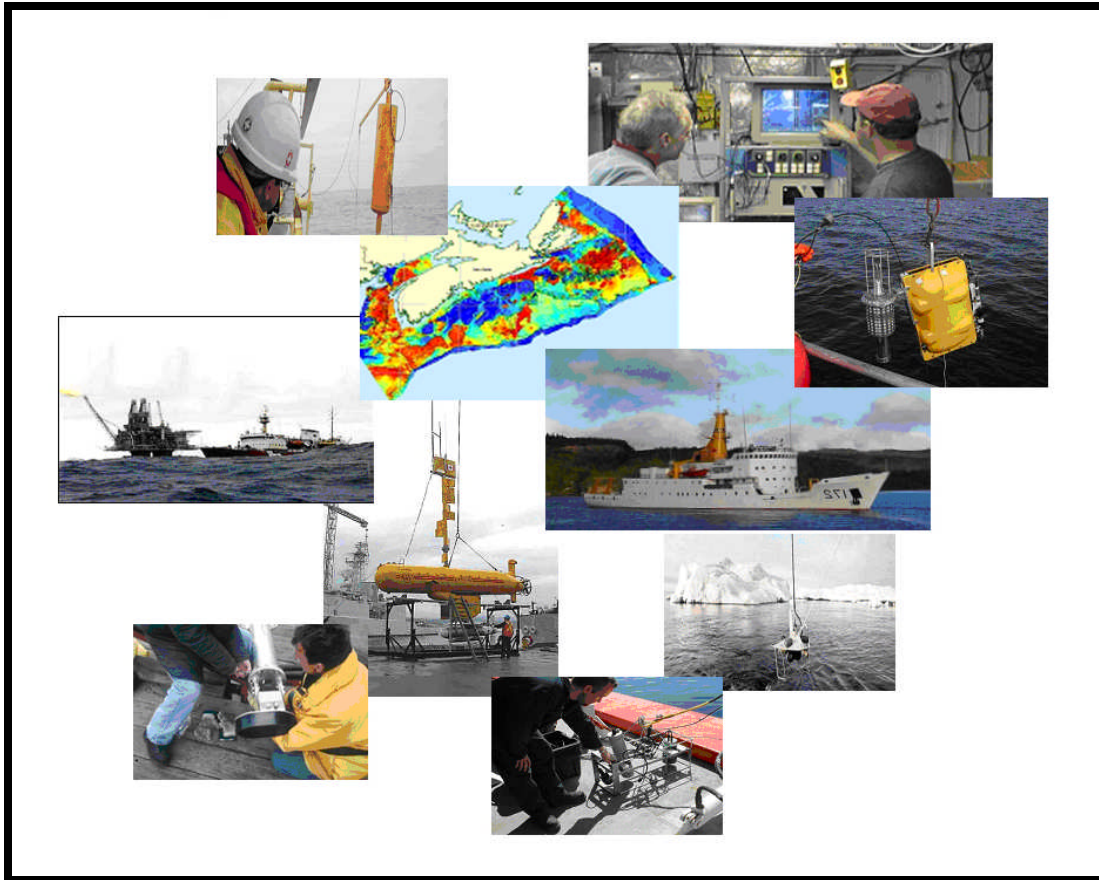


THE OCEAN TECHNOLOGY SECTOR IN ATLANTIC CANADA Volume 1: Profile and Impact



*Submitted to the
Atlantic Canada Opportunities Agency*

*Prepared by the
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THE OCEAN TECHNOLOGY SECTOR IN ATLANTIC CANADA

Volume 1: Profile and Impact

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EXECUTIVE SUMMARY

The Atlantic Canadian ocean technology sector, generally defined as any firm engaged in the delivery or creation of technology for marine applications (goods and/or services), consists of 137 identified firms. These firms are a mix of older well-established firms operating in areas such as the offshore oil and gas sector, ship/boat building and oceanographic research to newer start-up firms involved in areas such as electronic navigation, satellite technology and smart fishery technology. The range of products offered by the ocean technology sector can generally be summarized as acoustic systems and equipment, defence systems and equipment, imaging systems and equipment, instrumentation and information systems, marine communications, navigation, platforms and vehicles as well as a wide variety of services.

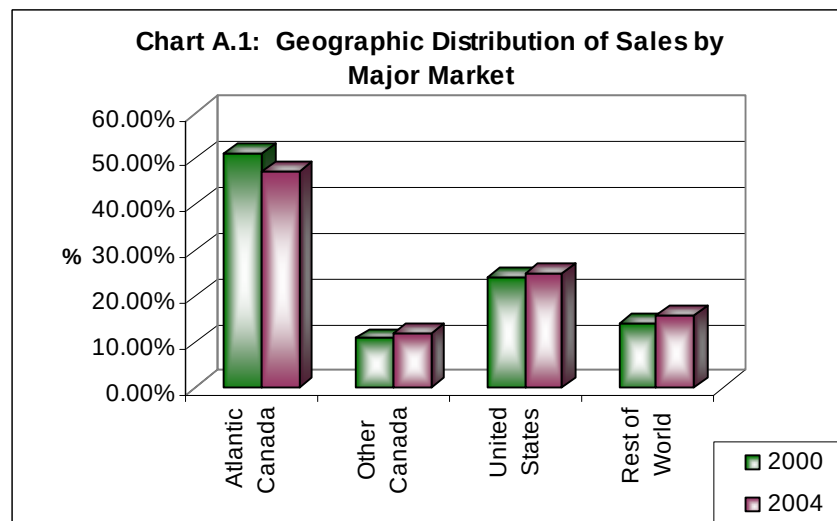
The economic importance of the ocean technology sector far exceeds its size. The sector makes a significant contribution to the Atlantic economy as one of the region's largest advanced technology industries with high levels of R&D and innovation, a highly skilled labour force, an export focus and its capacity to generate wealth.

The ocean technology sector annual sales are estimated to be \$329.2 million in Atlantic Canada. The Atlantic Canadian ocean technology sector directly creates an estimated 2,268 person years of employment resulting in over \$84.5 million of household income on an annual basis. This direct sector activity contributes \$152.8 million to the regions' gross domestic product (output). Ocean technology firms surveyed in Atlantic Canada had average annual sales of \$5.3 million, employed on average 33.6 full-time and 1.5 part-time employees earning \$1.3 million of labour income.

When we factor in the estimated indirect and induced (spinoff) economic activity we see the sector is responsible for close to 5,298 person years of employment, \$201.8 million of household (labour) income and \$280.9 million of GDP on an annual basis.

All levels of government benefit fiscally from the ocean technology sector. The federal government annually collects an estimated \$30.3 million while the four Atlantic provincial governments annually collect in total an estimated \$26.2 million from the direct and spinoff activities related to Atlantic Canada's ocean technology sector. Municipal governments throughout the four (4) Atlantic Provinces realize in excess of \$1 million annually directly from ocean technology firms in the form of property taxes.

The geographic distribution of sales by the Atlantic Canadian ocean technology sector spans the globe, a trend which has grown between the years 2000 and 2004. In 2000, 48.6% of sales were outside of the Atlantic region growing to 52.7% in 2004. Sales to the United States represent the largest export market for the Atlantic Canada ocean technology sector with 24.9% of total sales being shipped to the United States in 2004. Chart A.1 presents the geographic distribution of sales to major markets for the years 2000 and 2004.



The major end users for products and services from the Atlantic Canada ocean technology sector are businesses and governments to satisfy a general business need followed by businesses to satisfy government regulations/standards, households and the academic sector. The sales to the business sector represent close to 70% of all

sales to end users, followed by sales to government at 21.2%. Ultimately governments consume a higher percentage of ocean technology output because a significant portion of sales to businesses are component sales to other ocean technology firms. These components form part of a finished product (intermediate demand) which will ultimately be consumed by government (final demand).

The ocean technology sector is best characterized as a knowledge-based sector; hence its competitive advantage lies in its ability to innovate. Based on sector survey results, we have found that on average firms devote 31.1% of full-time employees to R&D activities.

Being knowledge-based and innovative translates into business outlook confidence. Surveyed Atlantic Canadian ocean technology sector firms felt their sales would grow by an average of 16.1% per annum over the next five (5) years.

CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF STUDY

A proposal was submitted for funding under the Atlantic Canada Opportunities Agency (ACOA) Atlantic Policy Research Initiative in October 2004 by Canmac Economics and the ACZISC Association to carry out a Study on the Economic Impact of the Ocean Technology Industry in Atlantic Canada and Potential Public Sector Demand for Ocean Technologies in Canada. The proposal was approved in December 2004.

The Study on the Ocean Technology Industry has two components: this section (Volume 1), carried out by Canmac Economics, deals with the economic importance of the industry in the region and its principal markets; the second section (Volume 2), carried out by the ACZISC Association, focuses on business opportunities with the federal government and procurements by individual departments and agencies.

This volume presents estimates of the economic importance of the ocean technology sector to the economy of the Atlantic Provinces and includes estimates of:

- the direct contribution to Atlantic Canada's employment made by the ocean technology sector;
- the direct contribution to labour income in Atlantic Canada made by the ocean technology sector;
- the direct contribution to production (output) in Atlantic Canada made by the ocean technology sector.

Additionally, from the above estimates, we report:

- the estimated total federal and provincial government revenues attributable to the ocean technology sector in Atlantic Canada;
- the contribution to Atlantic Canada's Gross Domestic Product (GDP) made by the ocean technology sector;

- the total economic contribution to Atlantic Canada's employment, labour income, and GDP made by the ocean technology sector.

1.2 STRUCTURE OF THE REPORT

The report is presented in three chapters. Chapter 1 introduces the study and its scope and provides background information on the socio-economic conditions of the Atlantic Provinces, as well as the definition of the ocean technology sector. Chapter 2 presents the analysis of the results obtained from the Atlantic Canadian ocean technology private sector survey. Chapter 3 is an analysis of results obtained from the input-output simulation of direct Atlantic Canadian ocean technology sector.

Appendix A provides the study methodology overview and Appendix B contains a NAICS based definition of the ocean technology sector discussed in section 1.4 (page 14). Appendix C contains a copy of the survey instrument used in data collection. Appendix D contains the provincial sector overview and market characteristics. Appendix E contains the estimated provincial economic impact of the ocean technology sector.

1.3 BACKGROUND

It is estimated that the total size of Canada's coastline is 202,080 km making Canada's coastline the longest of any nation. Not surprisingly, the ocean sector is a significant contributor to economic activity creating employment and income in Canada; approximately 1.5% of Gross Domestic Product (the value of all goods and services for final consumption or equivalently the sum of value-added in all stages of production), and 150,000 full-time equivalent positions in 2000 are attributable to the ocean sector. The ocean technology sector is the principle source of research and development, technology and innovation for this sector and facilitates growth through its activities. Creating technologies that can be applied to ocean sectors creates sustainable growth, and other benefits that are not economic in nature such as safety, geographic

information, environmental sustainability, etc. Ocean related industries are historically a foundation for Atlantic Canada growth from shipbuilding to transportation. The economic importance of the ocean technology relates not only to its own activities, but also relates to the interdependence between the broader ocean sector and the ocean technology sector and to the overall Atlantic Canada economy. The contributions of ocean technology firms resonate not only in the growth of their own sector (and supporting sectors) but also in the continued growth of one of Atlantic Canada's oldest and most significant sectors.

