

The Landscape of Prince Edward Island's Knowledge Economy

Presentation to the Public Forum on the Knowledge Economy
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Introduction

When I took on the task of preparing a paper and presentation on the "Landscape of Prince Edward Island's Knowledge Economy," I was optimistic that it could be carried out fairly quickly.

I soon gained a better understanding of the challenge before me -- in the words of the previous speaker, my task was to turn information into knowledge. So much data, so little time. And yet, in many cases, such poor data for our purposes. Several concerns exist regarding data quality and relevance.

Our Scale: Prince Edward Island as a Rounding Error. Prince Edward Island's small scale poses a challenge for anyone trying to use national statistical data. In surveys, our sample size is frequently so small that no reliable inferences can be drawn from the data; in some instances, in fact, no numbers are given for Prince Edward Island. Where dollar amounts are used, the sums can be so small that rounding to the nearest million can magnify small changes into massive swings.

Outdated Data. One answer to this challenge is to turn to comprehensive surveys, most notably the census data. Here, however, we encounter the trade-off between reliability and timeliness. The findings from the 1996 census are only beginning to be released, so in many areas it is necessary to fall back on 1991 census data -- and in the knowledge economy, seven years is an eternity.

On a more positive note, a substantial number of relevant findings from the 1996 census are scheduled to be released very shortly. Detailed labour force data are to be released in mid-March, 1998, and detailed data on education levels are to be released in mid-April. This information on Prince Edward Island's human resource will be complemented by the findings of a local study, the Knowledge Worker Demand Survey. This study, supported by the Knowledge Economy Partnership, is currently nearing completion and is exploring existing and anticipated demand for Information Technology (IT) workers in Prince Edward Island.

Under-reporting? Some of the comparisons and findings in the following slides show Prince Edward Island in a very discouraging light. This is particularly so with regard to the Research

and Development (R&D) area. It raises serious questions in my mind as to whether the full extent of activities in Prince Edward Island is being reported to agencies such as Statistics Canada.

Doing the Right Things? The issues above reflect concern that we may not be "doing things right" when it comes to reporting and measuring knowledge-related activities and indicators in Prince Edward Island. A larger issue exists as well: are we doing the right things? There is widespread recognition that measurement of the knowledge economy and society is really in its infancy, and that existing indicators and surveys are geared to the industrial era. Calls for better and more appropriate indicators are front and centre in many Organization for Economic Co-operation and Development (OECD) publications, and in studies such as the recently released *Final Report* of the federal Information Highway Advisory Council.

The good news to be drawn from these observations is that work like this is sorely needed. The bad news is that it isn't going to be easy. Nonetheless, for the purposes of today's presentation, I have gathered together some indicators from a variety of sources. In some cases, the data are second-hand; in others, findings from different surveys are being compared in order to draw out points that seem useful in better understanding the emerging knowledge era.

I believe that indicators that outline our historical progress toward a knowledge economy and our current status are critically important as we embark upon the Knowledge Assessment Methodology Project. It has often been said that the move to a knowledge-based economy in Prince Edward Island removes or reduces many of our traditional disadvantages of scale and peripheral location. This may be so -- but the same effect applies in every other small, remote, coming-from-behind jurisdiction in the world -- and we are competing against all of them as we seek to build our knowledge economy. It is essential that we have a clear understanding of our strengths and our weaknesses in the areas upon which the knowledge economy is founded.

Accordingly, this presentation is organized into five sections: Knowledge Economy

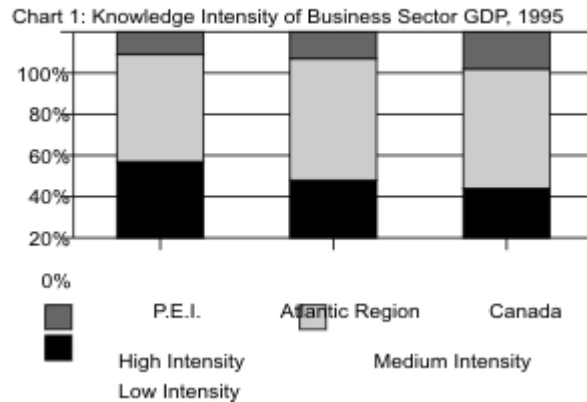
- Knowledge Infrastructure
- Knowledge Creation
- Knowledge Workers
- Knowledge Society

In some cases, only a few indicators are presented. I should note that further work is planned on this initiative, and I would welcome your comments and advice on how best to proceed.

[>>>top](#)

Knowledge Economy

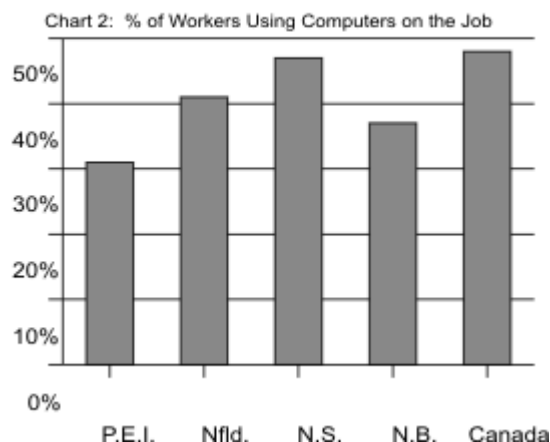
Private-Sector Knowledge Intensity



In November 1997, the Atlantic Provinces Economic Council (APEC) made a presentation in Charlottetown, one of several in the region, on its study "Information Technology: Transforming the Atlantic Economy." This study drew on specially commissioned survey work by Statistics Canada and on a number of other sources to explore the potential and the current status of the IT sector in the region.

