiers and put a strong emphasis on laddering between them. For the first time, I also encountered the concept of two-year technical diplomas and a related credential, the technologist. In 1993 I joined Okanagan University College’s Continuing Education division, and in 1997 I took on the position of College Professor with the institution’s Electronic Engineering Technology department. During that time the department identified the need for a stand-alone internetworking credential and I was seconded to design the corresponding two-year diploma program. As Associate Professor and Chair I was in charge of the new Network and Telecommunications Engineering Technology program and department, both of which were inaugurated in 2001. In the role of Chair I was directly involved with the education of technologists and their success in the marketplace. In 2005, having accepted the

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2 University of Alberta (Edmonton, Alberta)
3 Northern Alberta Institute for Technology (Edmonton, Alberta)
4 Southern Alberta Institute for Technology (Calgary, Alberta)
position of Associate Dean with a comprehensive portfolio that included science, engineering technology and health programs, I began to look at the role of technologists from a societal perspective and how they relate to similar credentials in other fields such as the Licensed Practical Nurse (LPN) as well as the Associate of Science. A severe drop in enrolments in electronics and information technology programs in the early 21st century produced the challenge to review the technologist designation as a whole and devise strategies to stabilize program enrolments (Roemer and Hay, 2007). Later in 2007 I moved to Camosun College in Victoria, British Columbia, and took over the Deanship for the School of Trades and Technology. This new role offered yet another perspective, i.e. the relationship between the vocational trades and non-degree technical programs.

Okanagan College and Camosun College have a lot in common. Both are medium-sized institutions serving large, geographically well demarcated regions, each of which is dominated by a single urban entity with a local university. In addition, at Okanagan College I had the opportunity to observe the transition of an institution from a two-year community college to a university college and to an applied degree college - each with its own peculiarities and perceptions. In the same period of transitions, I encountered different perspectives on college and technology education through my involvement with professional associations like the National Council of Deans of Technology (NCDOT) (2006), the American Society for Engineering Education (ASEE) (2006) and the Applied Science Technologists and Technicians of British Columbia (ASTTBC) (2006). In the fall of 2006 I took over the Chair for the BC Deans of Technology (BCDOT) and joined a national committee that was tasked to conduct a
federally sponsored study with respect to labour markets in engineering and technology (Canadian Council of Technicians and Technologists & Engineers Canada, 2007).

Finally, my interest in engineering technology as a distinct discipline, in particular the identity and recognition of engineering technologists in the marketplace and society, culminated in this research project and dissertation as part of a doctoral degree.

Personal Bias

I am a strong advocate for the Canadian model of a tiered education system. I am also a supporter of engineering technology as an interpreter between the realms of technicians and engineers. However, I am not convinced a priori that this model is sustainable, at least in its current format. Therefore I have attempted to conduct the research that is reported here in an open-minded fashion free of personal bias in an attempt to elucidate the situation of the Applied Science Technologist in British Columbia society today. The next chapter introduces the research problem in greater detail.

4. General Description of the Problem

Scientific and engineering knowledge is said to presently double every ten years (Wright, as cited in National Academy of Engineering, 2005, p.7). As research and development progress at an ever-faster pace the chasm between fundamental research and practical implementation widens, especially in the field of high technology. In order to accommodate “recent and emergent advances, such as those in biotechnology, nanotechnology, information and communications technology, material science and photonics, and other totally unanticipated technologies” (National Academy of
Engineering, 2005, p. 7) basic research is becoming increasingly abstract and university programs in science and engineering need to include greater amounts of theoretical subject matter in the curriculum. For example, electronic engineering programs now often offer electives in quantum electrodynamics (a field once seen by engineers as highly esoteric) because industry is beginning to harness quantum effects for commercial applications. Disciplines like engineering that were once viewed as mainly concerned with direct applications have experienced a shift toward design and conceptualization as well as process management, as projects increase in complexity and engineers are required to innovate, lead and manage. In the technical knowledge spectrum, Figure 1.1 places engineers (region 2) next to the research scientists (region 3) and also accounts for potential overlaps ("research engineer").

However, with this shift of engineering towards the declarative end of the knowledge spectrum, the technology field could become increasingly deficient in applied disciplines that successfully amalgamate theory and practice by providing hands-on practitioners with the appropriate amount of foundational knowledge without losing the focus on the practical application. This could ultimately lead to a break in the continuum of the technical knowledge spectrum, which is shown in Figure 1.1 as region 5.

By a related token, the length of professional engineering programs that have an increasingly theoretical and conceptual character, their academic rigour and their requirements for entry may effectively shut the door on students who cannot qualify for admission to university engineering degree programs, but who aspire to move beyond the predominately practical realm of technicians (region 1) and who can succeed in fields of
technological employment other than engineering. This type of two to three year post-secondary education is depicted in Figure 1.1 as region 4.

*Figure 1.1. The two-dimensional gap in technical education in Canada.*

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*Bridging the Gap: The Applied Science Technologist*

In the second half of the 20th century the developing two-dimensional gap introduced in Figure 1.1 ultimately led to a new occupation transitional between the traditional domains in the field of technology, that of the technician and that of the engineer: the domain of technologist, with its professional designations of Applied
Science Technologist (AScT), Registered / Certified Engineering Technologist (RET / CET) and Technologue Professionnel (TP). The technologist domain was originally designed in order to bridge the emerging dichotomy between the conceptual (declarative knowledge) focus of professional engineers who were increasingly engaged in research, design and managerial roles, and the practical (procedural knowledge) orientation of field technicians. The technologist category also provides access to post-secondary technical education for students situated at the medium levels of academic performance.

In the 1960s an emerging system of community colleges and technology institutes addressed the educational need for a bridging category located between one-year technician certificates and four-year engineering degree programs by virtue of two-year technical diploma programs. In Canada in 1973 the engineering technologist designation was created in conjunction with the establishment of a national regulating body. Since then, the technologist credential has found its way into numerous technical fields including Civil, Mechanical, Electronics or Computer Engineering Technology.

5. Research Question and Thesis Outline

Despite an apparent need for the occupational category of Applied Science Technologist, there are indications that the technologist designation has remained almost unnoticed by the general public and has not established a position in the social imaginaries (Taylor, 2002, 2004) of relevant social groups and modern Canadian society as a whole. Recent trends in post-secondary education in British Columbia such as the development of applied degrees and the establishment of special status universities seem to be further counterproductive to the wider acceptance of the Applied Science
Technologist (AScT) designation. Therefore it is timely to perform a comprehensive review of the concept of Applied Science Technologist and examine its identity, acceptance and recognition in British Columbia and Canada today.

This review will form the base for a discussion of whether the concept of Applied Science Technologist and its associated educational and training framework are still worth pursuing in their current form, or should be revised or even abandoned. Obviously, this question has policy and program implications for the colleges and institutes that currently offer programs leading to a technologist designation. The research for this dissertation focused on addressing this issue.

Chapter 2 reviews the history of science, engineering and engineering technology, and provides detailed descriptions and distinctions of both the occupational fields and the occupational categories of technician, technologist and engineer.

Chapter 3 proposes a conceptual framework with respect to identity and recognition of occupational categories which is largely based on Charles Taylor’s definition of a social imaginary. It discusses the methodologies used to evaluate the concept of Applied Science Technologist within this framework.

Chapter 4 evaluates the educational concept of two-year technical diploma programs and thus addresses region 4 in Figure 1.1. It examines the status of engineering technology programs within the college community and the expectations of technology students.

Chapter 5 correlates to region 5 in Figure 1.1 and focuses on the recognition of technologists in industry and the marketability of their designation. Bourdieu’s theories
of habitus and self-proliferating elites form the framework to examine the working relationships between technologists and engineers.

Chapter 6 addresses the social aspects of the technologist designation. It discusses the self-perception of technologists, as well as their recognition, status and prestige in Canadian society today.
CHAPTER 2. THE CROSSROADS: HISTORY AND STATUS QUO

1. Introduction

In Chapter 1 I introduced the two-dimensional gap in technical education in Canada as a result of two trends. On one hand, the increasingly declarative focus of engineering has created a skill set void between engineers and more procedurally oriented practitioners such as tradespersons and technicians. On the other hand, a system of technical education that limits formal post-secondary education to one-year trades apprenticeships and four-year engineering degrees appears polarized and offers no options for students seeking alternative careers in technology.

During the second half of the 20th century, the educational community in Canada proposed new post-secondary educational pathways, outside the traditional realm of universities, which resulted in the formation of two year community colleges and technical institutes. These new educational organizations were to provide post-secondary education that would be more inclusive of all strata of society and accessible outside the province’s metropolitan centres. Section 2 of this chapter highlights the establishment of this mid-level educational system in British Columbia.

Parallel to the development of the colleges and institutes, but not causally related, agents in the Market Domain identified an increasing need for a distinct skill set that, in the technical knowledge spectrum, would be adjacent to the practical side of engineering. The need for a more applied branch of engineering, to be referred to as engineering technology, was recognized in both Canada and the United States. Section 3 of this chapter reviews the emergence of engineering technology as a distinct discipline.
2. Community Colleges in British Columbia

History

In the early 1960s, access to post-secondary academic education in British Columbia was limited. Although the provincial legislature constituted Notre Dame University in Nelson as a private university in 1963 and Victoria College was affiliated with the University of British Columbia in Vancouver, the latter represented the only public degree-granting institution in the province. In addition to this geographical disparity with respect to access to degree programs, John Porter (1965) also links access to class structure: in his book *The Vertical Mosaic*, a study into the equality of opportunity in Canada, he claims that "...in the 1960’s it became clear that inadequate training facilities were keeping a large portion of the Canadian labour force unnecessarily unskilled" (p. 49). John MacDonald, a former president of the University of British Columbia, in a report commissioned by the provincial government (1962) called for the establishment of a community college system situated between the existing vocational schools and degree-granting universities.

Figure 2.1 shows the void the new college system was proposed to fill as part of the two-dimensional void introduced in Chapter 1.

While the emerging system of two-year regional colleges was initially influenced by both the University of British Columbia and local School Boards, the provincial government took over leadership of the college system in 1977 through the *Colleges and Provincial Institutes Act* (Dennison & Gallagher, 1986).
Figure 2.1. The Educational Void between vocational and academic education, prevalent in British Columbia before the review of the educational system in 1962.

John Levin writes that the regional colleges were both locally responsive and legislatively mandated to meet local needs but they were provincially governed and funded. They maintained a traditional community college orientation and philosophy, including a comprehensive curriculum, open-access to education and training, focus upon student needs, and community responsiveness. (Levin, 2003, p. 60)

As such community colleges had a “democratizing effect upon the opportunities for post-secondary education” and constituted a “second chance ... for those who found the doors to the university were, for many reasons, closed; they claimed that those
students who so desired would be prepared for specific occupational roles” (Dennison in Government of British Columbia, 1971, p. 13). Dennison’s statement of training for “specific occupational roles” is important for this research as it implicitly acknowledges that college graduates do not possess a mere subset of courses of four-year degree programs but undergo specialized training in order to succeed in distinct roles. This acknowledgment is foundational for identity and recognition.

Hybridization: The Degree-Granting College

In 1988 the Provincial Access Committee recommended that access to baccalaureate degrees should be increased through the establishment of so-called university colleges which would provide undergraduate degree programs alongside traditional community college education (Government of British Columbia, 1988). In addition, the new hybrid institutions were seen as generators of economic development in their respective regions, “with an applied emphasis and a focus upon employment opportunities” (Government of British Columbia, 1996). Levin (2004) states that the baccalaureate degree at community colleges serves several purposes including expanding access to postsecondary education and responding to economic pressures from both … government and local business and industry. The establishment of baccalaureate degree programs at community colleges conforms to the community college missions of both access and institutional responsiveness to community demands and to local markets. Furthermore, the addition of baccalaureate degrees at community colleges reflects the pressures of the state to use the community college as an instrument of economic policy. (Levin, 2004, p. 13)
This hybridization of institutional types has been critically analyzed by various scholars including Dennison (1992) and Dennison & Schuetze (2004). The continuous expansion of role, mission and offerings of community colleges, sometimes referred to as mandate creep, has given rise to concerns, many of which are directly applicable to engineering technology programs. By itself, mandate creep does not immediately suggest the devaluation of time-honoured programs and courses, if it only expands towards the declarative end the knowledge spectrum conveyed at the institution. However, when the role and mission expansion is coupled with a school's quest for academic prestige, which, in return, may be a result of societal trends such as credentialism, then it may lead to the marginalization of vocational and non-degree career programs. In the absence of university-level funding many colleges institutionalized mandate creep by establishing more affordable applied degrees in the field of liberal arts. Moore and Trenwith (1997) note that “typically, liberal-humanism treats education as a good in its own right rather than as a means to an end (e.g. producing skilled workers) and stresses general moral qualities … rather than concrete skills…” (p. 59), hence, “a distinction can be made between ‘academic’ credentials shaped by the interests and values of academics and educationalists in the world of education, and ‘occupationalist’ credentials shaped by perceptions of the ‘the needs of industry’ by agencies … or industry itself” (p. 61). The diverging imaginaries of the academic and vocational fields seldom peacefully coexist. The divergence can lead to a marginalization or to attempts at the academization of vocational fields. Academization can occur in various forms and may even be rooted in perceived benevolence on the part of the institution: while recent Bachelor of Technology degree programs offer course credits for Red Seal trades practitioners, i.e. nationally
recognized journeypersons, they conversely avoid the term “trades” in the designation and pre-empt efforts to introduce master tradesperson certification which has been the traditional advancement for journeypersons. I elaborate on this and other examples in the Chapter 4. Marginalization may manifest itself through a shift in strategic funding from one institutional sector to another, a change in hiring practices or new institutional priorities that are antithetical to the original broad objectives of the community college. For example, the introduction of research foci resulted in university colleges employing “a number of individuals, who, while well-qualified academically, had little experience or real appreciation of the comprehensive community college and its carefully nurtured values” (Dennison, 1992, p. 116). Ironically, this emerging form of academic arrogance had already been called into question much earlier by Sperrin Chant, then Dean at the University of British Columbia and Chair of the Academic Board of British Columbia.

In my experience I have not found that at the level of first and second year university, active engagement in research is a necessary component of good instruction. (Chant in Government of British Columbia, 1971, p. 11)

More recent reviews of the educational system in British Columbia such as the Campus 2020 Report (Plant, 2007) clearly promote the notions of on-going credentialisation and in fact suggest a further expansion of the mandates of hybrid institutions through the conversion of university colleges into regional universities.
Technology: An Attempt at Definition

While this thesis is obviously anchored in the technical realm, the distinctions among science, engineering and technology are not always clear. A long-standing entry in *Wikipedia – The Free Encyclopedia* was based on Philip Roussel’s (1991) definition:

Generally, science is the reasoned investigation or study of nature, aimed at discovering enduring relationships (principles) among elements of the (phenomenal) world. It generally employs formal techniques, i.e., some set of established rules of procedure, such as the scientific method. Engineering is the formal use of both scientific and technological principles to achieve a planned result based upon empirical (professional) experience. However, technology broadly involves the use and application of all forms of knowledge (i.e., scientific, engineering, mathematical, language, and historical), both formally and informally, to achieve some "practical" result. (Technology, 2006, ¶ 1).

However, this definition was later disputed and the Wikipedia community could only agree on the general statement that “it is very difficult to obtain a precise definition of technology. It is generally accepted that ‘technology’ is more than just a collection of physical products of science. ‘Technology’ is the relationship of society and its tools” (Technology, 2007, ¶ 6). In 1989, Ursula Franklin linked technology to practice:

I think what we are all discussing are political issues. They are political in the best sense of the word, in the original Greek sense of the word, in that they affect the community, the very citizens who have to work and live together. When all the technology is disposed of, when we have understood or put aside all the details, what is left are the issues of how people live together. These political issues have
existed ever since people have lived together and were articulate about their relationships.

To me, it is important to understand that technology is practice, it is the way we do things around here. This definition takes machines and devices into account, as well as social structures, command, control, and infrastructures. It is helpful for me to remember that technology is practice. Technology, as a practice, means not only that new tools change, but also that we can change the practice. If we have the political will to do so, we can set certain tools aside, just as the world has set slavery and other tools aside. It is also the nature of modern technology that it is a system. One cannot change one thing without changing or affecting many others. (Franklin, 1999, p. 6)

The comprehensiveness of this definition of technology is important to remember as we examine the emergence of engineering technology as a distinct discipline.

Science, Engineering and Engineering Technology

For millennia humankind has had the desire to unravel the mysteries of nature, its elementary objects and the laws that govern them. Within the natural sciences as the overarching discipline, theoretical or fundamental science attempts to get to the bottom of what Goethe’s Faust calls “...was die Welt im Innersten zusammenhält” (“what holds the world together at its innermost”), that is, to describe the fundamental building blocks of nature, as well as the forces and relations between them. In return, applied science endeavours to utilize the frameworks and constructs of theoretical science to confirm abstract theories, research real-world problems and provide practical solutions. When a solution is developed and implemented in a manner that affects a populace or its
environment, applied science transitions into engineering. Engineering is thus the design, production and application of devices and processes for practical purposes.

Engineering as a field of practice has existed for more than 6000 years but it was the evolution of alphabets and scripts that allowed for the formalization of knowledge and the transcription of skills. Kaiser and König (2006) found that Plato and Aristotle already distinguished between tradespeople and technicians in various writings (p. 37), although the term engineer did not exist in ancient languages and appeared only in the medieval ages (p. 1). Meiksins and Smith (1996) point out that even today the definition of traditional engineers, their training and, correspondingly, their social status varies significantly with different national and even regional contexts. For the most part, engineers define themselves in their respective socio-political environments through their education and certification.

In the continuum of the technical knowledge spectrum I introduced in Chapter 1 engineering occupies an extended range. Engineering still encompasses the understanding of abstract, conceptual and theoretical contexts (theoretical or declarative knowledge) as well as practical hands-on skills (procedural or process knowledge). However, advances in fields such as materials science, quantum physics, information science and biomedicine engage more and more declarative knowledge which causes related research to become increasingly abstract. Anna J. Harrison stated in 1984, that:

At the same time that scientific disciplines and engineering disciplines are proliferating, the two umbrellas, science and engineering, are moving closer together and may overlap, with scientists increasingly involved in problem-solving and engineers increasingly involved in the investigation of phenomena.
Many endeavors of society such as medicine and education are in part science, in part engineering, and in part technology. (Harrison, 1984, p. 543)

As a consequence, traditionally applied disciplines like engineering have experienced a shift away from process knowledge and application toward design and conceptualization. As mentioned earlier, industry has begun to harness quantum effects for commercial applications and electronic engineering programs now readily include electives of quantum mechanics and quantum electrodynamics. Today engineers are not only located closer than ever to research scientists, but with the increasing deployment of so-called “research engineers” there now even exists considerable overlap.

*Figure 2.2.* The skill set void in the technical knowledge spectrum situated between technician and engineering education.
This shift has resulted in a break in the continuum of the technical knowledge spectrum, depicted in Figure 2.2 as the *skill set void*, and has led to calls for a new discipline that would effectively bridge it.

In the United States the **American Society of Engineering Education** (ASEE) led the charge to evaluate the necessity for a new form of engineering education. It is generally agreed that ASEE’s *Report of the Committee on Evaluation of Engineering Education* (*American Society for Engineering Education*, 1955), which became colloquially known as the Grinter Report, had a significant impact on engineering education and became the blueprint for what Weese and Wolf (1994) call the *conceptualization of the bifurcation of engineering*:

The Committee’s objective was to provide a dual choice for each student of either a scientific or a more pragmatic orientation of his program of engineering. The Grinter Report conceptualized the bifurcation of engineering into *engineering science* and *applied engineering*. Under the name of *engineering science*, schools were encouraged to go further into the mathematical analyses that were beginning to flourish with the arrival of the digital computer. Others, taking the name of *applied engineering*, were to remain in the realms of design, construction, and manufacturing. (Weese and Wolf, 1994, p.1)

In reality, these *applied engineering* or engineering technology programs had been accredited in the United States since 1946, but it was ASEE’s report on *The Characteristics of Excellence in Engineering Technology Education* (1962) that defined the final accreditation criteria for engineering technology and became the foundation of numerous two-year programs. Based on the findings and recommendations by H.E. McCallick (1966), then chair of a sub-committee formed by ASEE’s Engineering
Technology Council, the first four-year engineering technology program was accredited in the United States in 1967.

While in both Canada and the United States engineering technology programs have become integral parts of an emerging system of colleges and technical institutes, educational institutions continue to refine the distinction, in order to articulate programs and outcomes in the new field. The Department of Engineering Technology at Old Dominion University in Norfolk, Virginia, publishes this explanation on their website:

Engineering technology and engineering are similar in many ways and there is much overlap between these two fields in the work place. The most important distinction involves a difference in focus.

Engineering technology emphasizes application and implementation of known technologies where engineering focuses on research and development of new technologies. From a course content viewpoint, engineering technology programs require mathematics and science courses that are more application based compared to the theoretical concepts that are the focus of engineering programs. 

(Old Dominion University, 2007, Centre Frame, Section 4)

Aside from the general shift toward increased levels of abstraction in engineering education, science and technology have experienced another trend: as research and development progress at an ever-faster pace, new specializations emerge and eventually become stand-alone disciplines. For example, the physics of electromagnetism gave rise to modern optics (photonics) which, in return, spawned the field of laser technology. While each bifurcation constitutes a fractal element of the ongoing furcation of science and engineering, the knowledge required to master the emerging area of specialization increases, because each new field both inherits the concepts of its parent and adds custom
specialized knowledge. It has been suggested that scientific and engineering knowledge presently doubles every ten years (Wright, as cited in National Academy of Engineering, 2005, p.7). Former US Secretary of Education Richard Riley claims that "none of the top 10 jobs in 2010 exist[ed in 2004] and these jobs will employ technology that hasn’t been invented to solve problems we haven’t yet imagined" (United States Chamber of Commerce, 2006, p.6). At some point a post-secondary system will not be able to provide both breadth, i.e. cover a wide educational spectrum, and depth, i.e. convey profound specialized knowledge, in academic education. Instead, breadth of training will have to give way to a more focussed education and integration will yield to specialization (although integration itself may subsequently become a specialty). ^5

5 This phenomenon is limited neither to North America nor to the post-secondary sector. A good example is the change in the high school system in Germany between 1980 and 2005. Before 1980, university-prep high schooling (Gymnasium) in the high-tech state of Bavaria consisted of 13 years of general schooling with only minor differences in the foci of individual schools. In the early 1980s the Bavarian government introduced a new system (Kollegstufe) whereby students had to choose two specializations for grades 12 and 13. Each of these two core subjects exposed the students to six hours per week of specialized education at a level comparable to community colleges in Canada. The contact hours in most other fields were reduced to two or three hours per week while certain subjects could be dropped in their entirety. In 2005 the Government shortened the length of Gymnasium from 13 to 12 years while retaining the Kollegstufe approach. It was felt that 13 years of general education released high school students too late into the academic system where they could pursue specialized post-secondary degrees, consequently putting them at a disadvantage with international competitors.
The abandonment of general arts, civility and citizenship skills in favour of purely technical education has become commonplace in post-secondary institutions in most Western societies. Table 2.1 lists the current requirements for accredited engineering programs in Canada as prescribed by the *Canadian Engineering Accreditation Board*.

Table 2.1

*Curriculum Requirements for Accredited Engineering Programs in Canada measured in arbitrary “academic units” (AU)*

<table>
<thead>
<tr>
<th>Competency Area</th>
<th>Minimum AU</th>
<th>Minimum AU (overall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complementary Studies</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>Mathematics</td>
<td>195</td>
<td>420</td>
</tr>
<tr>
<td>Basic Science</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>Engineering Science</td>
<td>225</td>
<td>900</td>
</tr>
<tr>
<td>Engineering Design</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td><strong>Total Accreditable Units</strong></td>
<td><strong>1800</strong></td>
<td><strong>1800</strong></td>
</tr>
</tbody>
</table>

*Note. AU = Academic Unit, a measure of exposure to corresponding curriculum that is based on hours but distinguishes between lecture, lab and practicum hours, and assigns different factors to each.*

In other words, only 12% of engineering curriculum is dedicated to arts, communication, or business, i.e. all non-technical skills.

*Cultures and Philosophies*

Plato repeatedly discussed the interplay between technical skill and scientific knowledge and rejected the definition of a technical discipline that was not based on
qualified knowledge (Kaiser and König, 2006, p. 37). While engineering may be approached as a subset of science, and engineering technology in return as a subset of engineering, they originally had diverging cultures. As recent as 1984, Jordan Baruch observed that:

Science has as its constituency the general public. Within the science culture, the results of the science process are considered free goods. While secrecy may be observed to ensure priority, once results are in, publication is the rule. Institutions that fund the major work in science, universities, and fellow scientists measure scientists, among other things, by how well and quickly they disseminate results. Science is among the most open of activities. The output is knowledge and understanding, and this output is most often embodied in publications and in the process of teaching. Engineering and technology are very different from science. There are, of course, engineering scientists engaged in engineering science -just as there are biological scientists and nuclear scientists- and they follow the science culture and leave as their legacy public scientific knowledge. Almost all engineering, as is the case with technology, however, reaches its expression in things and services. Only incidentally does engineering or technology result in a legacy of knowledge. That such knowledge is a by-product does not demean its importance; it merely identifies it as irrelevant to the driving forces in the culture and the constituency.

Because of this commonality in output, I shall use “technology” for both engineering and technology. ... Technology is developed in secret. Publication is an anathema, and the final test of validity is public use. (Baruch, 1984, p. 7)

Today this distinction is becoming increasingly out-of-date, as new hybrid occupations such as research engineer increasingly blur the boundaries between these fields and the unique cultures of each occupational category that existed when engineering technology emerged. Trends like “academic capitalism” (Slaughter and
Rhoades, 2004) see universities acting as corporate entities, patenting and protecting the research in fields that have potential commercial applications.

In the previous section I stated that for the most part engineers define themselves in their respective socio-political environments through their education and certification and that their social status varies significantly with different national and even regional contexts. In many technologically advanced societies engineers also possess under the law a monopoly to certify technical work and have achieved elevated social status. Pierre Bourdieu (1989) claims that in some jurisdictions this has led to the creation of what he calls a state nobility that establishes and zealously defends the exclusivity of its cadre.

When the process of social rupture and segregation that takes a set of carefully selected and chosen people and forms them into a separate group is known and recognized as a legitimate form of election, it gives rise in and of itself to symbolic capital that increases with the degree of restriction and exclusivity of the group so established. The monopoly, when recognized, is converted into a nobility. (Bourdieu, 1989, p. 79)

This claim is of great interest as globalization has brought about attempts at convergence of individual definitions but recognition of foreign credentials still remains a problem in many Western countries, including Canada. More importantly for this thesis, with the advent of engineering technology as a new discipline, Baruch's diverging cultures of science and engineering have been supplemented by a third, arguably distinct culture. The identity and recognition of engineering technologists will have to be included in a global solution. New occupational categories that straddle traditional boundaries such as biochemists, pharmaceutical physicists and research engineers as well as the increasingly recognized concept of practitioner-researcher (Jarvis, 1998) blur
established distinctions. This is not always without controversy. Attempts to redefine time-honoured boundaries are sometimes met with resistance. A good example is the attempted amalgamation of the professional bodies of engineering and engineering technology in British Columbia: while the respective associations proclaimed the benefits of merging two distinct occupational categories, the resistance on the part of the memberships was significant, especially on the engineering side. Resistance to losing defined territory in the knowledge spectrum is usually offered by the agent located further toward the declarative end of that spectrum. Jarvis (1998) notes that

Theory defined practice and was important because it emerged as a result of research that was scientific and therefore right. The theoretician was the legitimator of the correct knowledge and had a much higher status than the practitioner, who merely applied it. (Jarvis, 1998, p.13)

Harrison (1984) speaks of the “arrogance of scientists”:

The sum of scientific, engineering, and technological knowledge is a continuously expanding resource of unprecedented richness and value. Without a term for this body of knowledge, it is frequently referred to as scientific knowledge. This has enhanced the arrogance of scientists, demeaned the contributions of engineers and institutions of technology, and confused issues related to national security and international competition. A conventional wisdom of scientists is that science drives engineering and technology. A strong case can be made that both engineering and technology drive science. (Harrison, 1984, p. 543)

One may argue that the relationship would best be described as co-evolutionary as the development of new research tools such as the scanning tunneling microscope at IBM
Laboratories opens the door to new scientific knowledge which in turn may lead to the development of further knowledge.

Engineering technologists in Canada are normally part of the manufacturing process but do often not partake in the research and design of new technology. Because they are not permitted to certify engineering work, they frequently do not associate their names with projects or share intellectual property rights. Therefore, on a general level, the culture of the engineering technologist is more service oriented rather than based on prestige through publication that scientists seek, or large monetary rewards through the design, certification and intellectual property rights often gained by engineers. Porter's description of the practitioner in 1965 still applies to the technologist today:

They seem to attach little importance to prestige – after all many of them remain anonymous – and even less to high monetary rewards, although they will admit to liking money. The rewards lie in the right to control the resources and facilities of the society, and the receipt of deference from those without power, rather than in the enjoyment of prestige. (Porter, 1965, p. 17)

I will revisit this claim in Chapter 6.

However, for both engineer and engineering technologist the corporate world constitutes an intermediary agent that provides credit and reward while public recognition is only achieved implicitly through the adoption of the developed technology by the community of consumers. Thus, “the legacy of technology is the material advancement of society” (Baruch, 1984, p.7).
In the following chapters I will largely not address the occupational category of scientist and concentrate on the three levels of applied technical education: technicians, technologists, and engineers.

4. Technicians, Technologists and Engineers

Organization, Accreditation, Certification

In Canada, many professional disciplines, especially in the vocational trades, are represented by permanent Sector Councils. Externally, the Sector Councils represent the industrial sector in the public sphere and lobby the political process on behalf of the discipline. Internally, they provide quality control by identifying the skills and know-how required by their members, defining occupational standards and developing human resource strategies. For the engineering technology sector the Canadian Technology Human Resources Board (CTHRB) used to assume most of the duties indicative of Sector Councils. As a not-for-profit association between industry and educational institutions CTHRB was funded by the Federal Government via the Human Resources Partnership program of Human Resources and Skills Development (HRSD) as well as member subscriptions. However, federal funding was revoked in 2006, which, as of the time of this writing, has left the CTHRB in a non-operational state.

The central duty of the CTHRB was the creation and maintenance of the Canadian Technology Standards (CTS) (Canadian Technologies Human Resources Board, 2007) which form the base for college-level program accreditation in Canada. The CTS constitute a list of individually identified skills which are grouped by discipline and
area of competency. They are not limited to technical skills but also include proficiencies in science, communications, and ethics.

The **Canadian Council of Technicians and Technologists (CCTT)** constitutes the federal association of provincial certification bodies for technicians and technologists. Technicians and technologists began to organize themselves shortly after World War II. Most provincial representative bodies were formed in the 1960s, with predecessor organizations ranging back as far as 1956 (Ontario) and 1954 (Quebec). Table 2.2 shows the provincial certification bodies and their respective predecessors where applicable.

CCTT was formed as a national umbrella organization in 1973.

CCTT was originally incorporated on September 1, 1973 as the Canadian Council of Engineering Technicians and Technologists (CCETT). The CCTT was subsequently issued supplementary letters patent in April 1986.

CCTT is a national body that represents provincial associations who grant and maintain the certification of individual technicians and technologists. Where the provinces are responsible for an individual's certification, CCTT is responsible for accrediting the programs that train technicians and technologists in Canada.

