

Identification and Analysis of a Tertiary-Education Expectations Gap in Developed Countries

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Participation in tertiary education in developed countries has dramatically expanded over the past few decades. The perceptions of academic researchers, policy makers, employers and the general public have contributed to expectations of significant socio-economic and political gains from that expansion. This study, using a descriptive analysis and looking at the trends in historical perspective, found significant indications of a rising gap between the expectations and the perceived performance of higher education in developed countries. It is suggested that the recent expansion in tertiary-education may need refocusing to avoid growing gap between expectations and perceived-performance in tertiary education.

INTRODUCTION

Like most production functions, education experiences declining returns to scale (Wright et al, 2003) that will cause mass expansions to have declining marginal gains that are significantly below average gains. Governments in most developed countries (DCs) fail to grasp this economic truth and increasingly see higher-education-participation rates as key elements in their competitive strategy.

Gillard (2009), in her (then) roles as Australia's Deputy Prime Minister and Minister of Education, asserted that Australia must match the high-university-participation targets set by other nations (see, also, Bradley et al. 2008; Wilton 2008; Taylor and Pick 2008):

“For Germany the target is 40 percent. For Sweden and the UK it is 50 percent. For the Irish, it's 72 percent. ... [In response, the ambition of the Australian Government] is that by 2025, 40 percent of all [Australian] 25-34 year olds will have a qualification at bachelor level or above. Not just to have enrolled in higher education, but to have completed an undergraduate degree. Today that figure stands at 32 percent”.

The 40 percent or greater European Countries targets, reflects a common European Union goal “...to increase the share of 30-34 years old having completed tertiary or equivalent education to at least 40%...” (EC, 2011; Roth and Thum, 2010; Gros and Roth, 2008). In Australia, the “...proportion of the population with bachelor degrees or higher...[rose] from 5.8 percent of the population aged 15 years and over in 1982, to 14.3 percent of 15-64 year olds in 1998. The rate of increase has become more rapid since about 1987” (DEST 1992 and 1997, 2 and 6). In 2008, 21.9 percent of 15-64 year olds had a bachelor degree or higher (ABS 2008, 13).

Funding to raise higher-education-participation rates and outcomes comes with explicit and implicit expectations. Government policies in many DCs suggest that increasing the numbers of any type of Baccalaureate degrees will raise incomes, reduce criminality, and enhance health/wellbeing/longevity. After considering two centuries of education outcomes, this paper raises concern that the expected socio-economic-and-political outcomes of expanding higher education may be well beyond what is deliverable.

While education's socio-economic benefits are valued, it is often argued that knowledge and learning should be pursued as an exploration of the nature, limits, and potential of self, and one's place in the world. However, this fine sentiment is unlikely to placate stakeholders (e.g. governments, students, parents, and voters) who feel misled. The term misled is contentious and emotive and, it can be claimed that the cream of today's education system is every bit as good (if not better) than it has ever been. However, mass expansion of higher education is less likely to affect the cream of graduates than the marginal graduates.

This study uses a descriptive and speculative research methodology that:

- Reduces the risks of being: precisely wrong, less than relevant, and/or too-situation specific that can arise from isolated original research.
- Seeks to be approximately right (e.g. developing trends from data and a variety of public and expert opinions, expressed across wide-ranging sources), and
- Uses inductive logic to develop research questions for use in future empirical research.

The subsections of the next section of this study consider how expectations associated with expanding education have arisen and continue to rise and how job seekers are affected by rising minimum-education requirements. The third section uses multiple public sources to look at the trend of the opinion on quality and content in education and combines that trend with minimum education requirements into an imputed trend of the perceived competency of job seekers. The fourth section uses rising information flows as a proxy for growing complexity in society and considers how rising complexity will interact with the trends in education. The fifth section looks for a solution. The paper concludes with discussions, conclusions, and suggestions for future research.

HISTORICAL REVIEW OF EDUCATION

Expected deliverables from expanding baccalaureate programs

There is an extensive and often statistically intensive literature claiming that substantial socio-economic benefits will accrue to expanding participation in education. While the received literature (e.g. Berger and Parkin 2009; Allen 1999; Figures 1 and 2) indicates net premiums from all levels of education, Baccalaureate degrees appear to have the highest net return.

As governments in DCs became aware of this potential, they embraced mass-post-secondary education as a simple, low-cost solution to complex-socio-economic issues and an excellent investment for students and the nation. Levin (2009, 3) clearly articulates this notion:

“...more educated people are on average more productive workers and earn higher salaries. Their lifetime earnings are significantly higher than high school graduates, even taking into account the years of foregone income associated with more education, which means they pay more taxes. More than that, though, more education is also associated with just about every other imaginable social benefit, such as better health, greater longevity, and less criminality. These benefits are also intergenerational, being passed on at least in part to children.”

However, as David Hume's (1742, paragraph I.XIV.7) warned:

“...there is no subject, in which we must proceed with more caution, than in tracing the history of the arts and sciences; lest we assign causes which never existed, and reduce what is merely contingent to [false] stable and universal principles.”