The historical significance of the sector stems, in part, from the geography of Atlantic Canada. There were approximately 2,343,300 people living in the Atlantic Provinces in 2004 (Newfoundland and Labrador, Nova Scotia, Prince Edward Island and New Brunswick) or 7.3% of total Canadian population. A large percentage of Atlantic Canadians live in coastal communities. This is not surprising given the total land area of the Atlantic provinces is only 456,320 km² (5% of Canada's total land area) but surrounded by a perimeter of 32,606 km (16% of Canada's total coastline) of coastline.

Atlantic Canada accounted for 5.9% of Canada's GDP in 2003. Comparing growth in GDP over time, Atlantic Canada's real GDP growth is comparable to that of Canada's over the 1980's (both Canada and Atlantic Canada had real GDP growth of 2.8% from 1980-1990), however by the end of 2002, Atlantic Canada's growth in real GDP slowed to about 0.2% less than Canada's. In 1980, GDP per capita was approximately 68% of Canada's GDP per capita compared to approximately 76% of Canadian real GDP per capita in 2003. This reflects not only growth in factor productivity, but total factor supply and short-term utilization rates. Table 1.1 (page 11) illustrates productivity growth in the Atlantic Canada provinces relative to Canada's productivity growth.

Table 1.1: Average Percentage Change Per Year in Productivity Measures in Canada and Atlantic Canada Provinces from 1993 - 2003¹			
	Real GDP per \$1,000 of Capital Stock	Real GDP per Hour Worked	Total Factor Productivity
Canada	0.92%	1.81%	1.32%
Newfoundland	1.65%	2.70%	2.12%
Nova Scotia	0.42%	1.42%	0.88%
Prince Edward Island	0.42%	1.04%	0.71%
New Brunswick	1.15%	4.16%	1.47%

Historically, Atlantic Canada has had lower labour force participation rates than Canada (63.1% in Atlantic Canada versus 67.6% in Canada in 2004) and higher unemployment rates (10.7% in Atlantic Canada versus 7.2% in Canada in 2004). Table 1.2 (page 12) details comparative socio-economic statistics for the Atlantic Provinces and Canada for the year 2004.

Relative to Canada, Atlantic Canada has a higher proportion of its employment in resource-based industries. The principal domestic goods exported from Atlantic Canada are resource based. Forestry, agricultural and energy products accounted for 80% of domestic goods exported from Atlantic Canada in 2003 versus 35% in Canada for the same year. In 2003, 19% of the total exports from Atlantic Canada were services; this percentage is about half the Canadian average of 35%. This issue is important for this study since a large proportion of the ocean technology sectors' output is service based.

¹ Centre for the Study of Living Standards, Aggregate Income and productivity Tables for Canada and Provinces available at <http://www.csls.ca>.

Table 1.2: Socio-economic Profile of the Atlantic Provinces and Canada 2004² (thousands)						
	Canada	Atlantic Provinces	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick
Population, 15 years and over						
Both Sexes	25,432.70	1,904.90	429.7	110.9	756.9	607.4
Men	12,510.80	925.10	209.8	53.5	365.5	296.3
Women	12,921.80	979.80	219.9	57.5	391.4	311
Labour Force						
Both Sexes	17,183.40	1,202.80	255	75.2	484.3	388.3
Men	9,164.40	630.60	135.6	38.3	254	202.7
Women	8,019.00	572.30	119.4	36.9	230.4	185.6
Employed						
Both Sexes	15,949.70	1,073.90	215.2	66.7	441.6	350.4
Men	8,479.60	556.00	112.6	33.7	229.6	180.1
Women	7,470.10	517.90	102.6	33	212	170.3
Unemployed						
Both Sexes	1,233.70	128.90	39.8	8.5	42.7	37.9
Men	684.8	74.70	23	4.6	24.4	22.7
Women	548.9	54.50	16.9	3.9	18.4	15.3
Not in the Labour Force						
Both Sexes	8,249.30	702.10	174.7	35.7	272.6	219.1
Men	3,346.40	294.50	74.2	15.2	111.5	93.6
Women	4,902.80	407.50	100.5	20.6	161.00	125.4
Percent - %						
Participation Rate						
Both Sexes	67.6	63.1	59.3	67.8	64	63.9
Men	73.3	68.2	64.6	71.6	69.5	68.4
Women	62.1	58.4	54.3	64.2	58.9	59.7
Unemployment Rate						
Both Sexes	7.2	10.7	15.6	11.3	8.8	9.8
Men	7.5	11.8	17	12	9.6	11.2
Women	6.8	9.5	14.2	10.6	8	8.2
Employment Rate						
Both Sexes	62.7	56.4	50.1	60.1	58.3	57.7
Men	67.8	60.1	53.7	63	62.8	60.8
Women	57.8	52.9	46.7	57.4	54.2	54.8

² Cansim Table 282-0008, "Labour force survey estimates (LFS), by North American Industry Classification System (NAICS), sex and age group, annual".

On average, the Atlantic Provinces account for 6.7% of total employment (Table 1.3) and 5.7% of total Canadian GDP (Table 1.4).

Table 1.3: Distribution of Employment by Industry for Atlantic Canada and Canada 2004 ³				
	Canada (thousands)	% of Total	Atlantic Canada (thousands)	% of Total
All Industries	15,949.7	100.0	1,073.9	100.0
Goods-producing Sector	3,992.7	25.0	240.7	22.4
Agriculture	324.1	2.0	16.9	1.6
Forestry, Fishing, Mining, Oil and Gas	285.7	1.8	43.8	4.1
Utilities	133	0.8	8.5	0.8
Construction	952.8	6.0	63	5.9
Manufacturing	2,297.0	14.4	108.3	10.1
Service-producing Sector	11,957.0	75.0	833.1	77.6
Trade	2,503.6	15.7	177.3	16.5
Transportation and Warehousing	809.3	5.1	56.1	5.2
Finance, Insurance, Real Estate and Leasing	955	6.0	46.9	4.4
Professional, Scientific and Technical Services	1,010.1	6.3	45.5	4.2
Business, Building and Other Support Services	630.1	4.0	56.4	5.3
Educational Services	1,038.4	6.5	82.3	7.7
Health Care and Social Assistance	1,736.7	10.9	139.0	12.9
Information, Culture and Recreation	732.7	4.6	38.2	3.6
Accommodation and Food Services	1,006.8	6.3	70.4	6.6
Other Services	705.1	4.4	51.9	4.8
Public Administration	829.1	5.2	69.2	6.4

Table 1.4: Real Gross Domestic Product in Millions of Constant, Chained 1997 Dollars ⁴					
	1999	2000	2001	2002	2003
Newfoundland and Labrador	\$11,715	\$12,322	\$12,478	\$14,557	\$15,542
Prince Edward Island	\$3,052	\$3,111	\$3,102	\$3,290	\$3,353
Nova Scotia	\$22,285	\$22,970	\$23,641	\$24,874	\$25,180
New Brunswick	\$18,553	\$18,942	\$19,181	\$20,108	\$20,618
Atlantic Provinces	\$55,605	\$57,345	\$58,402	\$62,829	\$64,693
Canada	\$966,975	\$1,016,594	\$1,031,914	\$1,068,095	\$1,090,660

³ Cansim Table 282-0008, "Labour force survey estimates (LFS), by North American Industry Classification System (NAICS), sex and age group, annual".

⁴ Cansim Table 384-0002, "Gross Domestic Product (GDP), expenditure-based, provincial economic accounts, annual (Dollars)".

Relative to the rest of Canada, the Atlantic Canada provinces have lower levels of expenditure per capita on research and development activities (Table 1.5).

Table 1.5: Research and Development Expenditures by Atlantic Provinces and Canada (total of both funding and performing sectors) ⁵ - Millions					
	1998	1999	2000	2001	2002
Canada	\$16,089	\$17,638	\$20,531	\$22,733	\$22,370
Atlantic Provinces	\$610	\$661	\$699	\$704	\$736
Newfoundland and Labrador	\$119	\$127	\$138	\$142	\$148
Prince Edward Island	\$23	\$26	\$36	\$37	\$31
Nova Scotia	\$311	\$342	\$363	\$366	\$373
New Brunswick	\$157	\$166	\$162	\$159	\$184

1.4 DEFINITION OF THE OCEAN TECHNOLOGY SECTOR

The ocean technology sector can be generally defined as any firm engaged in the activity of creating technologies for marine applications, be it above or below surface, manifested as a good or a service. This is a similar (if not identical) definition to that adopted by Industry Canada. As one can imagine, the range of North American Industry Classification System (NAICS) industries that satisfy this conceptual definition are broad and not directly useful in creating a NAICS based definition of the sector. To narrow the range of NAICS industries defined as participating in the ocean technology sector, we examined the products of ocean technology firms and referenced industries that produced these products. The range of products offered by a firm participating in the ocean technology sector generally can be summarized as:

- Acoustic systems and equipment
- Defence
- Imaging
- Instrumentation and information systems
- Marine communications
- Platforms and vehicles
- Various services

⁵ Cansim Table 358-0001, "Gross domestic expenditures on research and development, by science type and by funding and performing sector, annual (Dollars)"

Since Statistics Canada does not provide a definition for the ocean technology sector in the NAICS framework, a definition of sector participants was derived from two sources: Industry Canada's Canadian Company Capabilities Database and the United States Federal Business Opportunities database for Vendors (formerly the Commerce Business Daily). The primary source of information was Industry Canada's Canadian Company Capabilities Database which provided a directory of firms that have voluntarily identified themselves as participants in the ocean technology sector as defined by Industry Canada. This directory provided a set of NAICS industries by product type. The United States Federal Business Opportunities database for Vendors was a secondary source of information.

Some products had a one to one relationship to a NAICS industry using this search method; however, many produced ambiguous industry definitions. For example, in searching for a definition for sonar production, a single NAICS industry was obtained (NAICS code 334511 - Fish finders (*i.e.* sonar), manufacturing Sonar systems and equipment, manufacturing) whereas imaging produced many possible NAICS industries.

CHAPTER 2

SECTOR OVERVIEW

2.1 INTRODUCTION

The contribution of the ocean technology sector to the economy of Atlantic Canada is significant and involves numerous sectors and jurisdictions. A comprehensive understanding of the size, importance and market potential of ocean technology firms provides an important framework for Policy planning.

2.2 SECTOR OVERVIEW

The Atlantic Canada ocean technology sector represents an important economic driver for the Atlantic economy. As defined for the purpose of this study, the sector is comprised of 137 identified firms with Nova Scotia and Newfoundland being home to over 80% of these firms. The sector's average sales over the last three (3) years amounted to \$5.3 million bringing the estimated average annual sector sales to \$329.2 million per year. All firms active in this sector are not 100% ocean technology firms; some firms having sales of goods and/or services directly related to other sectors. Each surveyed firm was questioned with regard to the percentage of their annual sales that were directly related to the ocean technology sector; 70.1% of total sales were reported as being directly related to the ocean technology sector.