*(Canadian Council of Technicians and Technologists, 2006a, ¶ 5)*

The **Canadian Technology Accreditation Board (CTAB)** was established in 1982 as a standing committee of CCTT and is responsible for the coordination and execution of the national accreditation program for applied science and engineering technology programs. Until 2008 the accreditation process was based on the Canadian Technology Standards and included three competency areas:
• Generics: A set of basic skills with general applicability
• Discipline Supportives: Service courses that provide the theoretical foundation for the field of study
• Majors: Core technical curriculum in the field of study

Table 2.2

Canadian provincial engineering technology certification bodies

<table>
<thead>
<tr>
<th>Province</th>
<th>Provincial certification body (acronym/year formed)</th>
<th>First provincial association to represent technologists (acronym/year formed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>ASTTBC (1985)</td>
<td>SETBC (1958)</td>
</tr>
<tr>
<td>Alberta</td>
<td>ASET (1963)</td>
<td>n/a</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>SASST (1988)</td>
<td>SETTS (1965)</td>
</tr>
<tr>
<td>Manitoba</td>
<td>CTTAM (1965)</td>
<td>n/a</td>
</tr>
<tr>
<td>Ontario</td>
<td>OACETT (1961)</td>
<td>APEO (1956)</td>
</tr>
<tr>
<td>Quebec</td>
<td>OTPQ (1980)</td>
<td>CTPPQ (1954)</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>NBSCETT (1968)</td>
<td>n/a</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>ACETTPEI (1972)</td>
<td>n/a</td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>AETTNL (2003)</td>
<td>AETTN (1968)</td>
</tr>
</tbody>
</table>

Note. Data aggregated from organizational websites, which were accessed through hyperlinks provided on the CCTT website (Canadian Council of Technicians and Technologists, 2008).

Table 2.3 shows the contents of each competency area for both the technician and technologist accreditation levels.
Table 2.3

*Required competency areas for accreditation of technician and technologist programs*

<table>
<thead>
<tr>
<th>Competency Area</th>
<th>Technician</th>
<th>Technologist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communications</td>
<td>Communications</td>
</tr>
<tr>
<td></td>
<td>Computers</td>
<td>Computers</td>
</tr>
<tr>
<td></td>
<td>Environment, Ethics and Society</td>
<td>Environment, Ethics and Society</td>
</tr>
<tr>
<td></td>
<td>Math Fundamentals</td>
<td>Math Fundamentals</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Science Fundamentals</td>
<td>Science Fundamentals</td>
</tr>
<tr>
<td></td>
<td>Organizational Skills</td>
<td>Basic Technology</td>
</tr>
<tr>
<td></td>
<td>Generics</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discipline Supportives</td>
<td>Applied Mathematics plus other related Supportives</td>
<td>Applied Mathematics Discipline-specific Management plus other related Supportives</td>
</tr>
<tr>
<td></td>
<td>Five technology discipline majors</td>
<td>Applied Research plus five other technology discipline majors</td>
</tr>
</tbody>
</table>

*Note.* Data obtained from Canadian Council of Technicians and Technologists (2006f).

Growing dissatisfaction with the lack of currency of the Canadian Technology Standards led to a proposal for a new set of guidelines, the *National Technology Benchmarks (NTB)* (Canadian Council of Technicians and Technologists, 2006e) which are set to replace the CTS in the spring of 2008.

A typical accredited technician program usually comprises approximately 1000 hours in eight to twelve months of study leading to a *Certificate of Technology.*
Generally, this would include five technician generic areas, five technician major areas of study, and the appropriate technician supportive areas of study. Technician programs show a significant focus on practical hands-on skills and much less on theory. Also, students are not required to conduct an applied research project. A person who has graduated with a certificate from a CTAB-accredited technical program (or who possesses equivalent training) and who has at least two years of current practical experience, may be certified in British Columbia by the **Applied Science Technologists and Technicians of British Columbia (ASTTBC)** as a **Certified Technician (C.Tech.)** or correspondingly in other provinces.

Accredited technologist programs typically offer about 2000 hours of study in the form of a two or three-year program leading to a **Diploma of Technology**. This format of training is often referred to as career-ready education, as the technologist will be able to apply a broad fundamental education to a variety of previously unknown problems and challenges in the field. This is contrary to job-ready technician education which provides specific skills without emphasis on theoretical backgrounds. Once graduates from CTAB-accredited two or three-year engineering technology programs complete “at least two years of current practical experience (minimum 1 year Canadian experience) in a position of responsibility that reflects a technologist level education” (*Applied Science Technologists and Technicians of British Columbia, 2004*) they can be certified as technologists, allowing them to practice engineering technology in the province or territory where certification was granted. In the British Columbia context, the **Applied Science Technologist (AScT)** now constitutes the only technologist designation conveyed by ASTTBC, although from an occupational perspective there is no immediate distinction...
between Applied Science Technologists, Certified Engineering Technologists (CET), Registered Engineering Technologists (RET), and the Franco-Canadian equivalent of Technologue Professionnel (TP).

Both certificates and diplomas of technology form part of the curricula of most community colleges, university colleges and institutes of technology. The various programs are well articulated and supported through professional networks such as the National Council of Deans of Technology (NCDOT) which “act[s] as an advocacy, consultancy, and reference group on national issues affecting technology training and education” (National Council of Deans of Technology, 2004, ¶ 1).

As of May 1, 2007, CCTT lists 47 accredited technician and 192 accredited technologist programs at public and private institutions across Canada. Further arrangements exist between CCTT and various other entities such as the Department of National Defense, the College of the North Atlantic Qatar, and the province of Quebec. Quebec technology programs are not accredited by the Canadian Technology Accreditation Board (CTAB), since the Quebec government has jurisdiction over programs delivered within the province. L'Ordre des Technologues Professionnels de Quebec (OTPQ) is a constituent member of CCTT, and works with provincial agencies and CCTT on provincial certification matters. CCTT and OTPQ are also working with the ETMF Secretariat to ensure that the international community recognizes and takes account of the special circumstance that surrounds certification within the Province of Quebec. A technologist who is certified as a Professional Technologist (PT)/technologue professionel (TP) from an educational agency within Quebec is recognized as certified by the Canadian Council of Technicians and Technologists. (Canadian Council of Technicians and Technologists, 2006c, ¶ 1)
Table 2.4 lists the number of nationally accredited technician and technology programs in Canada as of May 1, 2007, broken down by province.

Table 2.4

*Nationally accredited technician and technologist programs in Canada by province*

<table>
<thead>
<tr>
<th>Province</th>
<th>Accredited Technician Programs</th>
<th>Accredited Technologist Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Alberta</td>
<td>3</td>
<td>51</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Manitoba</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Ontario</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>13</td>
<td>21</td>
</tr>
</tbody>
</table>

Note. Data aggregated from Canadian Council of Technicians and Technologists (2006b).

As of May 1, 2007, eight public institutions in British Columbia offered a total of 3 accredited technician and 40 accredited technologist programs. Other public post-secondary institutions in British Columbia such as Vancouver Community College may offer similar programs but have not applied for national accreditation. I will not consider non-accredited programs in this dissertation.
Table 2.5

*Nationally accredited technician and technologist programs in British Columbia by institution as of May 1, 2007*

<table>
<thead>
<tr>
<th>Institution (Main Location)</th>
<th>Accredited Technician Programs</th>
<th>Accredited Technologist Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia Institute of Technology (Burnaby)</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Camosun College (Victoria)</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>College of New Caledonia (Prince George)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Kwantlen University College (Surrey)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Malaspina University College (Nanaimo)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>North Island College (Campbell River)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Okanagan College (Kelowna)</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Selkirk College (Castlegar)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

*Note.* Data aggregated from Canadian Council of Technicians and Technologists (2006b).

As of summer 2006, nearly 49,800 technology professionals were registered as technician or technologist with provincial associations.

In British Columbia, the Applied Science Technologists and Technicians (ASTTBC) represent approximately 1,250 Certified Technicians and 3,800 Applied Science Technologists. ASTTBC was incorporated and mandated by statute through the *Applied Science Technologists and Technicians Act (Government of British Columbia,*
2007d) of 1985. Individuals registering with ASTTBC need to complete a Professional Practice Course Module and pass an exam on the above Act and the regulations (by-laws) of the association.

The organizational framework for Professional Engineers is similar to that of Technologists. The Canadian Council of Professional Engineers (CCPE) forms the engineering equivalent of the CCTT. The Council's website states:

Established in 1936, the Canadian Council of Professional Engineers (CCPE) is the national organization of the 12 provincial and territorial associations and ordre [sic] that regulate the practice of engineering in Canada and license the country's more than 160,000 professional engineers. CCPE serves the associations and ordre, which are its constituent and sole members, by delivering national programs that ensure the highest standards of engineering education, professional qualifications and professional practice. …

Through the Canadian Engineering Accreditation Board (CEAB), CCPE accredits Canadian undergraduate engineering programs that meet the profession's high education standards. Graduates of those programs are deemed by the profession to have the required academic qualifications to be licensed as professional engineers in Canada. …

Through the Canadian Engineering Qualifications Board (CEQB), CCPE develops national guidelines on the qualifications, standards of practice and ethics expected of professional engineers. (Canadian Council of Professional Engineers, 2006, p. 2)

The designation of Professional Engineer (P.Eng. or PEng) allows an individual to practice engineering in the province or territory where it is granted. It is bestowed on
individuals who hold an applied science or engineering degree (which generally means a Bachelor of Applied Science (B.A.Sc.), Bachelor of Engineering (B.Eng.) or Bachelor of Science (B.Sc.) degree) and who fulfil certain conditions.

Table 2.6

**Overview of training requirements and formal organization of technicians, technologists and engineers in Canada as of May 2007**

<table>
<thead>
<tr>
<th></th>
<th>Technician</th>
<th>Technologist</th>
<th>Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core program length</td>
<td>8-12 months</td>
<td>2-3 years</td>
<td>4-5 years</td>
</tr>
<tr>
<td>Post-secondary certification</td>
<td>Certificate</td>
<td>Diploma</td>
<td>Degree</td>
</tr>
<tr>
<td>National representation</td>
<td>CCTT</td>
<td>CCTT</td>
<td>CCPE</td>
</tr>
<tr>
<td>National program accreditation board</td>
<td>CTAB</td>
<td>CTAB</td>
<td>CEAB</td>
</tr>
<tr>
<td>Member certification and registration</td>
<td>provincial</td>
<td>provincial</td>
<td>provincial</td>
</tr>
<tr>
<td>Professional designation</td>
<td>C.Tech</td>
<td>AScT, RET, CET, TP</td>
<td>P.Eng., ing.</td>
</tr>
<tr>
<td>Professional association in B.C.</td>
<td>ASTTBC</td>
<td>ASTTBC</td>
<td>APEGBC</td>
</tr>
<tr>
<td>Registered members (Canada)</td>
<td>5,000</td>
<td>44,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Registered members (British Columbia)</td>
<td>1,250</td>
<td>3,800</td>
<td>23,000</td>
</tr>
<tr>
<td>Professional practice required for certification</td>
<td>2 years</td>
<td>2 years</td>
<td>4 years</td>
</tr>
<tr>
<td>Professional practice exam required for certification</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
This includes a minimum of four years of accepted engineering work, preferably under the supervision of a licensed Professional Engineer, and passing the Professional Practice Exam with the respective provincial certification body. In order to legally practice engineering in British Columbia individuals must be licensed with Association of Professional Engineers and Geoscientists in British Columbia (APEGBC). APEGBC operates under the authority of the Engineers and Geoscientists Act (Government of British Columbia, 2007c). Nationwide there currently are over 160,000 registered Professional Engineers, 23,000 of whom are registered with APEGBC in British Columbia.

Table 2.6 gives an overview of training requirements and formal organizational structure of technicians, technologists and engineers in Canada today.

*Educational and Practical Differences*

As shown above, post-secondary programs for technicians, technologists and engineers differ significantly in length. Furthermore, they differ considerably in the position or orientation of their curriculum within the technical knowledge spectrum. As a result, the level of understanding of technical processes varies with each designation. The following example from the field of telecommunications technology may help to illustrate the differences between the three occupational categories.

*Twisted pair cabling* is the name of a certain type of cable used in data networks. The cable consists of multiple independently insulated wire pairs with the two members twisted around each other, as illustrated in Figure 2.3.
Figure 2.3. Unshielded Twisted Pair (UTP) Cabling.

Being asked to explain the purpose behind the twists, members of the three occupational categories may respond as given in this fictitious example:

**Technician:** “Data are carried in two of the eight cables. A second cable twists around each of the data cables in order to prevent cross-talk by shielding it from outside interference (noise). The more twists, the better the shielding. The better the shielding, the more data the cable can transmit per second from one terminating device to another.”

**Technologist:** “Shielding is not an accurate term in this case. Instead, any noise (N) induced into the data cable on top of the data signal (D) is also induced into the silent twisted cable. As a result, the data cable will now carry D+N, while the silent cable will carry N. By positioning a differential amplifier at the terminating device, we can subtract the induced noise on the silent cable from the combined signal on the data cable, thus cancel out the noise and extract the data, as illustrated in Figure 2.4, or D = (D + N) − N). A higher number of twists allows operation in areas of high-gradient electromagnetic interference (EMI) as each of the two wires will be closer to the source at some point.”
Figure 2.4. Differential amplifier for the cancellation of electromagnetic interference (EMI) in a cable pair.

Engineer: "Faraday's Law of Electromagnetic Induction states that the relation between the rate of change of the magnetic flux through the surface S enclosed by a contour C and the electric field along the contour can be derived from the Maxwell equations as

\[ \oint_C \mathbf{E} \cdot d\mathbf{l} = -\frac{d}{dt} \int_S \mathbf{B} \cdot d\mathbf{A} \]

Although somewhat stereotypical, this practical example may illustrate the differences among the three occupational categories at the technical skill level. Technicians are located at the procedural end of the technical knowledge spectrum. As such they are aware of standards and processes related to the technical tasks at hand. A network technician responsible for cabling and wiring in public buildings must be able to choose the cable type most appropriate for the anticipated rate of data transfer in a given environment without having to be fully aware of the signal handling at the terminating device. A technologist will deal with the terminating devices at the electronic component level and is knowledgeable of the processes that take place inside such devices. Combined with mathematics at the introductory calculus level he or she will be familiar..."
with basic derivatives such as the gradient and thus understand at least conceptually the underlying theories. An engineer should be able to describe the processes at a more declarative level, i.e. quantitatively explain the underlying theoretical framework through the use of physical formulas and advanced calculus. In the preceding example, the engineer would be able to calculate on a theoretical basis the permissible electrical field strengths and field gradients for a particular cable type including material, thickness and density. By predicting the behaviour of the electrical conduit the engineer will be able to define the standards and capabilities of the assembly.

Therefore, communication between technicians and engineers will be aided by technologists as they possess both the hands-on skills of technicians as well as an exposure to the component level and fundamental concepts in their field of high technology. This will allow the technologist to isolate problems, integrate technologies and innovate and at a deeper level than the technician.

In addition to purely technical skills, engineering technology graduates get exposed to secondary fields such as business administration or technical professional communication at a higher level than technicians. This complementary knowledge facilitates bridging multiple occupational fields and as a result, technologists can be found more often in interpretive and corporate representational roles than technicians.

5. Summary

In this chapter I described the emergence of the occupational category of engineering technologist in British Columbia and Canada at the crossroads of two societal trends: in industry, engineering technology evolved as a discipline to bridge the
increasing chasm between the process-oriented skill sets of tradespersons/technicians, and the declarative knowledge focus of engineering; in education, the provincial college and institute system was created to address the need for a new post-secondary credential situated between trades certificates and university degrees. The Applied Science Technologist arguably forms the intersection of these two, causally not related, concepts.

I also introduced some of the philosophies that underlie the fields of science, engineering and engineering technology and that are meant to delineate the differences between their respective occupational categories. Engineering technology attempts to distinguish itself from engineering just as engineering arguably managed to distinguish itself from science. However, recent societal trends begin to blur these distinctions; research engineers resemble scientists, hybrid institution straddle the mandates of universities and colleges, and the commercialization of education sees post-secondary institutions increasingly act like corporations. These trends may have a detrimental effect on the desire of engineering technology to establish itself as a distinct occupational category.

The overview of history, philosophy and status quo of the Applied Science Technologist sets the foundation for the question whether the original concept, almost forty years after its inception, has lived up to the expectations of its designers and whether the AScT has indeed matured into a distinct occupational category in industry, education, and in the public mind. In Chapter 4 I examine this question in the Formative Domain, that is, with respect to the agents that train and shape technologists.
You will need to know the difference between Friday and a fried egg. It's quite a simple difference, but an important one.

Friday comes at the end of the week, whereas a fried egg comes out of a chicken. Like most things, of course, it isn't quite that simple. The fried egg isn't properly a fried egg until it's been put in a frying pan and fried. This is something you wouldn't do to a Friday, of course, though you might do it on a Friday. You can also fry eggs on a Thursday, if you like, or on a cooker.

It's all rather complicated, but it makes a kind of sense if you think about it for a while.

(Douglas Adams, The Salmon of Doubt)
CHAPTER 3. CONCEPTUAL FRAMEWORK AND METHODOLOGY

1. The Introduction of Occupational Categories

Designing and purposefully introducing a new occupational category into the context of a modern society is a complex endeavour which is generally accompanied by the introduction of a distinct educational pathway. In British Columbia, post-secondary education falls under the auspices of the provincial government, therefore the necessity for a new occupational category as perceived by a societal group will likely result in the lobbying of the government for funding and legislation. These lobbyists may be located in different sectors of society, each with their own reasoning for the perceived need of the new occupational category. Table 3.1 introduces three sectors that may influence change in the educational and professional structure of society, potential triggers that may result in a call for change, as well as corresponding responses.

In technical college-level education the role of the educational sector is at times focussed on formalization. Requests for changes may be brought forward by market agents or the general public through Industry (or Program) Advisory Committees, Regional Stakeholder Committees or College Boards. Through their interpretive roles between the public and institutional administration, these groups effectively allow field practitioners and other constituents to take influence on college programming. This may be confined to a region or province due to local needs, or it could trigger the implementation of a new occupational category across Canada.
Table 3.1

Sectors of society that may bring about changes to the educational system or the structure of occupational categories

<table>
<thead>
<tr>
<th>Sector</th>
<th>Trigger</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry and Markets</td>
<td>As technology(^a) evolves, new specializations and fields emerge while traditional occupations may gradually disappear (midwives, blacksmiths etc.).</td>
<td>Demand for new credentials and occupational categories to address the need for new distinct skill sets.</td>
</tr>
<tr>
<td>Education</td>
<td>New educational philosophies emerge that strive to make the educational system more inclusive, successful and responsive to societal needs.</td>
<td>Design of new school types (e.g. community college, technical institute).</td>
</tr>
<tr>
<td></td>
<td>Globalization forces educational systems to interact with and translate to foreign structures and to map foreign credentials to domestic systems.</td>
<td>Consolidation and harmonization of educational systems (e.g. Bologna Process(^b) in Europe).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adoption of foreign credentials (e.g. Bachelor degree in Germany, Associate degree in Canada).</td>
</tr>
<tr>
<td>Public</td>
<td>As basic needs (security, sustenance etc.) are provided, society redefines key occupations and changes stratification patterns.</td>
<td>Demand for increased access to educational opportunities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educational credentials replace feudal structures and form a new base for societal prestige. Credentialism(^c) may occur.</td>
</tr>
</tbody>
</table>

\(^a\) This adheres to the broad definition of technology in Chapter 1, i.e. “the knowledge and application of tools and skills by humankind” (p. 5).

\(^b\) European Community (2005).

\(^c\) Overemphasis on academic credentials for conferring social status or employment.
Meanwhile, the general public slowly *reorients* itself over time with respect to highly regarded key occupations. As basic needs such as security and sustenance are provided, society focuses on achieving new goals such as environmental sustainability, technological advancement, or more inclusive higher education. Arguably, a societal shift of this type led to the creation of the college system in British Columbia some 40 years ago as it triggered John MacDonald’s review of higher education in British Columbia (MacDonald, 1962).

On the other hand, industry *identifies* new required skill sets as new technologies emerge and consumer trends shift. For example, the broader field of computer applications specialist (including end-user training and user interface design) materialized in conjunction with the success of the personal computer and related end-user software. Because of their applied focus most colleges readily incorporated computer application design courses after the desired skill set had been outlined by industry.

Colleges evaluate new trends and, once their viability is determined, propose new programming to the government which, in return, decides or rejects the funding and *institutionalization* of these propositions. These propositions may generate new fields that are additions to the current system such as Water Quality Engineering Technology which often constitutes a recombination and reorientation of existing modules in science and Civil Engineering Technology. It may lead to the fission of existing (generally overloaded) fields such as the spin-off of Network and Telecommunications Engineering Technology from traditional Electronics. When the changes are comprehensive enough, it may lead to the emergence of entire disciplines such as engineering technology out of engineering (see Chapter 2 for more information). Finally, when market and public sector
forces coincide, changes may result in a comprehensive change in the spectrum of occupational categories such as the engineering technologist designation. All of the above cases lead to a bifurcation of an existing single educational pathway. It may be constrained to a distinct field or discipline, or encompass the post-secondary sector as a whole. However, each bifurcation adds to the complexity of the educational system. Most changes will form part of an emergent design, i.e. further adjustments and modifications will be necessary to synchronize the occupational category with changing societal or sector needs. In the end, the process may repeat itself, leading to a fractal pattern aimed at harnessing the rapidly evolving knowledge. Figure 3.1 illustrates such a fractal element, showing the stages of identification, reorientation, formalization and institutionalization, all of which lead to the aforementioned bifurcation.

*Figure 3.1. A conceptual framework for the emergence of new occupational categories.*
Regardless where the change originated, once the new pathway has been institutionalized, its failure or success will be determined by all sectors depicted in Figure 3.1. This failure or success may be based on quantifiable parameters such as program enrolment figures (which constitute a reflection of acceptance of the new pathway) graduates’ earning potentials, or more intangible factors such as student satisfaction, or recognition and identity of graduated practitioners.

2. On the Subject of Recognition and Identity

At this point it is beneficial to introduce two socio-philosophical concepts, that of social imaginaries and that of habitus. Like other socio-philosophical models, the definitions of both the social imaginary and habitus are subject to interpretation and the concepts themselves are not without controversy. However, “...there are indications that for some time now the social imaginary (henceforth, SI) has occupied a central place in some of the recent literature of the social sciences in Europe and Latin America” (Andacht, 2000, p. 1). I consider in particular the model suggested by Charles Taylor to be a good basis for the discussion of the recognition and identity of occupational categories. On the other hand, Pierre Bourdieu, a philosopher, whose intellectual fervour is complemented by empirical observation and whose work focuses around the theory of practice, is well suited to comment on the strivings of new emerging professional classes. I will therefore focus on Bourdieu’s definition of habitus.

Culture

Both concepts, i.e. social imaginary and habitus, are related to a third socio-philosophical concept, that of culture. In order to avoid confusion, I will first delimit the
meaning of culture in a sociological context. Culture "generally refers to patterns of human activity and the symbolic structures that give such activities significance and importance. Different definitions of 'culture' reflect different theoretical bases for understanding, or criteria for evaluating, human activity" (Culture, 2007). As such, culture includes the features, behaviours, rules and ways of life that are consciously owned and executed by a society or social group therein. Culture is knowingly exhibited and passed on in a discursive manner between members of the social group or society. It is the realization and deliberate promotion that distinguishes culture from habitus.6

Habitus

_Habitus_ is a complex socio-philosophical concept that describes aspects of culture that bind individuals to larger groups through a set of dispositions that trigger perceptions and practices. Bourdieu (1980) considers these dispositions, i.e. the social and cultural practices that are deeply embedded in the field, "...objectively 'regulated' and 'regular' without being in any way the product of obedience to rules, they can be collectively orchestrated without being the product of the organizing action of a conductor" (p. 53) while Goedbloed (2007) paraphrases them as "the rules [of the game] that those in the field intrinsically know" (p. 2). Marcel Mauss referred to habitus as "those aspects of culture that are anchored in the body; or, daily practices of individuals, groups, societies

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6 In some contexts this definition of culture, i.e. involving realization, may appear ambiguous. For example, "corporate culture" often describes underlying patterns of human interaction at a place of work that are neither formalized nor realized, and thus involve, at least in part, habitus.
and nations. It includes the totality of learned habits, bodily skills, styles, tastes, and other non-discursive knowledges that might be said to ‘go without saying’ for a specific group” (Mauss as cited in Habitus, 2007, ¶ 1). The concept of habitus is especially helpful for discussing the occupational category of engineering technologist because as a hybrid category, technologists are used in positions that straddle the boundaries of adjacent regions of the knowledge spectrum such as trades and engineering, and are bound to confront established habitus. While Bourdieu (1990) states that if we “place someone in a different position within the field, or in a different field altogether, … they will behave differently – and will be more or less comfortable or ill at ease – depending upon their ‘feel for the game’” (p. 61), others warn of inherent opposition to new categories: “any discussion of creativity or innovation necessarily introduces a generally opposed concept of habit; likewise, any discussion of habit or routine in regard to human agents at least implicitly involves a concept of creative action” (Dalton, 2004, p. 604).

Social Imaginaries

Emile Durkheim (1893) observed an increasing specialization of the workforce of industrial societies near the end of the 19th century: Durkheim found that as society became more complex, individuals took on increasingly specialized roles and diverged in their social experiences, values, and beliefs. He alleged that interdependency among these specialized roles provided cohesion, which he called organic solidarity. Durkheim (1893) also introduced the concept of a collective conscience as a common social bond represented by the ideas, values, norms and beliefs of a social group, which, in return, provides the group with solidarity and a sense of identity. He claimed that these values
and ideas, which he labelled *collective representations*, are created in the process of living together and are shared among the members of the group.

In the style of Durkheim's *collective representations*, a *social imaginary* (SI) can be defined as the "set of values, institutions, laws, and symbols common to a particular social group and the corresponding society" (*Social Imaginary*, 2007, ¶ 1). Taylor (2002) refers to the social imaginary as the "ways people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations" (p. 105). In other words, "the social imaginary represents a system of meanings that govern a social structure" (*Social Imaginary*, 2007, ¶ 2). These meanings differ from person to person and social group to social group, therefore multiple social imaginaries co-exist. Cornelius Castoriadis (1997) takes this model further and postulates that reality itself is actually formed by mankind's applications of social imaginaries (p. 3).

Taylor (2004) also distinguishes social theory and social imaginary insofar that "theory is often the possession of a small minority, whereas what is interesting in the social imaginary is that it is shared by large groups of people, if not the whole society" (p. 23). In fact, "it often happens that what start off as theories held by a few people come to infiltrate the social imaginary, first of elites, perhaps, and then of the whole society" (p. 24). While I will delineate the term "elites" as synonymous with stakeholders and visionaries in a societal sector rather than as a designation for preferred classes or castes, Taylor's claim forms an interesting base for the discussion of technologists in society. Unlike tradespeople and engineers, technologists did not emerge from a distinct historical
context and subsequently there is no inheritable imaginary on part of the public. Instead, both the college system and the designation of Applied Science Technologist were arguably conceived and implemented by Taylor’s “elites”. The question, “what exactly is involved when a theory penetrates and transforms the social imaginary” (p. 29) is answered by Taylor (2004) himself:

For the most part, people take up, improvise, or are inducted into new practices. These are made sense of by the new outlook, the one first articulated in the theory; this outlook is the context that gives sense to the practices. Hence the new understanding comes to be accessible to the participants in a way it wasn’t before. It begins to define the contours of their world and can eventually come to count as the taken-for-granted shape of things, too obvious to mention. (p. 29)

This penetration is neither a given nor a simple transition and it depends on the social group it involves.7 This results in a theory of multiple concurrent social imaginaries which is especially helpful in the absence of quantifiable parameters. Following Habermas’ (1962) definition of the public sphere, Taylor (2004) interprets the

7 In Austria, feudal titles were abolished on April 3, 1919 by virtue of the Adelsaufhebungsgesetz (Law for the Abolition of Feudality). The use or display of feudal titles became subject to prosecution overnight. However, arguably few societies exhibit a greater love affair with titles than Austria. The effects of the Adelsaufhebungsgesetz severely impacted the social imaginary of the general populace who still indulged in the romantic aspects of the Austro-Hungarian monarchy. Instead of a change in their social imaginary, the public adopted with often ridiculed notoriety academic titles and professional designations as a means of stratification and mutual addressing, regardless of length or awkwardness in colloquial language (e.g. “Herr Diplom-Sozialpädagoge”, Mr. Diploma Social Pedagogue).
public sphere as a “mutation of the social imaginary” (p. 85), and he sees the public sphere as likely to harbour multiple social imaginaries, that is, a co-existence of different systems of values, meanings and symbols in Canadian society, which are sometimes confined to a group and sometimes shared by society as a whole. Discrete groups may therefore perceive their social surroundings in different ways. In return, as the imaginary is instrumental in determining prestige and stratum within a society, it is likely that multiple realities will be construed and different socio-cultural groups in Canadian society may hold different views about the status and value of technologists as an occupational category. The recognition accorded to Applied Science Technologist as a result may thus differ with the observing social group and its perception of the AScT today.

Because the social imaginary does not constitute an established reality, it must be assembled through various forms of expression on the part of the members of the social group observed. This may include semiotics, i.e. the study of signs and symbols, linguistics, i.e. the study of language, and pragmatics, i.e. the study of communication beyond what is explicitly stated.

From the above we can see that social imaginary and habitus are related. While habitus refers to current practices and rules intrinsically shared by a social group, the social imaginary describes how things “ought to go” (Taylor, 2004, p. 24) and what expectations should be met. As such, the social imaginary is broader. It includes expectations of implicitly shared habitus, but also encompasses a catalogue of imagined futures, i.e. prospects of a better world according to the observer. Consequently, the social imaginary is an effective tool in the struggle for identity-building because it
mediates between current realities and achievable futures. Since it pertains to changes that are realistically possible, the SI demarcates itself from fantasy, which Vigh (2006) calls “an emancipation from the limits of the world” (p. 23).

Based on the above definitions of social imaginary and habitus, we may wish to paraphrase the research question of this thesis in a socio-philosophical context: has the occupational category of Applied Science Technologist managed to infiltrate the social imaginary of and establish a unique identity in Canadian modern society, or has the habitus of established social groups suppressed the emergence of a distinct stratum?

3. Domains, Agents and Occupational Categories

A Model of Three Domains

With the introduction of the concepts of multiple social imaginaries and habitus we can expand the definition of the aforementioned sectors that may be involved in introducing a new occupational category. I will refer to these expanded sectors as domains and to entities residing and acting in a domain as that domain’s agents. Agents may be individual persons but also associations, corporations and governments. They share habitus and their social imaginaries have elements in common. I postulate that success is not synonymous to a group within a particular domain achieving the demanded change, but the change must also be recognized and endorsed by other groups in the
domain and even by other domains. Otherwise, the newly established furcation will sprout a lifeless occupational branch that will eventually die off.8

Domains interact and influence each other through their agents in various ways. With respect to this research I will make allowance for three distinct domains, all of which are based on the sectors of Table 3.1.

- The domain that produces and shapes the agents of the occupational category. I will refer to this domain as the **Formative Domain**.
- The domain that links the occupational category to economy and market forces, i.e. the **Market Domain**.
- The domain that determines the interactions of agents of the occupational category with society and the public sphere, i.e. the **Public Domain**.

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8 In 2006 the British Columbia residential construction industry demanded the creation of an accelerated Residential Construction Framing Technician (RCFT) trades program alongside the traditional four-year carpentry journeyperson program. Arguably, the RCFT was supposed to address the demand for framers in British Columbia’s booming economy by cutting out the more advanced, and thus time-consuming, elements of comprehensive carpentry. However, most apprentices soon realized the limitations that such a short-term and curtailed certificate would impose on their future career options, and continued to prefer enrolment in traditional carpentry. In other words, although market forces managed to trigger the institutionalization of the RCFT, the public sphere never recognized the program as a valid alternative to carpentry. Their social imaginary included an understanding of what a “real carpenter ought to look like”.

(Carpentry Instructor, Camosun College, personal communication, 2007)
Below are more detailed descriptions for the individual domains with emphasis on the occupational category of Applied Science Technologist. Figure 3.2 depicts the Formative Domain ("Formation"), Market Domain ("Market") and Public Domain ("Public") with respect to the implementation of a new occupational category.

**Formative Domain: Education, Certification and Representation**

The Formative Domain encompasses the training, credentialing and representation of members of an occupational category and factors affecting these processes. It actively creates the category’s members by providing both formal post-secondary education or task-specific industry training. Training is not limited to technical content but also includes formal education outside the realm of technology such as professional ethics, civility and citizenship, or business skills. Upon graduation, students may get certified and obtain additional professional designations such as the Applied Science Technologist.