FIGURE 1
ESTIMATES OF COST AND SLARY PREMIUM VS. YEARS OF EDUCATION, IN CANADA

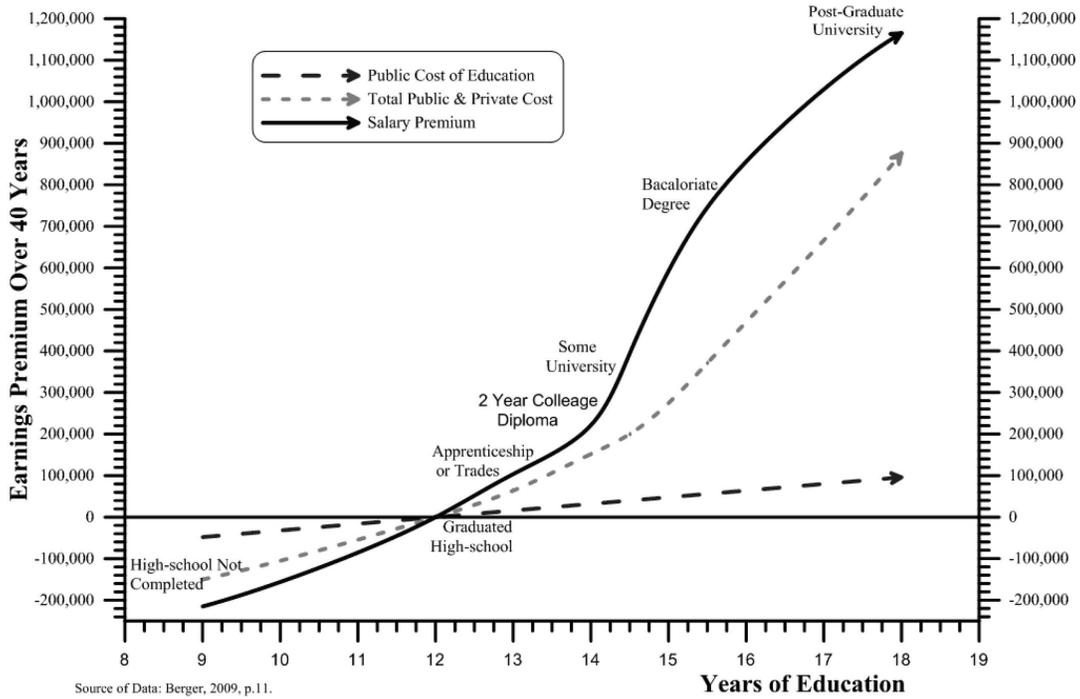
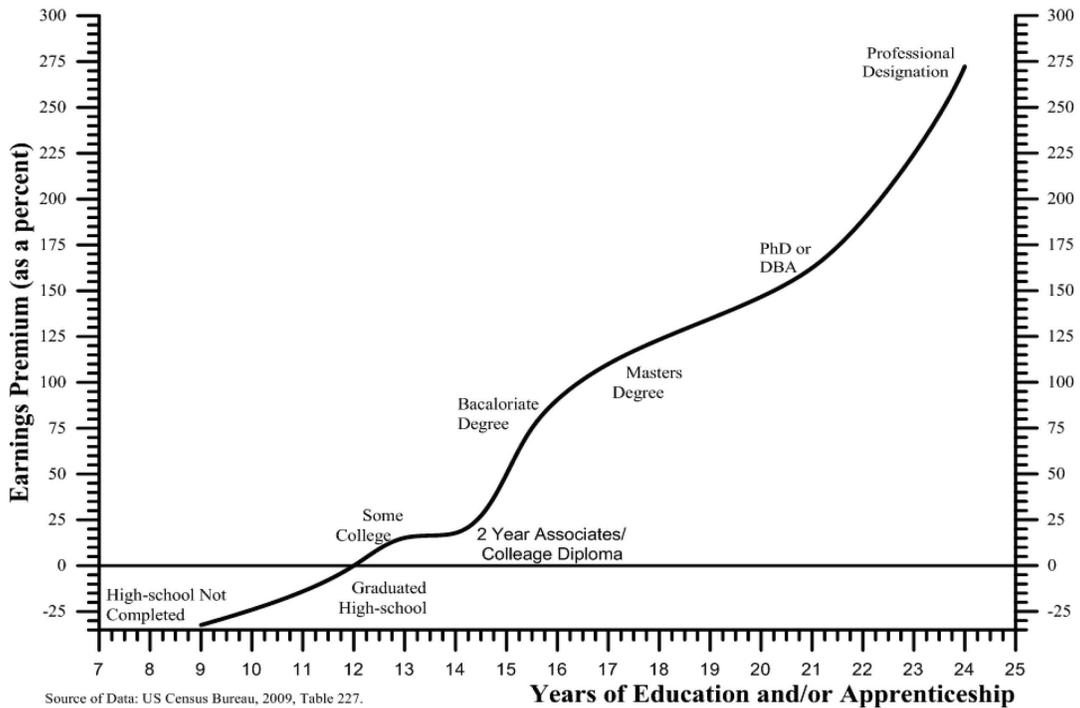


FIGURE 2
US SALARY PREMIUM VS. YEARS OF EDUCATION FOR INDIVIDUALS 35 TO 44 YEARS OF AGE



In modern parlance, correlation neither assures causation nor defines its direction or magnitude. An added caution to the notion that increasing the proportion of the population with Baccalaureate degrees will create enormous socio-economic and political gains, is that such a mass increase changes basic-social dynamics and thus violates the *ceteris paribus* assumption fundamental to many studies from which that notion was drawn. Other confounding factors include:

1. Over simplification – increased-earning power is not due to the degree but to a combination of skills from the education and the use of the degree by employers as a signal of a high-quality labour input. If the effort required to obtain a qualification is *watered-down*, that qualification can rapidly lose credibility as a signal of a high-quality labor input (Chan, et al. 2007).
2. Reverse causality – a tertiary qualification in an individual is just as likely to flow from a propensity to earn a higher income and/or lead a better life, as it is to be a significant cause of those propensities.
3. Education is subject to basic economics (Mokyr 2005; Taylor and Pick 2008):
 - Supply and Demand Axioms – As it becomes relatively more common, market forces are likely to cause the relative value of a degree to decline.
 - Returns to Scale – As noted previously, many of the purported gains to an expansion of tertiary education require constant returns to scale. While diminishing returns to scale is not an axiom, there are only a relatively few exceptional situations of constant or increasing returns to scale.
4. Conservation of misery – a sharp rise in the number of people with Baccalaureate degrees is likely to depress the market value of lesser educational accomplishments (e.g. the completion of grade 12). Thus, the continuation of an income gradation between those with and without higher education is no guarantee that increasing education adds value to society as a whole.

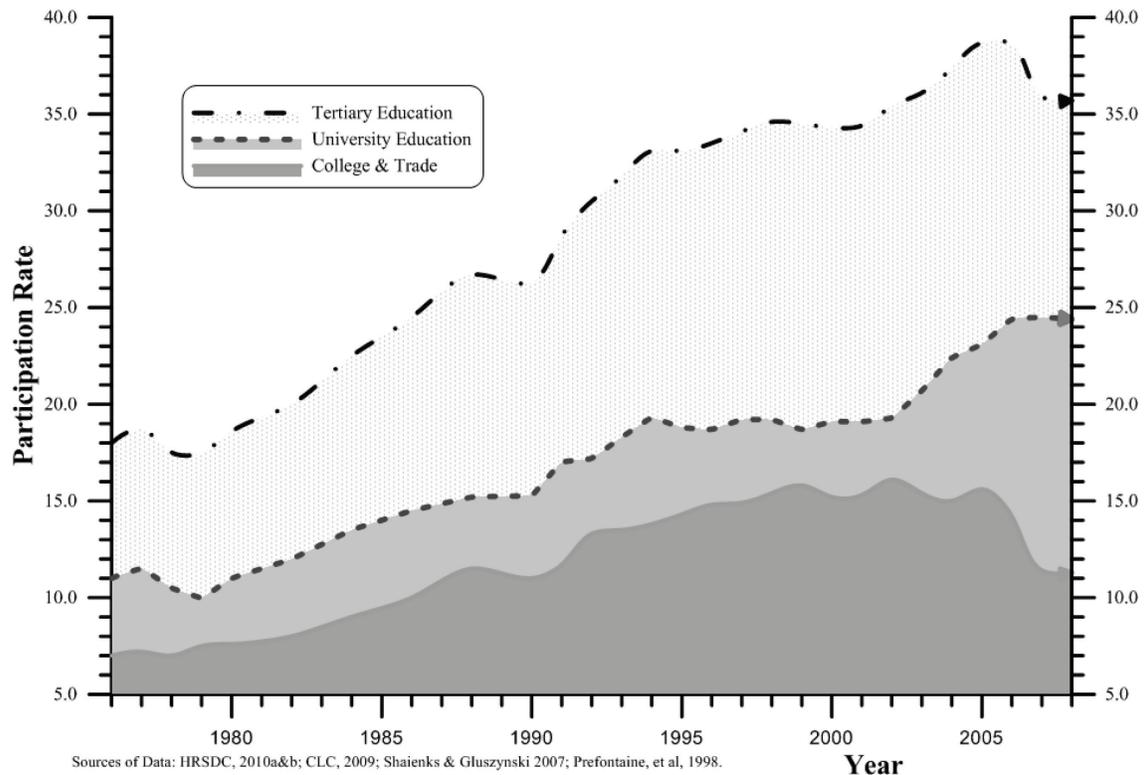
The above factors suggest that many of the benefits measured as accruing to education tend to be more relative than absolute and (in a variant of *Peer's Law* where "...the solution to the problem, changes the problem...") the gains expected from mass expansions of education may prove more illusory than real (e.g. due to the *fallacy of composition* which can occur if it is assumed that what is true for a small part of the whole must be true when scaled-up to encompass the whole or even a larger share of it – e.g. it fails to appreciate that the parts of the whole interact and, thus, the whole differs from the sum of its parts).