As indicated by the above chart,¹ the knowledge intensity of Atlantic Canada's, and, particularly, Prince Edward Island's, private sector lags behind the Canadian average. Only 9% of Prince Edward Island's business sector GDP was classified as high knowledge intensity, compared to 13% for the region and 17% nationally. Low knowledge intensity activities, on the other hand, accounted for 37% of Prince Edward Island's business sector GDP, compared to 28% for the region and 24% nationally.

Computers in the Workplace

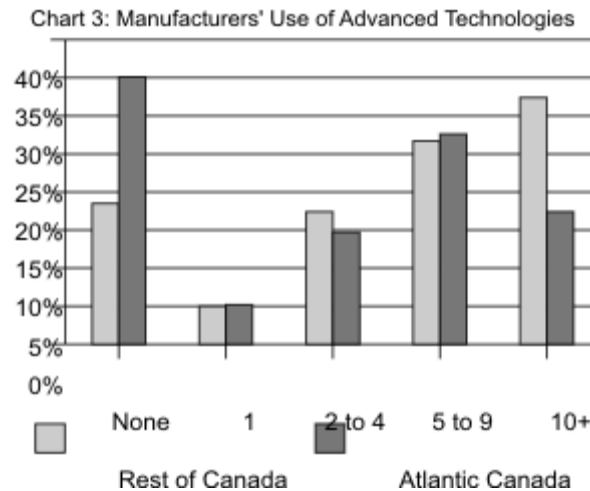


The study by APEC looked beyond IT and other knowledge sectors to explore application of knowledge and technology in the economy at large. One area examined by APEC was the extent to which workers used computers on the job, relying on 1994 data from Statistics Canada.²

Here again, as shown in Chart 2, Prince Edward Island lagged behind the region and the country.

[>>>top](#)

Manufacturers' Use of Advanced Technologies



Using data from the Statistics Canada survey they had commissioned, APEC also examined the extent to which manufacturers in Atlantic Canada use advanced technologies compared to those in the rest of Canada.³ shows its findings, with reference to a list of 22 advanced technologies related to manufacturing. It indicates a significant lag between the region and the rest of Canada. Over a third of the region's manufacturers used no advanced technologies at all, compared to less than one-fifth of manufacturers in the rest of Canada. At the other end of the scale, only 17% of the region's manufacturers used ten or more advanced technologies -- half as many as in the rest of Canada.

A good deal more work needs to be done in describing the economic aspects of Prince Edward Island's knowledge landscape. Little work has been done yet by local researchers and statisticians, whether in the public sector or in academia, to develop indicators of the knowledge economy from available data, or to define and gather more appropriate data. A clear need exists for further research in this area.

[>>>top](#)

The Knowledge Infrastructure

I had planned, in this section of the presentation, to discuss Prince Edward Island's educational system as well as its network of research facilities and its IT infrastructure. A complete presentation on the landscape of Prince Edward Island's knowledge economy should address the educational sector:

- the early childhood development sector, which many experts see as the first key step in developing knowledge workers;
- the elementary-secondary system and the vocational training system;
- private training capacities; and
- the post-secondary system, which lies at the core of both knowledge creation and knowledge worker education -- including the higher education opportunities of the region available through the regional system administered by the Maritime Provinces Higher Education Commission.

A comprehensive presentation would also describe the network of research facilities that some have dubbed the Belvedere Group -- an array of federal, provincial, and university facilities involved in plant, animal, and human health, and food quality. These facilities include:

- the Atlantic Veterinary College, among other strengths a world leader in salt water aquaculture;
- the Agriculture Canada Research Station, which emphasizes potatoes and the associated rotation crops;
- the Food Technology Center, a provincially supported facility located on the University of Prince Edward Island's (UPEI) campus, providing product development and quality services to the food industry;
- the recently established federal Center for Animal and Plant Health, a sophisticated facility carrying out testing and research into animal and plant diseases;
- the provincial Soil and Feed Test Lab, which has consistently ranked in the top 10% in North America in terms of the quality of its work; and
- relevant University facilities, such as the newly constructed K.C. Irving Chemistry Building.

Many see significant possibilities for biotechnology research, development, and applications through a closer partnership among these facilities.

Another key knowledge infrastructure on Prince Edward Island is its telecommunications system. Island Tel has made a commitment to support the development of the knowledge economy on the Island. In support of that commitment, it has invested significant resources during the past decade to upgrade and modernize infrastructure. The results are impressive:

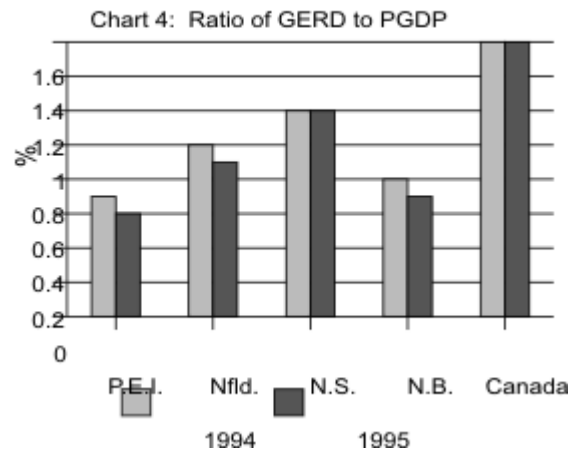
- In 1994, 11% of Prince Edward Island's residential telephones were on a party line, denying those Islanders access to fax and the Internet. Today, there are none.
- The network is 100% digital.
- Island Tel is a partner in the PEI Provincial Broadband Network Project, which will use ATM technology to enhance Islanders' access to speedy Internet use, video conferencing, multimedia applications and virtual reality, offering speeds up to 5,500 times faster than the current level. The intent is to build a high-speed backbone throughout the province, to which all communities will be connected through lines of varying capacity. Upon completion, this network is expected to give Prince Edward Island one of the best IT infrastructure systems on the continent.