In this context, students, instructors and examiners but also the educational institutions themselves form agents of the Formative Domain. Accredited technology programs in Canada are typically hosted by purely undergraduate institutions, i.e. colleges and technical institutes, although exceptions exist such as the Marine Institute which is integrated with Memorial University of Newfoundland and Labrador.
Figure 3.2. An occupational category and three interactive domains that are proposed to determine its recognition and identity: the Formative Domain ("Formation"), the Market Domain ("Market") and the Public Domain ("Public").

In addition to the post-secondary sector, the Formative Domain also includes occupational or professional associations that uphold provincial and national standards, provide lifelong professional learning opportunities to their members, and act as representatives and advocates for the occupational category in both the Public and Market
Domains. By shaping the image and identity of the occupational category, these regulatory bodies, such as the Applied Science Technologists and Technicians of British Columbia (ASTTBC), may act in a provincial context or come together at the national level, as is the case with the Canadian Council of Technicians and Technologists (CCTT). See Chapter 2 for more detail on these organizations.

**Market Domain: Industry Acceptance and Marketability**

The Market Domain will determine the *economic performance* of the Formative Domain’s product, i.e. the graduated and accredited Applied Science Technologist. In this context, I define *economic performance* as the aggregation of various quantities that can be easily linked to monetary values. In a bilateral exchange, remuneration, career opportunities and certification are offered to individual technologists commensurate to their perceived contribution. This contribution can be measured microeconomically, i.e. with respect to the employing agent, or macroeconomically, i.e. with respect to the Gross Domestic Product of British Columbia or Canada as a whole. The contributions of Applied Science Technologists to society may also occur in a more intangible fashion if we believe Taylor (2004) that “the more a society turns to commerce, the more civilized and polished it becomes, the more it excels in the arts of peace” (p. 74) but I will not consider this socio-philosophical claim within the context of *economic performance* or this dissertation as a whole. As individual agents, certified technologists will be part of the Market Domain even while undertaking training in the Formative Domain because they will incur measurable expenses (e.g. through tuition, access, and time) during their studies. They will enter the workforce and contribute to the economy after graduation.
Even if unemployed, they will still form part of labour statistics and affect economic indicators.

*Public Domain: Perception, Recognition and Prestige*

The Public Domain determines the recognition of an occupational credential or occupational category in the larger world outside the members of the occupation, its social status and prestige. It is the realm in which Applied Science Technologists will need to develop their identity as a distinct group or even as a social class. As such the domain includes the *public sphere* which Jürgen Habermas (1962) described as a network for communicating information and points of view that eventually generates a public opinion. Taylor (2004) defined the public sphere as a "common space in which the members of society are deemed to meet through a variety of media: print, electronic and also face-to-face encounters; to discuss matters of common interest; and thus to be able to form a common mind about these" (p.83). However, the Public Domain will also include elements of the *private sphere* since career choices are often based on familial influences such as occupational inheritance. In fact, the public recognition of an occupational category can ultimately be linked to the self-perception of its members because public recognition of an agent in the Public Domain is in part a reaction to the self-portrayal of that agent.

Explicit recognition in the Public Domain will require the recognized agent to be established and possess identity, so that he or she can form the subject of public discussion.
Interactions among Domains

The individual domains interact with each other while agents in one domain may also be agents in another. For example, students of engineering technology will be agents in the Formative Domain, while they also contribute to the educational institution’s microeconomy through tuition and fee payments, and thus constitute agents of the Market Domain as well. Furthermore, interactions between two domains may also be mediated through the third: the recognition of engineering technology programs on the part of the public will be aided by employers expressing their satisfaction with graduates from a particular institution. In other words, the three domains constitute a system – the whole is more than the sum of its parts.

It is these interactions that determine the overall identity and success of an occupational category as they mediate the actions of one domain to the next. If translation is skewed, misconceptions and false identities arise. For example, the graduates of a particular program might be highly regarded in the market because their skills are in high demand. But high regard in the Market Domain may not translate into high enrolment numbers for programs educating for that occupation if the knowledge of it remains confined to the Market and Formative Domains. In other words and with respect to careers in technology, if industry and occupational bodies do not successfully broadcast to the Public Domain their message of existence and marketability of an intermediate technical occupational category, the associated careers may remain unknown to many eligible individuals.
Success or Failure of Occupational Categories

Ideally, the concept of a new occupational category would meet the criteria for success in each of the three domains. In reality, however, this is often not the case while the definition of success itself is a moving target. For this research I postulate success of an occupational category to be a combination of quantifiable factors such as monetary values or accessibility, and more abstract parameters such as identity and recognition, the possession of a distinct social imaginary, and social prestige.

In this dissertation I briefly evaluate some of the quantifiable factors of each domain that originally led to conception and implementation of the new occupational category, but concentrate mainly on the question of identity and recognition.

4. Methodology

General Methodology

This thesis reports the results of a comprehensive assessment of the status of Applied Science Technologists in British Columbia in the 21st century by examining the three distinct domains described in Section 3 of this chapter. Research into these dissimilar domains was accomplished by choosing for each the most suitable research methodologies. As a result, in order to describe the realities of the working lives and education of engineering technologists in British Columbia and Canada today in a comprehensive manner, a mixed method approach was employed. A pragmatic knowledge claim seems appropriate here because it forms the “philosophical underpinning for mixed method studies” and the researcher is open to “use all approaches to understand the problem” (Creswell, 2003, p. 11).
The beginnings of this study are arguably linked to a basic definition of *phenomenology* as it is “experiential and qualitative [which] sets the stage for more accurate empirical investigations by lessening the risk of a premature selection of methods and categories” (van Kaam, as cited in Gall, Gall and Borg, 2003, p. 481). Out of my increasing involvement with the case of engineering technology and the intimate experience of the dissolution of Okanagan University College grew my interest in understanding how “individuals construct, and are constructed by, social reality” (Gall, Gall and Borg, 2003, p. 481). Through personal, unstructured communication with engineering technology practitioners and educators in both Canada and the United States I attempted to gain a “feel for the issues”, i.e. insight into how their views with respect to engineering technology might reinforce, contradict or supplement my own experience. Comments by individuals opened new perspectives, previously unknown concerns, which appeared worth examining. As such, the study began to show the hallmarks of what Gliner and Morgan (2000) call an *emergent design*:

> Although the problem may be well thought out at the time of deciding on a group to study, the constructivist researcher [must be] open to the possibility that a major change in emphasis about the problem could occur at any time during the study. (Gliner and Morgan, 2000, p. 24)

Out of this raw knowledge of co-existing paradigms, I distilled the two main questions I pursue through this study, that is, (a) whether the occupational category of Applied Science Technologist meets the expectations of its designers, and (b) whether the occupational category has developed identity and gained common recognition.
The first question of whether the AScT has met expectations can be aided by a quantitative analysis, i.e. through the use of statistical data from institutional research departments, non-educational sources such as BC Stats and labour market studies, and online surveys. The latter question of identity and recognition largely relies on on-line surveys and interviews that deal with the perceptions and expressions of status and prestige of the AScT in society. The surveys were conducted with students of engineering and engineering technologies, engineering and engineering technology practitioners, as well as the general public and are provided in the appendix.

Commercial online survey providers were used for design and execution of the questionnaires. Measures against multiple responses were foregone in favour of easy access and because the questionnaires per se were arguably long. Attempts to influence the results would have required substantial amounts of time on the part of the participants due to the high number of responses. Partial responses were discarded. A text box at the end of each survey provided the opportunity for unstructured comments.

Survey participation was both voluntary and anonymous. Engineering technology students at Okanagan College (Kelowna, BC) and Camosun College (Victoria, BC) as well as engineering students at the University of British Columbia Okanagan (Kelowna, BC) received generic hyperlinks to the survey via their institutional e-mail accounts. In some cases, technology instructors made class time available for the students to access the survey. Engineering and engineering technology practitioners were sent links to the corresponding practitioner surveys through their respective provincial associations. Members of the general public were accessed by selecting individuals in eight
occupational key fields with a request to proliferate the invitation to participate. Table 3.2 shows the number of valid and invalid responses per target group.

Table 3.2

Number of valid and invalid responses per target group for five on-line surveys used in this dissertation, and references to the surveys

<table>
<thead>
<tr>
<th>Survey Target Group</th>
<th>Valid Responses</th>
<th>Invalid Responses</th>
<th>Reference / Appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering students</td>
<td>37</td>
<td>2</td>
<td>Roemer (2007a) / Appendix 1</td>
</tr>
<tr>
<td>Engineering technology students</td>
<td>119</td>
<td>17</td>
<td>Roemer (2007b) / Appendix 1</td>
</tr>
<tr>
<td>Engineering practitioners</td>
<td>136</td>
<td>22</td>
<td>Roemer (2007c) / Appendix 2</td>
</tr>
<tr>
<td>Engineering technology practitioners</td>
<td>598</td>
<td>67</td>
<td>Roemer (2007d) / Appendix 2</td>
</tr>
<tr>
<td>General public</td>
<td>97</td>
<td>12</td>
<td>Roemer (2007e) / Appendix 3</td>
</tr>
</tbody>
</table>

The individual groups were chosen for the following reasons:

Engineering and engineering technology students, respectively, provided insight into how students choose their career paths, i.e. how access to programs and courses, perceived prestige of the occupation and earning potentials affect their choice of higher education. Linking this group with long-time field practitioners gave the opportunity to
compare the evolution of expectations and goals, and detect changes in attitude and perception with respect to the field of work.

The surveys of engineering and engineering technology, respectively, focused on how engineers and technologists relate to each other, if their expectations are met and how they perceive the future of technology education.

The survey of the general public provided a reference point with respect to the position of engineers and technologists in society.

Methodology by Chapter

Chapter 4 examines the concept of the Applied Science Technologist in the Formative Domain. I set out by linking technology education to the original intentions and expectations for a community college system in British Columbia based on the MacDonald Report on Higher Education in British Columbia (MacDonald, 1962). Through the aggregation of statistical data from institutional research departments and institutional websites I assess how well engineering technology programs meet the criteria for success of the community college concept that were established by the Academic Board of British Columbia and the first college councils.

From there I review the changes in the educational system since then, in particular the creation of hybrid institutions such as university colleges and special status universities (Dennison, 1992; Dennison and Schuetze, 2004), and their proposed evolution (Plant, 2007). In order to gain recognition it is important for a new discipline that the educational system provides a clear pathway to graduation and certification so
that the general public can readily discern the career path associated with the profession and compare it to alternative career options.

Surveys and interviews with students and instructors provide insight into habitus and social imaginaries of agents of the Formative Domain, and how these agents perceive the institutional identity. Taylor’s (1994) writings on multiculturalism are used to examine the co-existence of academic and vocational cultures at post-secondary institutions and their effects on institutional climate - in particular if the institution broadens its scope of offerings and redefines its mandate. From this I derive options for the evolution of engineering technology as an educational discipline.

Chapter 5 examines the economic performance of Applied Science Technologists in the Market Domain with a postpositivist perspective. Through the aggregation of statistical data from labour market studies and institutional research I assess how well graduates from post-secondary engineering technology programs meet the demands of the market, i.e. of managers, employers and industry as a whole. Surveys among students and practitioners of engineering and engineering technology, respectively, provide the basis for a comparison of expectations and aspirations of technology students with the social imaginaries of field practitioners.

From there I focus on the working relationships between Applied Science Technologists and Professional Engineers in order to evaluate whether there is collaboration or contention between the two occupational categories. Because many AScTs in industry report to Professional Engineers, I put special emphasis on the distinction and recognition of AScTs afforded by Professional Engineers, their respective social imaginaries and potential conflicts. Online surveys are used to present to industry
practitioners both multiple choice and free-form comment questions. I compare the
survey results and comments to Bourdieu’s (1989) theory of a state nobility, i.e. a self-
preserving academic elite.

Chapter 5 also investigates the role of occupational associations in securing
identity and recognition for their respective members.

Chapter 6 uses a socio-philosophical perspective to examine the status of
technologist occupational model in British Columbia society and identify potential
barriers to its development and acceptance. Surveys among engineering technologists in
conjunction with Porter’s (1965) *Vertical Mosaic* explores behavioural patterns of social
class and social group membership as well as occupational inheritance among
technologists.

I then explore the role of occupational associations in representing the
occupational category in public and in inducing its image into the social imaginaries of a
modern technological society. A review of mission statements and field-specific literature
provides insight into the self-perception of these associations.

Finally, I relate these findings to the results from a survey among members of the
general public in order to compare the perception of the occupational category of
engineering technologists among practitioners “on the inside” and untrained members of
the general public.

5. Scope and Limitations of the Study

For the most part, this investigation is limited to the status of Applied Science
Technologists in the province of British Columbia, although I have expanded the
discussion and analysis to a pan-Canadian, North American or even global scope where I
demed this approach to be both sound and beneficial. This strategy ensured that the
study remained manageable. Among the British Columbia colleges and technical
institutes I concentrated on those that offer at least three nationally accredited engineering
technology programs, especially in the core disciplines of electronic, mechanical and
civil technology. This criterion rendered the British Columbia Institute for Technology
(BCIT) in Burnaby, Camosun College in Victoria, and Okanagan College in Kelowna
key agents for analysis in the study. Of these three key agents, I used Okanagan College
and Camosun College as representative institutions, and their respective catchments areas
as representative regions. Following is the justification for this approach.

Okanagan College and Camosun College as Representative Institutions

Okanagan College and Camosun College may each be considered representative
for the province as a whole. Located in the southern parts of British Columbia, both
institutions constitute comparatively large 4-year colleges that provide training in
engineering technology, trades, health sciences, science, arts, and business
administration. Their main campuses are located in large urban centres which also host a
full-status university.

Each college’s region of mandate is geographically well defined due to a
demarcating topography. Camosun College’s main catchments area is synonymous with
Southern Vancouver Island including adjacent islands in the Georgia and Juan de Fuca
Straits, respectively. Okanagan College’s catchments area follows the population centres
along three major highways, the TransCanada Highway between Revelstoke and Chase,
Highway 97 between Sicamous and Osoyoos, and Highway 3 between Princeton and Osoyoos. With these clearly delineated boundaries and a comprehensive mix of high technology, manufacturing, service and agricultural industries as well as all post-secondary school types, both regions lend themselves as representative area for the province of British Columbia. The majority of their domestic students are drawn from their regions of mandate, while graduates find employment both locally and across Canada. Table 3.3 lists the age structure of each college region’s population in conjunction with that of the province of British Columbia.

Table 3.3

*The current age structure of the Camosun College and Okanagan College regions, respectively, compared to that of the province of British Columbia*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Okanagan College</th>
<th>Camosun College</th>
<th>B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percent</td>
<td>Count</td>
</tr>
<tr>
<td></td>
<td>Distribution</td>
<td>Distribution</td>
<td>Distribution</td>
</tr>
<tr>
<td>0-17 years</td>
<td>71,766</td>
<td>18.8</td>
<td>62,443</td>
</tr>
<tr>
<td>18-24 years</td>
<td>37,249</td>
<td>9.8</td>
<td>35,401</td>
</tr>
<tr>
<td>25-64 years</td>
<td>197,701</td>
<td>52.1</td>
<td>201,391</td>
</tr>
<tr>
<td>65+ years</td>
<td>72,970</td>
<td>19.2</td>
<td>62,519</td>
</tr>
<tr>
<td>Total</td>
<td>379,686</td>
<td>100.0</td>
<td>361,744</td>
</tr>
</tbody>
</table>

*Note.* Data aggregated from BC STATS (2006a, 2006b). Copyright 2006 BC STATS. Used with permission.
Table 3.3 shows the percentage of the population between the ages of 18 and 24, i.e. the primary age group for enrolment into engineering technology programs, as equal for each region and the province as a whole (9.8%) while Table 3.4 compares vital statistics for the two institutions.

Table 3.4

| Vital statistics of Camosun College and Okanagan College in British Columbia |
|----------------------------------------|-----------------|-----------------|
| Location of main campus               | Okanagan College | Camosun College |
|                                        | Kelowna, BC      | Victoria, BC    |
| Approximate number of student Full-Time Equivalents (FTEs) | 5,000           | 8,000           |
| Total number of campuses              | 4               | 2               |
| Approximate population within region of mandate (2006) | 380,000         | 362,000         |
| Approximate population within region of mandate as percentage of BC total population (2006). | 8.8%            | 8.3%            |
| Local University (acronym; 2006/07 enrolment) | University of British Columbia Okanagan (UBCO; 4,864) | University of Victoria (UVic; 19,475) |
| Number of nationally accredited engineering technology programs (technician and technologist levels) | 5               | 6               |

Educational data indicate that the percentile of 18-year-olds in the Okanagan that complete high school (73.7%) is close to the provincial average, which is important in college student recruitment comparisons. The data for high school completion in the Camosun College region (69.5%) diverge somewhat from the provincial average (76.8%) but approximately the same percentage of the population (20 years of age or older) in each region and British Columbia, respectively, hold college certificates or diplomas.

Table 3.5

Educational statistics of the Camosun College and Okanagan College regions, respectively, compared to that of the province of British Columbia

<table>
<thead>
<tr>
<th></th>
<th>Okanagan College</th>
<th>Camosun College</th>
<th>B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percent of Population</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of population (20 years or older) with post-secondary qualification (2001)</td>
<td>45.9</td>
<td>55.5</td>
<td>50.4</td>
</tr>
<tr>
<td>Percentage of population (20 years or older) with diploma or certificate (2001)</td>
<td>35.6</td>
<td>33.9</td>
<td>32.8</td>
</tr>
<tr>
<td>Percentage of population (20 years or older) with university degree (2001)</td>
<td>10.3</td>
<td>21.6</td>
<td>17.6</td>
</tr>
</tbody>
</table>


The Camosun College region hosts a larger percentile of persons with university degrees which can be attributed in part to the presence of both the University of Victoria (UBC Okanagan did not yet exist in 2001 while Okanagan University College had only a
limited number of degree programs) and the provincial government, the ministries of which attract employees with university education.

Table 3.6

*Estimated labour demand for selected occupations in the Camosun College and Okanagan College regions, respectively, compared to that of the province of British Columbia*

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Okanagan College</th>
<th>Camosun College</th>
<th>B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of total labour demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional occupations in natural and applied sciences</td>
<td>1.8</td>
<td>4.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Technical trades and other high skilled occupations in natural and applied sciences</td>
<td>2.4</td>
<td>3.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Technical trades and other high skilled occupations in health</td>
<td>1.5</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Management</td>
<td>10.2</td>
<td>11.3</td>
<td>10.8</td>
</tr>
</tbody>
</table>

*Note. Data aggregated from BC STATS (2006a, 2006b). Copyright 2006 BC STATS. Used with permission.*

Labour market data show that the economies and labour demands of the Greater Okanagan Valley and Southern Vancouver Island are diversified and include a significant high technology component. The local high technology industries are represented and promoted by two councils with similar mandate, the Okanagan Science and Technology Council (OSTEC) and the Vancouver Island Advanced Technology Centre (VIATeC),
respectively. This diversification of industries ensures that most graduates from engineering technology programs will find local employment if they prefer to stay in the region. Table 3.6 shows the labour demand for selected occupations in both regions.

One of the most significant demographical divergences from the provincial average lies in the greater percentile of seniors within the general population of each college region. The inflated numbers of senior residents presented in Table 3.3 will have little bearing on the results of the study although one may argue that the retiring “baby boomers” will influence the national labour market as a whole. However, the increasing number of retirees moving to Greater Victoria and the Okanagan Valley, and the subsequent overrepresentation of seniors in each college’s catchments area does not affect the data sets for this thesis because they will locally participate in neither the educational nor labour markets, and therefore not be included in statistical calculations.

Given these conditions the findings presented in this study with respect to engineering technology in the Okanagan College and Camosun College regions should translate well to the larger British Columbia context.
CHAPTER 4. THE FORMATIVE DOMAIN – DEFINITION, EDUCATION AND CERTIFICATION OF OCCUPATIONAL CATEGORIES

1. Introduction

The purpose of this dissertation is to evaluate identity and recognition of the occupational category of Applied Science Technologist (AScT) in Canadian society. In Chapter 3, I introduced two socio-philosophical concepts, social imaginary and habitus, in order to assess the perception of AScTs in various social environments. I defined the term "domain" as a societal environment that contributes to the success or failure of an occupational category. I delineated three domains (Formative, Market and Public) wherein the Formative Domain was responsible for providing the training, credentialing and representation of members of an occupational category. I also proposed some criteria for the success of an occupational category in the Formative Domain.

In Chapter 2 I reviewed the development of engineering technology as a distinct occupational category. The definition and organization of the Canadian engineering community is largely identical to that in the United States, and engineering technology as a distinct discipline was articulated in Canada and in the U.S. in a similar fashion and at about the same time, i.e. shortly after World War II. However, while some American universities confer graduate degrees in engineering technology, Canadian universities do not offer engineering technology programs at all. Although graduate programs with an explicitly applied focus exist (such as the Master of Engineering in Internetworking at Dalhousie University in Halifax, Nova Scotia), they still lead to a traditional engineering degree. Conversely, many colleges and technical institutes have instituted Bachelor of
Technology programs that deviate from a pure technology focus by bridging into the realms of business administration or project management. As a result, engineering technology in Canada is virtually synonymous with two-year technical diploma programs at community colleges and technical institutes. In other words, the implementation of engineering technology at the college level in British Columbia is strongly tied to the general argument for a community college system, i.e. increased access to post-secondary education and "...the best possible education opportunities for the people of British Columbia" (Chant in *Government of British Columbia*, 1971, p. 5). In this context, "access" and "opportunity" may refer to location, costs, or entrance prerequisites.

Following is a brief assessment of how well the challenge of increasing access to post-secondary education in British Columbia has been met with respect to engineering technology. This assessment provides a basis for the evaluation of engineering technology in the social imaginaries of the educational system in British Columbia today.

2. Engineering Technology in the Educational System

*Location*

Table 4.1 shows the number of accredited engineering and engineering technology programs in British Columbia by region. Although a few individual courses are available outside the larger centres, most engineering technology programs coincide with the locations of already existing full engineering programs. This is of particular concern with respect to geographical access because colleges traditionally do not attract the same percentage of out-of-region students as universities. Most colleges lack or have only a limited number of student residences while their clientele, compared to that of
university engineering programs, includes a larger percentage of mature students who, in return, often have familial, social or professional commitments and consequently a reduced mobility.

Table 4.1

*Accredited engineering and engineering technology programs in B.C. by region*

<table>
<thead>
<tr>
<th>Region</th>
<th>Population 2006</th>
<th>Engineering Programs</th>
<th>Technology Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Vancouver Island</td>
<td>580,000</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Northern Vancouver Island</td>
<td>160,000</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>South Fraser and Fraser Valley</td>
<td>1,100,000</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Greater Vancouver and North Fraser</td>
<td>1,200,000</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>North Vancouver and Sunshine Coast</td>
<td>270,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>North Coast, Peace River and Northern British Columbia</td>
<td>160,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Northern Interior</td>
<td>160,000</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Southern and Central Interior</td>
<td>570,000</td>
<td>3(^a)</td>
<td>6</td>
</tr>
<tr>
<td>Kootenay - Boundary</td>
<td>170,000</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

Note. Data in this table were aggregated from BCSTATS (2007), Canadian Council of Professional Engineers (2007), and Canadian Council of Technicians and Technologists (2006b).

\(^a\) The University of British Columbia Okanagan did not offer upper division engineering courses in 2006/07 but offered enrolment in lower division courses in electronic, civil and mechanical engineering programs. As of 2007/08 upper division courses were available.
Figure 4.1 shows the age and gender distribution of engineering and engineering technology students at the University of British Columbia Okanagan and Okanagan College, respectively, while Figure 4.2 illustrates the students’ background prior to enrolment.

Figure 4.1. Age and gender distribution among students of engineering and engineering technology.


Both Figure 4.1 and Figure 4.2 are a reflection of the same underlying demographics. In general, engineering students tend to enter their respective programs immediately after high school while engineering technology students commonly work for some time before enrolling in college.
Figure 4.2. The backgrounds of students prior to enrolment into engineering and engineering technology programs, respectively.


This translates into a more mature student body for engineering technology, who, as noted above, exhibit reduced mobility. Therefore, they pay less attention to their
school’s prestige and reputation in favour of proximity and convenience. Figure 4.3 illustrates this behaviour with respect to Okanagan College: on their first day of classes students were asked why they chose Okanagan College. The responses were aggregated into pools related to location and reputation, respectively.

Figure 4.3. Distribution of responses by first-semester Engineering Technology students when asked “What made you choose Okanagan College?”.

Note. Data aggregated from Roemer (2007f). Multiple responses permitted. Out-of-region students accounted for less than 1% of total responses and are included in the aggregation.

Of interest is the emergence of a new response category, “other”. Informal discussions with students often pointed towards a pre-arranged career path: local employers continued to employ the previously unskilled (or differently skilled) worker and/or promised employment after graduation. Computer technicians form a typical example: Having worked for local computer retailers, the uncertified technicians continue
to work for the company while achieving their certification. This provides stability and allows for improved planning for the future.

In the Lower Mainland, i.e. Greater Vancouver and the Lower Fraser regions the situation is different: population density and public transport provide access to more institutions than in remote areas of the province. When this is the case, the perceived reputation of the institution can supersede geographical accessibility and smaller colleges may lose students to nearby technical institutes and larger institutions. For example, despite a catchments area with a large urban population, Kwantlen University College was forced to abolish their engineering technology programs in 2001 because of decreasing enrolments.

_We tried everything to promote the [engineering] technologies. For example, we would host the Technolympics every year to get high school kids acquainted with technology careers. Every year, it was a lot of work, a lot of fun and we used to get a pretty good turnout. And at the end of the day, BCIT [British Columbia Institute of Technology] would have twenty new students and we would have two._

(Engineering technology instructor, Kwantlen University College, personal communication, 2004)

In summary, engineering technology diploma programs are well suited for the college environment, however, their geographical accessibility, especially across multiple disciplines, is not equally provided throughout the province.

**Costs**

Tuition fees for engineering technology programs have increased significantly in recent years. Table 4.2 lists the total tuition fees (including ancillary fees) domestic
students had to pay for a two-year electronic engineering technology program at three key institutions in British Columbia in 2007. In comparison, the University of British Columbia website (www.ubc.ca) published the tuition fees for Year One and Two in electrical engineering as $10,603.87. This is not significantly higher than the fees charged by colleges and institutes for their technical diploma programs. In other words, BC colleges do not offer increased access to technical programs through more affordable tuition.

Table 4.2

Typical tuition fees\(^a\) for a two-year diploma in electronic engineering technology in British Columbia in 2007

<table>
<thead>
<tr>
<th>Subject</th>
<th>BCIT(^b)</th>
<th>Okanagan College</th>
<th>Camosun College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Engineering Technology Diploma</td>
<td>$9,923</td>
<td>$9,981</td>
<td>$8,904</td>
</tr>
</tbody>
</table>

\(^a\) Ancillary fees such as student association, health and dental fees are included. Books and co-operative education costs are not included.

\(^b\) British Columbia Institute of Technology.

In contrast, industry training courses usually cost considerably more. For example, at the time of this writing typical intermediate Microsoft® software certification courses were advertised at an average price of $2,500 for five days of instruction. In other
words, the costs of a one-week industry certification course were similar to those of one entire semester with a regular course load at a public post-secondary institution.

In summary, engineering technology programs at public colleges constitute a more affordable alternative for obtaining a technical certification compared to industry programs. Conversely, there is little advantage over university tuition, in particular because significant grant and scholarship opportunities exist at both colleges and universities.

Entrance prerequisites

High entrance prerequisites for engineering and applied science programs often preclude this technical career path for students who cannot directly qualify for enrolment in university engineering degree programs, but who aspire to move beyond the predominately practical realm of technicians and who can succeed in fields of technological employment other than engineering. The college system envisioned in 1962 (MacDonald, 1962) was to be more inclusive and provide for a distinct clientele educational benefits that were not available otherwise. As a consequence, engineering technology programs have traditionally featured a much lower threshold for enrolment than engineering programs at universities. Table 4.3 summarizes the entrance requirements for electronic engineering technology and electrical engineering, respectively, at five key institutions in British Columbia. Entrance requirements for engineering and engineering technology programs often differ in style. While some institutions prescribe individually defined thresholds for certain grade 12 subjects, others apply an overall average to determine eligibility.
Table 4.3

Core high school subjects and their minimum required grade to fulfil entrance prerequisites for electronic engineering technology (EET) and electrical engineering (EE) programs at various post-secondary institutions in British Columbia

<table>
<thead>
<tr>
<th>Subject</th>
<th>BCIT&lt;sup&gt;a&lt;/sup&gt; (EET)</th>
<th>Okanagan&lt;sup&gt;b&lt;/sup&gt; (EET)</th>
<th>Camosun&lt;sup&gt;c&lt;/sup&gt; (EET)</th>
<th>UBC&lt;sup&gt;d&lt;/sup&gt; (EE)</th>
<th>UVic&lt;sup&gt;e&lt;/sup&gt; (EE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 12</td>
<td>60%</td>
<td>60%</td>
<td>60%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Principles of Mathematics 12 or Applications of Mathematics 12 or Principles of Mathematics 11</td>
<td>64%</td>
<td>60%</td>
<td>64%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Physics 12 or Physics 11</td>
<td>PASS</td>
<td>-</td>
<td>-</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Chemistry 12</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Chemistry 11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>75%</td>
</tr>
</tbody>
</table>

Note. Data obtained from institutional websites as listed below. Requisite letter grades and percentages shown may be substituted through other institution-specific arrangements such as grade averaging, college-level courses or Prior Learning Assessment.

<sup>a</sup> British Columbia Institute of Technology, from http://www.bcit.ca/study/programs/548ddiplt.
<sup>b</sup> Okanagan College, from http://www.okanagan.bc.ca/Page16751.aspx.
<sup>c</sup> Camosun College, from http://camosun.ca/learn/programs/elex/elex-apply.html.
<sup>d</sup> University of British Columbia, from https://you.ubc.ca/vancouver/bcyc.ezc#psr.
<sup>e</sup> University of Victoria, from http://registrar.uvic.ca/undergrad/admissions/requirements/bc.html.
Using a somewhat normative approach, most British Columbia university engineering programs require grade averages of 75-80% in grade 12 core subjects, while colleges admit students with average grades of 60-70%, respectively, and at times even settle for grade 11 subjects. Lately universities, colleges and institutes increasingly compete for the same pool of graduates: as student numbers in high schools drop and the provincial government changes educational guidelines, many institutions try to attract more students by lowering entrance prerequisites – a technique that is highly disputed among educational practitioners.

You can't win here. If we don't lower our requirements we get punished by the government for not meeting our enrolment targets. If we lower them [the entrance requirements] like everyone else, we also need to dumb down the program so that everyone can succeed. Worst case scenario, we lose our accreditation over this. And if we leave the program where it is, we get sued because too many people fail. Damned if you do, damned if you don't. (Engineering technology instructor, Okanagan College, personal communication, 2006)

In summary, while lower entrance requirements for engineering technology programs at colleges and technical institutes have provided increased access to the intermediate technical career path of Applied Science Technologist, mounting competition among post-secondary institutions may erode this distinction.

Gender and Background

Figure 4.1 shows that both engineering and engineering technology suffer from a significant gender disparity. In the engineering technology programs evaluated at Okanagan College and Camosun College, male students outnumbered female students at
a ratio of 9:1 (Roemer, 2007b). Online surveys among University of British Columbia Okanagan engineering students (Roemer, 2007a) indicate that the disproportion is smaller among engineering students. These findings are corroborated by Census (Statistics Canada, 2001) and market research data (Canadian Council of Technicians and Technologists & Engineers Canada, 2007) which found the percentage of women in undergraduate engineering programs since 1991 to fluctuate between 15% and 21%, while the situation seems reversed in industry where the percentage of women in the labour force ranges from 12% (engineers) and 19% (technicians and technologists). However, it is important to note that the results significantly depend on query parameters such as the date range analyzed or the definition of the designation, i.e. registered professional engineers vs. graduates from engineering programs or Certified Technicians (C.Tech) vs. technician graduates from both trades and technology programs. Generally, it is safe to say that women constitute between 10 and 20 percent of the technical labour force. The exact number also changes with the field of engineering and engineering technology. Figure 4.4 indicates that women are better represented in fields that exhibit less of a blue collar character (e.g. mining or civil engineering) and that relate more immediately to laboratory science such as chemical, water quality or environmental engineering technology. These trends are mirrored by recent labour market studies (Canadian Council of Technicians and Technologists & Engineers Canada, 2007).