On average, firms employed 33.6 full-time employees and 1.5 part-time employees working an average of 10.2 hours per week; however, for the 48% of the firms that employed part-time employees, the number increased to 2.9 part-time employees. This employment generates an average annual wagebill of \$1.3 million resulting in an estimated sector annual wagebill of \$84.6 million. Table 2.1 (page 17) outlines the basic statistics for the firms in the ocean technology sector. A provincial breakdown of the sector overview and market characteristics is presented in Appendix D.

Table 2.1: Statistics for Ocean Technology Firms		
	Annual Average	Total Sector
Sales	\$5,256,967	\$329,234,677
Full-time Employment	33.6	2,221.2
Part-time Employment	0.7	46.3
Employment (FTE) ⁶	34.3	2,267.5
Wagebill (Labour Income)	\$1,279,541	\$84,572,472
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey		

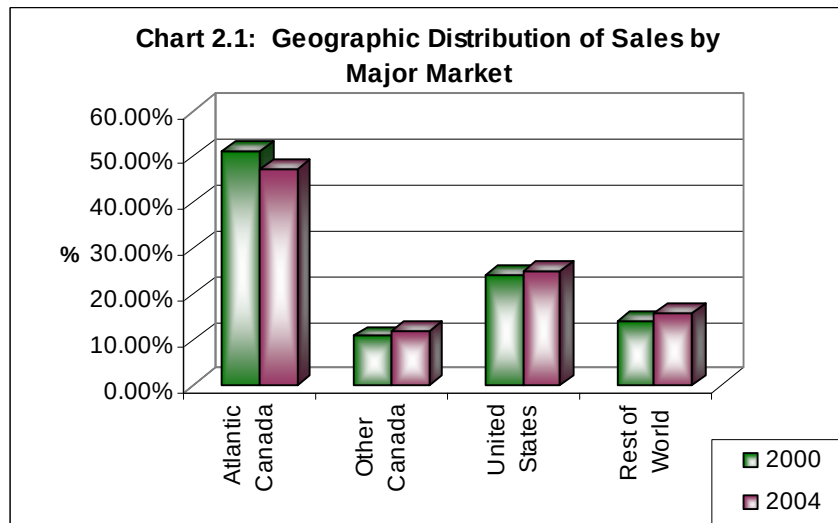
2.3 SECTOR MARKET CHARACTERISTICS

The ocean technology sector is best characterized as a heterogeneous group of firms that provide a variety of products and services. As outlined in the previous section, 70.1% of their average sales over the last three (3) years are directly related to ocean technology products and services.

The geographic distribution of sales by the Atlantic Canadian ocean technology sector spans the globe, a trend which has grown between the years 2000 and 2004. In 2000, 48.6% of sales were outside of the Atlantic region growing to 52.7% in 2004. Sales to the United States represent the largest export market for the Atlantic Canada ocean technology sector with 24.9% of total sales being shipped to the United States in 2004. Table 2.2 (below) and Chart 2.1 (page 18) present the geographic distribution of sales to major markets for the years 2000 and 2004.

Table 2.2: Geographic Distribution of Sales by Major Market		
Region	2000 % of Total Sales	2004 % of Total Sales
Atlantic Canada	51.39%	47.31%
Other Canada	10.69%	11.83%
United States	24.08%	24.93%
Rest of World	13.84%	15.93%
Total	100.00%	100.00%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey		

⁶ Full-time Equivalent



Not all firms in the ocean technology sector have export sales out of the region so more detailed geographic sales information was collected. Table 2.3 indicates the percentage of firms having sales to a specific county and/or region, and that percentage as a fraction of the firms' total sales as well as an estimation of the percentage of sales the country and/or region represents of total sector sales.

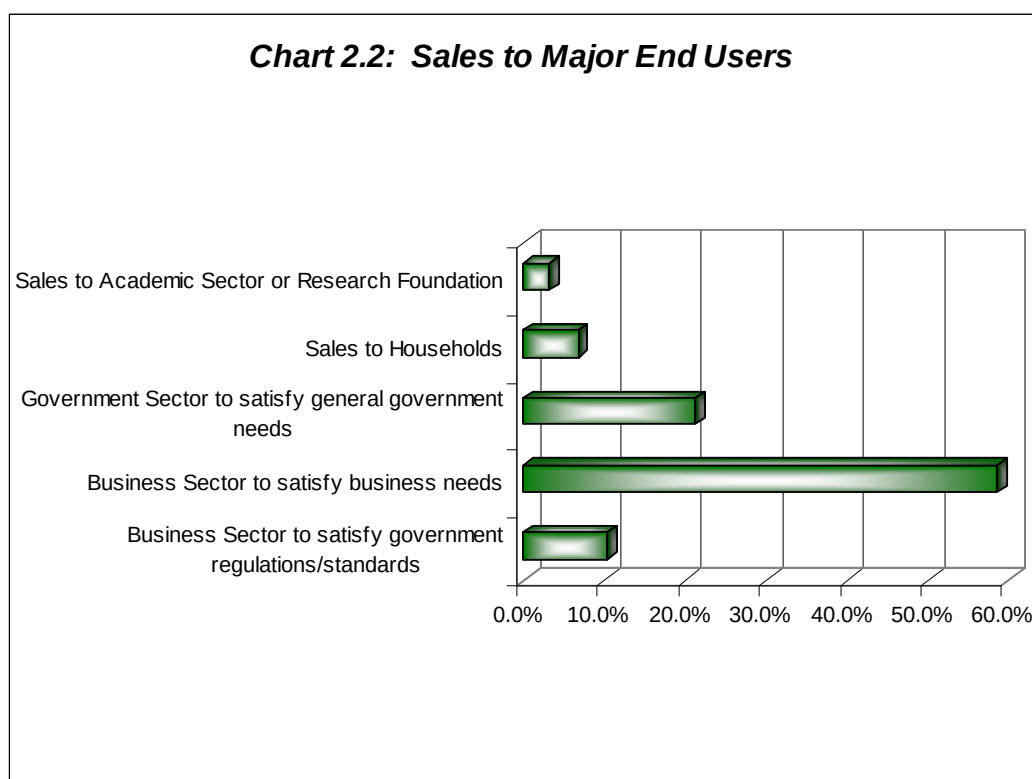
From Table 2.3 (page 19) we note that significant export increases have been realized in the West and Northwest regions of the United States and in Western Europe, both in terms of the percentage of firms that have sales in the region and in the average percentage of sales from that region.

Table 2.3: Geographic Distribution of Sales by Market						
	2000			2004		
Region	% of Firms which had Sales in the Region	Average % of their Sales	Average % of Total Sales	% of Firms which had Sales in the Region	Average % of their Sales	Average % of Total Sales
Atlantic Canada	74.1	58.6	51.4	82.8	52.2	47.3
Other Canada	56.9	15.9	10.7	69.0	15.7	11.8
United States	51.7	39.3	24.1	67.2	33.9	24.9
Northeast US	25.9	18.7	5.9	29.3	17.1	5.6
Southeast US	8.6	18.2	1.9	8.6	16.4	1.6
South US	10.3	32.7	4.1	13.8	29.3	4.5
Mid West US	3.4	10.0	0.4	3.4	7.5	0.3
West US	6.9	8.8	0.7	6.9	13.0	1.0
Northwest US	8.6	8.0	0.8	10.3	12.5	1.4
Rest of World	34.5	33.9	13.8	44.8	32.5	15.9
Western Europe	17.2	19.0	4.0	25.9	24.5	6.9
Eastern Europe	6.9	26.5	2.2	13.8	18.4	2.8
Africa	1.7	10.0	0.2	5.2	3.3	0.2
South America	5.2	15.0	0.9	8.6	14.4	1.4
Asia-China	6.9	15.8	1.3	10.3	7.5	0.9
Rest of Asia	13.8	15.3	2.5	19.0	10.2	2.2
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey						

The major end users for products and services from the Atlantic Canada ocean technology sector are businesses and governments to satisfy a general business need, followed by businesses to satisfy government regulations/standards, households and the academic sector. The sales to the business sector represent close to 70% of all sales. These sales to business are largely comprised of intermediate demand, *i.e.* sales to businesses that are in turn resold as part of a sale to final demand – government, households, etc. Hence the sales to the government sector of \$83.5 million represents only direct sales to governments. Historically government consumption accounts for between 20 and 30 % of final demand in the overall economy, but in the ocean technology sector we estimate this percentage to be more in the range of 50 % or greater. Under this assumption, final demand sales to government accounts for 50% (\$107.7 million) of Business to Business (B₂B) sales, considered intermediate demand sales. Including this percentage of B₂B sales we estimate the final demand sales to

government as \$191.2 million or 58.1% of total sector sales. Table 2.4 and Chart 2.2 present sales to the major end users.

Table 2.4: Sales to Major End Users			
Major End User	% of Total Sales	Sales to End User	Sale to End User (Total Sector)
Sales to business sector to satisfy government regulations/standards	10.3%	\$16,486,000	\$20,713,998
Sales to business sector to satisfy business needs	58.6%	\$171,445,339	\$215,414,198
Sales to government sector to satisfy general government needs	21.2%	\$66,432,622	\$83,469,927
Sales to households	6.7%	\$5,537,750	\$6,957,961
Sales to academic sector or research foundation	3.2%	\$2,131,857	\$2,678,593
Total	100.0%	\$262,033,569	\$329,234,677
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey			