[>>>top](#)

Knowledge Creation

In the previous section, I touched on Prince Edward Island's research infrastructure. In this section, I will look at some commonly used indicators of research activity, that describe how much research is done, who does it, and who pays for it.

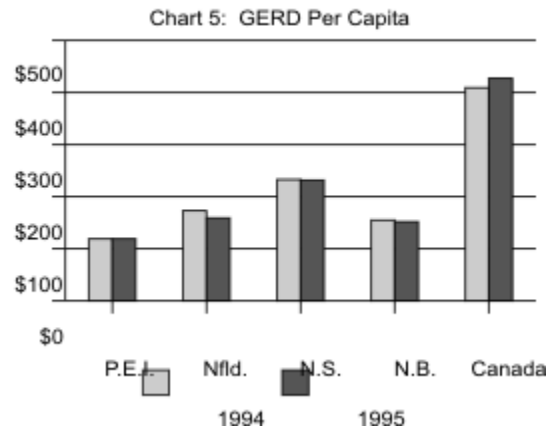
Ratio of Gross Expenditure on R&D (GERD) to Provincial Gross Domestic Product (PGDP)



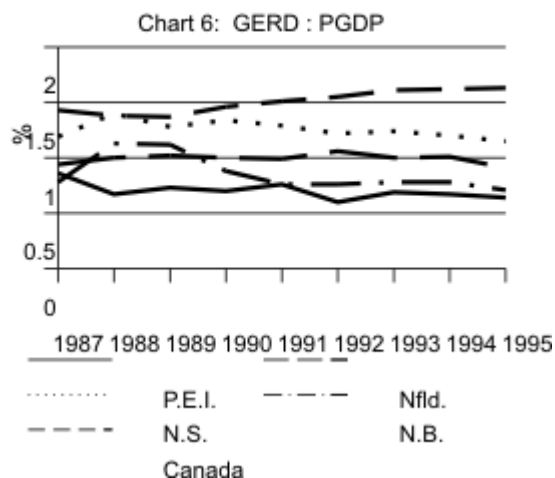
Gross Expenditure on Research and Development, or GERD, is a commonly used international measure of innovative activity. For comparative purposes, it is often expressed as a ratio of GDP. Chart 4⁴ sets out this ratio for each of the Atlantic Provinces and for Canada for 1994 and 1995. Again, the region as a whole, and the Island in particular, lags behind the national average -- a pattern that will be repeated in the slides to come. In fact, over four-fifths of Canada's R&D is concentrated in Quebec and Ontario. It should be noted that the Canadian level of 1.6% is itself the second-lowest among the G7 countries, with the U.S. at 2.6% and Japan at 3%.

[>>>top](#)

GERD Per Capita, 1994 and 1995



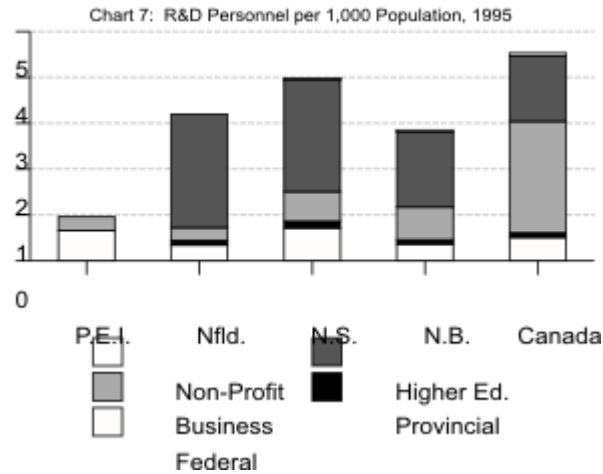
Another way of comparing research activity is to express GERD in per capita terms. By this measure as well, as shown in Chart 5,⁵ Prince Edward Island fares poorly. Prince Edward Island's GERD per capita is the lowest in the region, and less than one-third the Canadian average.



Historical GERD/PGDP, 1987 - 1995

If we look further back into time and compare GERD to Provincial Gross Domestic Product (PGDP) over the past decade, as shown in Chart 6,⁶ we see that Prince Edward Island slipped in both relative and absolute terms during that period. It has almost always lagged behind the rest of the provinces over that time. As well, it has fallen further behind the other provinces in the region as well as the national average. Its ratio has dropped, meanwhile, from over 0.8% to 0.6%, in that time.

R&D Personnel per 1,000 Population, 1995, by Sector

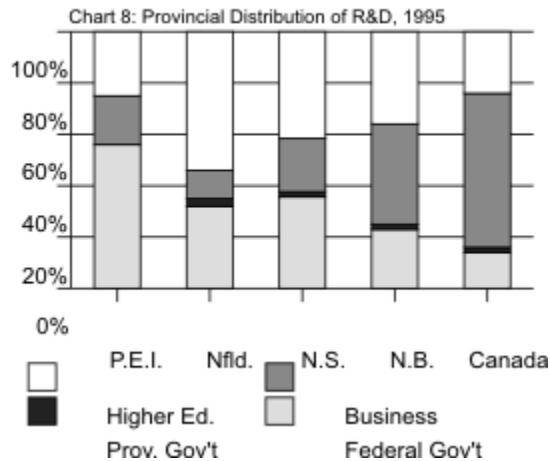


[>>>top](#)

Since knowledge workers are the heart of the knowledge economy, it is also useful to look at the level of R&D personnel in the province. Since the numbers are so small compared to other jurisdictions, I have shown this in numbers per thousand population. This indicator, as shown in Chart 7, once again shows a gloomy picture,⁷ with Prince Edward Island's levels less than one-third of even the regional average. The actual number of R&D personnel in Prince Edward Island in 1995, according to Statistics Canada, was 120, three-quarters of whom were with the federal government and the remainder with industry.