Regardless of gender, on average, more engineering technology students had completed upgrading programs, or had terminated a previous degree program than engineering students. For these groups a diploma in engineering technology apparently constituted an educational pathway worthwhile accessing. While nearly 80% of
engineering students enter their engineering programs straight out of high school, this
applies to only 33% of engineering technology students. Entering the workforce after
high school instead of pursuing post-secondary education is often indicative of limited
success in high school. Informal conversations with mature students at Okanagan College
have confirmed this. Conversely, to enter engineering programs with high entrance
prerequisites immediately after high school, applicants usually require a Grade 12 grade
point average of at least 75%.

Figure 4.4. Ratios of men and women in engineering technology, broken down by field
of specialization.

Note. Data aggregated from Roemer (2007d).
Other influences include familial background, particularly academic inheritance, and financial status. Surveys among technical students (Roemer, 2007a, 2007b) found the percentage of families in which at least one parent holds a university degree is virtually the same for engineering and engineering technology students (46% and 42%, respectively). Walters (2003) showed that graduates from degree programs are more likely to earn a higher income than people without degrees, however, the recent labour boom in British Columbia and Alberta may render these findings outdated. I did not examine the financial situation of the surveyed students in greater detail.

Bridging and Laddering

Aside from access to intermediate level technical careers, engineering technology programs at colleges and institutes also provide stepped access to engineering degrees through bridging and laddering arrangements. In 1971 D.L. Brothers, then B.C. Minister of Education, stated that he saw the strength of the community college largely in the fact that it is structured in such a way that a student may choose from a broad range of technical and career programmes, ..., and may transfer easily from one programme to another as he discovers his own strengths and interests. (Brothers in Government of British Columbia, 1971, p. 2)

Figure 4.5 shows the number of applications to the Camosun College Engineering Bridge program, the only such program in Western Canada. The figure also reflects recent trends with respect to engineering and technology education in general.
**Figure 4.5.** The Engineering-Technology-to-Engineering Bridge at Camosun College 2002-2007: total number of applications (solid line) and trendline (dotted line) as well as trendlines for three distinct disciplines.

![Graph showing applications and trendlines for different disciplines](image)

*Note.* Data informally supplied by the Engineering Bridge coordinator at Camosun College, July 2007. Data include applications for both winter and summer intakes. Numbers for Electronics include applications to electrical engineering and computer engineering bridge.

Overall, the numbers of applications to the Engineering Bridge show an upward trend which mirrors the movement towards higher credentials seen in many fields today. It is of interest that this trend is not mirrored by Civil Engineering Technology. As illustrated by Figure 4.6, Civil Engineering Technology, unlike many other engineering technology disciplines, has experienced strong and increasing enrolment across the province in this decade. This is widely attributed to the booming construction and
exploration industries in British Columbia and Alberta, and the resulting pervasive career opportunities.

Figure 4.6. Total number of applications to Civil, Mechanical and Electronic Engineering Technology programs at Camosun College and Okanagan College, 2003 – 2007.

Note. Data supplied by Institutional Research departments of Camosun College and Okanagan College, personal communication, 2007). Numbers includes incomplete and out-of-region applications. Electronics numbers include applications to Network Technician/Network & Telecommunications Technologist programs where applicable.

However, this current reality works both ways: while on one hand it draws growing numbers of high school graduates into related careers, Civil Engineering Technology students increasingly prefer entering the workforce immediately after graduation rather than obtaining additional post-secondary credentials. The shortage of Civil engineers, especially in British Columbia and Alberta, allows Civil Engineering
Technologists to enter rewarding positions that in the past were the domain of degree holders.

3. Other Issues Influencing Engineering Technology Programs

The following issues are not directly related to the Macdonald (1962) report on higher education, i.e. the call for a college and institute system, but they are nevertheless important for the discussion about the position of engineering technology in the social imaginaries of the post-secondary system because they influence stakeholders and decision makers.

Funding

Engineering technology programs rank among the most cost-intensive programs at colleges and institutes. Three main factors contribute to this:

1. *Capital funding.* The field of high technology requires expensive specialized equipment while the fast-paced nature of the field quickly renders devices outdated. To provide a homogeneous teaching environment, institutions are often required to purchase entire lab sets rather than being able to replace one device at a time. In addition, engineering technology programs require dedicated space for labs, equipment storage etc. rather than generic multi-purpose classrooms. Most arts and business administration programs have little need for specialized equipment.

2. *Operating costs.* High technology programs require large investments in consumables, on-going training for instructional staff, and specialized support personnel. Arts and business administration programs require few consumables and no specialized equipment has to be maintained.

3. *Class sizes.* Most engineering technology programs offer at least 50% hands-on in situ instruction in lab and shop environments. To be both effective and safe,
this imposes a maximum on the number of students per lab session which, in return, increases instructional costs. Arts and business courses are often taught in large lecture halls and can even be delivered through distance education.

Table 4.4

*Table 4.4 A comparison of approximate operating cost per student per contact hour at Okanagan College for various disciplines*

<table>
<thead>
<tr>
<th>Department / Subject</th>
<th>Minimum costs per student contact hour (full enrolment)</th>
<th>Actual Costs per student contact hour (stable enrolment 2006/07)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philosophy</td>
<td>$5.70</td>
<td>$9.00</td>
</tr>
<tr>
<td>Mathematics</td>
<td>$6.20</td>
<td>$10.30</td>
</tr>
<tr>
<td>History</td>
<td>$7.80</td>
<td>$11.20</td>
</tr>
<tr>
<td>Chemistry</td>
<td>$10.20</td>
<td>$18.20</td>
</tr>
<tr>
<td>Civil Engineering Technology</td>
<td>$10.00</td>
<td>$12.10</td>
</tr>
<tr>
<td>Mechanical Engineering Technology</td>
<td>$11.40</td>
<td>$20.40</td>
</tr>
<tr>
<td>Electronic Engineering Technology</td>
<td>$12.20</td>
<td>$24.90</td>
</tr>
</tbody>
</table>

*Note. Enrolment data aggregated from Okanagan College (2007b) and Okanagan College (2007c). Contact hours calculated as [students per course] x [course contact hours per week] x [weeks per semester]. Operating costs represent the institutional operating grant per department. Tuition revenues and capital expenditures are not included. Labour costs are not normalized with respect to seniority and placement on the salary scale.*

Table 4.4 compares approximate operating costs per student contact hour for various subjects at Okanagan College. Engineering technology courses cost twice as
much to deliver as typical lecture-based courses such as philosophy, history or mathematics. The situation is further aggravated if a discipline suffers from low enrolment. Engineering technology programs by default are block programs, i.e. they are organized as a set of prescribed and highly specialized courses. As a result, classes across multiple engineering technology disciplines cannot be combined nor can students from other areas be merged into underutilized classes. As shown in the case of electronic engineering technology in Table 4.4, low enrolment can drive program costs per contact hour to three times that of Arts courses. Promoting engineering technology to achieve high seat utilization would therefore yield a direct economic benefit for the institution and intermediately the government and taxpayer. In this context, some scholars speak of neoliberal trends at community colleges (Levin, 2005) and “academic capitalism” (Slaughter and Rhoades, 2004). That is, colleges are increasingly forced to operate like for-profit businesses, effectively abandoning the breadth of offerings in favour of best-selling credentials. These trends may introduce elements of competitiveness and jealousy between faculty of popular, lucrative programs on one hand, and those of undersubscribed, unprofitable course on the other. At both Okanagan College and Camosun College, liberal arts, business and trades programs form backbones of institutional revenue streams, each of comparable size, while engineering technology constitutes a significant cost factor as shown in Table 4.4. In my own experience, instructional faculty in colleges usually have insufficient exposure to or involvement in the budgeting process for it to cause animosities over the distribution of funds so the collegial principle is largely upheld. Problems may arise because of perceptions of a lack of fairness in the implementation (or deference) of large capital projects. However, in
colleges and institutes funding remains largely within the realm of the administration (although this is not true of the universities where faculty often have important roles in the budget-setting process through Senate and Board committees, as well as in Faculty level discussions where deans are often instructed by (and held accountable to) their faculties in respect of the position to take in higher level budget debates).

**Governance**

At most colleges engineering technology bodies are too small to form stand-alone entities and are combined with other disciplines into larger administrative units. These units are usually referred to as Schools, Faculties or Centres. The compositions of these Schools may have a direct effect on the status of engineering technology in the social imaginary of the institution because faculty, staff and administration may not be able to discern the boundaries and differences among the School’s divisions. In other words, the identity and recognition of engineering technology may be affected by its association with other fields. In such associations the trades form the most common partner as shown in Table 4.5, followed by the sciences.

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9 Most Canadian polytechnica and large colleges, such as the British Columbia Institute for Technology (BCIT) in Burnaby or Red River College in Winnipeg, deviate from this pattern due to a more specialized range of services and much larger enrolment numbers. This effectively yields multiple Schools of Trades and Technology that combine the programs of similar fields such as aviation, transportation, or manufacturing.
Table 4.5

_Nationally accredited engineering technology programs in British Columbia and their administrative affiliations with other fields_

<table>
<thead>
<tr>
<th>Institution</th>
<th># of Accredited Technology Programs</th>
<th>School / Faculty / Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia Institute of Technology</td>
<td>22</td>
<td>Trades and Technology&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Camosun College</td>
<td>8</td>
<td>Trades and Technology</td>
</tr>
<tr>
<td>Kwantlen University College</td>
<td>1</td>
<td>Science, Mathematics and Applied Sciences</td>
</tr>
<tr>
<td>Malaspina University College</td>
<td>1</td>
<td>Trades and Applied Technology</td>
</tr>
<tr>
<td>College of New Caledonia</td>
<td>2</td>
<td>Business and Technology</td>
</tr>
<tr>
<td>Nicola Valley Institute of Technology</td>
<td>1</td>
<td>n/a&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>North Island College</td>
<td>1</td>
<td>Trades, Technology and Tourism</td>
</tr>
<tr>
<td>Okanagan College</td>
<td>5</td>
<td>Science, Technology and Health</td>
</tr>
<tr>
<td>Selkirk College</td>
<td>3</td>
<td>Renewable Resources</td>
</tr>
<tr>
<td>Thompson Rivers University</td>
<td>1</td>
<td>Trades and Technology</td>
</tr>
</tbody>
</table>

*Note.* Data in this table were aggregated from *Canadian Council of Technicians and Technologists* (2006b) and the *British Columbia Deans of Technology* membership list (as of November 2007).

<sup>a</sup> Enrolment at the British Columbia Institute of Technology allows for grouping administrative units by field of technology such as School of Transportation, School of Construction and the Environment, School of Manufacturing, Electronics and Industrial Processes etc.

<sup>b</sup> A small institution, Nicola Valley Institute of Technology is not grouped into schools/faculties.
At most colleges the sciences are synonymous with university transfer courses which results in an inherent dichotomy of cultures in the School, i.e. the delivery of lower division courses as a means for access to a university versus the education towards a stand-alone college credential. Similarly, the associated student bodies are diverse in both abilities and interests. I return to this dichotomy in greater detail in the next section.

**Hybridization: Degree-granting Colleges, University Colleges and Regional Universities**

In Chapter 2 I introduced the concepts of university colleges and regional universities in regard to credentialism and mandate creep. The designation of community colleges as university colleges and more recently their re-designation as "regional universities" (Plant, 2007) will place these institutions in a new position or perceived role in the social imaginary of the regional populace. Internally, the adoption of a university component will introduce new imaginaries reflective of academic paradigms characteristic of research universities such as scholarly activity (in particular research and publication), bi-cameral governance and a new peer community for the institution itself. This need not prompt a chasm within the institution between the vocational/technical fields and the so-called academic disciplines, however, it often preludes a shift in institutional focus as well, in which case those responsible for governance may be challenged to managing conflicting organizational cultures. In theory the educational institution, which per definitionem aims to foster discussion and exchange, should function as a model for mutual recognition and tolerance. This exchange would be of particular benefit for a society in transition from a labour to knowledge-based economy because
discovering [or redefining] my own identity doesn’t mean that I work it out in isolation, but that I negotiate it through dialogue, partly overt, partly internal, with others. That is why the development of an ideal of inwardly generated identity gives a new importance to recognition. My own identity crucially depends on my dialogical relations with others. (Taylor, 1994, p. 34)

Instead, conflicting social imaginaries often prevent a sustainable working model by obstructing dialogue. Levin observed that

While academic faculty, and particularly those in baccalaureate degree programs, worked toward the development of a more prominent academic institution, with increased professional authority and a university culture, vocational and collegiate or non-degree program faculty worked toward program and job survival. (Levin, 2003, p. 71)

Conflict between the two imaginaries may be innate. Each will attempt to foster and preserve their respective paradigms, and thus the spectra of envisioned futures diverge. Early in the evolution of the college system, Sperrin Chant, then Dean at the University of British Columbia and Chair of the Academic Board of British Columbia, implicitly questioned the compatibility of university-level research and college-level instruction:

In my experience I have not found that at the level of first and second year university, active engagement in research is a necessary component of good instruction. (Chant in Government of British Columbia, 1971, p. 11)

But while the conflict itself may be innate, the underlying social imaginaries are acquired. For graduates from traditional PhD programs who aspire to enter a tenure track at a reputable university, Chant’s “good instruction” may only be of secondary concern.
Instead, they will attempt to replicate and succeed in the culture in which they were educated. If they cannot obtain a position at a traditional university, a teaching position at a college may be seen as an inferior or second class option. Any entry-level academic will be aware that unless they continue to engage actively in research and publication (which usually means having graduate students) they will soon fall behind in their career goals or lose position within the community of scholars in their chosen fields. At that point they will face two choices. They can redesign their career expectations, actively pursue a teaching career path, and acquire and hone the skills necessary for "good instruction" (Chant in Government of British Columbia, 1971, p. 11) or promote an academic habitus at the institution, effectively trying to convert it into the conventional research university environment in which they were educated and to which they aspire. This will inevitably lead to conflict with the agents of a more traditional college agenda.

Some hybrid institutions have tried to develop local solutions that aim to balance the status of academic and vocational instructors. For example, in 1990, Okanagan

10 The prestige associated with academic status is a powerful lure. At Okanagan University College even instructors who were reputable engineering practitioners and who were highly successful in practitioner education, expressed satisfaction about acquiring the apparent status of university professor through a "back door" when the concept of University College was implemented at the former regional college. When the British Columbia Government dissolved Okanagan University College and created the University of British Columbia Okanagan (UBCO) and a separate Okanagan College, some faculty fought hard to be transferred to the former, although engineering technology was not going to be offered by UBCO nor did they have an established track record of research and publication.
University College (OUC) adopted a policy to broaden the definition of scholarly activity:

Scholarly activity shall be understood to include continuing mastery of one’s field of knowledge, awareness of current scholarship in one’s own field, involvement in basic research and development, and professional or creative activity.
(Okanagan University College, 2001, p.55)

This definition was meant to bridge the chasm between conventional academic career paths and those of faculty in vocational/technical programs by defining scholarly activity more comprehensively, and by so-doing give equal importance to the work of both university-level research faculty and industry practitioners. In my experience, strong distinctions remained and, depending on the composition of committees and councils, discrimination prevailed. Among academic scholars, extended study leaves (ESL), a.k.a. (sabbaticals) formed a case in point. ESL committees at OUC were mandated to grant study leaves to faculty on both the university and college side of the institution. However, even senior members of the committee (who were mandated by the University College Board to promote the concept of a comprehensive institution) often denied or frustrated requests for leaves made by faculty on the technical/vocational side of the institution in order to rejoin industry and hone their skills. As a member of the committee I repeatedly observed first hand conversations of the following tenor:¹¹

¹¹ This is not a verbatim transcription but a simulated example.
Member A: “This proposal doesn’t constitute research.”

Member B: “It doesn’t have to in order to qualify as scholarly activity. The applicant is a practitioner, not a researcher.”

Member A: “Yeah, I know. But it’s not going to get my vote.”

By operating with a strong conventional academic bias, the committee regularly rejected applications from technical/vocational or career program faculty, a fact that contributed to a widening chasm between the practical and academic communities within the institution.

In a similar attempt to balance the status of academics and practitioners, Thompson Rivers University (which emerged as a regional university out of the former University College of the Cariboo) instituted two separate career tracks - that of university professor (which includes the ranks of assistant, associate and full professor, respectively) and that of lecturer (advancing to senior and principal lecturer). This dual track system conceptually pursues two goals. For one, it affords non-academic instructors an opportunity to pursue excellence in the field of vocational and career instruction by providing a distinct career track. On the other hand, it preserves the cherished title of professor for the academic side of the house. Rather than attempting to assimilate two distinct systems, it is supposed to enable coexistence.

However, in reality many hybrid institutions do just that: they enable diverging sides of the house to coexist, but they do not foster exchange. It is this exchange that is needed to overcome potentially maleficent habitus and create an institution that is comprehensive not only in its offerings but also in spirit and organizational culture. In
other words, the social imaginaries of both groups must mature in a way so that they can perceive the prospect of a common future.

This is not an easy task. The hybrid institution strives to amalgamate into a common framework two coexisting yet different cultures. However, the step from amalgamation to assimilation is small. And while the described chasm between vocational and academic divisions seems to be more prevalent in hybrid institutions such as university colleges and regional universities, this is not to say that traditional community colleges are immune to conflicts between the cultures and their respective imaginaries. Amendments to the British Columbia College and Institute Act (Government of British Columbia, 2007a) in 2003 granted community colleges the right to offer applied degrees and consequently extended their mandates to include baccalaureate degrees. In a fashion similar to university colleges, many community colleges embraced the new mandate and encountered the same polarizations as hybrid institutions before them, albeit in less pronounced ways as research and scholarly activity were not brought to the fore but merely accepted and supported.

A good example to illustrate the complexity of the problem of reconciling different cultures with an organization is the integration of trades graduates into a college’s convocation ceremonies. At Camosun College, for example, graduates of apprenticeship and six-month trades foundation programs are invited to take the stage in the semi-annual graduation. They don academic regalia such as gowns and mortarboards and the students who have attained the best exam results receive special mention. At no point are elements of hundreds of years of trades history celebrated, customs invoked or crafts pieces exhibited. While the institution inarguably intended this to be a benevolent
move, recognition and concession of worth is afforded by means of admittance and assimilation.

The situation is similarly contentious at other institutions. The following example relates to North Island College (NIC):

_We seem to have run the full gambit at NIC. A few years back it was mandated that trades grads would participate in the regular grad and would be required to wear academic regalia. They voted with their feet and didn't show. A couple of years ago we introduced embroidered golf shirts instead of regalia, and have seen participation increase. (Still hear the comments such as "I don't wear shirts with a collar", however......can't win them all). _

(Don Gillingham, Dean of Trades and Technology, North Island College, personal communication, 2007)

In the above examples, dominant cultures (through agents in positions of power) bestow recognition through absorption and assimilation instead of a promotion of coexistence and a celebration of differences. While Appiah warns that “… a politics of

12 This situation is reminiscent of that of Canada’s First Nations in the late 20th century. In order to combat poverty among aboriginal people and facilitate career achievement and social equality, they were benevolently given preferred access to university programs, reserved seats in higher education and scholarships based on their registration as statute members of a First Nations people. However, in general, no attempts were made to integrate indigenous cultures, customs and teachings into the post-secondary process. The only option for advancement was to adopt Western culture. More recently, policies such as the _Aboriginal Service Plans_ (Government of British Columbia, 2007b) make an effort to better recognize aboriginal culture and achievements.
identity can be counted on to transform the identities on whose behalf it ostensibly labours” (Appiah in Taylor (1994), p. 163), Taylor argues that

All judgments of worth are based on standards that are ultimately imposed by and further entrench structures of power. ... A favourable judgment on demand is nonsense, unless some such theories are valid. Moreover, the giving of such a judgment on demand is an act of breathtaking condescension. No one can really mean it as a genuine act of respect. It is more in the nature of a pretend act of respect given on the insistence of its supposed beneficiary. Objectively, such an act involves contempt for the latter’s intelligence. (Taylor, 1994, p. 70).

In other words, true recognition of a group within a comprehensive college or institute cannot be prescribed and imposed using the standards from only one side of the house, but need to result from an express wish to overcome entrenched habitus and produce a common social imaginary. At this point it is beneficial to remember that the social imaginary is not a rigid concept with a means to and end, but merely an undefined catalogue of possibilities.

There is no ‘goal orientation’ in the social imaginary but only agents tentatively plotting trajectories and seeking to actualise tactics and strategies. The social imaginary is thus not a fixity, like a temporal prolongation of the present or stable field, but a constantly changing, configured and reconfigured space of possibility. (Vigh, 2006, p. 209)

The creation of a comprehensive institution based on a pre-engineered, predetermined single vision that is a combination of existing culture and habitus, will likely yield fragmentation. If the vision for the future is a rigid concept, a finalized theory shared by only a small minority, then the college community is relegated to buying into that theory or to continue the pursuit of its own narrow imaginary. Instead, the agents of
different groups need to envision similar prospects for the future, i.e. their catalogues of possibilities how things ought to be, need to overlap. Taylor’s (1994) discourse on multiculturalism may hold a solution:

To come together on a mutual recognition of difference – that is, of the equal value of different identities – requires that we share more than a belief in this principle; we have to share also some standards of value on which the identities concerned check out as equal. (p. 52)

What has to happen is what Gadamer has called a “fusion of horizons.” We learn to move in a broader horizon, within which what we have formerly taken for granted as the background to valuation can be situated as one possibility alongside the different background of the formerly unfamiliar culture. The “fusion of horizons” operates through our developing new vocabularies of comparison, by means of which we can articulate these contrasts. So that if and when we ultimately find substantive support for our initial presumption, it is on the basis of an understanding of what constitutes worth that we couldn’t possibly have had at the beginning. We have reached the judgment partly through transforming our standards. (Taylor, 1994, p. 67)

In summary, social imaginaries are ultimately based on the prevalent standards in a social group and they are “both factual and normative” (Taylor, 2004, p. 24). This means, what ought to be, i.e. what is considered a desirable future that is permissible within the canon of the practice, will need to evolve out of one’s own personal system of standards and rules. Fundamentally changing the standards may give rise to the evolution of a new social imaginary. In the next section I review how institutional culture and habitus affect engineering technology.
4. Fusing Horizons

Engineering Technology Faculty

The position of engineering technology in the Formative Domain is unique and poses a dilemma. On one hand, attempts are being made by some to establish technology education as a truly academic discipline, identified with existing academic structures and demarcated from traditional vocational education. On the other hand, most instructors do not want to engage in university-type scholarly activity, instead demanding equal recognition for career, trade and technical instructors within the institutional community. Technology instructors at Camosun College and Okanagan College are members of the Faculty Association (as opposed to vocational instructors who belong to the British Columbia Government Employees Union). However, as technology instructors only form a small percentage of the membership of these faculty associations, their specific requests are often outvoted by the more academically oriented majority of Arts and Science instructors.

Any attempt at Gadamer’s “fusion of horizon” (Taylor, 1994, p. 67) introduced in the previous section will benefit from fields that already have standards in common. With its roots in both science and vocational education, engineering technology may have a unique opportunity to act as an interpreter between academic and vocational faculties. For example, after the dissolution of Okanagan University College, science instructors, who were formerly part of the coveted baccalaureate programs at OUC, found themselves teaching university transfer courses. That is, not only were they not part of a perceived institutional elite but they also did not graduate students anymore. Having completed
their initial coursework at the college most students transferred to a university without any formal celebration of their achievements. This deprived the science faculty of seeing their students walk the stage, i.e. accomplish their goals of attaining an academic credential. The high turnover rate also had a detrimental effect on developing the kind of student-instructor bond which is typically achieved during project work in the higher semesters of a credentialed program. “They show in September, leave in April, and you have no idea whatever happened to them. You’re lucky if you remember their names a month later” (Science Instructor, Okanagan College, personal communication, 2006).

Co-locating science instructors both physically (in the same building) and administratively (in the same faculty unit) with engineering technology, introduced science instructors to the culture (and consequently habitus) of technology instructors and encouraged a bidirectional exchange of paradigms. This resulted in a noticeable amalgamation of their respective cultures and the emergence of a form of occupational solidarity. As a consequence, various science departments stated a desire to develop field-related technology diplomas, e.g. analytical chemical technology on part of the chemistry department, and medical laboratory technology on the part of the biology department.

More and more science instructors joined their technology colleagues for staff socials and discussions evolved about where the institution, the fields, or the instructors might be headed. These discussions arguably formed the first step in an amalgamation of social imaginaries. The above is an example where engineering technology appears as a more distinct and defined discipline, which is a rare situation because normally engineering technology is the field that strives for distinction and recognition. Distinct and dominant agents of the Formative Domain are located on both sides of the engineering technology
faculty - agents of traditional academic (in the case of applied degree programs) and vocational education, respectively. Bourdieu argues that

the dominant agents appear distinguished only because, being so to speak born into a position that distinguished positively, their habitus, their socially constituted nature, is immediately adjusted to the immanent demands of the game, and they can thus assert their difference without needing to want to, that is, with the unselfconsciously that is the mark of so-called ‘natural’ distinction: they merely need to be what they are in order to be what they have to be, that is, naturally distinguished from those who are obliged to strive for distinction. Far from being identifiable with distinguished behaviour, [...] to strive for distinction is the opposite of distinction: [...] it involves recognition of a lack and avowal of a self-seeking aspiration. (Bourdieu, 1987, p. 11)

Since the less distinct agent normally approaches a more distinct partner, one may postulate that faculty instructing in university transfer programs at community colleges feel even less distinct than those instructing in engineering technology programs. While the abrupt change in status for Okanagan College’s Science divisions may have brought this issue aggressively to the fore, university transfer faculty generally state dissatisfaction with the status of their discipline.¹³

¹³ Arts and Science faculty at Okanagan University College were the driving forces behind the push for full university status for the institution. After the separation of OUC into the University of British Columbia Okanagan and a new Okanagan College, Arts faculty at the college stated discontent with their new roles as university transfer instructors and immediately pursued the creation of applied Arts degrees.
The Future of Technology Education

This opens a new perspective for engineering technology, and the social imaginaries with respect to engineering technology may encounter a trifurcation:

1. Evolution into a degree-granting discipline by the introduction of Year 3 and Year 4 curricula leading to a baccalaureate designation.
2. Conversion into an apprenticeship model through the application of trades training models to engineering technology.
3. Promotion of distinctive program structures by fostering diploma and associate degrees as valuable terminal credentials and acting as an interface and interpreter between vocational and degree education.

Both options 1 and 2 promote a polarization in the educational field because they implicitly abandon the concept of a strong middle-tier, i.e. diploma-based education.

Option 1 is a popular choice with industry practitioners as shown in Table 4.6. At the same time, neither technologists nor engineers see a need to make engineering technology a discipline with all four years taught at universities, as it occurs in the United States, e.g. at Purdue University. An inherent flaw of this option is a lack of recognition of “applied degrees” conferred by colleges on part of the academic community. In fact, the BC Government’s Campus 2020 Report (Plant, 2007) on the future of post-secondary education in British Columbia recommended “that legislation be amended to remove the Minister’s authority to designate degrees at the province’s colleges” (p. 72) and “to enhance clarity regarding the quality of BC degrees and transparency of the provincial degree granting approval process, [to] eliminate the statutory designation of ‘applied degrees’” (p. 73). Plant (2007) continues to say that in reality, little distinction is made
between applied degrees and academic degrees (p. 73), a sentiment that is echoed by Dennison and Schuetze (2004):

Although the concept of an ‘applied’ degree has long been accepted in Europe and the United Kingdom, in Canada there had been no conceptual distinction between academic and professional degrees, even if there might have been a status gap between academic and applied studies. (p. 26)

Table 4.6

*Responses of industry practitioners when asked about their preference with respect to the future of engineering technology education in British Columbia*

<table>
<thead>
<tr>
<th>Option</th>
<th>Applied Science Technologists</th>
<th>Professional Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering technology programs should remain 2-3 year programs at colleges and technical institutes</td>
<td>32%</td>
<td>23%</td>
</tr>
<tr>
<td>Engineering technology should offer exit points after 2 years (diploma) and 4 years (applied degree)</td>
<td>58%</td>
<td>70%</td>
</tr>
<tr>
<td>Engineering Technology should become a degree discipline taught by universities</td>
<td>10%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Note.* Data aggregated from Roemer (2007c, 2007d). The column “Professional Engineers” only includes individuals that felt sufficiently familiar with engineering technology to respond.

This “status gap” is evident in the reluctant acceptance of the Bachelor of Technology (B.Tech.) degree on the part of the academic community as Bachelor of Technology degrees possess limited options for laddering into graduate programs. On the other hand, a decrease in the number of graduate students (e.g. electrical engineering) increasingly forces universities to become more open to non-traditional undergraduate
credentials such as the applied college degree. In industry, the B.Tech. does not enjoy the same prestige as accredited engineering degrees because of its greatly reduced technical content, and B.Tech. programs are often the choice of public employees who want to enter junior management positions that require an undergraduate degree. Any new technical degree, regardless of its technical content, may face the same confusion in the market as the engineering technology diploma conveyed by a hybrid institution. Even members of the engineering community often do not fully comprehend the status of engineering technology within a degree-granting institution. The following is a comment by a member of the Okanagan engineering community.

*I don’t think OUC graduates are properly trained. I think I am way better qualified than OUC grads. I find it totally ridiculous that OUC thinks it can produce engineers in two and a half years when every other university needs four.*

(Engineer, Riverside Forest Products, personal communication, 2002)

At the time, the above engineer clearly did not understand the concept of engineering technologist and during the ensuing argument was reluctant to accept assurances that Okanagan University College did not offer engineering programs or

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14 This change in thinking is starting to happen as an increasing number of graduate programs now accept students with any (or even without an) undergraduate degree, as long as they have “appropriate experience” or can pass entrance exams. Private universities such as Capella University in Minnesota or the University of Phoenix are actively pursuing professionals in need of upgrading their credentials. While some may question the quality of the credentials conferred, private education providers have forced even established public institutions to review their admission policies.
graduate engineers with applied degrees. But the university college’s mandate creep and its degree-centred profiling had diffused the institution’s image in public. The phenomenon of colleges’ “…apparent efforts to be all things to all people” (Beinder in Government of British Columbia, 1971, p. 32) leads to career paths that are not widely recognized or understood. Applied technology degrees will add yet another exit point and credential to the spectrum of technical certifications and may further confuse the employment market. This is not to say that applied degrees for practitioners automatically face an uphill battle. Business administration baccalaureate degrees (BBA) are a good example. In recent years many such programs have managed to establish a solid reputation alongside university commerce degrees (B.Com.). For example, the BBA programs at Okanagan College and Camosun College account for a large percentage of either institution’s domestic and international enrolments (despite the local availability of B.Com. degrees), while their students compete successfully at reputable international competitions.

Option 2 seems to fall more in line with the B.C. provincial government’s Campus 2020 Report (Plant, 2007) which makes little mention of two-year diploma-based education, let alone career technical education. Option 2 could see the conceptual merger of six-month entry level trades education (ELT a.k.a. Foundation courses) with the eight-month approach to C.Tech programs. Unlike apprenticeship programs, Foundation courses constitute one-time block programs without industry involvement which makes them conceptually similar to technology programs that ultimately lead to the C.Tech designation. Engineering Technology diploma programs would then resemble a modern version of the European Master Tradesperson concept. Master Tradespeople
(meister in Germany) combine enhanced technical abilities with supplemented skills such as business administration and communication. On the other hand, this portfolio of non-technical skills is one of the elements of Canadian technologist education. Because the social imaginaries of trades and engineering technology practitioners and educators are noticeably divergent, the implementation of this option will require careful consideration.