Many DC governments, expecting that any and all Baccalaureate degrees can raise income, increase competence, improve health/longevity and reduce criminality, have greatly encouraged participation in Baccalaureate programs (e.g. per Figure 3, Canadian participation in tertiary education nearly doubled to 37 percent during the 30 years to 2008; paralleling similar increases in other DCs). The large, post-2005, drop in (two-year) college and trade participation in Canada (in Figure 3), mostly reflects conversion of many colleges and trade institutions into Baccalaureate-degree-granting universities or university-colleges.

The meeting of stakeholder expectations inferred in the policies that expanded education depends on continuation of the relationships inferred in those policies. In evaluating the likelihood of that continuation, this study considers trends in the:

- Education access, over the last 200 years,
- Minimum-education hurdles that employers are applying to school leavers,
- Perceived quality and content of education over the past few decades,
- Perceived competence of school leavers.

FIGURE 3
TERTIARY EDUCATION PARTICIPATION RATES IN CANADA 1976-2008



INCREASED ACCESS TO EDUCATION AND RISING HURDLES TO WORK

Increased access to education is being touted as a *rising tide* of benefits that raises all boats. However, many benefits attributed to increased education in an individual arise because employers often use educational attainment as a signal to identify high-value labor inputs. As a result, rising average-educational attainments are likely to profoundly affect private returns to education and extrapolations from backward-looking forecasts are likely to significantly over-estimate the private and social benefits to a given level of education. This is evidenced by the education hurdle (for entry into employment) rising in conjunction with increasing access to education. What drives this relationship is unclear; among other things, it may include:

- Increased availability of educated labor (Mason 1996 and 1999; Mokyr 2005),
- Society and work becoming more complex (Reedy 2006), or
- Increased access to education being accompanied, in part, by declines in the quality and/or content in the education provided (Pryor and Schaffer 2000).

Historical Events and Development in the Demand for Education

The following discussion on the escalation in education attainment demanded by employers over the centuries is intended as a broad guide. While a more detailed study would be interesting, is beyond the scope of this study. In early-medieval England, reading was so scarce and valued that those sentenced to hang would often be pardoned if they could read a passage from the Bible. However, by the late medieval period, reading was sufficiently common that it was no longer a way to escape hanging. In the 15th Century, a modern equivalent of grade-two attainment was considered to be following-edge education. (The education signal is similar to signals in computer technology: leading-edge technology is too exotic,

flaky, and unreliable for general use; following-edge technology is usually sufficiently advanced and reliable to be ideal; and trailing-edge technology is relatively inexpensive, but provides no competitive advantage and can be unreliable and flaky when interfacing with more advanced technologies). It should be noted that, prior to the 19th Century, most education in Europe was not directly comparable to modern education as it included Latin, Greek, and Bible Studies along with the now familiar subjects of reading, writing and arithmetic. Early in the 19th Century, two years of education was still considered good, but roughly four years became common, as Prussian-style compulsory education was adopted by the USA and UK in, respectively, 1853 and 1870 (Rothbard 1975; Know Britain 2010). As discussed in the next subsection, in 1895, an eighth-grade education attainment was considered leading-edge, but in 1944, England shifted that standard to high-school. In the 1970s, high-school completion was desirable; by 2000, the goal shifted to Baccalaureate completion, and as the first decade of the 21st Century came to a close, there was mounting pressure for business-bound students to get a Masters degree and a PhD is the upper limit to education. Table 1 and eqn (1) summarize this discussion into a broad approximately-right pattern of the following-edge education that potential employers required of job seekers, over the past two centuries.

$$D_{ed} = e^{(b[Year-c])} - 1 \tag{1}$$

D_{ed} = following-edge education (in years)
 Year = time line (1800 to 2100 CE)
 b = slope parameter
 c = x-intercept parameter

TABLE 1
FOLLOWING-EDGE EDUCATION ATTAINMENT OVER THE LAST TWO CENTURIES

Time-line	Following-Edge Education Attainment	Years of Education
1400-1800	Grade two	2.00
1850	Grade four	4.00
1895	Grade six	6.00 ^a
1950	Grade ten	10.00
1975	High-school Completion	12.50 ^b
2000	Baccalaureate completion	15.50
2020	Master's Completion	18.00
2030-2050	PhD Completion	22.00

Source: Inferred and extrapolated from the discussion, immediately, above.

a In 1895, mid-west USA, a grade-eight education was considered leading-edge and a following-edge attainment would be a slightly lesser accomplishment (e.g. six years).

b In the 1970s, many but not a majority of DC high-school jurisdictions had grade 13.