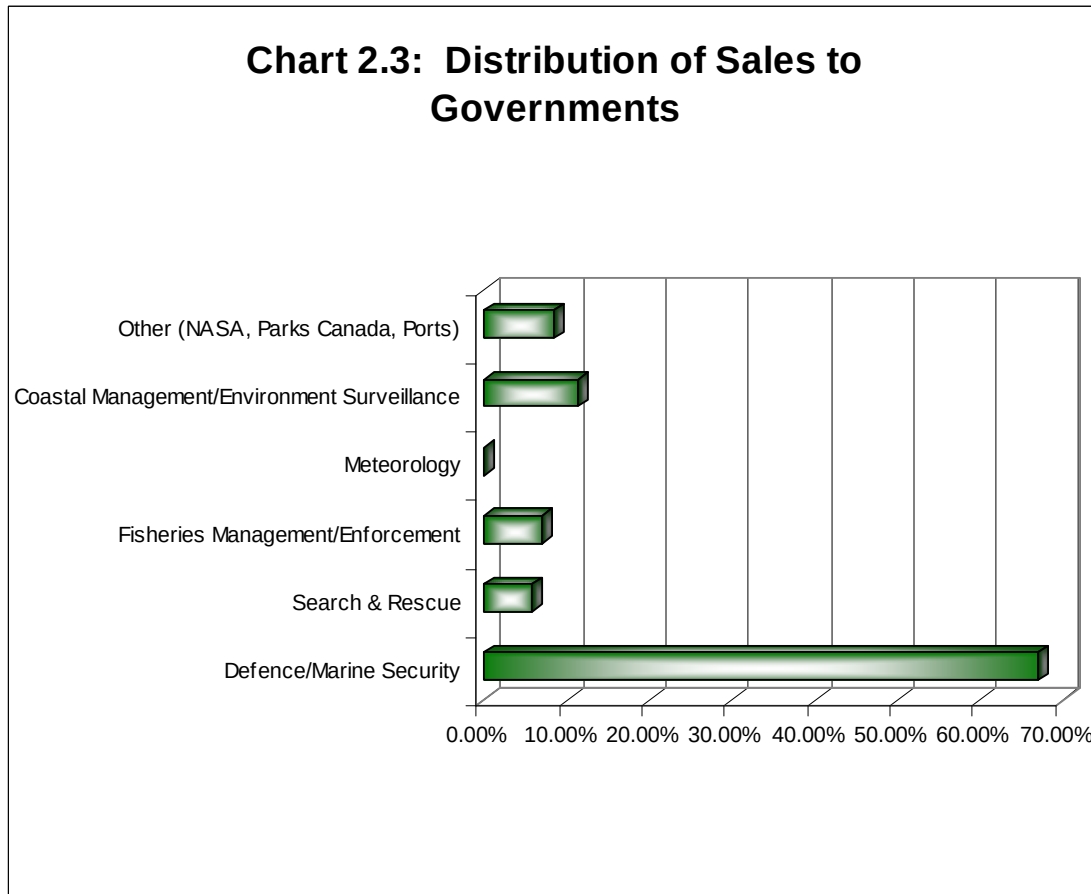


As with export sales, not all sector participants sell to all sectors. Table 2.5 (page 21) presents the percentage of firms that had sales to each major end user and the percentage of their sales that the major end user represents.

Table 2.5: Firms Sales by End User		
Major End User	% of Firms Selling to	% of their Sales
Sales to business sector to satisfy government regulations/standards	29.3%	26.7%
Sales to business sector to satisfy business needs	69.0%	64.5%
Sales to government sector to satisfy general government needs	43.1%	37.2%
Defence/Marine Security	24.1%	23.9%
Search and Rescue	17.2%	16.8%
Fisheries Management/Enforcement	19.0%	14.1%
Meteorology	3.1%	3.0%
Coastal Management/Environmental Surveillance	17.2%	13.3%
Other	8.6%	21.8%
Sales to households	13.8%	36.6%
Sales to academic sector or research foundation	15.5%	15.8%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey		

As shown in Table 2.4 (page 20), sales to governments, both Canadian and foreign, represent over 21% of total sector sales, with Table 2.5 showing 43.1% of firms sell to government. Table 2.6 provides more detail on sales to government. Together with Chart 2.3 (page 22), it presents the distribution and the estimated value of direct sales to governments. *Defence and marine security* represent the largest portion of sales by far to governments at 67% followed by *coastal management/environmental surveillance* at a distant 11.4%.

Table 2.6: Distribution of Sales to Governments ¹			
Major End User	% of Total Sales (Survey Respondents)	Sales to End User (Survey Respondents)	Sales to End User (Total Sector)
Defence/Marine Security	67.0%	\$44,532,905	\$55,953,811
Search and Rescue	5.9%	\$3,947,218	\$4,959,521
Fisheries Management/Enforcement	7.0%	\$4,624,493	\$5,810,489
Meteorology	0.1%	\$75,271	\$94,575
Coastal Management/Environment Surveillance	11.4%	\$7,602,383	\$9,552,090
Other (NASA, Parks, Canada, Ports)	8.5%	\$5,650,352	\$7,099,441
Total	100.0%	\$66,432,622	\$83,469,927
¹ Includes both Canadian and Foreign Governments.			
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey			



As well as asking ocean technology sector participants for sales and export sales distribution we also asked them to identify their top five (5) customer sectors and the nationality of these customer sectors that purchased their goods and services. Responses to this question correlate well with the export sales data, *i.e.* 21% to the United States and 51.9% in Canada versus major markets indicated in Table 2.2 (page 17) of 24.9% (US) and 59.1% (Canada). Table 2.7 and Chart 2.4 (page 23) present the top customer sectors for Atlantic Canadian ocean technology goods and services. Table 2.8 (page 24) presents the nationality of these top customer sectors.

Table 2.7: Top Customer Sectors for Atlantic Canadian Ocean Technology Goods and Services	
Customer Sector	Percent
Government	31.44%
Oil and Gas	11.34%
Value-added Manufacturing	11.34%
Fishing	10.82%
Commercial Shipping/Navigation	10.31%
Recreational Boating/Households	6.19%
Academic/Educational	4.12%
Fish Processors	4.12%
Government Contractors	3.09%
Wholesale Distributors	2.58%
Environmental	2.06%
Other	2.06%
Boat/Shipbuilding	1.03%
Total	100.00%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey	

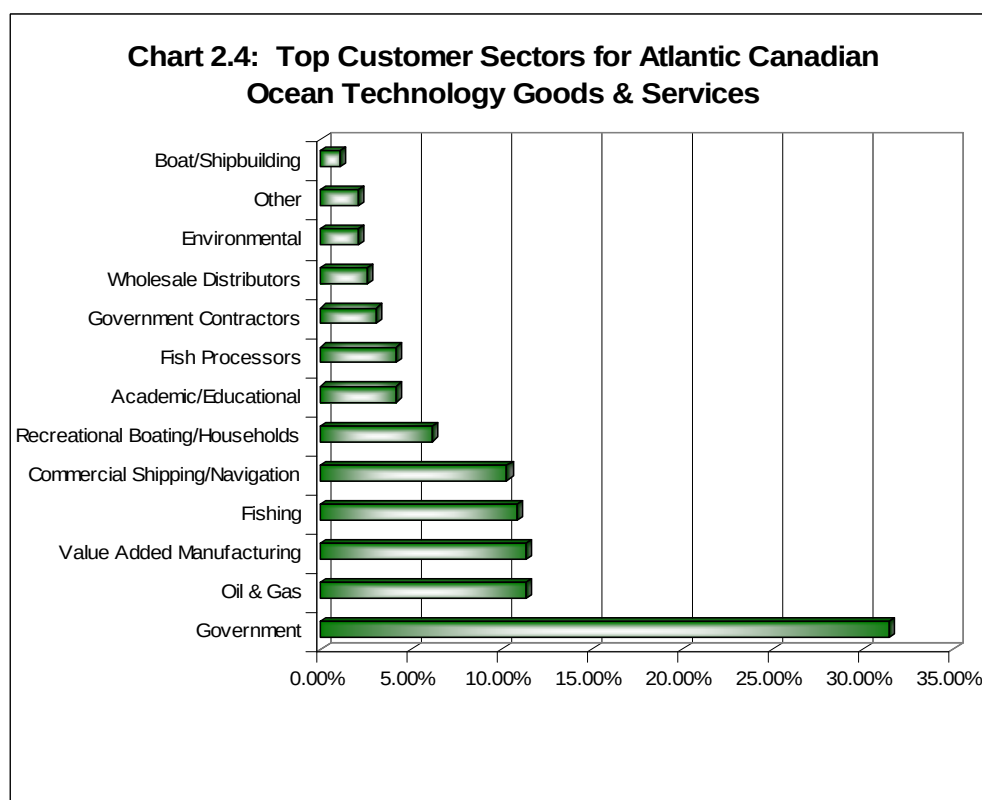


Table 2.8: Nationality of Top Customer Sectors for Atlantic Canadian Ocean Technology Goods and Services	
Customer Sector Nationality	Percent
Canada	51.87%
United States	21.03%
Europe	10.75%
Global	7.01%
Multi-National	3.74%
Asia/Middle East	2.80%
Australia	0.93%
Mexico	0.93%
Africa	0.47%
South America	0.47%
Total	100.00%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey	

Thus far we have only reviewed market characteristics from a sales perspective. During the survey application we also questioned firms as to the supply of goods and services (production inputs) and the percentage purchased in the Atlantic region. The largest inputs to production were components of the finished product at 35.7% of their top inputs with 24.4% being purchased in Atlantic Canada. This was followed by raw material inputs at 34.4% with 45.4% being purchased in Atlantic Canada. A distant third was office/shop (overhead) cost at 6.7% with all these costs being purchased locally. Table 2.9 (page 25) presents production inputs by major category and the proportion purchased in Atlantic Canada by the Atlantic Canadian ocean technology sector.

Table 2.9: Production Inputs by Major Category			
Top 5 Operating Costs	Top 5 Operating Costs	Top 5 Operating Costs	Top 5 Operating Costs
Major Category	% of Total	Average	Average % Purchased in Atlantic Canada
Components	35.7%	\$1,037,573	24.40%
Raw Materials	34.4%	\$1,886,113	46.40%
Office/Shop	6.7%	\$179,844	100.00%
Transportation	6.0%	\$845,962	75.60%
Software	5.5%	\$1,094,000	39.20%
Professional Services	4.7%	\$172,451	66.40%
Machining	2.6%	\$517,200	78.00%
Equipment	2.0%	\$149,006	28.50%
Travel	0.7%	\$36,684	91.00%
Electricity	0.6%	\$90,000	100.00%
Computer	0.4%	\$80,721	53.30%
Communications	0.3%	\$15,143	100.00%
Utilities	0.3%	\$39,286	100.00%
Total	100.0%	\$472,614	69.40%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey			

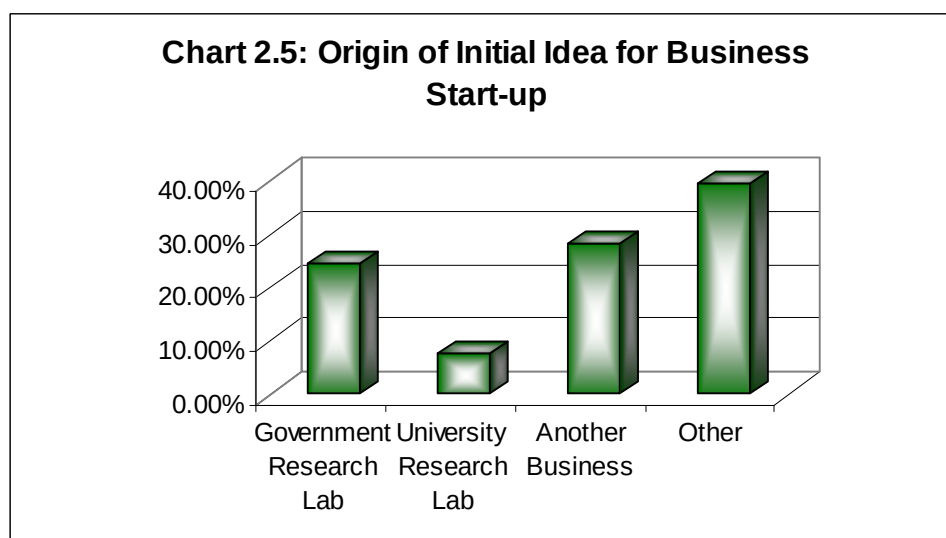
2.4 SECTOR INNOVATIVE PATTERNS

The ocean technology sector is best characterized as knowledge-based; hence its competitive advantage lies in its ability to innovate. Based on our sector survey results, we have found that on average firms devote 31.1% of full-time employees to R&D activities.