Option 3, i.e. the promotion of two-year college credentials as terminal degrees, is a continuance of the status quo, however, the tri-tiered education system, i.e. vocational certificates, career diplomas and academic degrees, could receive a boost through a deliberate consolidation and synchronization across dissimilar fields. For example, health care practitioners have recently encountered a reorganization of their credentials as the Registered Nurse (RN) designation has been merged with the nursing baccalaureate degree. Until recently, Licensed Practical Nurses (LPN) provided mainly facility and bedside care in hospitals, while the administration of medical care involving drugs, high-tech equipment and sophisticated procedures fell into the realm of Registered Nurses. Holders of nursing degrees such as the Bachelor of Science in Nursing (BScN or BSN) were usually entrusted with the administration and management of hospital wards. When three-year RN programs were abandoned in favour of four-year baccalaureate programs, the mandate of Licensed Practical Nursing gradually increased with LPNs now being expected to perform skills that were once reserved for Registered Nurses. Through the inclusion of more theoretical content Licensed Practical Nursing is gradually evolving from a vocational to a career discipline and suggestions have been made to upgrade the current 12-month program to a full two-year (16-month) diploma program. As a result, the field of applied care would then include a six-month vocational program (Home
Support/Residential Care Attendant, HS/RCA), a two-year diploma component (LPN) and a four-year degree option (BSN). This would mirror the development of credentials in the field of engineering and technology with technician (C.Tech), technologist (AScT) and engineering (B.Eng/BASc/P.Eng.) designations. Similar to technology education, health programs offer bridging and laddering opportunities among the three levels.

A more rigid structure of credentials across multiple applied disciplines such as technology, health and business administration combined with strong and comparable bridging and laddering options in each field will allow for a harmonized post-secondary model that would be easier to comprehend. It could also form the basis for a better integrated K-25 educational system (see Chapter 7 for a further discussion of this model). Most high school counsellors have graduated from five-year Bachelor of Education programs, that is, they have been exposed to only a university-type post-secondary environment. This is not to say that high school counsellors show an academic bias but the full portfolio of post-secondary fields and their respective unique and diverse credentials is difficult for many career counsellors to comprehend and explain. Efforts by colleges and institutes to shed more light on this complex portfolio of career options are often offset by a high turnover rate among career counsellors on both the secondary and post-secondary sides; with the result that many high school graduates may not be given the full framework of options available. In fact, the data in Table 4.7 suggest that one in three current engineering students has never heard of the engineering technology route to an engineering degree.
Table 4.7

Responses of engineering students when asked what role engineering technology played in their choice of educational pathways towards an engineering degree

<table>
<thead>
<tr>
<th>Option</th>
<th>Engineering Students</th>
<th>Engineering Practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>I possess a technology diploma</td>
<td>5%</td>
<td>20%</td>
</tr>
<tr>
<td>I would have preferred the engineering technology route but enrolled in a traditional engineering program</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>I gave serious consideration to the engineering technology route but preferred a traditional engineering program</td>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td>I had heard about the engineering technology route it but I never considered it a real option for me</td>
<td>46%</td>
<td>18%</td>
</tr>
<tr>
<td>I had never heard about the engineering technology route</td>
<td>32%</td>
<td>39%</td>
</tr>
<tr>
<td>To my knowledge, this alternative route didn’t exist when I enrolled in my engineering program</td>
<td>n/a</td>
<td>34%</td>
</tr>
</tbody>
</table>

Note. Data extracted from Roemer (2007a, 2007c).

5. The Student Perspective

The concept of a social imaginary is very applicable to engineering and technology students as it constitutes the spectrum of envisioned possibilities, i.e. expectations of what their professional lives ought to be, how they will relate to other occupations and how they will be recognized.

The imaginaries of technology students with respect to their occupational futures are largely formed through discourse with their peers and instructors. Unlike in the trades
where students are trained by experienced senior peers, instruction in the technologies is largely carried out by engineers. This may expose students to a social imaginary that does not match that of engineering technology practitioners in the field. I explore this aspect further in Chapter 6.

Employment Expectations

Engineering and engineering technology students respond very similarly when asked about mobility, preferred type of employment and salary expectations. Larger discrepancies occurred when students were asked about their preferred type of employer (Figure 4.7).

Figure 4.7. Responses by engineering and engineering technology students when asked about their preferred form of employment.

Note: Data aggregated from Roemer (2007a, 2007b).
Technology students have a strong affinity to public employers. Similarly, only engineering technology students were interested in maintaining and upgrading equipment and showed a greater interest for project management within a municipality (Figure 4.8).

Figure 4.8. Responses of engineering and engineering technology students when asked the question, “If you had multiple job offers, which of the following career paths would you be most likely to accept?”.

<table>
<thead>
<tr>
<th>Career Path</th>
<th>Engineering Students</th>
<th>Engineering Technology Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible for expensive equipment, preventive maintenance and upgrades</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Field supervisor for a project</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>In charge of a project or small department with a municipality or a Government agency</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>A commission-based sales representative for a technology product</td>
<td>40%</td>
<td>50%</td>
</tr>
<tr>
<td>Member of a research and development team</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Note: Data aggregated from Roemer (2007a, 2007b).

This may be reflective of the perceived job stability, unionized environments, benefits and career opportunities for non-degree graduates and seems to support Porter’s (1965) observation that practitioners often see their “...rewards ... in the right to control the resources and facilities of the society...” (p. 17). I will discuss this phenomenon in greater detail in Chapter 6. Students’ salary expectations generally were realistic (Figure 4.10). On average, engineering students anticipate a starting salary of $52,700 while engineering technology students expect $45,400 annually. After five years on the job,
engineering students expect to earn $75,100 annually, compared to $64,700 for engineering technologists. These amounts can be achieved in practice, although some job mobility may be required.

Both groups stated similar attitudes to job mobility although engineering technology students showed a greater desire to stay in the region where they were currently living. This may originate in the greater international transferability of the engineering degree, while the engineering technology diploma has no direct equivalent in various countries. Also, since engineering students typically have higher academic achievement they may have taken classes in foreign languages.

Figure 4.9. Responses of engineering and engineering technology students when asked about their job mobility.

Note: Data aggregated from Roemer (2007a, 2007b).
Figure 4.10. Annual salary expectations immediately after graduation as submitted by first and second year engineering and engineering technology students.


Membership in Occupational Associations and Certification

Occupational associations are active in the Formative, Market and Public Domains. In the Formative domain they form a complement to educational institutions insofar as they:

- accredit the engineering technology program and perform quality control functions;
- interact with students through presentations and student memberships;
- provide certification to instructors;
- interpret between Formative and Market Domains.
Students are generally not exposed to, and thus not aware of, the accreditation process. Encounters with occupational associations are generally limited to informational materials and presentations in the classroom as well as conversations with practitioners, i.e. instructors and lab technologists. However, many technologists are not registered with their provincial associations such as the Applied Science Technologists and Technicians of British Columbia (ASTTBC) or the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC). Maintaining active certification is generally not a requirement for employment as it would incur costs for the individual or, through collective agreements, for the institution. Exceptions may occur where the institutional accreditation process requires certification on part of the instructors, as it is the case with the Engineering Bridge program at Camosun College.

This indifference towards certification and membership is communicated to the students. Table 4.8 shows that initially only one quarter of technology students expected to seek certification after graduation. Information sessions about the purpose and mandate of ASTTBC might increase the number of future members, albeit a strong vote of support remains elusive. These results differ significantly from those of engineering students. After attending an information session more than two in three engineering students anticipated registering with a provincial professional organization once eligible, while none rejected the possibility outright (Table 4.8). This is likely related in part to the fact that active registration is required for professional engineers wishing to practice engineering in British Columbia, while the same does not apply for engineering technology. Engineering associations are well established and membership suggests exclusivity and is proudly displayed. Engineering technology associations have failed to
promote the same culture for that occupation. I return to this phenomenon in Chapter 6 where I discuss the interactions of engineers and technologists with the general public.

Table 4.8

*Responses by engineering technology students when asked how likely they would be to get certified and registered with a provincial occupational organization such as ASTTBC*

<table>
<thead>
<tr>
<th>Response</th>
<th>Engineering Technology (ET) Students</th>
<th>Engineering Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended ASTTBC* (ET students) or APEGBC (engineering students) information session</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>I fully anticipate to get registered as soon as I become eligible</td>
<td>26.4%</td>
<td>38.8%</td>
</tr>
<tr>
<td>When the time comes, I will review costs and benefits and decide if I want to register</td>
<td>45.8%</td>
<td>44.9%</td>
</tr>
<tr>
<td>I can't see too much return for my dues at the moment, so I don't think I'll pursue registration</td>
<td>11.1%</td>
<td>6.1%</td>
</tr>
<tr>
<td>I couldn't care less about registration with a professional organization</td>
<td>16.7%</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

*Note.* Data extracted from Roemer (2007a, 2007b).

*Applied Science Technologists and Technicians of British Columbia*

*Association of Professional Engineers and Geoscientists of British Columbia*
6. Summary

In Chapter 4 I reviewed the situation of engineering technology in the Formative Domain. I examined how engineering technology programs satisfy the criteria that led to the institution of a college and institute system in British Columbia, i.e. the educational void I proposed in Figure 2.1. I found evidence that by and large engineering technology programs have not improved access to technological education as far as geographical availability and tuition costs are concerned. On the other hand, effectively avoiding the academic rigour of engineering degree programs, they clearly provide a distinct pathway to employment and careers in the technology sector.

In the institutional environment, engineering technology occupies a hybrid position, i.e. it is neither a true vocational nor academic discipline. This causes problems with respect to identity and status within the institutional community, in particular as colleges broaden their scope of offerings and readily adopt the concept of applied degrees. In this context I discussed various possibilities for the future of engineering technology programs and showed that those favouring the expansion of engineering technology into a degree discipline while maintaining its procedural focus enjoy the greatest popularity.

In Chapter 5 I examine identity and recognition of the occupational category of Applied Science Technologist (i.e. predominately graduates from accredited programs in the Formative Domain) in the Market Domain. I particularly focus on the relationship between technologists and engineers.
CHAPTER 5. THE MARKET DOMAIN – OCCUPATIONAL CATEGORIES IN INDUSTRY

1. Introduction

In Chapter 3 I proposed a conceptual framework for the emergence of new occupational categories (Figure 3.1). I postulated that this emergence may be tied to the need for a unique skill set in industry, i.e. a skill set that originates in the Market Domain, or through a reorientation of the social imaginaries within the Public Domain with respect to highly regarded key occupations and personal fulfilment.

In Chapter 4 I showed how program development in the B.C. college system was triggered by a reorientation in the Public Domain, i.e. by the need for a tiered and distributed post-secondary system. In Chapter 4 I also examined the continuing evolution of the post-secondary system and associated social imaginaries from the perspective of engineering technology.

This chapter evaluates the occupational category of Applied Science Technologist (AScT) in the Market Domain. As in the previous chapter, I begin by assessing the economic performance of AScTs, i.e. whether they fill the need that gave rise to their occupation. In Chapter 3, I defined economic performance as the aggregation of various quantities that can be easily linked to monetary values. In a bilateral exchange, remuneration, career opportunities and certification are offered to individual technologists commensurate to their perceived contributions. Having assessed the economic performance of AScTs I will review habitus and social imaginaries in the Market Domain with respect to technologists and engineers.
2. The Emergence of Engineering Technology in the Market Domain

Applied Science Technologists in Industry

In Chapter 2 I reviewed the parallel evolution of engineering technology as a distinct occupational category in both Canada as in the United States. However, while in the U.S. engineering technology is sometimes taught as a university discipline leading to associate, baccalaureate and master's degrees, the Applied Science Technologist designation in Canada is synonymous with a two-year diploma from a college or technical institute.

The acceptance of graduate engineering technologists in industry is high. In fact, Figure 5.1 shows that most employers respond favourably when asked about the skill sets of graduates from technical programs in Canada. Within the three credentialing levels (engineering degree, technology diploma and technician certificate) engineering technologists score the highest level of employer satisfaction in both technical and non-technical skills and maintain this lead when practitioners with more than five years of field-related experience are compared. It is of interest to note that recently graduated engineers obtain the lowest score with respect to employer satisfaction where non-technical skills are concerned. This is likely related to employers' higher expectations of degree-holders and the comparatively small percentage of non-technical skills (12%) included in the curriculum of standard engineering programs (see Table 2.1 in Chapter 2).

Eighty-seven percent of the employer group surveyed within a Labour Market Study (Canadian Council of Technicians and Technologists & Engineers Canada, 2007) listed non-technical skills such as interpersonal, team-work and communication skills as the
most desirable assets respectively for recent graduates, and 94% for experienced practitioners.

*Figure 5.1.** Employer satisfaction with the technical and non-technical skill sets of engineers, technologists and technicians.

![Figure 5.1](image)

*Note.* Data aggregated from *Canadian Council of Technicians and Technologists & Engineers Canada (2007)*. National survey, n=625.

This high rate of employer satisfaction implicitly justifies the emergence of engineering technology as a distinct discipline, and technologists as representing a new occupational category with a unique blend of theoretical and practical competencies that allow them to perform specialized and interpretive functions. During the 2001 Census of Canada (*Statistics Canada, 2001*) 343,025 respondents categorized themselves as
technicians and technologists, and 189,970 described themselves as engineers. The skill set of technologists is complemented by a perception of a good return on investment: Table 5.1 shows that technologists enjoy the highest estimated hiring rates of all technical occupational categories considered.

Table 5.1

*Estimated hiring rates of engineers, technologists and technicians over the next 12 months as a percentage of occupational employment, as of November 2007*

<table>
<thead>
<tr>
<th></th>
<th>Engineers</th>
<th>Technologists</th>
<th>Technicians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiring rate (weighted)</td>
<td>7.2%</td>
<td>10.2%</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

*Note.* Data aggregated from *Canadian Council of Technicians and Technologists & Engineers Canada* (2007).

In the context of hiring intentions (Table 5.1), Figure 5.2 shows that employers have a good understanding of which occupational categories they consider most suited for given tasks. The majority of employers would prefer technologists for positions dealing with supply & installation, design and quality control as well as consulting and service & support. This gives testimony to both the technical and non-technical skill sets of technologists: design and quality control (QC) require competent individuals with good troubleshooting abilities and a commitment to excellence, while consulting and support necessitate communication and, at times, conflict resolution skills. The fact that technologists form the preferred occupational category in four of the first five categories in Figure 5.2 indicates that their unique spectrum of skills seems to serve industry well and that the contribution of technologists is well recognized by employers.
Figure 5.2. Responses by employers when asked to associate corporate job functions with suitable occupational categories.

Note. Data aggregated from Canadian Council of Technicians and Technologists & Engineers Canada (2007).

However, the picture changes when it comes to the certification of practitioners as Applied Science Technologists (AScTs). Figure 5.3 illustrates that only 4 in 10 employers show a preference for certified technologists while only 18% state it as an actual requirement for their staff to be certified and registered. Less than one in ten employers would approach the respective technical association for recruitment purposes (Canadian Council of Technicians and Technologists & Engineers Canada, 2007). It seems that employers shy away from mandatory certification for two main reasons; on
one hand because they anticipate an increase in salary demands as expressed in the following comment:

_I am certified and worked very hard to become certified. My original boss would not fill out the forms that the society required, he was afraid that I would have to be paid more money. I was granted my certification regardless in 1981..._.

(Roemer (2007d), Survey Respondent #42)

_Figure 5.3. Corporate policies with respect to licensure (for engineers) and certification (for technologists)._
successful applicants “must have graduated from a two-year technical diploma program” and “must be eligible for certification with a provincial association such as ASTTBC”.

The statement that only eligibility for membership is a job requirement effectively limits eligibility to AScTs who can still be hired at a technician’s pay grade while the institution avoids paying membership fees.

In my position with the provincial government, it is my 30 years of experience that has given me credibility. Engineers, geoscientists, agrologists and biologists have their annual registration fees paid for them. If I want to maintain my AScT designation, I pay for it myself. My designation, not my experience, is considered a joke. (Roemer (2007d), Survey Respondent #457)
Figure 5.4. Responses by engineering and engineering technology students when asked whether once certified they would display their respective professional title acronym (P.Eng. and AScT, respectively) on their business cards following their name.

![Bar chart showing responses]


This employer approach is mirrored in the lack of interest in certification on the part of technology students as shown in the previous chapter (Table 4.8) and complemented by a general understatement of their accomplishments. Figure 5.4 shows that only one in four technology students would display the AScT designation on their business cards out of pride for their achievements while this number is three times as high among engineering students.
Figure 5.5. Responses by Professional Engineers and Applied Science Technologists when asked how they would describe their work relationship with each other.

![Bar chart]

We are a team of peers. No distinction is made between engineers and technologists.

While the jobs of engineers differ somewhat from those of technologists, it is a very friendly relationship with no obvious hierarchy.

In general we get along well but at times [the technologists need some guidance that they might not always appreciate / the engineers appear arrogant or pull rank].

[The technologists are cautioned that they shouldn't consider themselves equal to the engineers / The engineers make it quite clear that they don't consider technologists as equals].


This is not to say that AScTs are disenchanted with their career choice or underestimate the value of their occupation for the industrial process. Ninety-one percent of registered AScTs who responded to an online survey (Roemer, 2007d; n=598) stated that they loved their current job or merely wanted to move to a different position within the same field.

Similarly, three out of four AScTs describe their working relationship with engineers as peer-oriented, with no obvious hierarchy. This perception is mirrored by engineers as shown in Figure 5.5. Conversely, AScTs in municipalities, governments or
public institutions feel a greater presence of hierarchy and pecking order (33%) than those in large corporations (24%) or small firms (19%), respectively (Roemer, 2007d).

3. The Dialectics of Identity, Recognition and Consecration

Applied Science Technologists generally have a very strong opinion of their role in industry. Remarks (n=210) that were collected as unstructured comments forming part of an online survey among practicing AScTs in British Columbia (Roemer, 2007d), show a prevalent theme. Although there is recurring concern that AScTs fulfil engineering duties (at a lesser pay) in many companies, most comments centre on distinction and interpretive functions of the technologist.

_We technologists are the bridge between the lay people and the engineers. We are the people that do the work the engineers/architects should know how to do but don't or can't. We translate poor design to tradespeople to get quality results on time and on budget._ (Roemer (2007d), Survey Respondent #284)

_I know many who think they are inferior to engineers and strive to achieve engineering status. To me, that is pointless as the two jobs are distinct. If you wanted to be an engineer, go to school and become one._ (Roemer (2007d), Survey Respondent #137)

_While I was attending BCIT, the instructors at that time made it clear to all students that the role of a technologist was designed to be a technically competent assistant to an engineer. ... I believe technologists should work diligently to enhance their role and that of the association (ASTT of BC) as proficient assistants to engineers._ (Roemer (2007d), Survey Respondent #255)

_Technology, being the glue that bonds the fabric of engineers and technicians/trades requires continued advertising to educate the public and_
increase awareness/knowledge about this occupation... .
(Roemer (2007d), Survey Respondent #217).

On the other hand, many professional engineers do not share this view of the technologist's interpretive, bridge or glue function between technicians and engineers. Figure 5.6 shows that over 50% of engineers rejected this definition (question 2). Similarly, engineering practitioners were split over whether the occupational category of Applied Science Technologist is fundamentally necessary or constitutes a hybrid designation that confuses the market. When asked to rate four different tracks of technical education (engineer, technologist, technician, tradesperson) relative to that of research scientist (Figure 5.7), professional engineers place technologists further away from the engineer than any of the other groups (area B). Conversely, AScTs place technologists closer to engineers than any of the other groups (area A). This could be indicative of engineers trying to preserve the difference, and technologists seeking equal status and recognition. Approximately two thirds of surveyed engineers knew what schooling was required for Applied Science Technologists (Roemer, 2007d) but only 14% of Professional Engineers would go so far as to consider engineering technology a blue-collar occupation (Figure 5.6, question 3) while only 23% thought that the engineering technology would not be able to sustain itself as a stand-alone occupational category (question 7).
Figure 5.6. Responses by professional engineers when asked about their perception of the status of engineers and engineering technologists in industry.


While a small majority of respondents supported the concept of a limited licensure for Applied Science Technologists, i.e. to certify certain levels of technical work (Figure 5.6, question 1), the percentile of supporters decreased to 28% when it came to merging the professional associations of Professional Engineers and Applied Science Technologists (question 5).
Figure 5.7. Responses by various groups when asked the question “If you were given a 10-step scale called ‘Level of Education’, on which research scientists were placed at step 10 (the highest), on a strictly personal level, where would you place tradespeople, technicians, engineering technologists, and engineers?”


As might be expected when asked to rank other occupational categories with respect to their own, degree holding professional engineers and technologists as diploma-holding practitioners show diverging results. It is noteworthy, however, that on average engineers tend to rate other degree professionals as “somewhat inferior”. This includes other baccalaureate disciplines such as teachers, social workers and nurses. Professions that carry post-baccalaureate degrees such as lawyers and veterinarians are considered
equal, while only medical doctors were rated higher in rank (Roemer, 2007d). Bourdieu
(1989) refers to such behaviour as *esprit de corps*.

This affective enchantment, born of the ability to admire oneself in one’s like-minded neighbours, is one of the foundations, along with logical conformity linked to the homogeneity of mental structures, of what is known as *esprit de corps*. This feeling of group solidarity in fact lies in the community of schemata of perception, appreciation, thought, and action that grounds the reflex complicity of well-orchestrated unconsciouses. (Bourdieu, 1989, p. 84)

And speaks of the existence of *symbolic capital* among the members of the corps: the “...symbolic capital that each member of the group holds as an individual” and “...that increases with the degree of restriction and exclusivity of the group so established” (Bourdieu, 1989, p. 79). In Canada, this symbolic capital lies in a legislated monopoly to certify certain areas of technical work. In British Columbia the monopoly is manifested through the *Engineers and Geoscientists Act* (Government of British Columbia, 2007c). The symbolic capital of this monopoly increases with the technological advancement of society because it forms the foundation for infrastructure, exploration and development. Bourdieu claims that “the *monopoly*, when recognized, is converted into a *nobility*” (Bourdieu, 1989, p. 79).

Technologists are torn between being trying to be distinct and being part of the perceived nobility. Their social imaginaries occupy a range of possibilities as they attempt to “...accede to a form of intellectual glory that remains inferior from the point of view of the very criteria they recognize” (Bourdieu, 1989, p. 50). One recurring strategy is to challenge the nobility at its weakest points, i.e. the young inexperienced engineering inductee (engineer-in-training, EIT) vs. the technology veteran:
... I find it increasingly frustrating to see doors so willingly opened up for young EITs while senior level technologists have to fight so hard for the same opportunities. I would add that I am constantly training these same EIT's in proper design and business practices. It is a struggle that has on more than one occasion made me consider leaving the profession or give in and obtain an engineering degree...the latter of which I would do simply for the piece of paper, not because I feel there is something worthwhile that I would learn that would benefit the quality of my work. It is a shame that engineers seem to be held in such high esteem while technologists continue to go unnoticed and unrecognized in this industry! (Roemer (2007d), Survey Respondent #156)

In other words, many time-honoured AScTs feel that their work experience and commitment to quality should automatically qualify them for registration with APEGBC, rather than the recent university graduates of whom “...Durkheim says ‘produce work prematurely and without genuine thoughtfulness’ and led, by their overconfidence in books or their own genius, to a state of intellectual self-sufficiency...” (Bourdieu, 1989, p.90).15

In return, engineers readily recognize technologists as similar, i.e. a group with common interests, ethics, and background, but many are reluctant to admit them to the “cadre” (Bourdieu, 1989, p.89).

---

15 I have encountered this competition between consecrated groups and field veterans in other environments such as the military where, especially in technical units, long-serving master sergeants struggle with reporting to recently graduated officers, often half their age. In fact, one may argue that the same controversy is at issue when following discussions about a disparity in value between academic Ph.D.s vs. professional doctoral programs such as the Ed.D.
In an effort to explore the views of Professional Engineers about technologists I examined various engineering profession-related websites and engineering journals.

- The provincial and national umbrella organizations, the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) and the Canadian Council of Professional Engineers (CCPE), respectively, generally endorse engineering technology as a distinct discipline. Where applicable, they present the engineering technology history of featured members and officials, and advertise the common heritage of both professions.

- An increasing number of provincial engineering associations endorse the concept of “limited licensure”, i.e. the recognition “that certain qualified individuals can be permitted to independently carry out certain specific functions normally within the definition of professional engineering, professional geology or professional geophysics without the supervision of a Professional Engineer, Professional Geologist or Professional Geophysicist” (Association of Professional Engineers, Geologists, and Geophysicists of Alberta, 2008).

- Outside their professional organizations, engineers and technologists often merge in social groups if there are additional unifying factors such as ethnic background. An example is the Society of Punjabi Engineers and Technologists in British Columbia (SPEATBC), “…a non-profit organization, which has successfully brought together Engineers and Technologists from different disciplines from both Canada and the Indian subcontinent” (SPEATBC, 2006, centre frame).

Of particular interest for this analysis was Innovation, the official journal of APEGBC, which represents Professional Engineers in British Columbia. Fifty-one issues of the journal were published between 2001 and 2006. Almost every issue included some reference to Technologists or the Applied Science Technologists and Technicians of
British Columbia (ASTTBC). Through the six years examined, *Innovation* included 73 unique articles and briefs that related to Technologists or ASTTBC.\(^{16}\)

Various articles on innovation and practice describe “team” working environments and often present Technologists as a substantial part of these teams. Interestingly, many articles that include images geared at depicting a hands-on work situation feature Technologists in a practical setting rather than engineers. The bullets below list taglines for workplace images and are examples of this effect. The images were taken at the respective featured company and were included with articles published in *Innovation*.

- “Optical technologist at the NxtPhase manufacturing facility inspects a sensor prior to assembly in insulator column” (Rahmatian, 2001, p. 16).
- “In his part of the address Lichensteiger, a technologist and the design manager for RSL Joint Venture, will look at some of the technical challenges of the project” (Rogers, 2006, p. 31).

\(^{16}\) One may argue that this picture is somewhat skewed by a proposed amalgamation between ASTTBC and APEGBC and the associated discussions that ensued between 2000 and 2005 and to which I refer later in this chapter. Out of the 73 articles, 41 of were linked to the merger issue. However, notwithstanding the purpose, *Innovation* did feature content relating to engineering technology.
Moreover, many articles include references to the more practical nature of Technologist education and their value as members of a team.

- "Over the past six years she has built a multitalented team of technologists, engineers, industrial designers and academic researchers who have established a reputation for creative design and innovative problem solving" (Rogers, 2002, p. 16).
- "As the team grew, so did its diversity. We added technologists, industrial designers, a market researcher, an orthotist and a machinist" (Paris, 2005, 26).
- "I was chair of the APEGBC/ABCFP Joint Practice Board and I really enjoyed working with this group and saw the benefits of sound teamwork. I also work with some very competent technologists, biologists and agrologists who understand and support this approach" (Ink, 2006, p. 18)

In fact, "team" and "group" were recurring themes whenever Technologists were included in articles. This approach is mirrored by job postings and classified ads in the Career section of the magazine. On average, the career section of each issue of Innovation holds 10 announcements for job openings, approximately 10% of which relate to Technologists. This ranges from a general mention of opportunities for Technologists among a diversified staff to specific job postings that require AScT certification.

Roughly three quarters of Technologist-related ads indicated that the advertiser has both Engineers and Technologists on staff. Out of these, two thirds offered different positions specifically at either the PEng or AScT levels, while the remaining third invited both Engineers and Technologists to apply for the same position. One to two percent of job postings overall were exclusively directed at AScTs. The language in most announcements emphasized the team aspect while one series of ads related to
Technologists as “our ASTTBC cousins”. At no point did ads state explicitly that Technologists were not eligible to apply.

Differences between the two certification levels became predominately evident where issues of distinction or professional remuneration were concerned.

Notwithstanding the “team” jargon, it is difficult to see how the proposed merger with ASTTBC will benefit our members in any way. You don’t see the Law Society trying to include notaries, or the College of Physicians and Surgeons trying to include nurses. This merger will dilute and diminish the value of the PEng/PGeo, but will provide growth and staffing opportunities for APEGBC. (Graham, 2002)

ASTTBC wants “right to practice” legislation that the government is not interested in granting. … Such a merger would significantly devalue the services provided by registered engineers and geoscientists. … The expansion of registration to include ASTTBC members is detrimental to APEGBC members. It is interesting to note that a merger, which would devalue the services provided by APEGBC members, is being considered when many members continue to battle to receive reasonable compensation for their services. (VanBuskirk, 2002)

The aforementioned idea of a merger between ASTTBC and APEGBC has now been abandoned; however, a review of the process still offers a unique opportunity to evaluate the relationship between engineers and technologists. Between 2000 and 2005 the councils of both ASTTBC and APEGBC discussed at great length both with each other and their respective memberships the perception of commonality and distinction between engineers and technologists. Council members of APEGBC broadly promoted the merger as a better reflection of the reality of current employment. Anne Garrett, then Executive Director of APEGBC noted in the association’s magazine, Innovation,
While change is scary to a lot of people, I think there is an opportunity with the merger to actually build an Association that embraces inclusivity of membership as well as recognition of our differences. We’re going to be a much broader organization with a broader set of skills. In that kind of organization, it’s important that we consider each member an equal but at the same time recognize our differences and ensure that we speak together with a more powerful voice. [I believe] that the broader mix of skill sets will be more in line with how industry actually works and an association that reflects industry puts it in touch with what’s going on out there in the real world, as opposed to being a kind of exclusive club (Rogers, 2003)

Bill Gilmartin, then President of APEGBC, bolsters the argument that current legislation does not properly mirror the perception of industry by noting that “the desire was to replace a much-revised, 80-year-old Act with one that would reflect the realities of the present” and that APEGBC “must work to instill a spirit of inclusiveness in [their] relations with ASTTBC” (Gilmartin, 2003, p. 12). However, this viewpoint of APEGBC’s council drew criticism from some members of the engineering community.

The most recent Viewpoint continues to trumpet that professional engineering and geoscience practice converges with work of technologists and technicians. This is true; technologists and technicians play a supportive role in the work of engineers and geoscientists. What is not true is that professional engineers and geoscientists must be regulated in one “integrated” legislative Act that includes technicians and technologists! (Hauptmann, 2004; emphases Hauptmann)

A 2002 APEGBC member survey revealed that more than 1800 respondents shared the perception of being “similar but distinct” when it came to a comparison between engineers and technologists. The survey questions were
• All members of the “Engineering and Geoscience Team” should be required to meet the appropriate standards of responsibility and accountability for their position on the ‘Team’ and practice under a uniform code of conducts and ethics.

• Due to the relationship between the work of engineers, geoscientists, technologists and technicians, it is appropriate to regulate the work of these individuals in differing grades of membership under one Act and through one professional body.

• Based on the research and evaluation of the proposed alliance undertaken to date by the Councils and Senior Staff of APEGBC and ASTTBC, the two organizations should proceed to merge under a One Act/One Organization model.

The responses to these questions are summarized in Figure 5.8.

While almost four out five respondents agree that the “Engineering and Geoscience Team” should practice under a uniform code of conducts and ethics (Figure 5.8, left set), the support wanes once the inclusion of both groups under one legislative Act is proposed (Figure 5.8, middle set), and barely produces a majority for the proposed merger between both associations (Figure 5.8, right set).17

17 A suspicion repeatedly expressed by the membership of APEGBC was that while the proposed amalgamation between the two associations was not beneficial to the engineers at large, it was all but a self-preserving move by APEGBC to increase its revenue base.
Figure 5.8. Responses to a survey among Professional Engineers and Geoscientists with respect to merging the operations of engineers and technologists in British Columbia.

Note: Data aggregated from member survey results published by the Association of Professional Engineers and Geoscientists of British Columbia (2002).

Engineering Technology as a Foundation

Currently the Canadian Engineering Accreditation Board (CEAB) accredits only engineering programs that include two semesters of mathematics and science as their first year. Many practicing engineers and even Deans of university engineering faculties to whom I have spoken question the validity of this approach. Not only does this approach confront high school graduates immediately with a highly academic environment, but the purely theoretical context of Year 1 may deter students that would have been successful in the program. The only exceptions to CEAB’s policy are two bridge programs that
allow engineering technology graduates access to Year 3 of an engineering program. One of these Engineering Bridges is located at Lakehead University in Thunder Bay, Ontario, the other at Camosun College in Victoria, British Columbia. In Chapter 4 I introduced the Engineering Bridge program at Camosun College within the context of an evolving college system, i.e. from the perspective of increasing access to post-secondary education. Here I look at the outcome, i.e. the quality of engineering students and engineers who entered engineering through a bridge program and after obtaining a diploma in engineering technology.