TABLE 2
REGRESSION RESULTS FOR EQUATION (1) ON THE DATA IN TABLE 1

Statistical Measures -- Goodness of Fit	Parameters		T-Statistic
$R^2 = 0.9998$	b =	0.0082075	143.47
LM Statistic = 1.0146E-12	c =	1658.0	681.12 ^a
Durbin-Watson Statistic = 2.3238			
CHI ² test on normality of residuals = 5.7272, with 3 degrees of freedom			

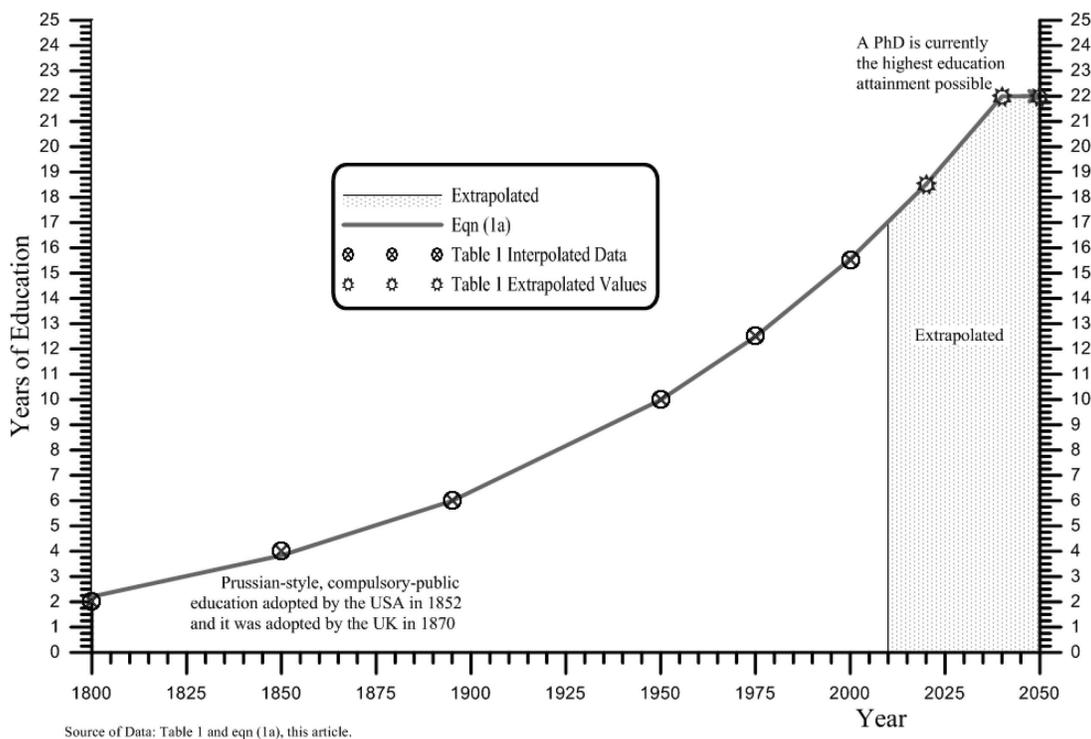
a The eqn (1) x-intercept infers a notional year in which education was not demanded by employers – thus, eqn (1) is meaningful from the year “c” to the present.

The regression results in Table 2 are far more precise than what is warranted by the crude nature of the forgoing analysis. However, the analysis is sufficient to provide insight into pattern of the *following-edge* education that potential employers required of job seekers and when the Table 2 parameter values are substituted into eqn (1), the result is:

$$D_{ed} = e^{(0.0082075[Year-1658])} - 1 \quad (1a)$$

The trend described by eqn (1a) in Figure 4 shows that the effort needed for a person to be defined as *well educated* shifted from 2 years of education to over 16 years, during the 210 years from 1800-2010. While that trend appears to be robust (i.e. a high R^2), it is unlikely persist beyond a few more decades (per Figure 4, the trend of rising following-edge education is likely to truncate at the PhD limit, sometime around 2030).

FIGURE 4
EDUCATION ATTAINMENT DESIRED BY EMPLOYERS



The use by employers of educational attainment as a signal of job-seeker quality, when combined with increasing participation in higher education, can create competitive pressures that may be value-deducting to those who already have higher degrees. Specifically, unless education content and quality is retained or enhanced and there are matching increases in the demand for educated individuals, continually increasing access to education pushes the gate-keeping education attainment to ever-higher levels and forces potential employees onto an education treadmill-to-oblivion.

RISING PARTICIPATION AND QUALITY-AND-CONTENT CONCERNS IN EDUCATION

It is important to note that this paper is not claiming that competency in education has been declining; what this section suggests is that here is a rising perception that competency in education has been

declining. There is a subtle but important distinction between these two points—the first, as discussed later in this section, is difficult if not impossible to prove, whereas, the second can be guestimated by reviewing the literature and specific opinions on education.

As previously noted, over the past 30 years, participation in post-secondary education doubled in many DCs and quadrupled in others. The number of tertiary-education providers also increased. For example, in business:

“...the number of business schools in Britain has risen from 20 in the early 1980s to 120 [and by] the spring of 2001, some 1,292 schools, or 92% of all accredited colleges and universities, offered an undergraduate major in business” (Pfeffer and Fong 2002, 78).

Given the increases in students and schools, a rising concern is: where are all the gains that were and continue to be promised for increased higher-education participation? Specifically, if that which was and is being promised were actually occurring, GDP per capita in DCs should have risen at a progressively faster rate (i.e. reflecting all the real net-wealth created by ever-higher numbers of better-educated graduates). As this is not occurring (Wolf 2002, 2004; CBC 2009), much of the purported gains from increased higher-education participation may be more private than social; more a wealth-transfer (than new-wealth creation); and more illusory than real. (Canada’s GDP per capita in constant purchasing power parity (PPP) rose at a fairly constant 1.81 percent, over the 33 years from 1976 to 2008 (i.e. inferred from the CBC (2009) observation that Canada’s GDP per capita rose from \$17,500 to \$31,600 (in constant PPP USD) from 1976 to 2008 [(31600/17500)^{1/33}]). Monteils (2002, 93), after reviewing and reappraising the extensive literature on education and endogenous growth, asserts that “...knowledge produced by education cannot be the engine of self-maintained economic growth.”

The aforementioned concern that increased higher-education participation may not meet its expected deliverables is intensified by a mounting public perception of an ongoing decline in the average quality and content of education. The debate on the existence and degree of decline in educational competence is made enormously difficult by advances, paradigm shifts, drift, and other changes in the cultures in which education occurs. Few things epitomize these issues better than the internet debate on an 1895 final-exam for grade-eight (Maggie's Farm 2006). While many Bloggers use that exam as definitive proof of declining education standards, others counter that the exam was for teacher applicants (not eighth-grade students) or that changing cultural realities make the content of an 1895 exam irrelevant. One astute commentator noted that:

“...most students taking this test will have been those who managed, one way or another, to stay in school as far as Grade 8. This means either that they had money, or aptitude, or both. Others [in 1895] will long since have dropped out, after learning basic writing and arithmetic, to workprobably the top 20% of our current students could – given ... enough time to memorize the facts it requires ... – pass this test. Does that represent any fewer students than would have [successfully] taken it in 1895?” (Maggie's Farm 2006).