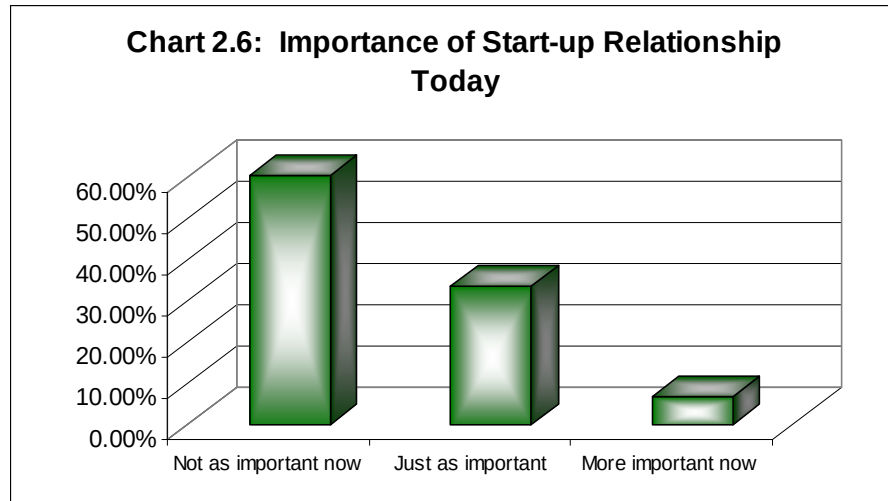
We asked survey participants about the original start-up of the firm. “*Thinking back to your original start-up, where would you say the initial idea for your business originated?*” As one might expect start-up originated from a diverse array of “origins” with the “*other*” category accounting for 39.6%. The response “*other*” was characterized by specifics

such as identified need/opportunity, field of training/expertise, ocean ranger disaster, development of offshore oil and gas industry, independent invention and consultation with government and industry. *Other* is followed by *another business* at 28.3% and *government research lab* at 24.53%. Table 2.10 and Chart 2.5 show the breakdown of the original concept when starting the ocean technology firm.

Table 2.10: Origin of Initial Idea for Business Start-up	
Other	39.62%
Another Business	28.30%
Government Research Lab	24.53%
University Research Lab	7.55%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey	



When further questioned as to how that relationship has evolved since the company was created, 33.3% stated “*Just as important now*”, 6.7% stated “*More Important Now*”, with the remaining 60% feeling the relationship was not as important as it was when the firm was initially started. Chart 2.6 (page 27) presents the distribution of responses to the importance of the start-up relationship today.

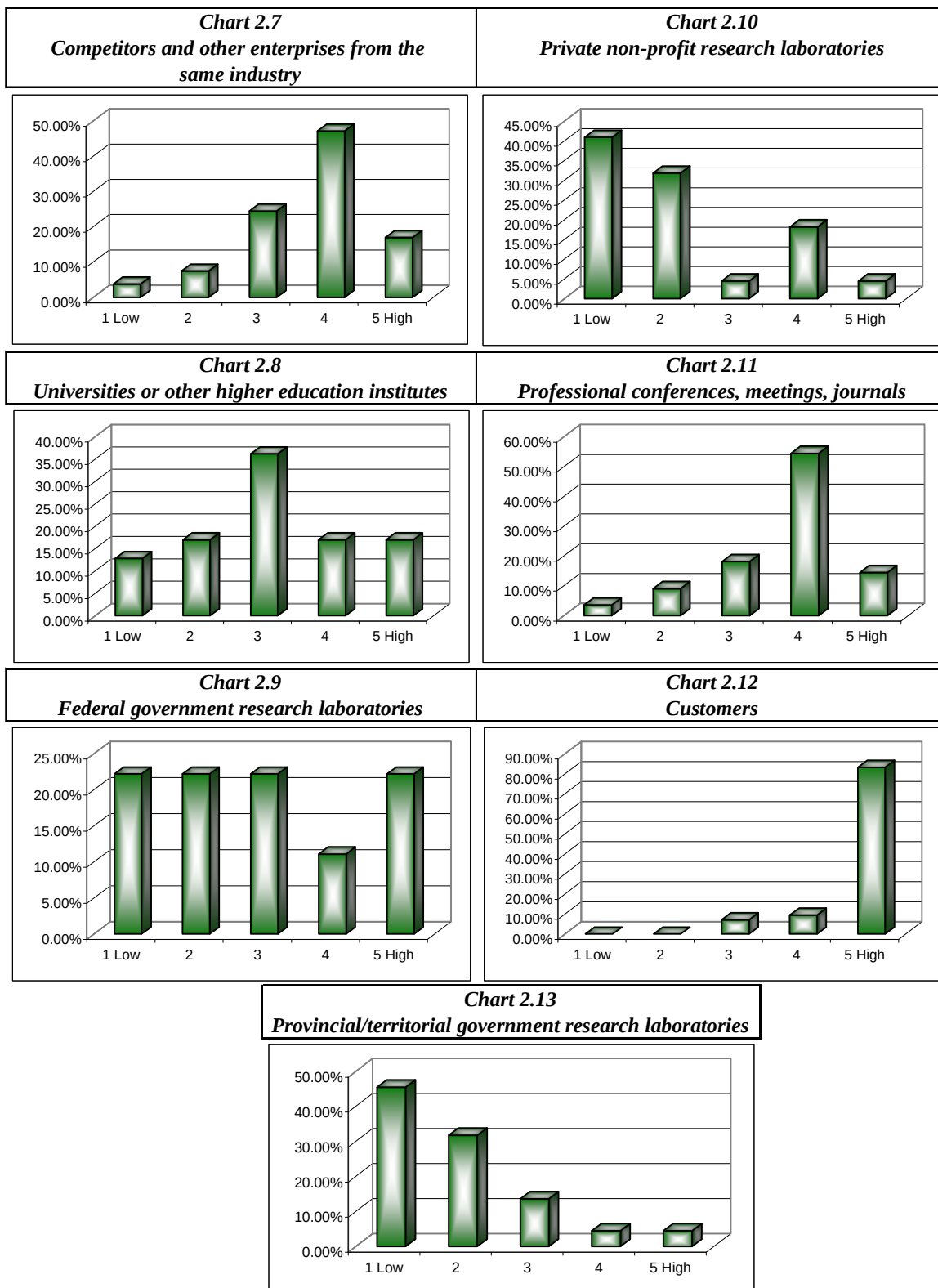


We also questioned firms as to their current sources of information needed for innovation. These sources were rated from a low importance of 1 to a high importance of 5 with a rating of 0 signifying the sources as not relevant. As shown in Table 2.11, customers were rated as the most important source of information needed for innovation with a ranking of 4.76 out of 5. Customers were followed by professional conferences, meeting and journals at 3.67 and competitors and other enterprises from the same industry at 3.66 out of 5. Table 2.11 presents the percentage of firms that felt the stated source was relevant and the average score (1 to 5) for that source.

Table 2.11: Sources of Information		
Sources of Information	% of Respondents	Average Importance Rating Scale 1 = Low; 5 = High
Customers	72.4%	4.76
Professional conferences, meetings, journals	94.8%	3.67
Competitors and other enterprises from the same industry	91.4%	3.66
Universities or other higher education institutions	81.0%	3.09
Federal government research laboratories	62.1%	2.89
Private non-profit research laboratories	37.9%	2.14
Provincial/Territorial government research laboratories	37.9%	1.91
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey		

Charts 2.7 - 2.13 (page 28) display the results distribution for each source of innovation.

Distribution (Ranking) of Each Source of Innovation



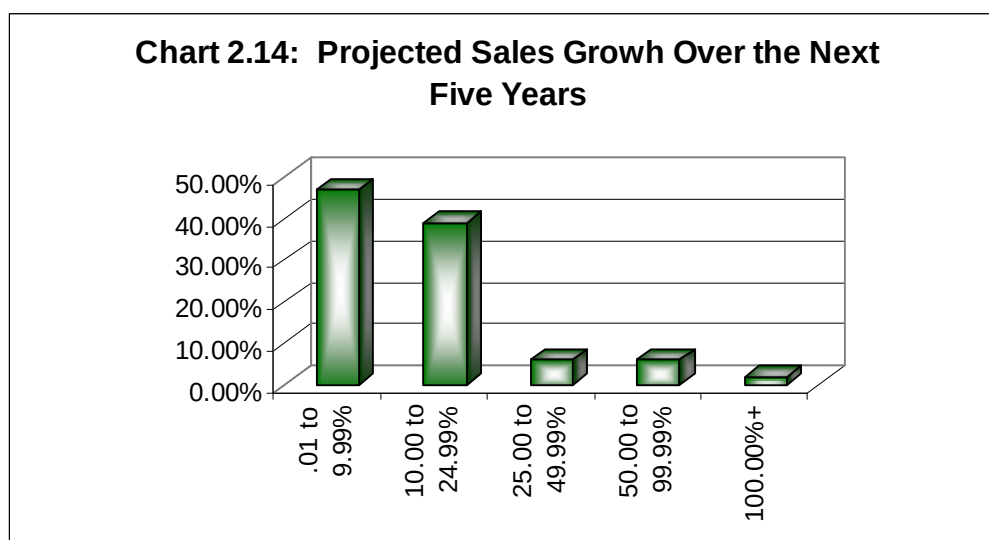
2.5 SECTOR OUTLOOK

A final direct question posed to the respondents of the survey “*what is your current projection for your ocean technology sales growth over the next five (5) years?*”

Response to this question varied widely with the majority, 85.7% believing their average annual sales will grow between .01 to 24.99% over the next five (5) years.

As noted, responses varied widely with the overall average annual growth projected to be 35.8% per year. This figure is somewhat skewed by a very large outlier of 1000% per year. Outliers are defined as a value far from most others in a set of data. When we remove this response the overall average annual growth rate for the Atlantic Canadian ocean technology sector is projected to be 16.1%. Table 2.12 and Chart 2.14 present the results of the projected sales growth question from the Atlantic Canadian ocean technology private sector survey.

Table 2.12: Projected Sales Growth Over the Next Five Years	
	Sales Growth Projection
.01 to 9.99%	46.9%
10.00 to 24.99%	38.8%
25.00 to 49.99%	6.1%
50.00 to 99.99%	6.1%
100.00%+	2.0%
Average	35.8%
Average (excluding large outlier)	16.1%
Source: Canmac Economics Limited, Ocean Technology Private Sector Survey	



2.6 SUMMARY

The direct contribution of the ocean technology sector is significant, but this emerging sector's importance goes beyond its size. The sector is on the forefront of providing the economy with a sustainable competitive growth due to its high levels of innovation and R&D, its highly skilled labour force and its focus on export markets.