Table 5.2

Upper division performance of graduates of the Camosun College Engineering Bridge in Computer, Electronic and Mechanical Engineering, respectively, at the University of Victoria as of December 31, 2006, grouped by cohort

<table>
<thead>
<tr>
<th>Cohort &gt;&gt;</th>
<th>2000(^a)</th>
<th>2001(^a)</th>
<th>2002(^a)</th>
<th>2003(^a)</th>
<th>2004(^a)</th>
<th>2005(^b)</th>
<th>2006(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Grade Point Average</td>
<td>8.05</td>
<td>8.67</td>
<td>8.31</td>
<td>8.49</td>
<td>8.67</td>
<td>8.11</td>
<td>8.83</td>
</tr>
<tr>
<td>Avg. Grade Point Average</td>
<td>6.11</td>
<td>6.41</td>
<td>6.09</td>
<td>6.10</td>
<td>6.56</td>
<td>5.79</td>
<td>5.01</td>
</tr>
<tr>
<td>Min. Grade Point Average</td>
<td>4.38</td>
<td>4.32</td>
<td>2.93</td>
<td>4.45</td>
<td>3.41</td>
<td>3.36</td>
<td>2.67</td>
</tr>
<tr>
<td>Avg. Years to complete</td>
<td>2.96</td>
<td>2.96</td>
<td>2.73</td>
<td>2.61</td>
<td>2.47</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note. Data collected by University of Victoria Faculty of Engineering. Used with permission. On the 9-step University of Victoria grading scale, 6 constitutes a B+, 7 an A- etc.

\(^a\) Graduating Grade Point Average (GGPA) for graduated members of the cohort

\(^b\) Cumulative Grade Point Average (GPA). Members of the cohort had not yet graduated.
In general, engineering students who access upper division courses after graduating from a bridging program do very well. Table 5.2 shows the Grade Point Averages (GPA) of seven cohorts of Camosun College engineering bridge graduates at the University of Victoria in three engineering disciplines between 2000 and 2006.

Figure 5.9. Responses of Professional Engineers when asked to comment on the statement that “the best engineers are those who entered engineering through the engineering technology route”.

48% of Professional Engineers surveyed considered the best engineers to be those who had started out with an engineering technology program or could see an advantage in a more practical approach (Figure 5.9), 35% felt that the current model of engineering
education was superior, and 18% regarded both routes as equal. With a membership split into large camps, it might be beneficial to engage in a broad and on-going discussion about offering more and varied routes to engineering in Canada as currently happens in the United States. Bourdieu warns that "habitus is ... at the basis of strategies of reproduction that tend to maintain separations, distances and relations of ordering" (Bourdieu, 1989, p. 3). If it is indeed habitus that keeps the engineering profession from evolving, it may find itself too entrenched to face other challenges such as globalization.

Comments from Deans of engineering programs indicate that many find the current engineering program accreditation scheme to be too inflexible and "governed by an old boys club that's more interested in keeping their seats than in what's good for the profession and the economy" (Administrator, British Columbia Institute of Technology, personal communication, 2007). Bourdieu claims that this is an expression of habitus:

Agents who, being both discernible and endowed with the ability to discern, perform the innumerable operations of ordination through which the social order is continuously reproduced and transformed. But neither are they beings who are fully conscious of what they are doing. The discernment at the basis of both classificatory acts and their products – that is, of practices, discourses, or works that are different and thus discernible and classifiable – is not the intellectual act of a consciousness explicitly positing its ends in a deliberate choice among a set of possible alternatives constituted as such by a projects. Rather, it is the practical operation of habitus, that is, generative schemata of classifications and classifiable practices that function in practice without acceding to explicit representation ...

(Bourdieu, 1989, p. 2).

When asked about the future of engineering technology education in Canada, respondents preferred different models (Figure 5.10) but were virtually unanimous in
their opinion that engineering technology should not become an exclusive university discipline. Nevertheless, almost 60% of the respondents saw value in a degree option. This is reminiscent of the situation in the United States where the first four-year engineering technology program was accredited in 1967, twenty years after the first engineering technology program (see Chapter 2).

Figure 5.10. Responses by Professional Engineers when asked what they considered the most beneficial model for engineering technology education in Canada.

Note. Data aggregated from Roemer (2007c).

Limited Social Imaginaries

Summarizing the technologists' struggle for distinction and recognition it seems that they are challenged by a limitation in their own social imaginaries. As I mentioned
earlier in this chapter, they attempt to "...accede to a form of intellectual glory that remains inferior from the point of view of the very criteria they recognize" (Bourdieu, 1989, p. 50). That is, while they strive for distinction, AScTs readily copy trademarks of the engineering profession such as wearing an imitation of the engineers' iron ring. Many do not display the designation's acronym, AScT, on business cards, forgetting that "the magic of the assignment of distinctive names or titles only works if those they distinguish accept the exceptional obligations they imply" (Bourdieu, 1989, p. 104). In other words, engineering technologists will need to build their own set of "exceptional obligations", i.e. distinguishing skills, rather than trying to live up to the engineers' standards.

Engineers themselves are no strangers to the struggle for recognition and worked over centuries to set themselves apart from scientists - while retaining recognition and status. Through rigid and arguably self-serving rules of classification engineers attempt to preserve the status quo.

One feels compelled to paraphrase (and reverse) Owen Lattimore's assertion, that the Great Wall was built as much to keep the Chinese in as to keep the barbarians out (McColl in Hsieh, 2004, p. 397): it seems that the associations were created as much to keep the engineers in (organized) as to keep the neighbours out.

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18 Pierre Bourdieu, in spite of his often scathing opposition to consecrating and consecrated groups acknowledges in his book The State Nobility the existence of a perception of "...applied, and hence inferior, science" (p. 3).
4. Summary

In this chapter I reviewed the identity and recognition of Applied Science Technologists in the Market Domain. I showed that the skill sets of engineering technologist are generally understood and accepted, and that the occupational category fills the Skill Set Void I introduced in Figure 2.2. This translates into employer satisfaction and the intent to hire. Conversely, many Applied Science Technologists state that their skills exceed the amount of recognition afforded by employers and in particular engineers. Another common concern among AScTs is that employers do not respect the distinct skill set provided by the occupational category, or its organization in industry.

Examining the relationship between engineering technologists and engineers I found two predominant trends in the engineering community. On one hand, a large percentage of engineers seem to welcome technologists as quasi-peers, and promote collaboration and team spirit; on the other I found indications for elitism and consecration. Caught in the middle, engineering associations promote commonality in history and focus, while trying to preserve the distinct status of Professional Engineers.

In Chapter 3 I postulated that “success is not synonymous to a group within a particular domain achieving the demanded change, but the change must also be recognized and endorsed by other groups in the domain and even by other domains” (p. 64). In Chapter 6 I explore the identity of Applied Science Technologists in the Public Domain in order to determine whether the occupational category is recognized outside its occupational field, i.e. if it has developed status and prestige within British Columbia society.
CHAPTER 6. THE PUBLIC DOMAIN – ENGINEERING TECHNOLOGY IN SOCIETY

1. Introduction

In Chapter 3 I defined the Public Domain as the domain that shapes the interactions of agents of the occupational category with society through both the public and private spheres. The success of a new occupational category will ultimately depend on its acceptance in the Public Domain because agents of this domain will constitute students in the Formative Domain and practitioners in the Market Domain. In other words, a well-conceived occupational category may be unsuccessful either because it holds no appeal or it is not discernible for agents of the Public Domain.\(^{19}\)

Taylor (2004) interprets the public sphere as a spectrum of social imaginaries, that is, the co-existence of different systems of values, meanings and symbols in Canadian society, which are sometimes confined to a group and sometimes shared by society as a whole. Identity and recognition, and as a result the prestige and stratum, accorded to Applied Science Technologist may thus differ depending on the social imaginary of the observing social group.

\(^{19}\) A current example for this is plastics manufacturing. In spite of producing a core product for many industries, promising career paths and financial incentives, plastics manufacturing has not been able to establish an image in the Public Domain. As a result, even large institutions like the British Columbia Institute of Technology abandoned the field and well-equipped expensive training facilities remain unused.
In this chapter I examine the issue of identity and recognition of the Applied Science Technologist in British Columbia society today. I question whether Applied Science Technologists (AScT) hold a distinct position in the social structure, if they appear in the social imaginary of society or some of its groups, and how they relate to other occupational categories.

2. Social Stratification

Technologists as a Social Group

If we accept Porter’s claim that “ranking of individuals or groups in an order of inferiority or superiority is a universal feature of social life” and that “the kind of social stratification that exists in any society will depend on many factors such as size, internal complexity, and historical development” (Porter, 1965, p. 7), we can ask whether AScTs constitute a stratum in Canadian society, whether they share a stratum with non-technical professions that are based on two-year college diplomas, or if they are at all distinctly positioned within the societal framework.

Before I enter into a discussion about Technologists as a class, I will examine whether AScTs form a social group. In Chapter 3 I introduced Durkheim’s (1983) claim that in an increasingly complex society individuals take on specialized roles and diverge in their social experiences, values, and beliefs. In this context social groups are not merely aggregates of people but the group members will exhibit some cohesiveness. Social groups differ from classes insofar as “in social groups the members have a sense of identity with one another, share common values and traditions, and have awareness of unity and common purpose” (Porter, 1965, p. 10). Durkheim (1983) referred to this social
bond represented by the shared ideas, values, norms and beliefs of the social group as collective conscience (see Chapter 3, p. 60). In other words, members of the group will have expectations and obligations with respect to membership in the group, and possess a group identity if they are aware of themselves as a group and as a discrete, discernable, and classifiable entity.

The occupational provincial and national engineering technology associations will unwittingly support this socio-philosophical concept of group identity because the establishment and representation of a community constitutes their major raison d'être. Their respective mission statements include the institution of common values and norms (professional standards and ethics), and common purpose, i.e. the recognition of their occupational category and its members. However, in order to truly form a social group, the members must readily adopt the mission, vision and values set out by the Executive of their corresponding association. In other words, not only do the members have to demonstrate awareness of common goals, but there must be a sufficient number of them sharing these values, they must display cohesion within the group, and, ideally, possess the desire to recruit new participants in order to maintain or expand the group.

In Canada, the behaviour of social groups is often easy to observe in conjunction with ethnic backgrounds. In public and social settings, immigrants often seek out their own, emphasize commonality, display loyalty and form bonds. They exchange stories about the difficulties of obtaining immigrant status, their economic situation in the adopted country, and how the latter compares to their country of birth. Personally, I have often been approached by individuals and groups of German origin, in both social settings and formal business meetings. A common opening statement, “Sind Sie auch
Deutscher?” (verbatim, “Are you a German, too?”) often represents more than a simple query with respect to ethnic roots. It immediately provides for a shared platform ("auch" - too) which, in return, infers solidarity. The use of the noun Deutscher rather than the adjective Deutsch, i.e. German, “of German origin”, or “with a German heritage” implicitly introduces value rather than merely associating the individual with a broad if not blurred geographic region. The reference to the individual ("being a German") bestows membership on the individual and narrows the focus from an ethnic cluster to an exclusive group. Similar patterns can be found in various ethnic groups (“Are you an American?”) and less in others (“Are you Canadian?”), but they are also apparent in professional circles.

Applied Science Technologists by virtue of their membership in provincial associations to which they can only accede through certification and registration certainly constitute a discernable entity. From this standpoint I have attempted to find indicators of group awareness, that is, to locate signs of group behaviour distinctive to the members of these technology associations.

In conjunction with Porter's (1965) definition I began by searching for members' knowledge of commonality, history and tradition of their occupational category of engineering technologist. When surveyed about the history and background of their occupation in Canada (Roemer, 2007d), AScTs display a somewhat fragmented knowledge. Seventy-six percent of survey respondents felt that they knew how their profession was organized in British Columbia. Although this represents three of four respondents, one must remember that this survey was conducted only among registered members of the provincial technologist association, ASTTBC. In other words, despite
being part of the organization, one in four AScTs is not aware of the organizational structure of the occupation. Only 46% of AScTs responded that they knew why the designation was created, i.e. the history of engineering technology in Canada. For comparison, 39% of professional engineers claimed to have the same knowledge. In other words, engineers showed almost the same knowledge (or lack thereof) of engineering technology as the technologists themselves. Only 13% of AScTs had knowledge about how engineering technologists are organized with Canada's largest trading partner, i.e. how their designation would map to similar occupational categories and classifications in the United States.

*Figure 6.1. Responses by Applied Science Technologists when asked about history, background and organization of their designation and occupational category.*

Note. Data aggregated from Roemer (2007d).
In order to detect peer affinity I posed the question if AScTs would actively seek out other technologists in social settings. For this I drew the scenario of a hypothetical gathering at which the host points out other technologists or engineers to a newly arrived AScT or engineer, respectively. Table 6.1 shows that one in three AScTs stated an affinity to other members of the occupational category that would compel them to actively engage strangers in a conversation. Only one in ten technologists displayed no interest in meeting peers. In comparison, the number of engineers stating no desire to meet fellow engineers was two and a half times as high.

Table 6.1

*Responses by various survey groups when asked the question “As you enter the house and exchange a few words with the host, he tells you that ‘the people standing over there are [technologists/engineers] as well’. How do you react?”*

<table>
<thead>
<tr>
<th></th>
<th>Applied Science Technologists</th>
<th>Professional Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would be interested enough to actively engage the group</td>
<td>32%</td>
<td>17%</td>
</tr>
<tr>
<td>Would be interested to discuss technical matter but would not actively engage the group</td>
<td>56%</td>
<td>55%</td>
</tr>
<tr>
<td>Not interested</td>
<td>11%</td>
<td>27%</td>
</tr>
</tbody>
</table>

Note. Data aggregated from Roemer (2007c, 2007d)

At this point I changed the scenario presented by the survey questions (see captions to Tables 6.1 and 6.2 for the different situations that frame the survey questions).
In Table 6.1 the identity of other technologists was previously confirmed by the host while Table 6.2 only assumes a suspicion that the conversational partner may be a member of the same occupational category.

Table 6.2

Responses by various survey groups when asked the question “In a social setting you engage in a conversation with another guest and you realize that he/she is a practitioner in the same field as yours. You talk about some theoretical models which are related to your field and that you encountered during your studies. You suspect that he/she must have gone to college or university as well. Which question will you most likely ask?”

<table>
<thead>
<tr>
<th>Question</th>
<th>Applied Science Technologists</th>
<th>Professional Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you [a technologist/an engineer]^a?</td>
<td>5%</td>
<td>27%</td>
</tr>
<tr>
<td>Are you [a technologist/an engineer]^a, too?</td>
<td>9%</td>
<td>14%</td>
</tr>
<tr>
<td>Are you [an engineer/a technologist]^b?</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>Do you have a degree?</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Do you have a diploma?</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Are you certified?</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>What designation do you hold?</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td>Where did you go to school?</td>
<td>56%</td>
<td>53%</td>
</tr>
</tbody>
</table>

Note. Data aggregated from Roemer (2007a, 2007b, 2007c, 2007d)

^a I.e., a member of one’s own occupational category.

^b I.e., not a member of one’s own occupational category.
Table 6.2 shows that engineers who responded to the survey were three times more likely than technologists to locate members of their profession by trying to establish commonality. Over 40% of engineers would use “Are you an engineer (too)?” as an opening statement while only 14% of Applied Science Technologist would use the equivalent “Are you a technologist (too)?”. In fact, more technologists would inquire whether the conversational partner is an engineer rather than a member of their own occupational category.

These results seem to indicate that although Applied Science Technologists are keen to talk about their technical occupation, they are however reluctant to presume common knowledge about their occupational category, its designation and organization. Possible explanations for this behaviour could be (a) a lack of pride for one’s own designation, or (b) a concern over forcing the other party into admitting that he or she is ignorant of the occupational category of engineering technologist (and thus a deviation into a more pervasive occupational category would avoid a potentially awkward situation). Option (a) is supported by a survey among technology practitioners (Roemer, 2007d) which indicates a low desire to advertise one’s own AScT designation (see Chapter 5, Figure 5.4), while option (b), i.e. the deficient knowledge of the occupational category on part of the public, is identified as a concern among technologists (Table 6.3) and further corroborated by Figure 6.3 in this chapter.

While there is some indication here, albeit weak, of group behaviour, the social imaginaries of Applied Science Technologists diverge. The survey question responses among AScTs, as reported above, (Roemer, 2007d) were supplemented by an opportunity for a voluntary open-form commentary. Survey participants were asked to comment
freely on anything that might come to mind. Although no coaching or guidance was
given, the 210 commentaries that were offered by respondents showed recurring themes.
A majority concentrated on deficiencies of the technologist occupational category and
how things ought to be. Most respondents limited their comments to only one of these
issues, i.e. identified their "pet peeve".

Figure 6.2. Responses by Applied Science Technologists and Professional Engineers
when asked about their job satisfaction.

Note. Data aggregated from Roemer (2007c, 2007d)
Table 6.3

*Frequency of response categories by Applied Science Technologists when given the opportunity to provide unstructured, unguided comments, grouped and sorted by prevalence*

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Bias</th>
<th>Predominant Sentiments</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>Negative</td>
<td>Lack of recognition of the occupational category in the Market Domain</td>
<td>18%</td>
</tr>
<tr>
<td>Registration and Certification</td>
<td>Negative</td>
<td>Designation and certification have not provided benefits. The association is not providing satisfactory services or representation.</td>
<td>13%</td>
</tr>
<tr>
<td>Degree</td>
<td>Neutral / Negative</td>
<td>Obtained a degree on top of my AScT designation. Degree greatly improves career opportunities. Bridging into degrees should be facilitated.</td>
<td>13%</td>
</tr>
<tr>
<td>Recognition</td>
<td>Negative</td>
<td>Lack of identity of the occupational category in the Public Domain</td>
<td>9%</td>
</tr>
<tr>
<td>Recognition</td>
<td>Neutral / Negative</td>
<td>Applied Technologists have a distinct skill set. They are neither technicians nor engineers. This is often not recognized by other agents of the Market Domain.</td>
<td>9%</td>
</tr>
<tr>
<td>Outlook</td>
<td>Positive</td>
<td>Satisfaction with the career choice. Situation is improving</td>
<td>8%</td>
</tr>
<tr>
<td>Registration and Certification</td>
<td>Positive</td>
<td>Designation and certification have provided benefits. The association is providing satisfactory services or representation.</td>
<td>6%</td>
</tr>
<tr>
<td>Outlook</td>
<td>Positive</td>
<td>Working as a team. The situation is improving</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>Neutral</td>
<td>Comments on the survey. Personal backgrounds. Other comments.</td>
<td>20%</td>
</tr>
</tbody>
</table>

Note. Data aggregated from Roemer (2007d).
Although Table 6.3 shows a significant commonality with respect to general dissatisfaction with the status quo, the social imaginaries among AScTs diverge significantly in regard to the reasons given for dissatisfaction. In other words, individuals have differing viewpoints on what ails the occupational category, who may be to blame, and how improvements should come about.

The most commonly cited issues for discontent among AScTs were:

- Lack of recognition with respect to a distinctive skill set, its value and function in industry.
- Lack of professional status for the occupational category.
- Lack of respect and arrogance on the part of professional engineers.
- Credentialism in industry, i.e. the need to obtain a degree (of any kind) to advance one’s career.
- General unawareness of the occupational category on part of the public.
- Dissatisfaction with performance and service provided by ASTTBC.

Nevertheless, overall job satisfaction is very high. 91% of all respondents stated content with their chosen field which is virtually the same number for engineers (Figure 6.2).

*Technologists as a Class*

Above I have presented evidence that Technologists may be considered members of a social group albeit one without strong cohesion and with a diversity of social imaginaries. Extending this discussion into the realm of social classes will first require a definition of the term class as I will use it here. To form a class in the Marxist sense would necessitate that Technologists “become conscious of class identity and class
interest” (Porter, 1965, p18). Dahrendorf (1973) built on this Marxist paradigm to define classes as conflict groups (with property as the focus of contention), and strata as statistical groups.

However, the introduction of new occupational categories blurs the boundaries of power, income potential and, subsequently, personal property. Whether or not college graduates actually form a distinct class, they certainly represent a new layer of post-secondary education which was not readily available at the time of the writing of Paul Porter’s *Vertical Mosaic*, i.e. before the 1970s. The new occupational categories effectively bridge between blue-collar labour and degree-based professions and lower the gap between them. Consequently, it is harder to find class perception, let alone class envy. To paraphrase Porter, class can only become real for technologists if they experience it. Porter himself expanded the definition of Dahrendorf’s stratum by postulating that

>The construction of class categories is simply a process of classification by which units which are similar in some respect are grouped together for the purpose of description and analysis (that is, they are statistical creations). The respect in which people are similar for the analysis of social class is their similar location in one of the social strata. (Porter, 1965, p. 9)

In many of their societal analyses such as the quintannual *National Census* (*Statistics Canada*, 2001) or continuous *Labour Market Surveys* (*Statistics Canada* 2007b), Statistics Canada uses only one occupational code for technicians and technologists, effectively equating the two occupational categories, at least for the purposes of statistical analysis.
Objective measures such as income, personal property, or holding positions of responsibility and power can be used to construct and distinguish social strata. Ginsberg contends that “the primary determinants of social stratification in modern communities are unquestionably economic” (Morris Ginsberg in Porter, 1965, p. 10), however, statistical evaluations of the economic status of technologists in Canada today show that their earning potentials occupy a wide range (Canadian Council of Technicians and Technologists & Engineers Canada, 2007; Statistics Canada, 2007a) and can match or exceed those of university graduates (Walters, 2003), so that no clear stratum boundary can be established.

More subjective methods can be used to try to determine the prestige of individual strata within public opinion. If we accept Porter’s claim that the public tends to link prestige to the “…degree of specialized training required and the amount of responsibility involved” (p. 15) then we may have found a potential base for the social prestige of technologists because virtually all of the education of AScTs is specialized and most of their positions in industry and the public sector are well defined. However, a problem arises if the general public is unaware of an occupational category like that of Technologist and doesn’t know the educational pathways or skill sets required of its members. Figure 6.3 shows the results of a survey among members of the general public with respect to their knowledge of the designation of Applied Science Technologist or Certified Engineering Technologist. These members of the public were selected by utilizing “seed” contacts from eight key occupational categories with the request to promote the survey among their friends and relatives. Sixty-five percent of respondents had not heard about the designations or did not know any specifics about them. This
number increased to almost 80% when respondents who stated science, engineering and technology as their primary area of expertise were omitted. Only 15% of all respondents felt comfortable to explain the difference between Certified Technicians (C.Tech) and Applied Science Technologists (AScT). For another two-year science and technology college credential, the Associate of Science degree, the percentage of respondents who had not heard about this credential was 96%.

Figure 6.3. Responses by members of the general public when asked about their familiarity with the designation of Applied Science Technologist (AScT) a.k.a. Certified Engineering Technologist (CET).

Note. Data aggregated from Roemer (2007e).

This is not to say that the general public dismisses the value of two-year college credentials. However, credentialism and prestige associated with academic degrees tend
to split the public opinion on how college credentials compare with respect to university degrees, as illustrated by Figure 6.4. On the other hand, the lack of recognition might be limited to the designation itself. That is, the public might be well aware of occupations that can be associated with technologists, without pooling them into a distinctive occupational category or demarcating them through a professional designation. In this case, the occupational category would become a more important class criterion than the level of education or the professional title itself.

Figure 6.4. Responses by members of the general public when asked about the value of two-year college credentials.

Note. Data aggregated from Roemer (2007e).
Furthermore, Porter (1965) states that “social class rests on the prestige derived from occupational roles [and] the prestige in turn comes from the evaluations which members of the society make about the importance of the roles for society’s survival” (p. 18). This seems plausible because citizens of technologically advanced societies may frequently encounter the services of technologists and engineers in the public sector, because they ensure health and safety, inspect structures and roadways, and enable the operation and safety of utilities such as gas, telecommunications and electricity. Yet, many of these services remain all but invisible – at least as long as they function satisfactorily. Ensuring the reliability of the freshwater supply, the integrity of the radio frequency spectrum and the privacy of personal phone calls are tasks that occur mainly in the background. The complex organizational structure that allows such services, and ultimately society, to function does not usually reveal itself. It often takes extreme situations for the service providers to enter the public’s view. During the height of British Columbia’s catastrophic wildfire season of 2003 various technologists, engineers and other professionals came to the fore and eclipsed elected officials in news media reports. For a while it seemed that the public was not interested in political rhetoric anymore but wanted to hear direct and unedited reports from practitioners who were dealing with the fire at the front line. Press conferences and media events featuring hands-on specialists were common and avidly watched. As the situation normalized, the experts faded into the background and the spotlight returned to municipal and provincial policy-makers. The practitioners didn’t seem to mind, in fact, most engineers and technologists appeared to give little importance to public exposure and prestige. Porter (1965) found that

When asked about the satisfactions which they have derived from being in powerful positions, men will most frequently respond in terms of the
achievements which have been possible for them. They feel they have been “useful”, or “have left something behind” or have “got something done”. They seem to attach little importance to prestige – after all many of them remain anonymous – and even less to high monetary rewards, although they will admit to liking money. The rewards lie in the right to control the resources and facilities of the society, and the receipt of deference from those without power, rather than in the enjoyment of prestige. (p. 17)

However, “attaching little importance to prestige” may have different roots. On one hand, it may originate in low esteem for one’s own profession, that is, agents may relegate themselves to a low stratum. If exhibited in public, this mindset and corresponding behaviour could incur a self-fulfilling prophecy because it is unlikely to impress others as to the value or worth of the occupation. It seems to me that this pessimistic social imaginary would have to be acquired over a prolonged period of time as few people would enter a program of study despite a clear aversion for the field. 20

Credential creep in the Public, Market and Formative Domains usually exposes high school students to career counsellors who are familiar only with the academic post-secondary environment of their own fields, or college students to engineering technology instructional faculty with engineering degrees. As the composition of teaching and counselling staff shifts away from technologists and other career practitioners, the social

20 A notable exception might be Walters’ (2003) notion of “degree recycling”, i.e. the enrolment of degree holders into college diploma programs because the latter often better chances for employment than their (usually) baccalaureate degree.
imaginaries with which students interact or experience early on will be those of degree-holders. This exposure of technology students to members of what Bourdieu (1989) calls the “state nobility” rather than agents of their future occupational category is different from the situation in the trades where instructors are almost exclusively long-time practitioners (masters) within the same occupation. Of course, this is not meant to infer malevolence on part of engineers or counsellors, but it may nonetheless have a significant effect on the self-esteem of the aspiring technologist. Bridging programs to engineering degrees serve here as a good example: often presented as highly desirable they remain elusive to all but the brightest technology students. Thus, implicitly, technology students may be

induced to adopt a depreciatory image of themselves. They have internalized a picture of their own inferiority, so that even when some of the objective obstacles to their advancement fall away, they will be incapable of taking advantage of the new opportunities. (Taylor, 1994, p. 26)

and “their own self-deprecation, on this view, becomes one of the most potent instruments of their own oppression” (Taylor, 1994, p. 25). We must not forget in this context that technology students are merely technologists in the making; their identities

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21 As of fall 2008 Okanagan College’s Engineering Technologies instructional faculty of 24 included only three AScTs, two of whom were slated for retirement within two years. At times, AScTs are hired on a part-time basis but ironically this may aggravate the detrimental effect as it might suggest that technologists are only eligible for supplemental positions where no alternatives exist.
have yet to be forged and they have yet to experience the reassuring effects of an appreciative job market. Or, as Taylor (1994) put it

my discovering my own identity doesn’t mean that I work it out in isolation, but that I negotiate it through dialogue, partly overt, partly internal, with others. That is why the development of an ideal of inwardly generated identity gives a new importance to recognition. My own identity crucially depends on my dialogical relations with others. (p. 34)

Ideally, discourse during an engineering technology program would expose students to the imaginaries of both engineering and engineering technology practitioners, in order to avoid the limitations of what Taylor (1994) calls social embeddedness: “From the standpoint of the individual’s sense of self, it means the inability to imagine oneself outside a certain matrix” (p. 55). It is “both a matter of identity – the contextual limits to the imagination of the self – and of the social imaginary: the ways we are able to think or imagine the whole of society” (p. 62). Unfortunately, at the time of this writing the engineering technology curriculum in British Columbia did generally not include lectures or seminars dedicated to the history, identity, status or social imaginary of technologists. In fact, even professional ethics did not have a place in the standard curriculum but were covered en passant. Hence, sociological aspects of the identity of technologists in the Public Domain can only be conveyed within the program of technical courses – a practice which relies heavily on the background and qualifications of the instructor. If it is skewed, it may lead to false perceptions on part of the graduands. In this case, members of the stratum are likely to hold most other professions in a higher regard.

On the other hand, attaching little prestige to one’s own occupational category could be indicative of Porter’s notion of a general satisfaction with one’s rank and
stratum while being conscious of personal achievement and position. This attitude would be expressed by ranking a cross-section of other professions as at least equal or even inferior. While Figure 6.2 points to the high level of job satisfaction among AScTs, Figure 6.5, below, illustrates their own perception of their occupational category in relation to others.

**Figure 6.5.** Responses by technology practitioners with respect to how they would rank their own occupational category of Applied Science Technologist in relation to others.

Note. Data aggregated from Roemer (2007e).
By and large, the data in Figure 6.5, drawn from surveyed technologists, showed consistency with respect to social prestige, that is, most occupations offered for ranking incurred a clear concentration of votes in one or two ranking categories. As a general trend, AScTs seem to rank themselves above occupations that are perceived as requiring little or no formal education (e.g. realtor, TV reporter, home inspector), and below occupational categories that are clearly identified as degree disciplines (e.g. lawyer, veterinarian, medical doctor) or that are perceived as carrying large responsibilities (e.g. airline pilot, engineer). They most commonly see themselves as equal to other practitioners such as nurses, computer programmers or conservation officers.

This returns the focus back on the question of whether technologists form a class. I contend that the exposure and distinction of technologists in the Public Domain is not sufficient to constitute a class, however, in conjunction with other diploma practitioners such as nurse practitioners (vs. baccalaureates in nursing, BSNs), graduates from two-year business administration programs (vs. baccalaureates in business administration, BBAs) and Human Service Workers (vs. baccalaureates in Social Work, BSWs), they have moved beyond the predominately hands-on culture of tradespersons and technicians without obtaining academic degrees. “Neither fish nor fowl” they hold a new class of credential that fulfils interpretive and coordinating duties in diverse societal environments and fields of the economy. As such they break through entrenched habitus, spawn new social imaginaries and force discourse within society. Last but not least they also offer a distinct entry point for the credentialing of foreign professionals – which should form a key topic of discussion for any immigration country.
The Roles of Occupational Associations in the Public Domain

The roles of occupational associations in the Public Domain are diverse. They may include but are not limited to registration and other member services, practitioner certification, maintenance and control of technical and ethical standards, political lobbying as well as promotion and representation of the occupational category in the Public, Market and Formative Domains. The tenor of the association’s representation in the public sphere will have an effect on the perception of the occupation within society. As tradespersons, technicians, technologists and engineers all are directly involved with technology, their occupational categories are inarguably related and their respective social imaginaries correlate, although distinct differences remain. The greatest similarities can be found when it comes to workmanship, standards and quality control. Each occupational category displays pride in their discipline, adheres to excellence in the workplace and the protection of the public. These sentiments are expressed in mission and value statements of their respective professional associations. The following are sample mission statements from a number of occupational associations that operate within the technical knowledge spectrum I introduced in Chapter 2.

Roofing Contractors Association of British Columbia: RCABC is an association of professional roofing contractors, manufacturers and suppliers who are dedicated to the promotion and protection of the public’s interests in everything that relates to roofing. (Roofing Contractors Association of British Columbia, 2007, Centre Frame, ¶ 2)

British Columbia Sheet Metal Association: [The purpose of the association is] to establish and maintain high ethical standards of conduct between members of the Association, and between members and owners, architects, engineers, other
contractors, and the public [and] to study and help in the development and enforcement of governmental codes and regulations, and such legislation as may be necessary for the best interest of the public and the sheet metal industry. 