An extensive literature claims that competency in education has been declining for decades (Hirsch 1987; Trout 1997; Shattuck 1997; Bercuson et al. 1997; Reeves 2001; Allit 2005; Roman 2005; Amble 2005; Vedder 2005; Leigh 2005; Reedy 2006; Leef 2006, 2009; Gollin 2009; TPA 2009; Leigh and Ryan 2010). And other researchers argue in counter-point (Reynolds 2002; Ehrenberg 2002; Jamison, et al. 2007). In the literature, difficulties in assessing the true-state of education centre on three themes:

- 1) Hirsch’s (1987) concept of cultural literacy creates issues because cultures evolve, shift and change over time. Thus, cultural drift makes it difficult to set meaningful measurement standards, over the time-frames needed to fairly evaluate any change in educational standards and content,
- 2) Academic degradation, like the parable of the frog, is a slow incremental progression that is often little noticed, until conditions have deteriorated to where they are difficult or impossible to reverse (e.g. in the parable of the frog, a frog dropped in scalding water reacts quickly and jumps out, but if it is dropped into a pot of cool water that is

- then slowly heated, the fog swims about, dumb, happy, and unconcerned, until it is well-and-truly cooked.), and
- 3) There is always a difficult-to-quantify range of quality across education providers and across the degrees provided.

The interaction of these themes makes it important but difficult to compare Baccalaureate degree quality and content across decades. One reasonably-reliable indicator is the time students take to complete a degree. Further, if (as suggested by Carney, et al., 1978, Kolevzon 1981, Millman, et al. 1983, Sabot and Wakeman-Linn 1991, Kuh and Hu 1999, Johnson 2003, Chan, et al. 2007 and many other researchers) grade inflation occurs during the elapsed time, then any declines in the time taken to complete a degree is a doubly-clear indicator of academic degradation; as is any a shift to using non-honors courses.

In the 1970s, a common requirement for a BCom in many DCs was four-to-five years of university courses (much of it at the honors level). Currently, many Baccalaureate-degree-granting institutions, in DCs, offer BCom degrees that require only three-years of education (with little or none at the honors level).

A decline in the quality of UK university graduates is implicit in Tarver's (2007) comments: "After seven years of the new regime, I had the opportunity to compare the class of 1999 with the class of 1992. In 1992 I set ... [a] course in Artificial Intelligence requiring students to solve six exercises, including building a Prolog interpreter. In 1999, six exercises had shrunk to one; which was a 12 line Prolog program for which eight weeks were allotted for students to write it. A special class was laid on for students to learn this and many attended, including students who had attended a course incorporating logic programming the previous term."

Murray (2008), working from the mathematical tautology that half of all students are below average, asserts that, because the proportion of young people who participate in higher education has been greatly increased (unless the degree content is greatly watered-down):

"...the number of students who want, need, or can profit from four years of residential education at the college level is a fraction of the number of young people who are struggling to get a degree. We have set up a standard known as the BA, stripped it of its traditional content, and made it an artificial job qualification. Then we stigmatize everyone who doesn't get one. For most of America's young people, today's college system is a punishing anachronism."

Please note, the US college system refers to their higher education system (two year- to four-year university-level courses), whereas, in other countries (e.g. the UK and Australia) college may refer to an institution offering secondary-level education.

One of the striking trends in the mid- to late-20th Century is soaring enrolments in business-degree-granting tertiary-education institutions in developed countries and in their on-shore and off-shore partners and affiliates. Bennis and O'Toole (2005) note there are well-documented expressions of public concern that, as MBA student numbers increase, the quality of their education may deteriorate. Rubin and Dierdorff (2009, 208) investigated the relevancy of MBA curricula, in relation to the managerial competency requirements, with 8,633 managers across 52 occupations, found that the "...behavioral competencies indicated by managers to be most critical are the very competencies least represented in required MBA curricula". Pfeffer and Fong (2002, 80 and 88) suggest:

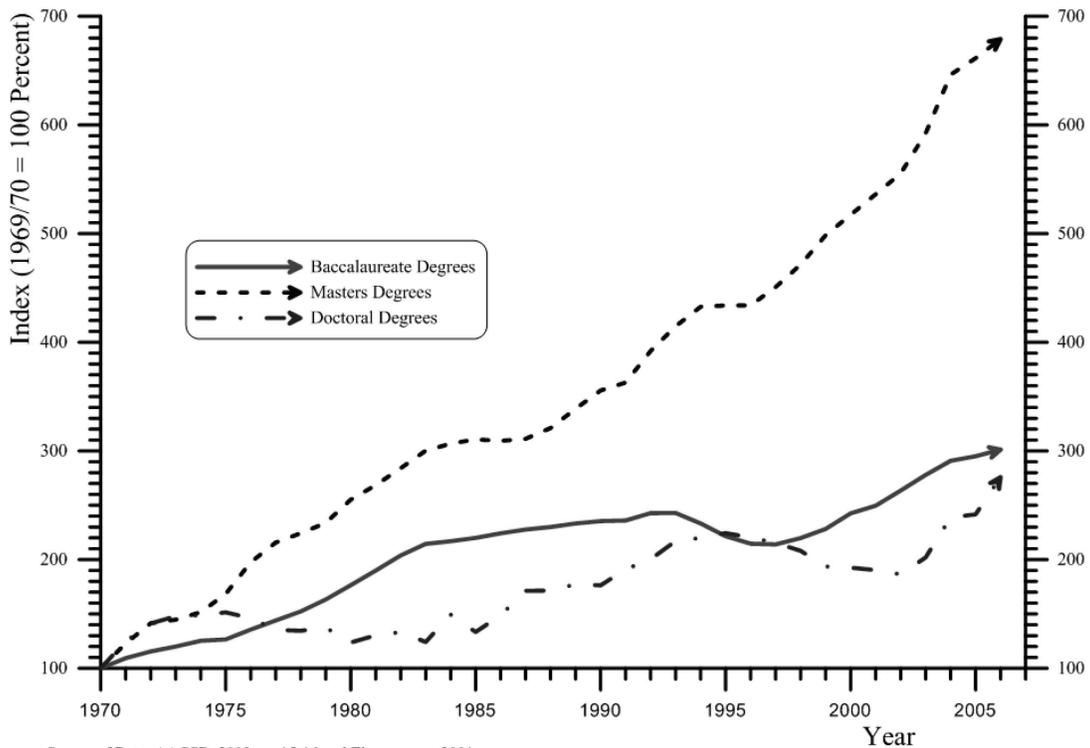
"There is little evidence that mastery of the knowledge acquired in business schools enhances people's careers, or that even attaining the MBA credential itself has much effect on graduates' salaries or career attainment. ... [A] large body of evidence suggests

that the curriculum taught in business schools has only a small relationship to what is important for succeeding in business.”

Ghoshal (2005, 75-76 and 79) asserts that many of:

“...the worst excesses of recent management practices are rooted in ideals that emerged from business school academics over the last 30 years. [Specifically, the propagation of]...ideologically inspired amoral theories [justified via a pretense of scientific knowledge by], business schools have actively freed their students [and others they influenced] from any sense of moral responsibility.”