One has to question whether some sort of error might exist with this statistic. Looking at the other provinces in the region, one can see that the higher education area accounts for the majority of R&D personnel, yet this sector is unrepresented in Prince Edward Island. Given the extent of research activity at the University, particularly at the Atlantic Veterinary College, it would appear that some reporting or recording error has taken place.

Within the provincial government, some research activity takes place as well, notably in the health area. However, there is no process at this time within the provincial government to track and measure innovative activity system-wide. This might impede accurate reporting of activity within the provincial government.

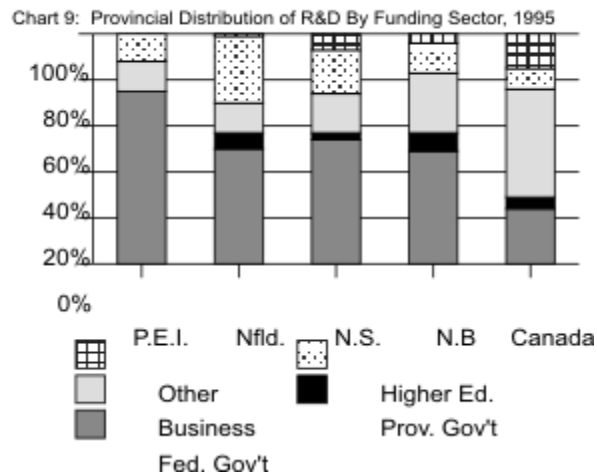


Provincial Distribution of GERD by Performing Sectors, 1995

When we look at the data on provincial distribution of GERD by performing sectors, it underlines the point just made above. Almost one-quarter of R&D in Prince Edward Island is carried out in the higher education sector, so clearly there must be a commensurate level of personnel involved. Some other findings stand out as well with this indicator, as shown in Chart 8.⁸ While Prince Edward Island's share of university R&D is comparable to the national average, and below that of its sister provinces in the region, its shares of industry and federal R&D are almost the reverse of the national picture. Well over half of Prince Edward Island's R&D is done by the federal government, compared to less than a fifth nationally.

[>>>top](#)

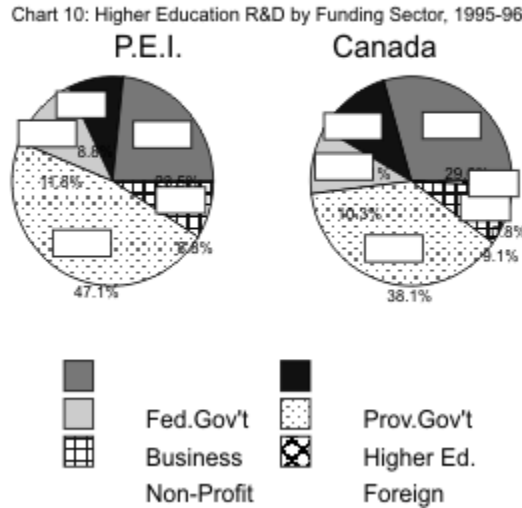
Provincial Distribution of GERD by Funding Sectors, 1995



The federal government's dominant role in Prince Edward Island's R&D picture is even more evident when we examine the distribution of R&D by funding sector, as shown in Chart 9.⁹ The

federal government pays for over three-quarters of the R&D done in Prince Edward Island, the highest level by far in the country. The provincial government, however, is not represented. Industry pays for a smaller proportion of research than in any other province.

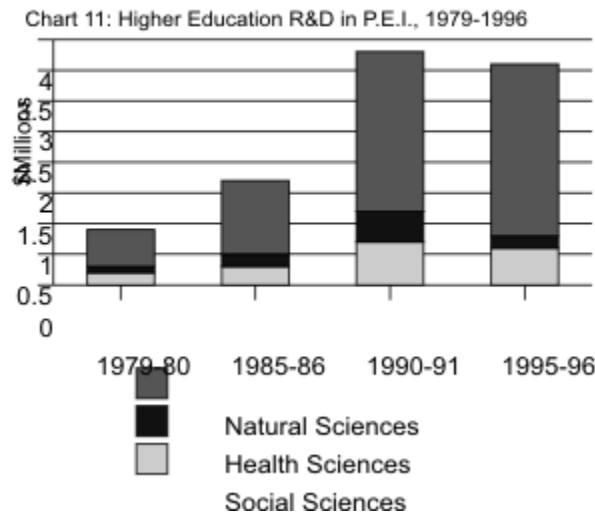
Higher Education R&D in Prince Edward Island By Funding Sector, 1995-1996



In the higher education sector, Chart 10¹⁰ shows that the University on Prince Edward Island is noticeably less reliant on federal and provincial funding of R&D than the national average. Most of this difference is made up from within the University's resources, although it is also slightly more likely than average to receive industry support for R&D.

[>>>top](#)

Types of Higher Education R&D in Prince Edward Island, 1979-1996



The higher education sector in Prince Edward Island has achieved significant growth over the past two decades, as we see in Chart 11.¹¹ The sharp increase in 1990-91 over 1985-86 represents the advent of the Atlantic Veterinary College. This also explains the dominance of research in the area of natural science.

In short, the area of knowledge creation is clearly a weakness for Prince Edward Island. Investment in this area is extremely low. Available data indicate that we lag behind the country by a considerable distance and we are falling further behind. Moreover, we are vulnerable owing to the dominance of federal research funding and activity, itself concentrated in one federal department, Agriculture Canada.

As I noted, however, we have to ask if the available data are correct. My belief is that research within the provincial government, and perhaps within the University as well, is not fully represented in the data. Perhaps an increased effort is needed to gather this information so that it can be fully reported.

We also need to get a better sense of how essential this area is to building a knowledge economy. This is one of the benefits we may gain from the Knowledge Assessment Methodology: to gain insights on how best to overcome our weaknesses; or, instead, to compensate for them by becoming stronger in other areas.