(British Columbia Sheet Metal Association, 2007, Purpose of the SMACNA-BC, ¶ 3f)


Association of Professional Engineers and Geoscientists of British Columbia: BC’s Professional Engineers and Professional Geoscientists enhance and protect the quality of life and are recognized and respected by Industry, Government and the Public. (Association of Professional Engineers and Geoscientists of British Columbia, 2003, p. 2)

Beyond the immediately work-related statements, the mission statements of tradespeople/technicians and engineers show a divergence. Tradespeople/technicians more often refer to the viability of their respective industries, efficiency and profitability, as well as the economic safety of their members.

British Columbia Sheet Metal Association: [The purpose of the association is] improve the financial stability and business conditions of the sheet metal industry, and to develop and promote methods to improve managerial proficiency (¶ 1) [and] to promote harmony in labour relations (¶ 6). (British Columbia Sheet Metal Association, 2007, Purpose of the SMACNA-BC)
Canadian Home Builders' Association of British Columbia: The Canadian Home Builders' Association of British Columbia is the voice of the residential construction industry in B.C. The association is dedicated to fostering a housing environment in which the industry operates effectively and professionally while maintaining affordability and profitability. CHBA BC is also dedicated to solving the critical skills shortage in the residential building industry through its Strategic Skills Plan. (Canadian Home Builders’ Association of British Columbia, 2007, ¶1)

Automotive Industries Association of Canada: AIA’s mandate is to promote, educate and represent members in all areas that impact the growth and prosperity of the industry. (Automotive Industries Association of Canada, 2007, ¶3)

Mechanical Contractors Association of British Columbia: ... Today as always, MCABC is here to make sure mechanical contractors and sector suppliers alike are able to provide the best possible products and services they can, to maintain and enhance their reputation for honesty, reliability and quality workmanship, to stay at the leading edge of consumer protection, and above all, to grow and prosper. (Mechanical Contractors Association of British Columbia, 2007, Centre Frame)

In contrast, professional engineering associations not only define and defend what constitutes a Professional Engineer, but also promote the image of an intellectually advanced member of society that takes on grander, i.e. somewhat more abstract and philosophical, goals. Mission and vision statements go beyond the economic well-being of the individual engineer, and also include phrases such as ‘ingenuity’ in a ‘global context’, and refer to the ‘evolution’ of the nation as a whole:

Canadian Council of Professional Engineers: Canadian engineers provide leadership to advance the quality of life through the creative, responsible and
progressive application of engineering principles in the global context. CCPE is the national body of professional engineers who enable the evolution of Canada’s future. (Canadian Council of Professional Engineers, 2006, p. 2)

APEGBC: BC’s Professional Engineers and Professional Geoscientists enhance and protect the quality of life and are recognized and respected by Industry, Government and the Public. [Our mission is to] advance and support a professional membership dedicated to protecting the public and the environment, and creating economic value through innovation and ingenuity. (Association of Professional Engineers and Geoscientists of British Columbia, 2003, p. 2)

Jarvis (1998) notes that, “the research community defines the epistemologies of research and also controls its image” (p.7). The same is true for the engineering community, as it actively points out its “…immense relevance for the people” (Professional Engineers of Ontario, 1998, Appendix I, Preamble) and explicitly reflects on “…the social impact of engineering” (De Rego, Zoltowski, Jamieson and Oakes, 2005) within university curricula. It is important to note in this context that engineers do not draw comparisons or diminish the relevancy of other occupational categories; instead their social imaginary seems to more readily promote their own standing as a leading occupation in Canadian society.

Conversely, tradespeople are represented by their guilds, the national Sector Councils and various occupational organizations. While the image of the researcher may be defined by the research community itself, “the [current] image of apprenticeship was defined by the epistemology of modernity”. That is, “theory defined practice and was important because it emerged as a result of research that was scientific and therefore
right. The theoretician was the legitimator of the correct knowledge and had a much higher status than the practitioner, who merely applied it" (Jarvis, 1998, p.13).

Technologists introduce a hybrid philosophy. As practitioners they share curriculum and hence skill sets with both technicians and engineers. Professional associations are tasked with defining this hybrid state through concise and appropriate mission and vision statements. This is further impeded if the association represents both technicians and technologists, as it will now need to define an occupational spectrum rather than a discreet occupational category.

**CCTT:** Canada is a world leader in the application of new technology, and technicians and technologists are key elements in Canada's success. Keeping Canada at the top is the business of the Canadian Council of Technicians and Technologists (CCTT), and we do this by ensuring that our technicians and technologists maintain high standards of excellence. (*Canadian Council of Technicians and Technologists, 2006d*)

It will be difficult for the general public to recognize and potentially accept a hybrid philosophy. In order for Applied Science Technologists to receive recognition for their credential (and subsequently their expert opinion) in the Public Domain, the credential must be discernable from related occupations. Table 3.4 shows the comfort level among members of the general public with respect to distinguishing related (or seemingly related) occupations and credentials.
Table 6.4

Responses by members of the general public when asked the question, “If you were asked to explain the difference between the two occupational categories or credentials in each of the following pairs, which statement would best describe your comfort level?”, supplemented by a calculated score (see Note below for details on score calculation)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Very Low $^a$</th>
<th>Low $^b$</th>
<th>Medium $^c$</th>
<th>High $^d$</th>
<th>Score $^e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD vs. MD</td>
<td>4%</td>
<td>16%</td>
<td>20%</td>
<td>60%</td>
<td>2.36</td>
</tr>
<tr>
<td>Bachelor’s degree vs. Master’s degree</td>
<td>5%</td>
<td>22%</td>
<td>23%</td>
<td>49%</td>
<td>2.15</td>
</tr>
<tr>
<td>Scientist vs. Engineer</td>
<td>5%</td>
<td>18%</td>
<td>38%</td>
<td>39%</td>
<td>2.11</td>
</tr>
<tr>
<td>Licensed Practical Nurse (LPN) vs. Registered Nurse (RN)</td>
<td>4%</td>
<td>25%</td>
<td>27%</td>
<td>43%</td>
<td>2.08</td>
</tr>
<tr>
<td>Psychiatrist vs. Psychologist</td>
<td>14%</td>
<td>17%</td>
<td>34%</td>
<td>36%</td>
<td>1.93</td>
</tr>
<tr>
<td>Certified Financial Planner (CFP) vs. Certified General Accountant (CGA)</td>
<td>17%</td>
<td>18%</td>
<td>32%</td>
<td>34%</td>
<td>1.84</td>
</tr>
<tr>
<td>Engineering Technologist vs. Engineer</td>
<td>20%</td>
<td>19%</td>
<td>23%</td>
<td>38%</td>
<td>1.79</td>
</tr>
<tr>
<td>College Professor vs. University Prof.</td>
<td>11%</td>
<td>34%</td>
<td>34%</td>
<td>22%</td>
<td>1.68</td>
</tr>
<tr>
<td>Chartered Accountant (CA) vs. Certified General Acct. (CGA)</td>
<td>18%</td>
<td>32%</td>
<td>23%</td>
<td>27%</td>
<td>1.59</td>
</tr>
<tr>
<td>Conservation Officer vs. Naturalist</td>
<td>20%</td>
<td>25%</td>
<td>33%</td>
<td>22%</td>
<td>1.57</td>
</tr>
<tr>
<td>Microsoft Certified Systems Engineer (MSCE) vs. Professional Engineer (PEng)</td>
<td>28%</td>
<td>20%</td>
<td>24%</td>
<td>27%</td>
<td>1.49</td>
</tr>
<tr>
<td>Bachelor of Engineering (BEng) vs. Professional Engineer (PEng)</td>
<td>27%</td>
<td>23%</td>
<td>25%</td>
<td>24%</td>
<td>1.45</td>
</tr>
</tbody>
</table>
Note. Data aggregated from Roemer (2007e). Sorted by “Score”. “Score” is the weighted sum of all “Column Scores” in a given row. “Column Scores” were derived by assigning a value to each comfort level (see notes (a) through (d) below for details).

<table>
<thead>
<tr>
<th>Applied Science Technologist (AScT) vs. Certified Technician (CTech)</th>
<th>44%</th>
<th>27%</th>
<th>14%</th>
<th>15%</th>
<th>0.99</th>
</tr>
</thead>
</table>

a Comfort level ‘very low’ presented in survey as “I wouldn’t be comfortable trying to explain the difference between the two”. Column score=0.

b Comfort level ‘low’ presented in survey as “I have a rough idea what the difference is”. Column score=1.

c Comfort level ‘medium’ presented in survey as “I have a good idea what the difference is but I am unsure what education is involved with each designation”. Column score=2.

d Comfort level ‘high’ presented in survey as “I know what the difference is and what education is involved with each designation”. Column score=3.

e Calculated as the Sum of (Column Score x Percentage of Responses) across all columns, i.e. comfort levels.

As Table 6.4 shows, Applied Science Technologists appear virtually indistinguishable from Certified Technicians to the members of the general public who responded to the survey question. In fact, the weighted score (column 6) drops even more when respondents are excluded who declared science, engineering and technology as their main field of expertise. This is not the case for other disciplines that straddle multiple levels of certifications such as nursing or accounting.

In British Columbia, the switch from the designations of “Engineering Technologist” to “Applied Science Technologist” may have further confused the public as to the position of technologists in the technical knowledge spectrum. This change originated in the early 1980s with the adoption of new fields into the association. An attempt to table the legislative act under the name “Professional Technologists Act” in
1985 was met with strong opposition. (The lack of recognition as “professionals” further undermines the status of technologists in the public opinion as it implicitly equates them with technicians). Various respondents to a survey among AScTs bemoaned the loss of the prefix “engineering” which is still used in Alberta and other provinces.\(^\text{22}\)

\[I\ \text{believe that shifting the titles from Certified Engineering Technologist/Technician to Applied Science Technologist etc. was a mistake - we lost much of our "identity" and we haven't gained it back. (Roemer (2007d), Survey Respondent #461)}\]

\[...\ \text{The ASTT has so many different letter combinations as titles that it really is an embarrassment. ... (Roemer (2007d), Survey Respondent #474)}\]

\[I\ \text{do not like the AScT designation in BC. I would prefer to align with the Alberta CET or RET designations. No one outside of BC understands the AScT designation. (Roemer (2007d), Survey Respondent #405)}\]

In the United States the consolidation of two-year college programs into a family of credentials, namely *Associate Degrees*, allows for a better integration of diploma-level education into post-secondary pathways. The term “Associate of Science” is often carried in conjunction with the discipline such as Associate of Science in Electronic Engineering Technology, or ASEET. Although there are differences in the ratios of technical and non-

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\(^{22}\) There are no restrictions to the use of the term “engineering” in Canada since a corresponding challenge in court by the Canadian Council of Professional Engineers was dismissed. This is different from the title of “Professional Engineer” which is protected by law.
technical content between the AS and the AScT, this concept of consolidating post-secondary titling and nomenclature across multiple disciplines may be worth investigating. The implementation of credentials such as the Associate of Science in Nursing (ASN) or the Associate of Business Administration (ABA) may help to better educate the public about post-secondary pathways.23

3. Occupational Inheritance

Porter (1965) claims that “no modern industrial society has yet achieved that degree of openness in which the career is entirely independent of the class position of the family into which the individual is born” and that “although we know that industrial societies must be upwardly mobile societies, the amount of mobility that exists is a matter of investigation in each case” (p. 8). Since the occupational category of engineering technologist was created forty years ago, it would theoretically be possible to encounter up to two generations of occupational inheritance.

Figure 6.6 illustrates some correlations between the occupations of the parents and the career choices of the surveyed engineering and engineering technology practitioners.

23 Currently, associate degrees in British Columbia are used primarily for transfer functions between colleges and universities. Defined by the British Columbia Council on Admissions and Transfer (BCCAT), associate degrees constitute a prescribed set of lower division courses in arts or science and carry third-year standing upon transfer to most BC universities.
Figure 6.6. Occupational inheritance among Professional Engineers and Applied Science Technologists.

![Graph showing occupational inheritance among Professional Engineers and Applied Science Technologists with age groups 20-39 and 40+.

Note. Data aggregated from Roemer (2007c, 2007d). “Parent” may refer to one or both parents.

Roberts (2005) states that “Canada can be considered a relatively open society, in which access to a given position is not overly affected by inheritance and which status is achieved rather than ascribed” (p. 241). He found that

Self-reproduction was modest at the highest level (18 percent in the upper service class in 1986 and 20 percent in 1994) but higher in the lower service class (35 percent in 1986 and 38 percent in 1994), and much higher in the blue-collar (skilled and unskilled) class (46 percent in 1986 and 41 percent in 1994). (Roberts, 2005, p. 241).
In this context, the overall rates of occupational inheritance — 21% for technologists and 23% for engineers, respectively — are modest, and some trends are visible:

- Occupational inheritance is more pronounced among older members of the respective professions. Especially engineers show a significant drop in occupational inheritance between the two age groups of 20-39 and 40+, respectively.
- On average, children with at least one parent holding a technical degree are twice as likely to enter an engineering degree program rather than a technology diploma program.
- Children of AScTs are more likely to enter the same career path than children of engineers.

With respect to social mobility Porter (1965) points out that “upward social mobility has been a characteristic of all industrial societies in that industrialization brings with it a proliferation of occupation requiring great variations of skill and specialization” (p. 42). The latter has intensified as industrialization has given way to the age of digitalization (which itself may morph into the era of nanotechnology). In the Vertical Mosaic, Porter observed that “families at the middle occupational levels are too small to support all the recruits for these constantly increasing middle level occupations” which translates into a “general historical trend of upward social mobility” (p. 42) but Roberts (2005) found that this trend slowed down in the 1990s (p. 241).

A slowing trend of upward social mobility coupled with credentialism in Canadian society may have a detrimental effect on recruitment for the occupational category of Applied Science Technologist.
4. Summary

In this Chapter I examined status and prestige of Applied Science Technologists in Canadian society. I showed that AScTs exhibit some, albeit weak, social group behaviour. They are relatively unaware of history and organization of their occupation and have only begun to form a distinct social imaginary which, in return, centres on the shortcomings of their occupational category.

Although AScTs show moderate occupational inheritance and share a perception of their position in society with respect to other occupations, their numbers are too small to form a (statistical) class and they are often aggregated with technicians into a common occupational category.

As a result, they are all but invisible to the general public, although their services permeate the structures of everyday life. Although colleges are generally seen as worthwhile element of the post-secondary system, credentialism shows a detrimental effect on the regard of two-year college diploma programs on the part of the public. A more consistent nomenclature for intermediate credentials could prove beneficial for the recognition of college graduates in general, and the engineering technologist in particular. I will review this suggestion in Chapter 7.
CHAPTER 7. CONCLUSIONS, COMMENTS AND RECOMMENDATIONS

1. Conclusions

From the results discussed in Chapters 4, 5 and 6, I conclude that some 40 years after its inception, the occupational category of engineering technologist has developed neither habitus nor a distinct culture. As a result, it has been unable to establish itself in the social imaginaries of Canadian society. It plays a role, albeit small, in the imaginaries of specialized groups that are linked to industry and education, but these groups typically show little interest in reviewing and improving the status of technologists on a fundamental level. The main obstacle for a comprehensive level of success of engineering technology in Canada is that, unlike in the United States, the discipline occupies the intersection of not one but two voids as depicted by Figure 1.1 ("The two-dimensional gap in technical education in Canada"), i.e. (a) a skill set void located between the procedural orientation of trades occupations and the declarative focus of engineering, and (b) an educational void located between post-secondary trades education and four-year applied science degrees.

To assess the current situation of Applied Science Technologists in the social imaginaries of British Columbia, I introduced three domains: respectively the Public, Market and Formative Domain. In summary,

• In the Public Domain engineering technology as a field and the engineering technologist as an occupational category are virtually unknown. Although society often encounters the services provided by technologists, the underlying discipline and designation remain obscure. Attempts to improve this situation
have been few and far between, often confined to a local context and generally have met with little success.

- In the **Market Domain** while the skill sets of Applied Science Technologists are well regarded, the designation of AScT has attained only patchy acceptance. The status of AScTs as non-professionals and the corresponding general ineligibility of registered technologists to certify technical work\(^{24}\) poses a significant barrier for advancement, entrepreneurial activities or recognition among professionals;

- In the **Formative Domain** the situation of engineering technology is typical for a hybrid discipline. Neither fish nor fowl, the discipline struggles to become a fully accepted part of either the academic or vocational sides of colleges in British Columbia, while at the same time the small sizes of ET faculties preclude them from forming a recognizable and viable third layer within the college environment.

From an idealistic perspective, engineering technology portrays an image of a distinct position within the framework of a tiered post-secondary system with ample bridging and laddering opportunities. In the field of technical education, this framework appears to be concise and defined; it offers opportunities for life-long learning and it

\(^{24}\) For the Limited Licensure model, see Chapter 5 (p. 158).
addresses the needs of industry. As such, it is no surprise that it attracts the interest of countries with developing educational systems such as Qatar or Saudi Arabia.25

Domestically, however, current societal trends are not favourable for an increase in recognition for the two-year diploma credential. A 2006 submission by Seneca College to the federal government states:

Two trends have occurred over time. The first is “credential creep”. The majority of entry level officer positions in the Public Service of Canada require “a university degree” as the minimum academic credential to apply. ... The second trend is the lack of recognition for the ever-evolving role Canada’s colleges play in providing post-secondary education. The breadth and sophistication of a college education has changed dramatically.... (Seneca College, 2006, p. 8)

Expansion and dilution of the mandates of colleges and institutes have further exacerbated the situation. In the Campus 2020 report to the B.C. Ministry of Advanced Education, Plant (2007) stated that “the university college model of learning has succeeded, but, for several reasons, the label has failed” (p. 66). One may want to paraphrase this notion for engineering technology: the engineering technology model of technical education has succeeded, but, for several reasons, the label has failed.

25 Following an evaluation of technical education systems around the world by the Qatari government, the College of the North Atlantic (CNA) in Newfoundland and Labrador was invited to establish a campus in the Qatari capital of Doha. Since its inception in 2002, CNA Qatar has experienced significant and sustained growth and the model has attracted the interest of other nations in the region.
2. Summary Comments and Recommendations

Engineering technologists will not be able to go it alone. Table 3.6 shows that services of technicians and technologists in British Columbia account for only 3% of the labour demand while management-related services account for 11%. The move from a labour-oriented to a service-oriented economy does not stop at the level of engineering technologists. Business Administration programs at Okanagan College and Camosun College have experienced significant increases in enrolment over the past decade, and it seems that more and more high school graduates are interested in managing high technology than researching, inventing and producing it. Well-meant promotions of engineering technology are regionally confined and drown in the maelstrom of corporate and commercial advertising. The commercialization of post-secondary education (Levin, 2005), so-called neoliberal trends in academia (Levin, 2001; Slaughter and Rhoades, 2004) and the shrinking pool of domestic high school graduates is forcing universities and colleges increasingly to compete for the same pool of prospective students. With considerably fewer resources afforded to colleges and institutes, the battle is lopsided, especially for two-year technical diploma education which also does not attract many international students.

This competitive market is further exacerbated by the fast-paced consumerism prevalent among teenagers and young adults. College staff and career counsellors presenting at high schools often speak of a decreased attention span among today’s high school students. Although a common quip, “whatever you can’t bring across in one minute – you might as well save your breath”, might be facetiously exaggerated, it still points to an existing trend. For disciplines that are not part of the public’s social
imaginary such as engineering technology, it means that representatives at high school career days and similar events will not have the luxury to painstakingly explain the differences, distinctions and options among various technical occupational paths.

As a consequence, disambiguation will have to become the guiding principle.

Engineering technology as a field, including its related credentials and associations will need to decide what it wants to be.

The Campus 2020 report (Plant, 2007) was widely and immediately rejected in the college community, mainly because of its recommendation to strip colleges of their most prized possession, the applied degree. In the turmoil following the release of the report, however, we must not forget to open-mindedly discuss its findings. Almost 30 years ago, Beinder already wrote about the colleges’ "apparent efforts to be all things to all people" (Beinder in Government of British Columbia, 1971, p. 32). Plant only resurrects this sentiment when he asks to “… provide greater clarity of purpose and role … for the system as a whole” (Plant, 2007, p. 70)

And although we should not turn back time and toss aside the obvious benefits the current system has brought, especially for remote areas of British Columbia, we should still acknowledge the problems that Campus 2020 has revealed and seek progressive solutions. I do not share Plant’s opinion that degrees should be removed from the colleges. The Bachelor of Business Administration (BBA) is a prime example for the benefits applied degrees can bring to a region, while universities have clearly stated
disinterest in its practical focus. The Bachelor of Technology as a degree option for engineering technologists and even a potential modern substitute for the European title of Master Tradesperson is another example how applied (college) degrees might gain acceptance and thrive in the social imaginary of the future. However, keeping the applied degrees does not preclude the consolidation and optimization of the system that Plant recommends.

Consolidation of the Tiered Education System

Among the public, the terms bachelor and baccalaureate are well recognized as describing four-year undergraduate degrees (although in practice some may take five years or more). This nomenclature spreads across virtually all disciplines and although exotic acronyms proliferate (such as the BAIST (Bachelor of Applied Information Systems Technology) at the Northern Alberta Institute of Technology or the BCIS (Bachelor of Computer Information Systems) at Okanagan College), none deviates from the B-pattern, that is, the baccalaureate as a synonym for a four-year education concluding with the award of a degree. On the trades side, the term "journeyperson" in

\[26\] In 2005 the University of British Columbia (UBC) rejected the inclusion of Okanagan University College’s BBA degree program and faculty into the framework of the new University of British Columbia Okanagan. The practical orientation of the degree was cited as not compatible with the focus of UBC’s Faculty of Business and its Commerce degree (B.Com.).
conjunction with the interprovincial ticket, a.k.a. the Red Seal, is a recognized certification across a large number of trades.

If the intention truly is to facilitate Canada’s unique network of postsecondary structures and policies (Jones, 1997), the same consistency should be applied to two-year education. A common credential that was synonymous with a two-year post-secondary experience would facilitate the recognition of college programs in the public mind, both domestically and abroad. In this context one could think of various names for the credential, but for the purpose of international recognition and transferability and in light of current attempts to consolidate educational systems across international borders (e.g. the Bologna Process (European Community, 2005) in Europe), I would recommend following the American model of the Associate Degree. Not only are the name and meaning established but the terminology addresses two critical points: on one hand it satisfies the forces of credentialism because it carries the suffix degree; on the other hand, it implicitly defines the role and position of its bearer, i.e. to be an associate or assistant to a professional. Many instructors and professionals seem to share this perception for the engineering technologist:

While I was attending BCIT, the instructors at that time made it clear to all students that the role of a technologist was designed to be a technically competent assistant to an engineer. ... I believe technologists should work diligently to enhance their role and that of the association (ASTT of BC) as proficient assistants to engineers. (Roemer (2007d), Survey Respondent #255)

This nomenclature could also be adopted for business diplomas (Associate of Business Administration, ABA), licensed practical nursing (Associate of Science in Nursing, AScN) or human service work (Associate of Social Work, ASW) programs.
Since the current technology content in engineering technology diploma programs falls between the two poles of Associate and Bachelor’s degree, an adjustment may be needed to fit the designations of A.Eng. and B.Eng.

Towards the procedural end of the technical knowledge spectrum, engineering technology associations such as ASTTBC or CCTT may want to consider relocating technician certification exclusively to the trades.

The term technician is already in use within the trades (e.g. Residential Construction Framing Technician, Building Envelope Technician, Telecommunications Technician etc.) and some disciplines like network and telecommunications technology offer technician programs as either trades apprenticeships or one-year engineering technology certificates. Kevin Evans, CEO of British Columbia’s Industry Training Authority (ITA), currently the coordinating body and funding source for most trades training in BC, states that “many disciplines envy the apprenticeship model” (personal communication, 2007). I tend to agree insofar as the model of alternating education in the classroom and on-the-job experience, coupled with immediate income for the apprentice and comparatively low tuition (which is often paid by the employer) holds a high appeal for high school graduates as it caters to a modern fast-paced, often consumer-driven, life style.

If provincial technology associations such as ASTTBC doubled as Industry Training Organizations (ITO) they could continue to define technical education at both the technician and technology level but at the same time integrate with two strong and pervasive models – the trades programs and certification on the procedural end of the knowledge spectrum, and more academic applied degrees on the declarative end.
Technology credentials would then find equivalents and thus allies in other disciplines, by dint of the pervasive Associate and (applied) Bachelor degrees proposed above - in particular if other areas of practice such Health or Business Administration choose to adopt the same general framework.

By the same token, trades education is currently delivered in two models: (a) within the apprenticeship framework in collaboration with industry (covered above), and (b) in the form of Entry-Level Training (ELT) or Foundation programs. These courses usually are six to eight months in length and convey hands-on skills exclusively at the educational institution, i.e. the student is not indentured with an industry sponsor (employer). As such, Foundation courses represent the trades equivalent of engineering technology technician level courses, thus further facilitating the transfer of technician level training into a trades framework.27 Graduates from Foundation courses are generally eligible to ladder into Year Two of an apprenticeship program.

Finally, it is imperative for the engineering community to acknowledge the evolution of engineering technology as a distinct discipline beyond the technologist level. The introduction of the Limited Licensure model (see Chapter 5, p. 158), i.e. to permit

27 The Industry Training Authority of British Columbia has questioned its responsibility for Foundation programs as these are not true collaborations between industry and post-secondary education. Currently, both ITA and the Ministry of Advanced Education provide funding for Foundation courses which further confuses the matter. It has been proposed that Foundation courses should solely reside with the Ministry, effectively forming an “academic version” of trades training, i.e. without direct industry sponsorship.

200
engineering technology practitioners to certify narrow areas of technical work, constitutes the first step in this direction. Entering engineering through a two-year engineering technology program supplemented by a bridging program should evolve into a common option alongside the traditional route of Engineering One, i.e. a strong emphasis on mathematics and science during the first year of study. Within the above recommendations, an Associate of Applied Science (AASc) would then replace the engineering technologist as the two-year exit point for engineering technology (no such exit point would exist for engineering). Beyond this two-year exit point, student could choose between a baccalaureate degree in engineering technology (BASc or BTech, to be conferred at colleges or universities) and a baccalaureate degree in engineering (BASc or BEng, to be conferred at universities) after completing a bridging program.

Table 7.1 summarizes these recommendations for various fields of practitioner education.

First Steps

Whether or not the above framework will be adopted, colleges and institutes, i.e. the providers of engineering technology education, must set an example (in conjunction with or ahead of industry) and relinquish the practice of using technician and technologist certification interchangeably when it suits them fiscally. That is, institutions must willingly accept the AScT as a distinct certification and reflect this in their staffing and remuneration policies. Arguably, this commitment would be aided by converting the diploma credential to an Associate Degree, as the distinction between technician certificate and a two-year degree is more apparent than that between technician and technologist.
Table 7.1

A proposed common structure for practitioner education in British Columbia.

<table>
<thead>
<tr>
<th>Field</th>
<th>One Year Exit Point</th>
<th>Two Year Exit Point</th>
<th>Four Year Exit Point</th>
<th>Six Year Exit Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Technology</td>
<td>Technician Certificate</td>
<td>Associate of Applied Science (AASc)</td>
<td>Bachelor of Applied Science (BASc) or Bachelor of Engineering (BEng)</td>
<td>Master of Applied Science (BASc) or Master of Engineering (BEng)</td>
</tr>
<tr>
<td>Engineering</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health and Human Sciences*</td>
<td>Home Support and Residential Care Aid Certificate</td>
<td>Associate of Science in Nursing (ASN)</td>
<td>Bachelor of Science in Nursing (BSN)</td>
<td>Master of Science in Nursing (MSN)</td>
</tr>
<tr>
<td>Business Administration b</td>
<td>Bookkeeping Certificate</td>
<td>Associate of Business Administration (ABA)</td>
<td>Bachelor of Business Administration (BBA)</td>
<td>Master of Business Administration (MBA)</td>
</tr>
</tbody>
</table>

* Without limiting generality, the upper example describes a specialization in care-giving / nursing.

b Without limiting generality, the example describes a specialization in accounting.

Finally, individual engineering technologists will have to become part of the solution as well, largely by creating, reinforcing and promoting a distinct culture for their social group. Complaints about the lack of recognition of the discipline have a hollow ring when the same complainants refuse to maintain their membership in the association
because “it doesn’t do anything for them”, or if practitioners refuse to proudly display their title because “nobody recognizes it anyway”. The information technology industry has shown that good self-promotion can catapult exotic designations and credentials into the public eye. Even today, in spite of the dotcom crash of 2000/01, the IT industry still appears to be more attractive than engineering technology as a whole. After all, there are no superstars in engineering technology, the likes of Steven Jobs and Bill Gates, but evident success, especially financial success, matters in terms of status. In my view, instead of mimicking engineers, technologists should develop a more distinct group culture. Taylor (2004) contends that “it often happens that what start off as theories held by a few people come to infiltrate the social imaginary, first of elites, perhaps, and then of the whole society” (p. 24). If a social imaginary is a “set of values, institutions, laws, and symbols common to a particular social group and the corresponding society” (Social Imaginary, 2007) then creating symbols and values that set engineering technology apart from existing imaginaries (like that of engineers) would be a first step. Just as engineers don’t attempt to mimic scientists but rather celebrate the difference, engineering technologists should create a comprehensive culture ranging from trades certifications to Associate and Bachelor degrees. One might say, instead of pursuing the engineers’ coveted symbol of the iron ring, engineering technologists should forge a new ring out of brass and convince all members of the engineering technology community to wear it proudly. As such, the ring would constitute a symbol of the field rather than of one distinct exit point. In fact, it would then also constitute a symbol for a true K-25 education model and help to infiltrate the social imaginary of the Canadian public with respect to a more classless society, or at least a more equitable education system.
The issue of the status and position of technologists in the Canadian social imaginary is of interest well beyond the realm of technology because it is representative of the definitions and status differences between occupational categories (and educational options) in Canada in general. If our technological knowledge indeed continues to double every ten years (Wright, as cited in National Academy of Engineering, 2005, p. 7), new specializations will emerge at an increasing pace and furcation of the technical field (as I introduced it in Chapter 3) will accelerate. This should not be accompanied by a confusing plethora of designations and credentials with unresolved status and inadequate transferability.
PART THREE. REFERENCES AND APPENDICES
REFERENCES


Canadian Council of Technicians and Technologists, & Engineers Canada. (2007). 


APPENDICES (SURVEYS) – GENERAL NOTES

Appendices 1-3 contain the online survey templates as presented to the five survey groups, broken into three categories.

<table>
<thead>
<tr>
<th>Survey Target Group</th>
<th>Category</th>
<th>Appendix</th>
<th>Valid Responses</th>
<th>Invalid Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering students</td>
<td>Students</td>
<td>Appendix 1</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>Engineering technology students</td>
<td>Students</td>
<td>Appendix 1</td>
<td>119</td>
<td>17</td>
</tr>
<tr>
<td>Engineering practitioners</td>
<td>Practitioners</td>
<td>Appendix 2</td>
<td>136</td>
<td>22</td>
</tr>
<tr>
<td>Engineering technology practitioners</td>
<td>Practitioners</td>
<td>Appendix 2</td>
<td>598</td>
<td>67</td>
</tr>
<tr>
<td>General public</td>
<td>Public</td>
<td>Appendix 3</td>
<td>97</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:

- Appendices 1-3 display the survey questions in a consolidated format but without omissions. The online surveys did not substitute the acronym “ET” for “engineering technology”.