FIGURE 5
DEGREES CONFERRED BY US BUSINESS SCHOOLS INDEXED TO 1969/70



In contrast to the forgoing negative commentaries, many higher-education institutions are trying to be more relevant by: seeking to improve outcomes, concentrating on more experienced students, adopting more multi-disciplinary-program designs, and encouraging critical thinking on actual business issues. However, Pfeffer and Fong (2002, 84) found these reforms are hindered by on-going-budgetary pressures, faculty shortages, increased teaching loads, and the tendency for faculty to be promoted more for theoretical-and-analytical contribution than for experience and applied knowledge. Healy and Tronson (2010) observed nearly a decade later that the:

“...university sector faces an infrastructure funding gap of \$10 billion-\$15 bn to meet the Rudd [Australian] government's participation targets in the next 15 years, and there are now calls for an urgent re-examination of how the targets will be properly funded...”

While the forgoing comments from academics are worrying, the most disturbing evidence of issues in education comes from employers, who complain they increasingly have to resort to:

- Supplementary training to overcome deficiencies in the knowledge, skills, aptitudes, and attitudes of the new graduates they hire (Balch 2004; Amble 2005),
- Raising the education hurdles for job interviews (Amble 2005; Wilton 2008; Figure 4, above; and phone interview with Witt 2010), and
- Bringing back retirees, to be exemplars of work ethics, reliability, and personal integrity for younger new staff (Meyer 2006; SeniorMag 2010).

A probable cause of the above problems is well described by Leef (2009):

“Human capital gains occur when an individual *improves* his mental ability; when his learning enables him to better think through problems, produce value, communicate, evaluate options, and so on. Unfortunately, at many colleges and universities, students can easily pass courses with just the mental toolkit they possessed in high school... [Thus] passing a college course no more indicates a human capital gain than just going to a gym indicates an improvement in physical fitness.” (Leef, 2009, 1).

A UK forum for a private-business survey (Amble, 2005, 1) notes that standards of literacy, numeracy and oral skills of school leavers recruited by business was poor or very poor and per one survey respondent:

“...qualifications are so invalidated that many employers now have the additional task of making their own assessment of any applicant, irrespective of their apparent qualifications”.

Leef (2009, 1) asserts that:

“...many [college] students don’t have to become better at reading, at writing, at math, at logic. Sadly, the key consideration at many colleges is not educational excellence or even modest progress, but simply enrolling and collecting tuition from as many students as possible. Therefore, course content has been watered down and expectations lowered so that even the weakest and most disengaged students can pass.”

Bauerlein (2008) suggests the problem arises from the current generation of students:

“... even though Americans now have more formal education than ever – more classroom time, more degrees – the young generation is quite poorly educated. It isn’t just that they don’t know much, but that they’re not much interested in acquiring knowledge and are ill-equipped to comprehend anything that isn’t written in the simplest of modes.”

Sperber (2000) suggests that declining standards in higher education may be due to a faculty/ student non-aggression pact where students get light assignments and good grades in return for expecting little instructional effort from lecturers, who busy trying to advance their academic careers (via research-focused progression criteria). An article by Hodges and Garner (2009) offers an alternate explanation and gives a horrific example of what can happen when a higher educational institution is caught between a rock (the pressure to recruit and retain students) and a hard place (satisfying requirements of quality assurance). In such cases, eventually, one or the other or both must yield.

Even though allegations of ongoing competency declines in education are not proven, there is a mounting perception of problems. It could be argued that, given the many government programs to verify Quality Assurance in higher education and the need for many programs to gain accreditation from professional bodies (e.g. accounting, engineering, law) how is it that competency in higher education could decline? Harvey (2005, 268) provides part of the answer when he notes that by “...the early 1990s, quality had evolved from a marginal position to being the foremost concern in British higher education alongside funding issues and expansion”—if quality was not becoming an apparent issue in 1990, why was it becoming so important? Harvey (2005, 272) provides another insight when he notes that quality “...evaluations involve game playing to case the evaluated programme or institution in the best possible

light.” It is equally important to note that many quality assessment tools (e.g. ISO 9000) are more about consistency and documentation of processes than the quality of outcomes. Harvey (2005, 263) asserts that government “...quality evaluations [of higher education] were guided as much by political pragmatism as rational evaluation” and also suggests that:

“The more cynical view is that the huge quality superstructure is designed to hide a worsening academic base. Evaluations that rely on fitness for purpose tend to be reductionist, fragmenting the notion of quality rather than exploring the complex interrelationships that ultimately impact on the key stakeholders. They are deliberately disassociated from the politics of quality and are incapable of making any link between the quality monitoring procedures, the resource envelope, the student experience of learning and the range of accomplishments and standards of graduates” (Harvey, 2005, 274).

On the topic of quality assessments of higher education, Laughton concludes that:

“...if academics are not convinced of, or do not actively support, the values and methodologies associated with teaching quality review, then there is little chance that these reviews will either produce accurate or meaningful assessments of teaching quality, or act as a spur to the quality enhancement of this aspect of individual and institutional activity” (Laughton, 2003, 309).

The issues faced by the Professional Accreditation bodies are similar to those of the academic peer and the government quality assurance bodies and are greatly compounded because their legitimate concerns with practical and professional competencies often conflict with the academic pursuits and perspectives of the academics who teach higher education. Also, many professional accreditations are more of a desk audit that a detail review of processes and outcomes. Even so, several universities have either lost their accreditations with professional bodies or have had the duration between reviews significantly reduced.

While currently, the perceived ongoing decline in educational competency is not a proven fact and may ultimately be proven wrong, the perception represents current forces that should be addressed, by society, to sustain confidence in all levels of education.

THE PERCEIVED COMPETENCY OF NEW FOLLOWING-EDGE EMPLOYEES

This analysis portrays the perceived declining competency in higher education by setting parameters in eqn (2) to mirror published assertions of a nonlinear decay pattern that (indexed to 1965) progresses slowly until the mid-1980s, and becomes increasingly apparent by the middle of the first decade in the 21st Century.

$$E_Q = 101 - e^{b(\text{Year}-c)} \quad (2)$$

E_Q = competencies from education
 101 = anchor parameter
 b = scaling parameter = 0.05995
 c = assumed initiation = 1965