CHAPTER 3

ECONOMIC IMPACT

3.1 INTRODUCTION

The ocean technology industry is the ocean sector's principal avenue of research and development, technology and innovation. Sector growth is facilitated by these activities. The sector contributes to sustainable growth and results in benefits for the entire sector, e.g., safety. Ocean related industries are historically a foundation of growth in Atlantic Canada, including the fishery, ship/boat building, transportation and all related activities. The activities of ocean technology firms not only contribute to growth in their own sub-sector but also resonate to the ocean sector as a whole creating opportunities and growth in one of the regions oldest and most significant sectors.

3.2 IMPACT METHODOLOGY

The impact analysis process is traditionally, and in this study, separated into two distinct phases: data collection and impact analysis/simulation.

Data Collection

This phase of the study involved the collection of economic activity data through direct survey of sector participants in Atlantic Canada. The primary sources used to identify ocean technology participants were Industry Canada's Canadian Company Capabilities Database and input from members of the Project Steering Committee from each of the four Atlantic Provinces. Once the participant database was completed initial contact was made to determine if the firm was active in ocean technology and, if so, its willingness to be interviewed for the study.

After the initial contact the database of ocean technology firms was culled from the initial 172 firms to 137 firms by removing duplicates, firms out of business, and firms not

involved in the ocean technology sector. Table 3.1 provides the statistics for ocean technology firms in Atlantic Canada by province.

Table 3.1: Ocean Technology Firms by Province					
	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Total
Initial Database	57	6	85	24	172
Final Database	47	6	64	20	137
Source: Canmac Economics Limited					

Of the 137 ocean technology firms identified in Atlantic Canada, 58 or 42.3% agreed to be interviewed and complete the survey. The survey instrument is provided in Appendix B. Of the 58 firms surveyed 52 or 89.7% were conducted through direct personal interview with the remaining six (6) firms being surveyed through a combination of telephone, email and facsimile communications. The survey collected direct output (sales), direct employment, direct labour income, export sales, main production inputs by source, and the proportion of total sales/output directly related to the ocean technology sector. This information was utilized in the economic impact analysis. Data was requested in terms of the average of the past three (3) fiscal years to avoid outliers which would be presented by one poor or phenomenal year.

Economic Impact Analysis

The primary purpose of this study was to estimate the overall economic impact of the entire ocean technology sector in Atlantic Canada. 42.3% of the sector was surveyed. The remaining 57.7% was estimated from preliminary analysis of the surveyed population and secondary sources of data such as annual reports, company capability database and initial contact information. These were utilized to estimate direct output, employment and income. Where no secondary data was available, output was estimated using median and mean data from surveyed firms to estimate output for unsurveyed firms. In this exercise, we used a conservative approach of removing the largest firms from the median and mean calculations as the majority of large firms were surveyed. Once output was estimated, employment to output ratios and average annual wage values were used to complete the estimate for the unsurveyed (non-responsive

and declined) firms. The resulting direct economic impact estimate is presented in Table 3.2.

Table 3.2: Actual and Estimated Direct Economic Impact Atlantic Canadian Ocean Technology Sector			
	Surveyed Firms	Unsurveyed Firms	Total Sector
Output (sales)	\$283,926,251	\$45,308,426	\$329,234,677
Employment (FTE)	1,955.41	312.04	2,267.45
Wagebill	\$72,933,826	\$11,638,646	\$84,572,472
Source: Canmac Economics Limited			

3.3 ECONOMIC IMPACT

With direct economic activity estimated for the entire Atlantic Canadian ocean technology sector we then ran the input/output (I/O) simulations for the four (4) Atlantic provinces combined estimating the indirect (supplier) and induced (household wage spending) impacts for employment, income, output (GDP) as well as the associated Federal and Provincial fiscal impacts.

As the output data collected was in the form of sales it is considered purchaser price data which includes margins and taxes. The I/O model strips estimated margin and taxes resulting in only the production cost (producer price) being impacted. Table 3.3 presents the summary total economic impact estimate of the Atlantic Canadian ocean technology sector.

Table 3.3: Total Estimated Economic Impact Atlantic Canadian Ocean Technology Sector			
	Direct	Spinoff	Total
Employment	2,268	3,030	5,298
Household Income	\$84,572,472	\$117,180,725	\$201,753,197
GDP	\$152,783,828	\$128,068,990	\$280,852,818
Source: Canmac Economics Limited, Statistics Canada Input-Output Division			

As shown in Table 3.3 the Atlantic Canadian ocean technology sector directly creates an estimated 2,268 person years of employment resulting in over \$84.5 million of

household income on an annual basis. This direct sector activity contributes \$152.8 million to the regions' gross domestic product (output).

When we factor in the estimated indirect and induced (spinoff) economic activity we see that the sector is responsible for close to 5,300 person years of employment, \$201.7 million of household income and \$280.9 million of GDP on an annual basis.

The impact of the Atlantic Canadian ocean technology sector is felt through all major sectors of the region's economy. Naturally, the sectors that experience the largest impact are the manufacturing and service sectors as these sectors house the majority of ocean technology sectors participants. Table 3.4 presents the total regional economic impact of the Atlantic Canadian ocean technology sector by major industry sector.

Table 3.4: Atlantic Canadian Impact by Major Industry Sector Atlantic Canadian Ocean Technology Sector			
Major Industry Sector	Employment	Household Income	GDP
Resources	233.1	8,877,140	11,795,818
Manufacturing	1,229.1	55,280,376	75,268,555
Construction	37.1	1,815,779	1,965,970
Transportation and Communications	508.6	20,982,332	35,387,455
Wholesale and Retail Trade	694.1	20,578,826	26,961,871
Finance, Insurance, Real Estate	164.2	13,113,958	33,421,485
Services	2,431.8	81,104,748	96,051,664
Total	5,298	201,753,197	280,852,818

As shown in Table 3.4 all major industry sectors in the Atlantic region are impacted by the ocean technology sector. Provincial breakdown of the economic and fiscal impacts are presented in Appendix E.

3.4 FISCAL IMPACT

Economic activity generates fiscal revenue for Federal, Provincial and to a lesser extent Municipal governments through income tax, sales tax (HST,GST/PST), indirect taxes and corporate tax sources. This revenue is generated by both the direct and spinoff activity related to the ocean technology sector. To estimate fiscal revenue we utilize effective tax rates, *i.e.* the actual revenue generated per income as opposed to using

the actual tax rate. This approach is taken as it captures all of the various tax rates and exemptions, *i.e.* income tax has various rates per level of income and tax payers have many tax deferrals such as RRSP contributions which would cause an overestimation of income tax if an average rate was used. The effective tax rate for income, sales, and other indirect Federal and Provincial taxes are based on personal income where as the corporate effective tax rate is based on corporate profits before taxes. These rates are calculated using the latest National and Provincial Accounts Database. Table 3.5 presents the estimated fiscal impact related to the Atlantic Canadian ocean technology sector.

Table 3.5: Estimated Fiscal Impact by Source Atlantic Canada Ocean Technology Sector			
Level of Government	Direct	Spinoff	Total
Federal			
Income Tax	\$7,894,785	\$10,938,876	\$18,833,661
Sales Tax	\$2,720,684	\$2,372,725	\$5,093,409
Other Indirect Taxes	\$1,624,653	\$984,542	\$2,609,195
Corporate Tax	\$1,407,485	\$2,392,054	\$3,799,540
Total	\$13,647,607	\$16,688,198	\$30,335,805
Provincial			
Income Tax	\$5,353,400	\$7,417,578	\$12,770,978
Sales Tax	\$3,695,800	\$3,927,063	\$7,622,863
Other Indirect Taxes	\$2,735,100	\$1,532,219	\$4,267,319
Corporate Tax	\$561,662	\$954,557	\$1,516,219
Total	\$12,345,962	\$13,831,417	\$26,177,379
Municipal Property Tax	\$1,041,872	(1)	\$1,041,872
(1) Direct property tax was collected as part of the survey process; for unsurveyed firms property tax was estimated using surveyed property tax per output. No attempt was made to estimate spinoff property tax. Source: Canmac Economics Limited, Statistics Canada Input-Output Division			

As shown in Table 3.5 all levels of government benefit fiscally from the ocean technology sector. The federal government annually collects an estimated \$30.3 million while the provincial governments annually collect an estimated \$26.2 million from the direct and spinoff activities related to Atlantic Canada's ocean technology sector. Municipal governments throughout the four (4) Atlantic Provinces realize in excess of \$1 million annually directly from ocean technology firms.

3.5 SUMMARY

The total contribution of the ocean technology sector is measured in its direct and spinoff impacts, and also in the future economic benefits that it represents for Atlantic Canada. Future growth in Atlantic Canada is dependent on a successful transformation to a knowledge-based economy. The ocean technology sector provides a successful example of this.

CHAPTER 4

CONCLUSION

As shown by this study the Atlantic Canadian ocean technology sector is a diverse and intricate part of the Atlantic Canadian economy. The ocean technology sector is the principle source of research and development, technology and innovation for the ocean industries sector and facilitates growth through its activities. In fact, the economic importance of the ocean technology sector far exceeds its size. The sector makes a significant contribution to the Atlantic economy as one of the region's largest advanced technology industries with high levels of R&D and innovation, a highly skilled labour force, an export focus and its capacity to generate wealth.

In Atlantic Canada the ocean technology sector directly creates 2,268 person years of employment, providing \$84.6 million of labour income and contributing \$152.8 million to GDP from sales of \$329.2 million on an annual basis. Including estimated spinoff, the sector provides 5,298 person years of employment providing \$201.7 million of labour income and contributes \$280.9 million to GDP on an annual basis.

The Atlantic Canadian ocean technology sector exports over 50% of its products and services. The United States is the biggest export market receiving 25% of the sectors output followed by the rest of the world at 16% and other parts of Canada at 12%. The majority of sales (70%) are to businesses followed by sales to governments (21%).

The sector can be described as having a high level of sector growth confidence with sector participants expecting sales growth of 16.1% per year over the next five years.

Appendix A

Methodology Overview

Methodology Overview

The economic impact analysis process is traditionally, and is in this case, separated into two phases: data collection and impact analysis/simulation.

Data Collection: This crucial phase of the project involved the collection of economic impact data through direct survey. The survey instrument is contained in Appendix C. The survey allowed for the collection of direct output (sales), direct employment and direct labour income (wagebill or payroll) from participants in the sector. Respondents were asked to provide averages for direct output, employment, and labour income as well as the proportion of total sales in the ocean technology sector over the past three fiscal years so the data collected is representative of the firms' participation in the sector and avoids single year outlier data. In the data collection phase, corrections were made in netting out firms with no involvement in the ocean technology sector. Firms that indicated a Non-Response to the survey instrument were probed to obtain the extent to which they are participants in the sector (the respondents were asked to estimate what percentage of total sales were in the ocean technology sector) and the firm's involvement was extrapolated from surveyed firms and secondary sources to obtain a full population measurement of the direct output, employment and labour income for the sector.