Knowledge Workers

"People are our most important resource." This cliché has come true in the knowledge economy. Some see this as cause for optimism. Our lack of the natural resources, such as oil, minerals, and hydro-electric capacity, with which other Canadian provinces have been blessed, is no longer a limitation on our capacity for economic growth and wealth creation.

But does the shift from natural resources to human resources put Prince Edward Island any further ahead? In order for our human resource to serve as the foundation of economic competitiveness and potential, it must be developed; that is, it must be educated and equipped with the appropriate skills to participate in the knowledge economy.

The data in this area are more positive than those for the knowledge creation area. While there are some bright spots, however, there is also cause for concern with regard to the significant numbers of low-skilled individuals and occupations in Prince Edward Island. If our human resource is indeed the key to our future, the data suggest that more emphasis will be needed in this area.

[>>>top](#)

Sectoral Distribution of Employment, Prince Edward Island and Canada

Chart 12: Sectoral Distribution of Employment, December 1997

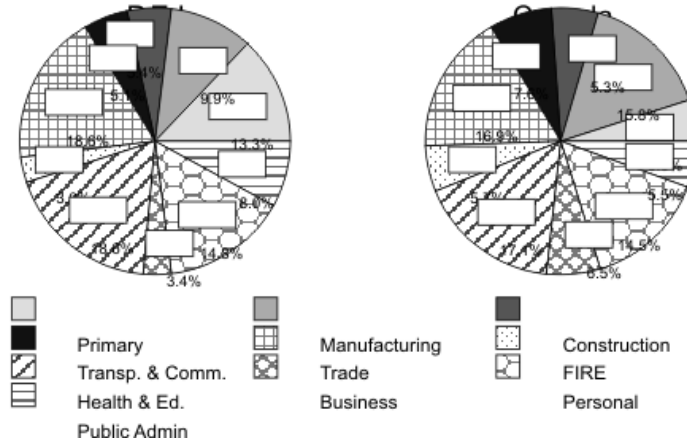
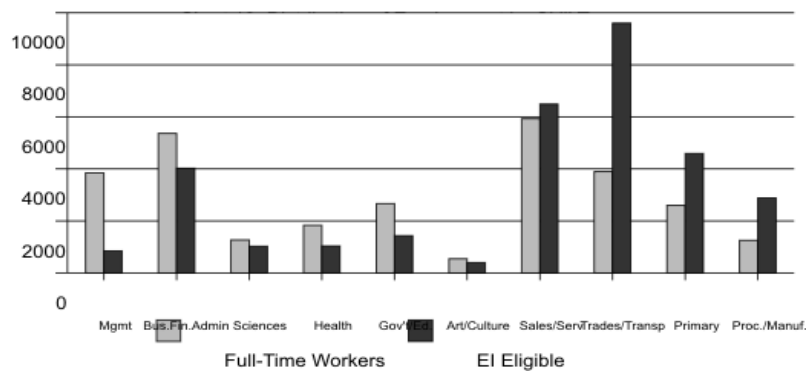


Chart 12,¹² while unfortunately rather cluttered, does point up some significant differences in the sectoral makeup of Prince Edward Island's labour force compared to the national average. Over 13% of our labour force is employed in the primary area, compared to only 5% nationally. We also know that our manufacturing sector, as well as being smaller than the national average, contains a number of relatively low-skilled, food- and fish-processing jobs.

In the knowledge intensive sectors of business services and FIRE (finance, insurance, and real estate), our proportions are barely half the national average. The share of employment held by the Island's transportation, communication, and utility sector is also roughly two-thirds that of the sector nationally. The province's knowledge workers tend to be concentrated in the public sector rather than the private sector, with the public administration and health and education sectors bulking larger in Prince Edward Island than nationally.

Distribution of Employment by Skill Type, P.E.I.



Charts 13 and 14 are taken from a study carried out by Human Resources Development Canada in 1996 to create an information base for the development of a Labour Market Development Agreement. The study analyzed workers eligible for Employment Insurance (EI) by examining administrative data for the 1993-95 period, and also analyzed full-time full-year workers using data from the 1991 Census. As the study draws on two different data sets, the findings are not

fully comparable; however the analysis is so useful that I have run the risk of an apples-and-oranges approach. I should note that when the 1996 Census data becomes available in three weeks, this analysis can be updated to provide a more comparable set of figures.

Chart 13,¹³ above, shows both the level and proportion of employment in ten occupational sectors, for full-time workers and EI eligible workers (i.e. workers in receipt of EI benefits at some time in the three-year period, 1993-1995). This comparison raises some interesting points:

- The largest concentrations of full-time employment are in the business, finance, and administration area, and the sales and services area. These areas have a relatively high proportion of unemployed workers as well, reflecting the loss of clerical jobs in the former area, and the seasonality of the tourism sector in the case of the latter.
- The highly skilled professional, cultural, and management occupations account for a relatively small share of overall employment, but a significantly larger share of full-time employment.
- A substantial share of workers and an even larger share of unemployed workers are concentrated in the seasonal areas of trades and transportation, primary industry, and the processing and manufacturing sector, which is dominated by food processing.