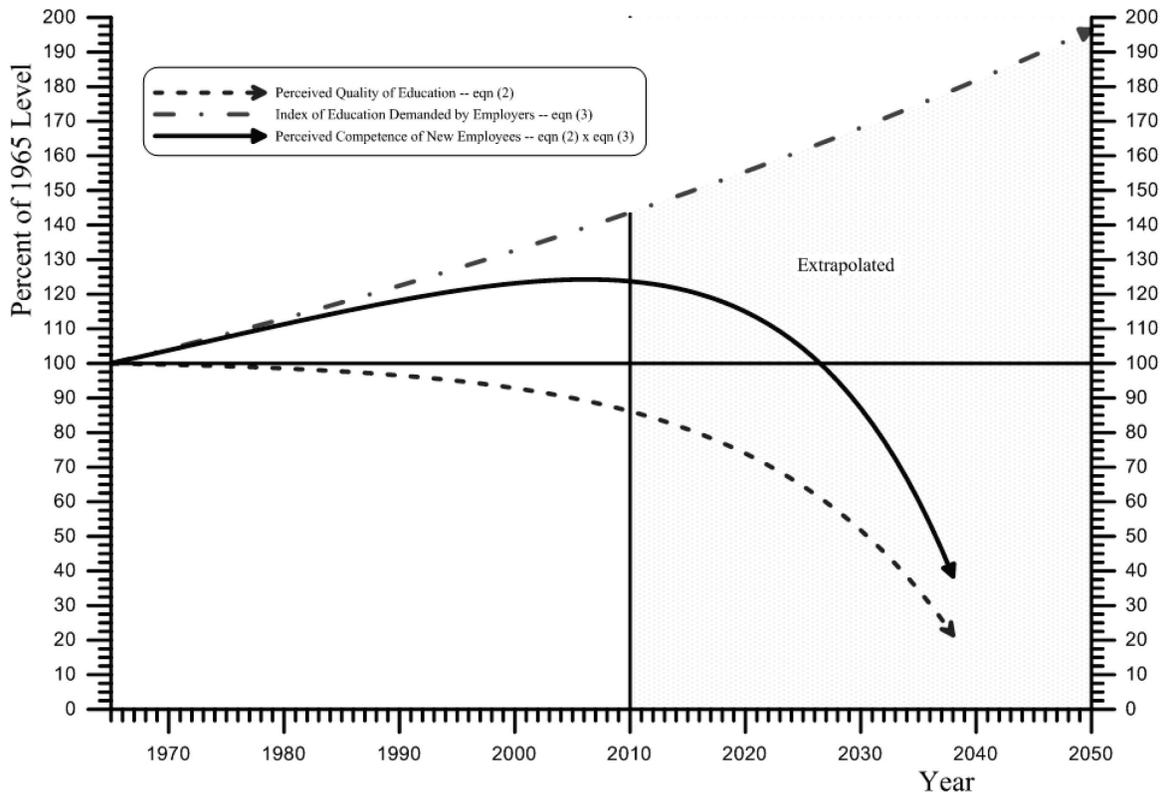
The perceptions that eqn (2) is intended to track are, by nature, fuzzy and the nonlinear nature of the equation makes the choice of scaling parameter highly sensitive.

Figure 6, contrasts the perception of declining quality and content in education (eqn (2)) with the following-edge education demanded by employers (eqn (1)). That contrast required, however, that eqn (1a) be indexed (eqn (3)) by expressing all its results, as a percent of the 1965 level:

$$I_{De} = (e^{(0.0073203[Year-1965])} - 1)100 / (e^{(0.0073203[1965-1965])} - 1) \quad (3)$$

I_{De} = Indexed following-edge education

FIGURE 6
PERCEIVED COMPETENCY OF FOLLOWING-EDGE NEW EMPLOYEES



The perceived net competency of new employees was illustrated by multiplying eqn (2) by eqn (3). Competence is having the requisite knowledge, skills, abilities and behaviors (Brannick et al. 2007; Schippmann et al., 2000). Figure 6, illustrating eqns (2) and (3) and the product of those equations, shows how (after rising for decades) the perceived competency of new following-edge employees is now declining at an accelerating rate. The previously cited acerbic comments by employers and academics, on the perceived competency declines in education, are more consistent with the post-2010 portion of Figure 6. However, those comments refer to (what were then) trailing-edge new employees (i.e. graduates of high-school or two-year-tertiary programs) and following-edge qualification had risen to somewhere between a Baccalaureate and Masters Degree (Table 1).

ACCELERATING INFORMATION FLOWS AND PERCEPTIONS OF EDUCATION QUALITY

The forgoing trends in higher education are likely to combine with a third trend (rapidly-accelerating-information flows) to threaten the career prospects of the next generation. The general shapes of the following trends are starting to be revealed:

- Perception of an ongoing debasement of education competency,
- Rising entry level of education attainment demanded by industry, and
- Accelerating information flows.

Although solid evidence and specifications for the above trends may take over a decade to ripen, ideally, their implications should be considered while there is still time to take corrective action. As with most early warnings, the speculative thought in this paper is derived from preliminary facts and patterns. However, by the time there is incontrovertible evidence, the trends are likely to be so firmly entrenched that they may be difficult to reverse or even deflect to happier outcomes.

An Accelerating Need for Increasingly Competent Employees

Double exponential increases in information flows are being driven by a pull-based response to accelerating advances in information-processing technology that cut information costs (Wright and Dawood 2007; Kurzweil 2005) and a push-based response to rapid advances in knowledge (Wright et al. 2008). Equation (4) is adapted from Wright et al. (2008) to estimate managerial information loads after the information flows are filtered by company information systems, divided by an estimate of the information capacity of the human brain, and divided by five. This rule-of-thumb is derived from the well accepted adage that managers should be able to make good decisions with 20 percent of the ideal information).