Impact Analysis and Simulation: With the full population measurements for direct output, employment and labour income, impact simulations were run using Statistics Canada's input-output data. The Input-Output (I/O) simulation involves estimating the indirect, induced and total output, employment, labour income and GDP from the basic structure of the economy for each of the Atlantic Provinces.

I/O or inter-industry analysis was developed by the economist Wassily Leontief during the 1930s. It is an empirical representation of a general theory of production based on the notion of economic interdependence. Leontief's original I/O table showed how each sector of the economy depends upon every other sector (including households), either

to supply its inputs or to purchase its outputs. This is still the basic characteristic of all I/O models.

In an I/O model each industry in the local economy depends, in principle, on every other industry for the supply of intermediate goods. The ultimate goal of the I/O model is to trace the transmission of demand through the economy. The model's operations are somewhat restricted. Firstly, industry production functions are linear and inputs must be used in fixed proportions. In other words, economies and diseconomies of scale are not permitted, as they would require intricate calculation of non-linear functions representing complex and rapidly changing relationships between industries. Secondly, a generally strict assumption of I/O models is that prices and wages are fixed and the supply of both intermediate goods and final goods is unlimited. Thirdly, I/O models take a long time to construct, and may reflect economic relationships that are slightly out-of-date when they are applied.

The I/O model describes impacts in terms of direct, indirect and induced effects with the total being the sum of the three effects. In this impact exercise, the direct effect is defined as the total value of output for the ocean technology sector. The indirect effect is defined as the total value of output from other industries in the regional economy that supply the sector. This supply includes 'suppliers of suppliers' that is the demand for goods and services includes both direct suppliers to the direct sector, and to their suppliers. The induced effect refers to the additional industry output that arises as households spend the incomes they earn by working in the direct sector, or in supplying inputs to the direct sector (that is, at the direct and indirect stages), or other goods and services in the economy. The total economic value is measured as the sum of the direct, indirect and induced effects.

The economic impacts for this study have been estimated using an Input-Output model based on Statistics Canada Input-Output tables. The model is based on 1996 data at the small level aggregation of 43 industries. Expenditures are entered into the model

which extract retail, wholesale and transportation margins and reallocate them to the retail trade, wholesale trade and transportation industries.

Import coefficients are applied to the remaining dollar amounts to “leak out” the province expenditures which are NOT produced in the province. For example, most expenditures on parts for vehicles would be leaked out because most mechanical parts used in vehicles throughout the province are NOT produced in the Atlantic Provinces.

Conversely, most expenditures on services such as the mechanics repairing a vehicle would stay in the province as this is a commodity (repair service) performed in the province.

The dollars remaining in the province are allocated to the industries which produce the commodities (the information about which industry produce which commodities is provided by the Output tables). In turn, those industries will consume commodities used to produce the commodities (this information about what commodities are used by each industry in their production process is provided by the Input tables) consumed by the consumer (for example, a fishermen buying fuel for his boat to catch salmon purchased at the food store by shoppers), etc.

The model continues to iterate until there is no money left in the model (imports, taxes and savings are all leakages which will eventually reduce to zero the amount of money spent initially by the direct industry). Then the model stops and the total impacts by industry are added up from all iterations.

Appendix B
***NAICS (North American Industrial
Classification System) Based Definition
of Ocean Technology Sector***

Acoustic Systems and Equipment

Sonar

334511 Fish finders (*i.e.* sonar), manufacturing

Sonar systems and equipment, manufacturing

417320 Sonar equipment, wholesale

Echo Sounder

334511 Fish finders (*i.e.* sonar), manufacturing

Sonar systems and equipment, manufacturing

Sub Bottom Profilers

334511 Fish finders (*i.e.* sonar), manufacturing

Sonar systems and equipment, manufacturing

Data Acquisition and Processing Systems

541990 All Other Professional, Scientific and Technical Services

Defense

Sonobuoys

334511 – Navigational and Guidance Instruments Manufacturing

Naval Equipment and Systems

325190 Naval stores, gum or wood, manufacturing

Search and Rescue

Shows up in US sources as NAICS 1997 621910 – Rescue Services

Surveillance Equipment and Services

811210 - Electronic and Precision Equipment Repair and Maintenance

541690 Other Scientific and Technical Consulting Services

Imaging

Remote sensing and Data Acquisition

541360 - Geophysical Surveying and Mapping Services

Imaging Analysis

561990 - All Other Support Services

Geomatics

541360 - Geophysical Surveying and Mapping Services

Instrumentation and Information Systems

Buoys (moored and drifting)

339990 All Other Miscellaneous Manufacturing

Oceanographic and Meteorological Sensors

334512 - Measuring, Medical and Controlling Devices Manufacturing

Optical Sensors

334511 Cabin environment indicators, transmitters and sensors, manufacturing
and Flight and navigation sensors, transmitters and displays, manufacturing

336320 Electronic sensors (*e.g.*, air bag, brake, fuel, exhaust), manufacturing

Data Collection and Information Systems

334512 - Measuring, Medical and Controlling Devices Manufacturing

334110 Computer and Peripheral Equipment Manufacturing

Marine Communications

All under 513320 - Beeper (radio pager) communications carriers, Mobile telephone communications carriers, Personal communication services (PCS) (*i.e.* communications carriers), Radio paging communications carriers, Ship-to-shore broadcasting communications carriers, Telecommunications carriers, cellular telephone

Two-way paging communications carriers, Wireless data communications carriers,

Wireless telephone communications carriers

488339 Radio beacon service, ship navigation

Shipboard

Wireless

Subsea

Platforms and Vehicles

335930 - Wiring Device Manufacturing

336390 - Other Motor Vehicle Parts Manufacturing

336990 - Other Transportation Equipment Manufacturing

Remotely Operated Vehicles

Autonomous Vehicles

Manned Submersibles

Handling Systems

Diving Contractors

561990 - All Other Support Services

Services

Training

561990 - All Other Support Services

Consulting

541690 Other Scientific and Technical Consulting Services

Vessel Operations and Survey Companies

488339 Docking and undocking marine vessel services

Marine vessel traffic reporting

532410 Bareboat (vessel) chartering

541360 Electrical geophysical surveying services, Electromagnetic geophysical surveying services, Geological surveying services, Geophysical surveying services, Gravimetric surveying services, geophysical, Magnetic geophysical surveying services, Oceanic surveying, geophysical, Oil gas field seismographic surveys, Radioactive geophysical surveying services, Seismic geophysical surveying services

541990 Marine surveyor (*i.e.* ship appraisal) services, Quantity surveyor services

561310 Ship crew agencies

Ship crew registries
 541360 Oceanic surveying, geophysical
 541370 Oceanic surveying (except geophysical) services
Navigation and Positioning
 488339 Harbour navigational operations, Radio beacon service, ship navigation
 488332 Ship piloting service
Naval Architecture and Marine Engineering
 232450 Painting ships, contractors
 232460 Joinery, ship, contractors
 332319 Ship sections, prefabricated metal, manufacturing
 332999 Propellers, ship and boat, machined, manufacturing
 333920 Ship cranes and derricks, manufacturing
 418110 Dismantling ships, Marine wrecking, ships for scrap
 488390 Drydocks, floating, for repairing ships and boats
 Ship repair and maintenance, not in a shipyard
 Ship scaling services
 541330 Marine engineering services
Testing and Simulation
 541380 Acoustics testing services
 Automobile proving and testing ground
 Biological testing (except clinical and veterinary)
 Calibration and certification testing services
 Electrical testing laboratory
 Environmental laboratory testing services
 Film badge testing services
 Food testing laboratory
 Geotechnical testing laboratory
 Hydrostatic testing laboratories
 Industrial testing laboratories
 Laboratories, product testing
 Laboratory testing service (except clinical and veterinary)
 Laboratory, food testing
 Mechanical testing, laboratories
 Metallurgical testing laboratories
 Non-destructive testing services
 Pollution testing service (except automotive emissions testing)
 Product testing services
 Radiation testing services
 Radiographic testing services
 Radon testing services
 Seed testing laboratories
 Soil testing services
 Testing laboratory (except medical or dental)
 Thermal testing, laboratories
 Vibration testing services

Other Ocean Related Services

541710 Oceanographic research and development laboratories

Sources:

<http://strategis.ic.gc.ca/epic/internet/inicot-icto.nsf/en/to00016e.html>

<http://www.statcan.ca/english/Subjects/Standard/naics/1997/naics97-index.htm>

Appendix C

Survey Instrument

Ocean Technology Private Sector Survey

NAME OF ORGANIZATION: _____

ADDRESS: _____

CITY: _____

PROVINCE: _____

POSTAL CODE: _____

1A. RESPONDENT: _____

1B. RESPONDENT TITLE: _____

1C. EMAIL: _____ WEBSITE: _____

1D. PRODUCT OR SERVICE PROVIDED: _____

THE PURPOSE OF THIS SURVEY:

CANMAC ECONOMICS LTD., AND THE ATLANTIC COASTAL ZONE INFORMATION STEERING COMMITTEE (ACZISC) HAS BEEN ENGAGED BY THE ATLANTIC CANADA OPPORTUNITIES AGENCY (ACOA) TO UNDERTAKE A STUDY OF THE OCEAN TECHNOLOGY SECTOR IN ATLANTIC CANADA. THE OVERALL PURPOSE OF THE STUDY IS TO MEASURE THE ECONOMIC IMPORTANCE OF THE SECTOR AND TO DEVELOP STRATEGIES TO HELP THE SECTOR TO GROW (WITH PARTICULAR EMPHASIS ON THE DOMESTIC PUBLIC SECTOR). TO COMPLETE THIS STUDY THERE IS A NEED FOR DATA FROM FIRMS INVOLVED IN THE OCEAN TECHNOLOGY SECTOR.

THE DATA YOU REPORT IS CONFIDENTIAL:

CANMAC ECONOMICS LTD. WILL NOT PUBLISH OR RELEASE ANY STATISTICS THAT REVEAL INFORMATION OBTAINED FROM THIS SURVEY RELATING TO ANY IDENTIFIABLE ORGANIZATION. THE DATA REPORTED ON THE QUESTIONNAIRE WILL BE TREATED IN STRICT CONFIDENCE, USED FOR STATISTICAL PURPOSES AND RELEASED IN AGGREGATE FORM ONLY.

YOUR PARTICIPATION IS IMPORTANT:

YOUR PARTICIPATION IN THIS SURVEY IS VOLUNTARY. HOWEVER, YOUR COOPERATION IS ESSENTIAL TO THE ACCURACY OF THE INFORMATION COLLECTED. THE INFORMATION YOU PROVIDE WILL HELP SHAPE CURRENT AND FUTURE PROGRAMS.