[>>>top](#)

Distribution of Employment by Skill Level, Prince Edward Island

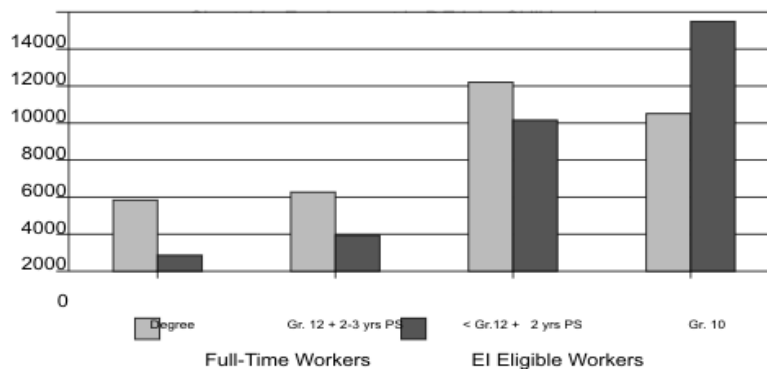


Chart 14¹⁴ presents an even more telling picture of the knowledge economy than does the previous chart. I should emphasize that these charts describe the jobs in the Prince Edward Island economy, rather than the skill levels of the individuals in those jobs. Looking at Chart 14, we see that the lower the skill level of occupations, the more likely they are to experience unemployment. We also see a high concentration of jobs in the two lower-skilled categories. I should also note, however, that this chart excludes over 4,000 jobs in the management category, as statistical conventions hold that these can fall into any of the skill categories above. I would argue, however, that those jobs are likely to require a significant degree of both education and experience. As such, this chart likely under represents the extent of skilled jobs in Prince Edward Island

Education Levels of Labour Force, Prince Edward Island and Canada, 1996

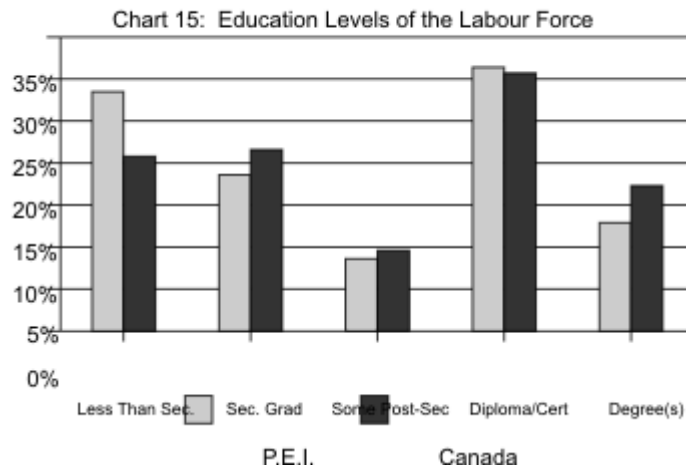
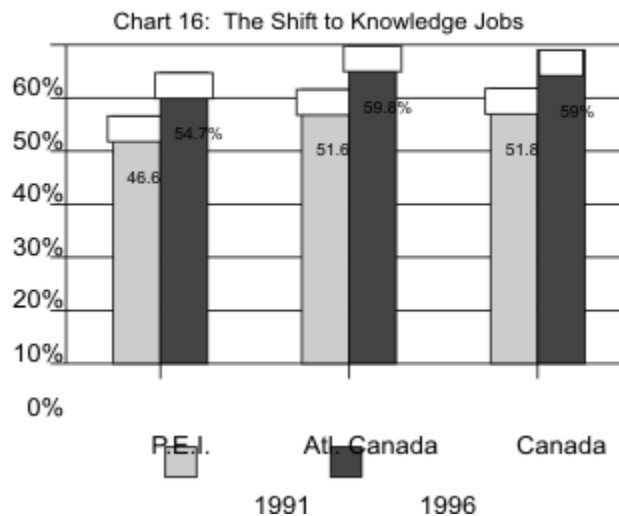


Chart 15¹⁵ shows that the share of Prince Edward Island's labour force that failed to complete high school is a third higher than the national average -- 28.5% compared to 21%. While Islanders are slightly more likely than average to hold a diploma or certificate, they lag in the other areas of secondary and post-secondary completion. In particular, less than 13% have a post-secondary degree, compared to over 17% nationally.

[>>>top](#)

The Shift to Knowledge Jobs, 1991 -1996



To examine trends over time, let us turn again to the APEC presentation, *"IT: Transforming the Atlantic Economy."* Chart 16¹⁶ shows that in five short years the proportion of jobs in Prince

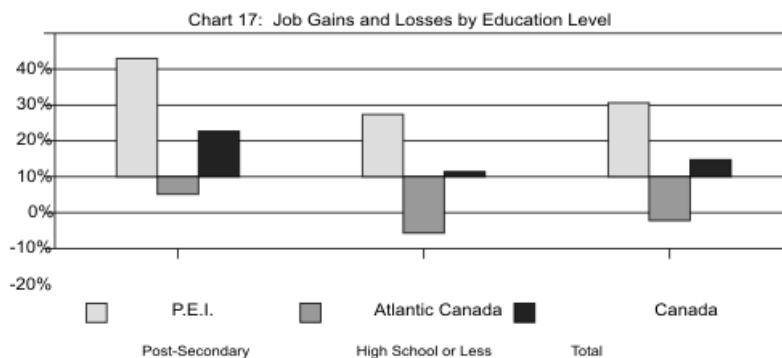
Edward Island requiring at least some post-secondary education increased from 46.6 % of the labour force to 54.7%.

When we take into account the fact that Prince Edward Island's jobs increased in number from 53,000 to over 60,000, this shift is even more significant. It means that in those five years, the number of jobs in Prince Edward Island requiring post-secondary education increased by 8,200. Granted, some of this may have been credential creep; and some of it certainly was due to the GST processing center and the link. Nonetheless it is unlikely that this trend has reversed since 1996.

When we compare Prince Edward Island to other provinces, we see that it continues to lag behind the region by about five percentage points. Prince Edward Island has, however, closed the gap somewhat with the national average, cutting its lag from 5.2 percentage points to 4.3. It is noteworthy that Atlantic Canada as a region has a slightly higher proportion of jobs requiring post-secondary education than does Canada as a whole.