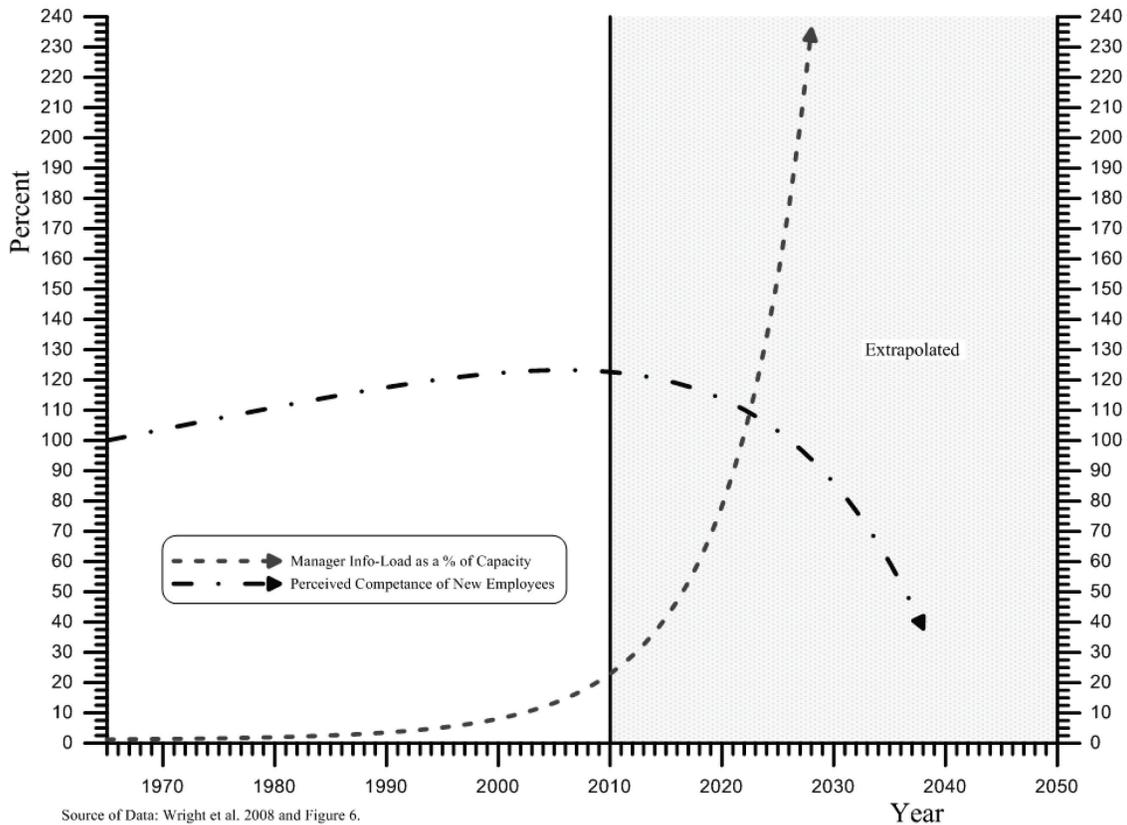
$$I = \frac{[e(e[1.9141+0.01111(t-1969)])+1,800](100)}{5E13(2E6)5} \quad (4)$$

I = information flows per year

The need for high-quality employees has been accelerating since the 1990s (Figure 7). In theory, newer employees should be better able to handle higher-information loads than older, less-well-educated employees. However, the decline in the perceived competence of higher education (Leigh 2005; Leigh and Ryan 2010) became more apparent during and after the 1990s (Figure 6) and business responded to this perceived decline by increasing their demand for individuals with higher degrees (Wilton 2008). The perceived competence of following-edge new employees (eqn (3)) continued rising (Figure 7) until around 2005, then flattened-out and begin to decline steeply, after 2010. Figure 6 suggests the cause of that decline is likely driven by the perceived decline in educational competence that began in the mid-1960s, accelerated in the mid-1990s, and dominates the employer perceived-competence-of-following-edge new employees after 2005.

Figure 7 suggests the declining perceived-competence-of-new-employees trend is likely to collide with the trend of accelerating information-loads on managers. A massive information bottleneck is likely to result around 2025, as businesses are overwhelmed by double-exponential rises in information. In the early stages of this debacle, those with little or no higher education will have progressively more difficulty finding employment. Governments will respond to that crisis with loans and other means for the chronically unemployed to get more education. As the crisis deepens, confidence in education may falter and fail causing even those with higher degrees to have difficulty finding work, as employers perceive that a rising share of new workers fail to measure-up against older workers. Finally, confidence in business may falter as the fraction of information that managers can reasonably access increasingly becomes too little too late and good management devolves from a science, to a black art, to a lottery (Wright et al. 2008). There is a real risk that educators will be blamed when society chokes on the ever-accelerating flows of information and the reputations of many tertiary-education institutions will reach a tipping point. Kurzweil (2001, 2005) asserts that this crisis is unavoidable and that, around the mid-third of the 21st Century, information speeds/loads be unsustainable by modern humans and a singularity (i.e. a discontinuity) is inevitable. Continuity of the global economy/culture requires that this crisis be averted or resolved (Wright and Dawood, 2007).

FIGURE 7
MANAGERIAL INFORMATION LOADS AND THE PERCEIVED COMPETENCE OF FOLLOWING-EDGE NEW EMPLOYEES



RISING TO NEW CHALLENGES IN EDUCATION

Universities have, over the last millennia, reinvented themselves many times (Watson, 2005). However, over the last few decades ongoing budgetary constraints imposed by governments, who are promoting expanded participation in Baccalaureate programs as a low-cost simple solution to complex socio-economic problems, seem to be diverting universities from reinventing themselves to help society transcend an ever-rising glut of information.

Accelerating rates of change are creating risks and opportunities for universities; who can only stay relevant to society if they are in the forefront of creating and disseminating the human capital their students need to cope with the coming info-tsunamis (Wright et al. 2008, 7). Human capital is becoming exponentially more durable and valued than mere qualifications or memorized knowledge. Established models and modes of passing extant knowledge from one-generation-to-the-next via rote learning are rapidly becoming less effective. Specifically, accelerating info-tsunamis are making the ability to learn, adapt and think ever more valued than memorized knowledge. The half-life of knowledge is the time that it takes for half of it to become obsolete, forgotten, or incorrect. See Burton and Kebler (1960) and Rousseau (2000) for a detailed discussion of the half-life of information. Universities need to reinvent the delivery of their degrees to involve less memorized knowledge and more of the skills, critical thinking, attributes, aptitudes, and know-what needed to integrate vast and rising flows of information.

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

Over the last few decades, DC governments have come to believe that increasing the proportion of their population with Baccalaureate degrees is a cost-effective solution to a host of socio-economic problems. These beliefs have translated into policies that encourage, cajole, and demand universities increase Baccalaureate-program participation and completions. However, such policies often ignore the content of those degrees and the competencies of their graduates. Further, estimates of the capacity of universities to evoke social change, may have been greatly exaggerated, because they do not appear to have considered *Peer's Law* and/or *the Fallacy of Composition*. This effect has been exacerbated as many universities have responded to government expectations by self-selecting programs, academics, policies, preferred research and administrative structure so as to facilitate the production of low-cost Baccalaureate degree completions. However, the quality-and-content risks of this self-selection are being perceived and commented on by the public and employers.

The info-tsunami will put overwhelming pressure on the economy at global-, national-, regional-, and local-levels. Universities may have to reassess how they add value to their societies and what value their societies and students will need in future decades. Specifically, universities need to start thinking about how to educate their students to best serve and survive, in the in rapidly-evolving economies of the coming decades.

If universities are unable to reverse the escalating perception that many are failing their societies, it will be interesting to see how their societies seek to supplement or replace the social role of universities. Professional-accreditation bodies might have the motive and the means to quickly fill such a gap. Future research should reappraise how university degrees are used in society and if young people need 15-20 years in school to prepare them for productive employment and/or to enjoy high-quality lives. For example, can unskilled or semi-skilled jobs be learned by grade 10? Additional education might then be a voluntary life-long-learning process where, after and as they gain work-and-life experience, the young could choose how much more and what education they want, need, and can afford.

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