- Wherever option brackets, i.e. “[ option 1 | option 2 ]”, are used in the appendix, option 1 refers to engineering students or practitioners, option 2 to engineering technology students or practitioners, respectively.
# APPENDIX 1 – STUDENT SURVEYS

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
<th>Eng. Stds.</th>
<th>ET Stds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you...</td>
<td>☐ Male ☐ Female</td>
<td>(all)</td>
<td>(all)</td>
</tr>
<tr>
<td>To which age group do you belong?</td>
<td>☐ 18 – 20 ☐ 21 – 25 ☐ 26 – 29 ☐ 30 – 39 ☐ 40 – 49 ☐ 50 – 59 ☐ 60 or older</td>
<td>(all)</td>
<td>(all)</td>
</tr>
<tr>
<td>Which institution do you currently attend?</td>
<td>☐ UBC Vancouver ☐ UBC Okanagan ☐ SFU ☐ UVic ☐ UNBC ☐ BCIT ☐ Okanagan Coll. ☐ Camosun College</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>What is your status with respect to your [Engineering</td>
<td>[ET]] program?</td>
<td>☐ First-year Standing ☐ Second-year Standing ☐ Third-year Standing ☐ Fourth-year Standing ☐ Enrolled in Year 1 ☐ Enrolled in Year 2</td>
<td>x</td>
</tr>
<tr>
<td>In which field of [Engineering</td>
<td>[ET]] are you currently enrolled?</td>
<td>☐ Civil / Geomatics / Building / Architecture ☐ Chemical / Gas and Petroleum ☐ Forestry ☐ Electronics / Electrical / Instrumentation ☐ Computer Design / Software Programming ☐ Mechanical / Manufacturing / Robotics ☐ Mineral / Mining ☐ Network / Telecommunications ☐ Water Quality / Environmental / Bioscience</td>
<td>(all)</td>
</tr>
<tr>
<td>Is your ET program nationally accredited?</td>
<td>☐ Yes ☐ No ☐ Don’t know</td>
<td>n/a</td>
<td>(all)</td>
</tr>
<tr>
<td>Have you had an opportunity to attend an information session with respect to certification, registration and professional associations for [Engineers</td>
<td>Technologists]?</td>
<td>☐ Yes ☐ No ☐ Don’t Know</td>
<td>(all)</td>
</tr>
<tr>
<td>What was your situation right before you enrolled in your Engineering program? Check all that apply.</td>
<td>O Had completed high-school the same year</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed high-school 2 – 3 years prior</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed high-school more than 3 yrs. prior</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed univ. transfer program (science)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed univ. transfer program (eng'g)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed upgrading program</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed engineering bridge program at Camosun College</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had been working for one or more years (not counting summer jobs)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had partially completed one or more years in a degree or diploma program (other than current)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed a certificate or trades program</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed a diploma program</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O Had completed a degree program</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

| With respect to your professional life, what do you want to do following your graduation? | O Find employment as a [technologist | engineer] in my field of study | (all) |
| | O Find employment not directly related to my studies in [engineering | ET] | (all) |
| | O Start my own business | (all) |
| | O Enter [a | another] diploma program | (all) |
| | O [Pursue another degree | Enter a bridging program towards an engineering degree] | (all) |
| | O Enter a degree program in a different field | (all) |
| | O Other | (all) |

<p>| What would be your preferred form of employment? | O A position with a large international corporation | (all) |
| | O A position with a large Canadian corporation | (all) |
| | O A position with a medium-size company | (all) |
| | O A position with a small company or with an independent entrepreneur/inventor | (all) |
| | O A position with municipal, provincial or federal Government | (all) |
| | O Operating my own business and working as an independent entrepreneur or consultant | (all) |</p>
<table>
<thead>
<tr>
<th>If you had multiple job offers, which of the following career paths are you most likely to accept?</th>
<th>(all)</th>
<th>(all)</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Member of a research and development team</td>
<td>○ A commission-based sales representative for a technology product</td>
<td>○ In charge of a project or small department with a municipality or a Government agency</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How would you rank your job mobility? Select only the first applicable answer.</th>
<th>(all)</th>
<th>(all)</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ I would happily move to somewhere else in the world if this meant a good job for me</td>
<td>○ I would happily move to somewhere else anywhere the U.S. if this meant a good job for me</td>
<td>○ I would happily move to somewhere else anywhere in Canada if this meant a good job for me</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After graduation, what would you expect the starting salary to be in your field of study?</th>
<th>(all)</th>
<th>(all)</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ $20,000 - $29,999</td>
<td>○ $30,000 - $39,999</td>
<td>○ $40,000 - $49,999</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In your field of study, what do you expect your salary to be after 5 years on the job?</th>
<th>(all)</th>
<th>(all)</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ $20,000 - $29,999</td>
<td>○ $30,000 - $39,999</td>
<td>○ $40,000 - $49,999</td>
</tr>
<tr>
<td>How applicable would you consider each of the following reasons with respect to your decision to enrol in your field of study? That is, do not judge how worthwhile you feel each reason might be in general, but how much it actually influenced you then in your decision to enrol.</td>
<td>n/a</td>
<td>(all)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| o I wanted to work with technology  
  o I wanted to make good money  
  o I didn’t want to go to school for more than two years  
  o I wanted to be in charge of a project  
  o I wanted to enter a career path that will allow me access to a degree in the future  
  o I wanted to be / do something like someone I know (parent, relative, friend, neighbour etc) I wanted to help build / improve Canada or a developing country  
  o I wanted to help protect and preserve the environment  
  o I wanted to learn something that would allow me to become an independent entrepreneur one day  
  o I wanted to learn something that would allow me to travel and work abroad some day  
  o I didn’t want to study too much math and science  
  o I didn’t want to move away from my home / family / friends  
  o I was looking to minimize the overall costs of my education | n/a | (all) |
| If you have been monitoring the job market, what is the status of your job search? Check all that apply. | n/a | (all) |
| o I haven't spent much time yet with respect to employment or the job market  
  o I know of 1 or 2 businesses that employ people in my field, but I don't know if they currently hire  
  o I know of 3 or more businesses that employ people in my field, but I don't know if they hire  
  o I know of 1 or 2 businesses that currently hire people with my certification  
  o I know of 3 or more businesses that currently hire people with my certification  
  o I already have 1 or 2 firm offers for employment  
  o I already have 3 or more firm offers for employment  
  o I am already employed |
<p>| What level of importance do you give to technology with respect to your career? Assuming that you had the right training, select which careers you would consider. Check all that apply. | O as a highly technical person, i.e. someone who directly applies technology such as a designer, implementer, troubleshooter, field technologist  O as a field supervisor who inspects and certifies work done by technicians, tradespeople and other technologists  O as a project and team manager for a technology company, who is situated in an office for most of the day and has little hands-on exposure to field work  O in the field of technology training such as an industry trainer, educator or courseware designer  O as someone who works with technology at one degree of separation; for example, sales representative, technical writer or product consultant  O as someone who works for a technology company but is largely removed from operations: this could include accountants, marketers or HR staff  O as someone who is effectively removed from the field of technology as long as there is a promising future in the job | (all) (all) |
| How much do you know about the history and background of [Engineers | Technologists] in Canada? Check all that apply. | O I know why the designation was created  O I know when the designation was created  O I know how [Engineers | Technologists] are organized in BC  O I know how [Engineers | Technologists] are organized in some other provinces  O I know how the equivalent of “Professional Engineer” in the United States  O None of the above | (all) (all) |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>n/a</th>
<th>(all)</th>
</tr>
</thead>
</table>
| How would you feel about including in your program a seminar that discusses the status of Technologists in industry today? This could include things like their history, roles, salaries, professional ethics, how they rank internationally etc. | ○ I would be very interested  
○ I would be somewhat interested  
○ Right now, I don't think I would be too interested, but I would give it a try  
○ Sounds really boring |     |       |
| How much do you know about the designations of Applied Science Technologist (AScT) a.k.a. Certified Engineering Technologist (CET)? Check all that apply. | ○ I know what kind of schooling you need for the designation  
○ I can name at least three institutions in BC that offer engineering technology programs  
○ I know what requirements must be met after graduation in order to become certified as an AScT  
○ I know why the AScT designation was created  
○ I know when the AScT designation was created  
○ I know how Engineering Technologists are organized in BC  
○ I know very little about the AScT designation |     |       |
| One possible route towards an engineering degree is through an engineering technology diploma supplemented by a bridging program. Did this alternative play a role in your choice of education? | ○ I possess a technology diploma and entered engineering through a bridging program  
○ I would have preferred the engineering technology route but enrolled in a traditional engineering program  
○ I gave serious consideration to the engineering technology route but preferred a traditional engineering program  
○ I had heard about the engineering technology route but I never considered it a real option for me  
○ I had never heard about the engineering technology route |     |       |
After some practical experience you will become eligible to register with a provincial professional organization such as [APEGBC | ASTTBC]. How likely will you get certified and registered as [a P.Eng. | an AScT]?

- I fully anticipate to get registered as soon as I become eligible
- When the time comes, I will review costs and benefits and decide if I want to register
- I can’t see too much return for my dues at the moment, so I don’t think I’ll pursue certification
- I couldn’t care less about registration with a professional organization

After two years on the job you have become eligible for registration [as Professional Engineer | with ASTTBC]. You passed the certification exam and your boss offers to get you new business cards with [“PEng” | “AScT”] printed after your name. What will you most likely tell him?

- I couldn’t care less for professional or academic titles
- I don’t find “PEng” worthwhile displaying. BEng, BASc or BSc is enough.
- Although I wouldn’t mind having a professional or academic title, I don’t find “AScT” worthwhile displaying
- I don’t want [“PEng” | “AScT”] displayed because I think most people don’t know what it means anyway
- I want [“PEng” | “AScT”] displayed because I think most people are impressed by titles
- I want [“PEng” | “AScT”] displayed because I think it will provide me with recognition in the field
- I want [“PEng” | “AScT”] displayed because I worked hard for it and am proud of it

On a strictly personal and subjective level, how would you rank the designations listed below in comparison to your future designation of [Engineer | Technologist]?

- Electrician
- Airline Pilot
- TV Reporter
- High School Teacher
- Lab Scientist
- Social Worker
- Veterinarian
- Realtor
- [Engineer | Technologist]
- Computer Programmer
- Carpenter
- Medical Doctor
- Home Inspector
- Registered Nurse
- Police Officer
- Ferry Captain
- Army Sergeant
- Lawyer
- Tax Accountant
- Conservation Officer
- Winemaker / Brewmaster
- Land Surveyor

(all) (all)
If you were given a 10-step scale called “Level of Education”, on which research scientists were placed at step 10 (the highest), on a strictly personal level, where would you place…

<table>
<thead>
<tr>
<th>Tradespeople</th>
<th>Technicians</th>
<th>Engineering Technologists</th>
<th>Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
<td>(all)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This question tries to determine the familial background of most [Engineers | Technologists]
Please select only the first (i.e. leftmost) answer. Who in your family…

<table>
<thead>
<tr>
<th>…is a Professional Engineer?</th>
<th>…is a Certified Technologist?</th>
<th>…has a degree in a predominately technical discipline, e.g. science, engineering or health etc.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
<td>(all)</td>
<td>(all)</td>
</tr>
</tbody>
</table>

[Both Parents | One Parent | Sibling | Close Relative]

<table>
<thead>
<tr>
<th>…has a degree in a predominately non-technical discipline e.g. business, arts, social work etc.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…has a diploma in a predominately technical discipline, e.g. science, engineering or health etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…has a diploma in a predominately non-technical discipline e.g. business, arts, social work etc.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…has a trades certificate?</th>
<th>…owns their own business in a technical profession?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…owns their own business in a non-technical profession?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…works for a municipal, provincial or federal government (including RCMP, military etc.)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…travels on business within Canada?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…travels on business to the United States?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>…travels on business to foreign countries other than the US?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
</tr>
<tr>
<td>How do you feel about [Engineering</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

| How would you compare the education of Applied Science Technologists to that of Engineers? | o I don't have an opinion or haven't thought about the issue | o I think Engineers are much better educated than Technologists | o I think Engineers are somewhat better educated than Technologists | o I consider Technologists to be the "hands-on version" of engineers | (all) | n/a |

| You are invited to food and drinks at a friend’s house on a Friday night. There is a large number of people at the party and while you have met a few of the guests before, you don’t know most of them. As you enter the house and exchange a few words with the host, he tells you that “the people standing over there are [Engineers | Technologists] as well”. How do you react? | o I couldn’t care less | o I wouldn’t actively seek them out, but if we happened to run into each other during the night, I might ask them what each was doing. If anyone happened to be from my field I would be interested in a longer conversation | o I wouldn’t actively seek them out, but if we happened to run into each other during the night, I might ask them what each was doing and engage in a conversation about [Engineers | Technologists] in general | o I would actively approach them at some point during the night to see if anyone was from my field | o I would actively approach them at some point during the night to see what other [Engineers | Technologists] have to say | o I would walk over right away, join the conversation and introduce myself as a fellow [Engineers | Technologists] | (all) | (all) |
At the same event, you engage in a conversation with another guest and you realize that he/she is a practitioner in the same field as yours. You talk about some theory that is related to your field and that you encountered during your studies. You suspect that he/she must have gone to college or university as well. Which question are you most likely to ask?

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you an [Engineer</td>
<td>Technologist]?</td>
</tr>
<tr>
<td>Are you an [Engineer</td>
<td>Technologist], too?</td>
</tr>
<tr>
<td>Are you a [Technologist</td>
<td>Engineer]?</td>
</tr>
<tr>
<td>Do you have a degree?</td>
<td></td>
</tr>
<tr>
<td>Do you have a diploma?</td>
<td></td>
</tr>
<tr>
<td>Are you certified?</td>
<td></td>
</tr>
<tr>
<td>What designation do you hold?</td>
<td></td>
</tr>
<tr>
<td>Where did you go to school?</td>
<td></td>
</tr>
</tbody>
</table>

In the United States, ET is often branded as the "applied branch of engineering" and some institutions offer programs that lead to undergraduate and even advanced applied degrees in ET. These programs are not as heavy on math and science as traditional engineering programs but concentrate on the application of engineering principles. Graduates will possess an applied degree, but do not usually register as Professional Engineers but as Engineering Technologists instead. What would you do if this pathway were available in Canada?

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>As long as it is a recognized degree, I would prefer to take an engineering technology program because I would like to have a more hands-on career</td>
<td>x</td>
</tr>
<tr>
<td>I wouldn't really care and let other factors such as location, costs, or reputation of the school determine where I enrol</td>
<td>x</td>
</tr>
<tr>
<td>Although I would prefer more hands-on education, I would still choose a traditional engineering program because I think “engineering technology” doesn’t have the same status as engineering</td>
<td>x</td>
</tr>
<tr>
<td>I would still prefer a traditional engineering program because the ratio between theory and practice is just right for me</td>
<td>x</td>
</tr>
<tr>
<td>I would prefer to complete my post-secondary education for now and exit with a diploma</td>
<td>-</td>
</tr>
<tr>
<td>I would prefer to continue towards a degree in engineering technology</td>
<td>-</td>
</tr>
<tr>
<td>I would prefer to continue towards a degree in engineering</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
</tr>
</tbody>
</table>
### APPENDIX 2 – PRACTITIONER SURVEYS

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
<th>Eng. Prct.</th>
<th>ET Prct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you…</td>
<td>○ Male ○ Female</td>
<td>(all)</td>
<td>(all)</td>
</tr>
<tr>
<td>To which age group do you belong?</td>
<td>○ 18 – 20 ○ 21 – 25 ○ 26 – 29 ○ 30 – 39 ○ 40 – 49 ○ 50 – 59 ○ 60 or older</td>
<td>(all)</td>
<td>(all)</td>
</tr>
<tr>
<td>What is your current status?</td>
<td>○ Professional Engineer (P.Eng.) ○ Engineer-in-Training (EIT) ○ Other</td>
<td>(all)</td>
<td>n/a</td>
</tr>
<tr>
<td>When did you graduate from your [Engineering</td>
<td>ET] program?</td>
<td>○ 1-3 years ago ○ 4-9 years ago ○ 10 or more years ago</td>
<td>(all)</td>
</tr>
<tr>
<td>Are you still working in the same field of [engineering (even if in a different occupation)] [ET] from which you graduated?</td>
<td>○ Yes ○ Yes, and I still am in a technical occupation ○ Yes, but in a different occupation, e.g. management, instruction etc. ○ No</td>
<td>- x</td>
<td>x -</td>
</tr>
<tr>
<td>From which field of [Engineering Technology</td>
<td>ET] did you graduate? [Select the most applicable answer</td>
<td>Select the most applicable answer, or more than one if you have multiple diplomas].</td>
<td>○ Civil / Geomatics / Building / Architecture ○ Chemical / Gas and Petroleum ○ Forestry ○ Electronics / Electrical / Instrumentation ○ Computer Design / Software Programming ○ Mechanical / Manufacturing / Robotics ○ Mineral / Mining ○ Network / Telecommunications ○ Water Quality / Environmental / Bioscience</td>
</tr>
<tr>
<td>Do you perform additional engineering tasks outside your primary form of employment, e.g. teaching, consulting, technical documentation etc.?</td>
<td>○ Yes ○ No ○ Prefer not to say</td>
<td>(all)</td>
<td>n/a</td>
</tr>
<tr>
<td>From which institution did you graduate?</td>
<td>BCIT</td>
<td>Camosun College</td>
<td>Capilano College</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Was your ET nationally accredited?</td>
<td>Yes</td>
<td>No</td>
<td>Don't know</td>
</tr>
<tr>
<td>[What is your primary form of employment</td>
<td>Municipality, Government, Public Institution</td>
<td>Large provincial, national or international corporation</td>
<td>Small local or regional firm</td>
</tr>
<tr>
<td>work?]</td>
<td>I love what I am doing and have no intention of making major changes in the near future</td>
<td>Overall, I enjoy the technical field I chose, but I would like to move to a different job within the same technical field</td>
<td>I am not overly excited anymore about the technical field I chose, but it's a job and I will stick with it for the time being</td>
</tr>
<tr>
<td>How would you describe your job satisfaction?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How would you rank your job mobility?</td>
<td>(all) (all)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In your position, how often do you perform tasks that would fall into the broader categories listed below.</td>
<td>(all) (all)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With which of the following occupational categories do you interact on a daily basis? Check all that apply.</td>
<td>(all) (all)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which of the following best describes your work relationship with [Certified Technologists</td>
<td>Engineers] at your place of employment?</td>
<td>(all) (all)</td>
<td></td>
</tr>
</tbody>
</table>

- How would you rank your job mobility?
  - I would happily move to anywhere in the world to further my career
  - I would happily move to anywhere in Canada to further my career
  - I would prefer to stay in the region
  - I don't want to move from here and would even take a different job if necessary to stay

- In your position, how often do you perform tasks that would fall into the broader categories listed below.
  - Troubleshooting, repair, support
  - Consulting
  - Education and training of others
  - Supervision of others
  - Project management
  - Sales, advertising, marketing
  - Budgeting and financial management
  - Research and development
  - Strategy meetings in excess of one hour
  - Upgrading your skills through courses and scheduled training
  - Attending product demonstrations, sales presentations, and conferences

- With which of the following occupational categories do you interact on a daily basis? Check all that apply.
  - Workers (without field-related post-secondary education)
  - Tradespeople
  - Technicians
  - Technologists
  - Engineers
  - Doctors or scientists or other academics

- Which of the following best describes your work relationship with [Certified Technologists | Engineers] at your place of employment?
  - I don't work directly with [Technologists | Engineers]
  - We are a team of peers. No distinction is made between engineers and technologists
  - While the jobs of engineers differ somewhat from those of technologists, it is a very friendly relationship with no obvious hierarchy
  - In general we get along well but at times the technologists need some guidance that they might not always appreciate; engineers appear arrogant or pull rank
  - [The technologists are cautioned that they shouldn't consider themselves equal to the engineers; The engineers make it quite clear that they don't consider technologists as equals]
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>(all)</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many Technologists do you coordinate or supervise as part of your job?</td>
<td>○ None ○ 1-3 ○ 4-9 ○ 10 or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much do you know about [the designations of Applied Science Technologist (AScT) a.k.a. Certified Engineering Technologist (CET)</td>
<td>○ I know what kind of schooling you need for the designation</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>○ I can name at least three institutions in BC that offer engineering technology programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know what requirements must be met after graduation in order to become certified as an AScT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know why the AScT designation was created</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know when the AScT designation was created</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know how Engineering Technologists are organized in BC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know how Engineering Technologists are organized in some other provinces</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ I know the equivalent of “Applied Science Technologist” in the United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ [I know very little about the AScT designation]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None of the above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you intend to pursue a degree in the foreseeable future?</td>
<td>○ No, probably not ○ I consider pursuing an engineering degree one day</td>
<td>n/a</td>
<td>(all)</td>
</tr>
<tr>
<td></td>
<td>○ I consider pursuing a non-engineering degree one day ○ I am currently enrolled in a degree program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you were given a 10-step scale called “Level of Education”, on which research scientists were placed at step 10 (the highest), on a strictly personal level, where would you place…</td>
<td>○ Tradespeople ○ Technicians ○ Engineering Technologists ○ Engineers</td>
<td>(all)</td>
<td>(all)</td>
</tr>
</tbody>
</table>
One possible route towards an engineering degree is through an engineering technology diploma supplemented by a bridging program. Did this alternative play a role in your choice of education?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ This is the route I took</td>
<td>(all)</td>
</tr>
<tr>
<td>○ I would have preferred the engineering technology route but enrolled in a traditional engineering program</td>
<td>n/a</td>
</tr>
<tr>
<td>○ I gave consideration to the engineering technology route but preferred a traditional engineering program</td>
<td></td>
</tr>
<tr>
<td>○ I had heard about the engineering technology route but I never considered it a real option for me</td>
<td></td>
</tr>
<tr>
<td>○ I had never heard about the engineering technology route</td>
<td></td>
</tr>
<tr>
<td>○ To my knowledge, this alternative route didn’t exist when I enrolled in my engineering program</td>
<td></td>
</tr>
</tbody>
</table>

Your employer is issuing new business cards and offers to print “A SeT” after your name. Assuming that you are certified, how will you most likely respond?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ I couldn’t care less for professional or academic titles</td>
<td>(all)</td>
</tr>
<tr>
<td>○ Although I wouldn’t mind having a professional or academic title, I don’t find “A SeT” worthwhile displaying</td>
<td>n/a</td>
</tr>
<tr>
<td>○ I don’t want “A SeT” displayed because I think most people don’t know what it means anyway</td>
<td></td>
</tr>
<tr>
<td>○ I want “A SeT” displayed because I think most people are impressed by titles</td>
<td></td>
</tr>
<tr>
<td>○ I want “A SeT” displayed because I think it will provide me with recognition in the field</td>
<td></td>
</tr>
<tr>
<td>○ I want “A SeT” displayed because I worked hard for it and am proud of it</td>
<td></td>
</tr>
</tbody>
</table>

Some engineers state that the best engineers are those who entered engineering through the engineering technology route. What is your opinion on this statement?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ I couldn’t disagree more</td>
<td>(all)</td>
</tr>
<tr>
<td>○ There may be some advantages to taking a more practical start but in the end the traditional way of engineering education is the superior approach</td>
<td>n/a</td>
</tr>
<tr>
<td>○ In reality, there is no difference between the two routes</td>
<td></td>
</tr>
<tr>
<td>○ Although I don’t have too much information on the technology route, I could well imagine that a more hands-on start would be superior to the traditional approach</td>
<td></td>
</tr>
<tr>
<td>○ The statement is correct</td>
<td></td>
</tr>
</tbody>
</table>
Please rate the following statements whether you agree or disagree?

[Strongly Disagree | Disagree | Agree | Strongly Agree]

- The technologist is a hybrid designation between technician and engineer that only confuses the market. There should just be technicians and engineers not a third layer in between.
- In the long run, engineering technology won't be able to sustain itself as a separate occupational category.
- Engineers and Engineering Technologists should be part of the same professional association.
- Engineering is a white-collar occupation.
- Engineering technology is a blue-collar occupation.
- Technologists form the glue between technicians and engineers.
- Engineering Technologists should be permitted to certify certain levels of technical work.

This question tries to determine the familial background of most
[Engineers | Technologists]
Please select only the first (i.e. leftmost) answer. Who in your family...

[Both Parents | One Parent | Sibling | Close Relative]

- ...is a Professional Engineer?
- ...is a Certified Technologist?
- ...has a degree in a predominately technical discipline, e.g. science, engineering or health etc.?
- ...has a degree in a predominately non-technical discipline, e.g. business, arts, social work etc.?
- ...has a diploma in a predominately technical discipline, e.g. science, engineering or health etc.?
- ...has a diploma in a predominately non-technical discipline eg. business, arts, social work etc.?
- ...has a trades certificate?  
- ...owns their own business in a technical profession?  
- ...owns their own business in a non-technical profession?
- ...works for a municipal, provincial or federal government (including RCMP, military etc.)?
- ...travels on business within Canada?
- ...travels on business to the United States?
- ...travels on business to foreign countries other than the US?
On a strictly personal and subjective level, how would you rank the designations listed below in comparison to your future designation of [Engineer | Technologist]?

| | ○ Electrician  ○ Airline Pilot  ○ TV Reporter  ○ High School Teacher  ○ Lab Scientist  ○ Social Worker  ○ Veterinarian  ○ Realtor  ○ [Engineer | Certified Technologist]  ○ Computer Programmer  ○ Carpenter  ○ Medical Doctor  ○ Home Inspector  ○ ER Nurse  ○ Police Officer  ○ Ferry Captain  ○ Army Sergeant  ○ Lawyer  ○ Tax Accountant  ○ Conservation Officer  ○ Winemaker / Brewmaster  ○ Land Surveyor |
|---|---|
| | (all) |

You are invited to food and drinks at a friend’s house on a Friday night. There is a large number of people at the party and while you have met a few of the guests before, you don’t know most of them. As you enter the house and exchange a few words with the host, he tells you that “the people standing over there are [Engineers | Technologists] as well”. How do you react?

| | ○ I couldn’t care less  ○ I wouldn’t actively seek them out, but if we happened to run into each other during the night, I might ask them what each was doing. If anyone happened to be from my field I would be interested in a longer conversation  ○ I wouldn’t actively seek them out, but if we happened to run into each other during the night, I might ask them what each was doing and engage in a conversation about [Engineers | Technologists] in general  ○ I would actively approach them at some point during the night to see if anyone was from my field  ○ I would actively approach them at some point during the night to see what other [Engineers | Technologists] have to say  ○ I would walk over right away, join the conversation and introduce myself as a fellow [Engineers | Technologists] |
| | (all) |

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<table>
<thead>
<tr>
<th>At the same event, you engage in a conversation with another guest and you realize that he/she is a practitioner in the same field as yours. You talk about some theory that is related to your field and that you encountered during your studies. You suspect that he/she must have gone to college or university as well. Which question are you most likely to ask?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Are you an [Engineer</td>
</tr>
<tr>
<td>• Are you an [Engineer</td>
</tr>
<tr>
<td>• Are you a [Technologist</td>
</tr>
<tr>
<td>• Do you have a degree?</td>
</tr>
<tr>
<td>• Do you have a diploma?</td>
</tr>
<tr>
<td>• Are you certified?</td>
</tr>
<tr>
<td>• What designation do you hold?</td>
</tr>
<tr>
<td>• Where did you go to school?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In the United States, ET is often branded as the &quot;applied branch of engineering&quot; and some institutions offer programs that lead to undergraduate and even advanced applied degrees in ET. These programs are not as heavy on math and science as traditional engineering programs but concentrate on the application of engineering principles. Graduates will possess an applied degree, but do not usually register as Professional Engineers but as Engineering Technologists instead. What would you do if this pathway were available in Canada?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• I have not thought about this or have no opinion on this issue</td>
</tr>
<tr>
<td>• Engineering Technology programs in Canada should remain the way they are</td>
</tr>
<tr>
<td>• Engineering Technology programs should remain at colleges and technical institutes but should offer a degree option</td>
</tr>
<tr>
<td>• Engineering Technology programs should remain at 2-3 years but should offer more hands-on content</td>
</tr>
<tr>
<td>• Engineering Technology programs should remain at 2-3 years but should offer more theoretical content</td>
</tr>
<tr>
<td>• Engineering Technology should remain a college/technical institute discipline with exit points after 2 years (diploma) and 4 years (applied degree)</td>
</tr>
<tr>
<td>• Years One and Two of Engineering Technology should be taught at colleges (diploma) and Years Three and Four at universities (degree)</td>
</tr>
<tr>
<td>• Engineering Technology should become a degree discipline taught by universities [side by side with engineering</td>
</tr>
</tbody>
</table>
## APPENDIX 3 – SURVEY OF THE GENERAL PUBLIC

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you…</td>
<td>☐ Male ☐ Female</td>
</tr>
<tr>
<td>To which age group do you belong?</td>
<td>☐ 18 – 20 ☐ 21 – 25 ☐ 26 – 29 ☐ 30 – 39 ☐ 40 – 49 ☐ 50 – 59 ☐ 60 or older</td>
</tr>
<tr>
<td>What is your employment status?</td>
<td>☐ Currently unemployed ☐ Employed in the public sector ☐ Employed in the private sector ☐ Self-employed ☐ Retired</td>
</tr>
<tr>
<td>Where do you live?</td>
<td>☐ In or within 20 km of an urban centre in BC that hosts both a university and a college ☐ In or within 20 km of an urban centre outside BC that hosts both a university and a college ☐ In or near a community in BC that hosts a college but no university ☐ In or near a community outside BC that hosts a college ☐ In a rural area in BC that has no local post-secondary institution within 20 km ☐ In a rural area outside BC that has no local post-secondary institution within 20 km</td>
</tr>
<tr>
<td>Which statement best describes your familiarity with the engineering and technology sector?</td>
<td>☐ I am working or have worked in a technical occupation ☐ I interact or have interacted with people from the engineering and technology sector on a daily basis ☐ I have close friends or relatives who work in the engineering and technology sector ☐ I am somewhat interested in technology but do not have frequent contact with people from the engineering or technology sector ☐ I am not overly interested in technology and do not have contact with people from the engineering and technology sector</td>
</tr>
<tr>
<td>Assume you have a child that is about to get married to a tradesperson. Which of the statements below best describes your deep-down opinion.</td>
<td>☐ I am not impressed at all, as I don’t think there is a lot to becoming a tradesperson ☐ I value the trades but I would have hoped for something better for my child ☐ Given the choice, I would have preferred someone with a degree for her but the trades are honourable professions, so, as long as my child is happy, so am I ☐ I am pleased ☐ I am thankful that he/she found a practitioner and not some head-in-the-clouds university graduate</td>
</tr>
<tr>
<td>How confident would you be explaining the difference between the two occupational categories or credentials in each of the following pairs?</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td>I wouldn't be able to discern I have a rough idea what the difference is I have a good idea what the difference is but don't know specifics with respect to the educational pathways I know what the difference is and how the educational pathways differ</td>
<td></td>
</tr>
<tr>
<td>○ Bachelor’s degree vs. Master’s degree ○ Certified Financial Planner (CFP) vs. Certified General Accountant (CGA) ○ Licensed Practical Nurse (LPN) vs. Registered Nurse (RN) ○ PhD vs. MD ○ Psychiatrist vs. Psychologist ○ Chartered Accountant (CA) vs. Cert. General Accountant (CGA) ○ Bachelor of Engineering (BEng) vs. Professional Engineer (PEng) ○ College Professor vs. University Professor ○ Engineering Technologist vs. Engineer ○ Microsoft Certified Systems Engineer (MSCE) vs. Professional Engineer (PEng) ○ Applied Science Technologist (AScT) vs. Certified Technician (CTech) ○ Conservation Officer vs. Naturalist</td>
<td></td>
</tr>
<tr>
<td>How much do you know about the designations of Applied Science Technologist (AScT) a.k.a. Certified Engineering Technologist (CET)?</td>
<td></td>
</tr>
<tr>
<td>○ I have not heard of these designations ○ I have heard of these designations but I don’t know any specifics ○ I know what type of schooling you need to achieve these designations ○ I know why these designations were created and what type of schooling you need to obtain them ○ I know when and why these designations were created and what type of schooling you need to obtain them ○ I know when and why these designations were created, what type of schooling you need to obtain them, and how the designations are awarded in BC</td>
<td></td>
</tr>
<tr>
<td>On a strictly personal and subjective level, how would you rank the designations listed below in comparison to the designation of High School Teacher?</td>
<td></td>
</tr>
<tr>
<td>○ Electrician ○ Airline Pilot ○ TV Reporter ○ Tax Accountant ○ Lab Scientist ○ Social Worker ○ Veterinarian ○ Realtor ○ Certified Technologist ○ Computer Programmer ○ Carpenter ○ Medical Doctor ○ Home Inspector ○ ER Nurse ○ Lawyer ○ Police Officer ○ Ferry Captain ○ Army Sergeant ○ Engineer ○ Conservation Officer ○ Winemaker / Brewmaster ○ Surveyor</td>
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