[>>>top](#)

Job Gains and Losses By Skill Level, 1991-1996



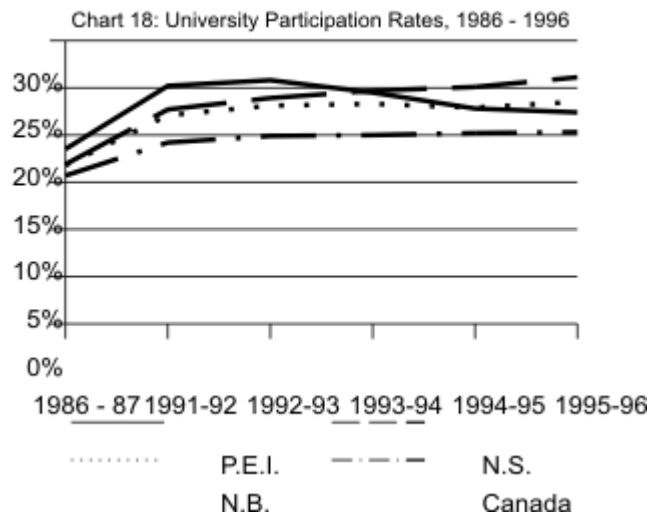
I found Chart 17 perhaps the most surprising of all the findings in my research for this presentation. According to the APEC presentation, from which the chart is derived,¹⁷ the number of jobs in Prince Edward Island requiring at least some post-secondary education went from about 24,000 in 1991 to over 32,000 in 1996, an increase of 8,200 jobs, or 33% in five years. The number of jobs requiring high school or less, meanwhile, fell by only 1,400 or 5%, a much better outcome, from a labour market point of view, than that of the region or the nation. To adapt the saying, we are adding good jobs, but we don't seem to be shedding our low-skill jobs as fast as other jurisdictions. As a result, Prince Edward Island's overall net job growth for the five years was almost 13%, a stellar performance. It should be emphasized, however, that these are not necessarily full-time full-year jobs.

Looking beyond the Island, we see that the Atlantic region's jobs requiring post-secondary education increased by some 84,000, or over 17%, while jobs requiring secondary graduation or less fell by almost the same amount and proportion, for net job growth of 1.4%. The national

picture was more positive, with growth in high-skill jobs of over 20%, and a decline in low-skill jobs of 12%, for a net job growth of about 5%.

[>>>top](#)

University Participation Rates, 1986-1996



The trends shown in the previous charts clearly emphasize the need for continued education and training of the labour force if we are to realize the opportunities of the knowledge economy. The availability of a skilled labour force is critical to the establishment and expansion of knowledge-based enterprises. Without it, we will not see a continuation of the very positive growth described above.

In this regard, it is interesting to note that participation by Island youth in university education slipped noticeably in the early 1990s. As shown in Chart 18,¹⁸ it fell from the highest in the region and well above the national average at the beginning of the decade, to the middle of the pack by 1996. This finding is reinforced in the report, "Education Indicators for Atlantic Canada," which showed that the proportion of Prince Edward Island high school graduates going straight on to university dropped a startling ten percentage points in the two years between 1991-1992 and 1993-1994, from 46% to 36%, while levels in the other Atlantic Provinces remained stable. This trend requires investigation: does it reflect financial barriers, or a shift to the labour market, or to more overtly job-related learning opportunities such as CompuCollege and Holland College?

This has only been a cursory overview of this complex and detailed subject. It requires a thorough analysis, using the more current data soon to become available from the 1996 Census, and, perhaps, administrative data as well. We need a clear picture of the education and training levels of Islanders to ensure that they can participate in, benefit from, and, indeed, make possible the development of Prince Edward Island's knowledge economy.

[>>>top](#)

Knowledge Society

It is difficult to say what indicators can best represent the emergence of the knowledge society. Many of its attributes are intangible, such as the new forms of human interaction and relationships, recreation, and consumption made possible by advances in information technology. However, since these activities require access to information technology, the extent of such access in a society can be used as an indicator of the enabler of the "knowledge society."

Wired Households, 1997

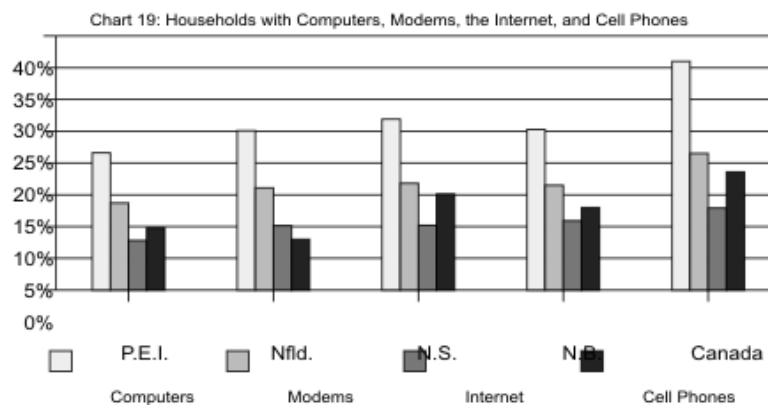


Chart 19¹⁹ shows that again, Prince Edward Island is last on most indicators. Fewer than 22% of the province's households had computers in 1997, compared to over 25% in each of the other Atlantic Provinces and 36% for the country. Similar gaps existed for modems and Internet access. The only indicator on which Prince Edward Island ranked second-last, rather than last, was cell phones, perhaps a reflection of the fact that Prince Edward Island has 100% cellular coverage.

Statistics such as this reflect the fact that computer and IT use is linked to household income, and the majority of Prince Edward Island households have a low to moderate income. They offer justification for initiatives such as the provincial government's recent program to encourage computer purchases by families, the expansion of IT capacity in the schools, and the development of free public access to the Internet through the Community Access Program. Efforts such as these help to offset the disadvantages created by Prince Edward Island's lower personal incomes, and to improve access by all Islanders to participation in the knowledge society.

[>>>top](#)

Lifelong Learning

It has been said that the knowledge society is fundamentally a learning society. Moreover, the pace of change and up-skilling of jobs demand that all workers take part in continuous and ongoing self-development and training. As such, the extent to which Islanders participate in adult learning, compared with elsewhere, provides a useful indicator of the knowledge society.

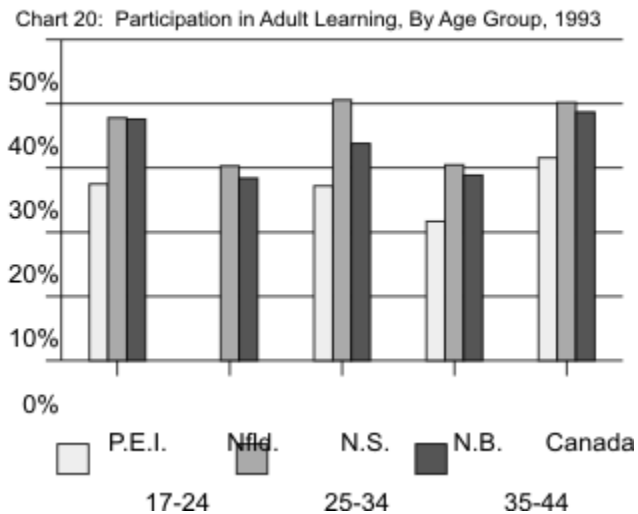


Chart 20²⁰ indicates that, generally, Islanders took part in adult learning to a greater extent than residents of the other Atlantic provinces, although slightly less than the national average. The only exception was the 25-34 age group, on which Nova Scotia outstripped both Prince Edward Island and the national average. Overall, over a third of adult Islanders participated in adult learning at some point in 1993. It would be useful to update these figures, and to explore what impact the increasing cost of training and the federal policy changes in the training area may have had.

[>>>top](#)

Conclusion

As I have said before, the picture painted in these graphs and charts is not altogether encouraging. They depict an economy reliant on low-knowledge intensity and seasonal activities, significant weaknesses in the area of knowledge creation, and some weaknesses in the education and skill levels of both the jobs in our economy and the people available to fill those jobs. Some of these weaknesses may reflect outdated data, limitations on data availability, under-reporting, and shortcomings in statistical methodology. Nonetheless there can be no doubt that, on many conventional indicators of the "Knowledge Economy," Prince Edward Island has far to go.

On the other hand, there are many reasons for optimism, some of which cannot be captured in quantitative data. To name just a few:

- we have an outstanding IT infrastructure in the province;
- we have strengths in our educational system, although there is scope for further development and enhancement;
- we have strong participation rates in learning, both adult and post-secondary, and our drop-out rates are among the lowest in the country;
- we have a strong social and governmental commitment to equal opportunity and to sustaining our communities and our society, demonstrated by the fact that our poverty rate is by far the lowest in the country despite our limited wealth, and expressed through such programs as the Community Access Program;
- we have an exceptional mechanism for joint action in the Knowledge Economy Partnership; and
- we have initiatives such as the Knowledge Assessment Methodology, of which this Public Forum is a part. Through the KAM, as we call it, we will be enabled to clarify our strengths and our weaknesses, and to judge where to invest our limited resources for maximum impact and benefit.

Although in many ways we are coming from behind, we can compensate for this in large measure through a focused strategic approach, based on a shared understanding and consensus and a sense of common purpose. It is also encouraging to note that studies show that the benefits of the knowledge economy can be the greatest for those industries and societies that were previously marginalized or disadvantaged. Simply put, we have more to gain. Through projects such as the KAM, perhaps we can do so.

[>>>top](#)

Endnotes

1. Derived from Atlantic Provinces Economic Council, IT: Transforming the Atlantic Economy, presentation given in Charlottetown P.E.I., November 1997. APEC cites Industry Canada Working Paper # 14, and Informetrica Ltd.
2. Ibid.
3. Ibid.
4. Statistics Canada, Science Statistics, Cat. # 88- 001-XPB, Vol. 20, # 9, Table 2; Vol. 21, # 8, Table 4.
5. Statistics Canada, Science Statistics, Cat. # 88-001-XPB, Vol. 20, # 9, Table 2; Vol. 21, # 8, Table 4.
6. Statistics Canada, Science Statistics, Cat. # 88-001-XPB, Vol. 21, # 9, Table 5.
7. Statistics Canada, Science Statistics, Cat. # 88-001-XPB, Vol. 21, # 10, Table 7.
8. Statistics Canada, Science Statistics, Cat. #88-001-XPB, Vol. 21, # 8, Table 8.
9. Statistics Canada, Science Statistics, Cat. #88-001-XPB, Vol. 21, # 8, Table 9.
10. Statistics Canada, Science Statistics, Cat. #88-001-XPB, Vol. 21, # 8, Table 3.
11. Statistics Canada, Science Statistics, Cat. #88-001-XPB, Vol. 21, #9, Tables 5, 6, 7.
12. Statistics Canada, Labour Force Information, January 9/98, Cat. # 71-001-PPB, Table 14.
13. Human Resources Development Canada, Analysis of Selected Client Groups in P.E.I., (Unpub. Report, June 1996), Charts 3 and 10.
14. Ibid.

15. Statistics Canada, Labour Force Annual Averages, 1996, Cat. # 71-220-XPB, Table 5.
16. Derived from APEC, IT: Transforming the Atlantic Economy, Nov/97 (APEC cites "Statistics Canada labour force data").
17. Ibid.
18. Maritime Provinces Higher Education Commission, Statistical Compendium, 4th Edition, (Council of Maritime Premiers, November 1997), Table 4.
19. Statistics Canada, Household Facilities and Equipment 1997, Tables 5.1, 5.5, 5.6.
20. Atlantic Provinces Education Foundation, Education Indicators for Atlantic Canada, 1996 (Atlantic Provinces Education Foundation, Halifax, 1996) Figure 6.1.2.

[>>>top](#)

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