IF YOU REQUIRE ASSISTANCE IN THE COMPLETION OF THE QUESTIONNAIRE OR HAVE ANY QUESTIONS REGARDING THE SURVEY, PLEASE CONTACT:

MR. MARK DEVEAU
CANMAC ECONOMICS LTD.
495 SACKVILLE DRIVE, LOWER SACKVILLE, NOVA SCOTIA, B4C 2S1
PHONE (902)864-3838 / FAX (902)865-5762
E-Mail: mark.canmac@ns.sympatico.ca

Economic Impact Factors

1. Firm Data - Please respond with the average for the most recent three (3) fiscal years.		
2. What is your firm's fiscal year end? (<i>Month</i>)		
3. What is the average number of full-time employees employed by your firm (<i>Full-time employee is defined as those who work 27.5 or more hours per week</i>)		
4. What is the average number of part-time employees employed by your firm? (<i>Part-time employee is defined as those who work less than 27.5 hours per week</i>).		
5. What is the average hours per week for part-time employees?		
6. What was your firm's average annual sales for the last three (3) complete fiscal years?	\$	
7. What percentage of your firms total sales for the last three (3) complete fiscal years were directly related to the Ocean Technology Sector?		%
8. Please estimate the percentage of the full-time employees in your business unit who were involved in research and development (R&D) activities in 2004.		%
9. What was your firm's annual wage bill (average for the last three (3) complete fiscal years)?	\$	
10. Firm Market Data - Please provide the distribution of sales for your total organization over the following two fiscal years.		
	2000 (%)	2004 (%)
Atlantic Canada		
Other Canada		
United States		
Northeast		
Southeast		
South		
Mid West		
West		
Northwest		
Rest of World		
Western Europe		
Eastern Europe		
Africa		
South America		
Asia-China		
Asia – Rest of Asia		
Total	100%	100%
11. Please identify the commercial market for your products and services by the following major end users and the percent of sales represented by each major user group.		
Major End Users	% of Sales Represented by Major End User	
1. Sales to business sector to satisfy government regulations/standards ----->	%	
2. Sales to business sector to satisfy business needs ----->	%	
3. Sales to government sector to satisfy general government needs ----->	%	
i. Defence/Marine Security ----->	%	
ii. Search and Rescue ----->	%	
iii. Fisheries Management/Enforcement ----->	%	
iv. Meteorology ----->	%	
v. Coastal Management/Environmental Surveillance ----->	%	
vi. Other (<i>please specify</i>) ----->	%	
4. Sales to households ----->	%	
5. Sales to Academic Sector or Research Foundation ----->	%	

12. <u>Customers</u> – Thinking about your major customers, please identify the top five customer sectors for your goods and services and their nationality.		
Customer Sector	Nationality	
1.		
2.		
3.		
4.		
5.		
13. <u>Suppliers</u> – Thinking about your annual expenditures, please identify the top five categories of goods and services purchased by your company in the past fiscal year (<i>input material and equipment purchased from other firms</i>).		
Goods and Service Category	Annual Operating Costs	Percentage Purchased in Atlantic Canada
1.	\$	%
2.	\$	%
3.	\$	%
4.	\$	%
5.	\$	%
14. Over the last five (5) years has there been a trend within your firm of (<i>please check one</i>)		
1. Greater contracting out of the production of goods and services.		☐
2. Less contracting out of the production of goods and services.		☐
3. About the same level of contracting out of the production of goods and services.		☐
15. Please indicate the amount your firm paid in taxes (other than HR) for the last complete fiscal year by category.		
1. Property Taxes	\$	
2. Corporate Taxes	\$	
3. Other (<i>please specify</i>)	\$	
Sources of Innovation		
16. How long has your firm been in business?	Years	
17a. Thinking back to your original start-up, where would you say the initial idea for your business originated? Government Research Lab ☐ University Research Lab ☐ Another Business ☐ Other (please specify) ☐ _____ _____		
17b. How has this relationship evolved since your company was created? Not as important now ☐ Just as important ☐ More important now ☐		
18. <u>During the last five years, 2000 to 2004</u> , which of the following played an important role as sources of information needed for suggesting or contributing to the development of new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services). Please indicate the importance of using the following scale where 1 is low importance and 5 is high importance. Check ☐ if not relevant to your business unit.		
Sources of Information	Low <----->High	Not Relevant
1. Competitors and other enterprises from the same industry	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
2. Universities or other higher education institutes	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
3. Federal government research laboratories	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
4. Provincial/territorial government research laboratories	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
5. Private non-profit research laboratories	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
6. Professional conferences, meetings, journals	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
7. Customers	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	0 ☐
19. What is your current projection for your ocean technology sales growth over the next five years? Average annual sales growth projection for the next five years		%

Comments

Do you have any further comments with respect to the Ocean Technology Sector?

[illegible]

Thank You!

Appendix D
Provincial Sector Overview
and Market Characteristics

Table D1: Statistics for Ocean Technology Firm				
Total Sector				
	NL	NS	NB & PEI	Total
Sales	\$150,466,678	\$155,247,511	\$23,520,488	\$329,234,677
FT-Emp.	971.6	1,033.0	216.6	2,221.2
PT-Emp.	24.4	19.5	2.4	46.3
Emp (FTE)	996.0	1,052.5	219.0	2,267.5
Wagebill	\$37,149,604	\$39,254,596	\$8,168,272	\$84,572,472

Table D2: Geographic Distribution of Sales by Major Market								
Region	NL		NS		NB & PEI		Total	
	2000	2004	2000	2004	2000	2004	2000	2004
Atl. Canada	51.06	43.44	52.32	48.63	46.25	55.75	51.39	47.31
Other Canada	11.47	12.26	9.25	10.90	17.50	16.75	10.69	11.83
U.S.	22.63	24.07	23.93	25.47	31.25	25.00	24.08	24.93
Rest of World	14.84	20.23	14.50	15.00	5.00	2.50	13.84	15.93
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table D3: Sale to Major End Users			
	% of Sales	End User	Total Sector
	Newfoundland		
Business Sector to Government Regulations/Standards	11.3%	\$13,139,436	\$16,509,175
Business Sector to Business Needs	60.6%	\$87,710,168	\$110,204,310
Government Sector to General Government Needs	18.3%	\$16,645,871	\$20,914,869
Sales to households	8.4%	\$2,067,332	\$2,597,520
Academic Sector to Research Foundation	1.4%	\$191,653	\$240,804
Total	100.0%	\$119,754,459	\$150,466,678
	Nova Scotia		
Business Sector to Government Regulations/Standards	9.4%	\$1,521,124	\$1,911,232
Business Sector to Business Needs	56.7%	\$70,405,978	\$88,462,289
Government Sector to General Government Needs	24.0%	\$46,625,652	\$58,583,263
Sales to households	4.9%	\$3,128,364	\$3,930,664
Academic Sector to Research Foundation	5.0%	\$1,878,343	\$2,360,063
Total	100.0%	\$123,559,461	\$155,247,511
	New Brunswick & Prince Edward Island		
Business Sector to Government Regulations/Standards	10.4%	\$1,825,440	\$2,293,592
Business Sector to Business Needs	58.5%	\$13,329,194	\$16,747,598
Government Sector to General Government Needs	21.3%	\$3,161,100	\$3,971,795
Sales to households	6.6%	\$342,054	\$429,777
Academic Sector to Research Foundation	3.3%	\$61,862	\$77,727
Total	100.00%	\$18,719,648	\$23,520,488

Table D4: Firms Sales by End User		
	% of Firms	% of Their Sales
Newfoundland		
Sales to business sector to satisfy government	36.4%	31.0%
Sales to business sector to satisfy business needs	86.4%	70.2%
Sales to government sector to satisfy general government needs	50.0%	36.6%
Defence/Marine Security	31.8%	19.4%
Search and Rescue	27.3%	9.0%
Fisheries Management/Enforcement	22.7%	6.8%
Meteorology	4.5%	1.0%
Coastal Management/Environmental Surveillance	31.8%	11.1%
Other	9.1%	37.5%
Sales to households	13.6%	61.7%
Sales to academic sector or research foundation	18.2%	7.8%
Nova Scotia		
Sales to business sector to satisfy government	30.0%	22.9%
Sales to business sector to satisfy business needs	70.0%	59.4%
Sales to government sector to satisfy general government needs	46.7%	37.7%
Defence/Marine Security	23.3%	28.4%
Search and Rescue	13.3%	28.5%
Fisheries Management/Enforcement	20.0%	20.2%
Meteorology	3.3%	5.0%
Coastal Management/Environmental Surveillance	10.0%	18.3%
Other	10.0%	11.3%
Sales to households	16.7%	21.6%
Sales to academic sector or research foundation	16.7%	22.2%
New Brunswick & Prince Edward Island		
Sales to business sector to satisfy government	21.6%	26.2%
Sales to business sector to satisfy business needs	50.5%	64.0%
Sales to government sector to satisfy general government needs	32.6%	37.4%
Defence/Marine Security	17.3%	23.9%
Search and Rescue	11.1%	12.9%
Fisheries Management/Enforcement	14.2%	15.3%
Meteorology	2.5%	3.0%
Coastal Management/Environmental Surveillance	9.9%	10.4%
Other	6.8%	16.6%
Sales to households	11.1%	26.6%
Sales to academic sector or research foundation	11.7%	17.4%

Table D5: Distribution of Sales to Governments			
	% of Total Sales (Survey Respondents)	Sales to End User (Survey Respondents)	Sales to End User (Total Sector)
Newfoundland			
Defence/Marine Security	14.7%	\$2,445,749	\$3,072,986
Search & Rescue	19.2%	\$3,198,630	\$4,018,950
Fisheries Management/Enforcement	18.6%	\$3,094,015	\$3,887,506
Meteorology	0.1%	\$17,820	\$22,390
Coastal Management/Environment Surveillance	37.0%	\$6,156,694	\$7,735,640
Other (NASA, Parks, Canada, Ports)	10.4%	\$1,732,962	\$2,177,398
Total	100.0%	\$16,645,871	\$20,914,869
Nova Scotia			
Defence/Marine Security	87.6%	\$40,852,003	\$51,328,905
Search & Rescue	0.7%	\$336,610	\$422,937
Fisheries Management/Enforcement	2.4%	\$1,114,101	\$1,399,823
Meteorology	0.1%	\$53,975	\$67,818
Coastal Management/Environment Surveillance	1.4%	\$652,611	\$819,980
Other (NASA, Parks, Canada, Ports)	7.8%	\$3,616,351	\$4,543,800
Total	100.0%	\$46,625,652	\$58,583,263
New Brunswick & Prince Edward Island			
Defence/Marine Security	35.3%	\$1,115,837	\$1,402,004
Search & Rescue	14.0%	\$442,237	\$555,653
Fisheries Management/Enforcement	14.0%	\$442,879	\$556,459
Meteorology	0.1%	\$3,462	\$4,350
Coastal Management/Environment Surveillance	26.9%	\$851,303	\$1,069,629
Other (NASA, Parks, Canada, Ports)	9.7%	\$305,383	\$383,701
Total	100.0%	\$3,161,100	\$3,971,795

Table D6: Business Start-up Idea			
	NL	NS	NB&PEI
Government Research Lab	22.7%	28.6%	0.0%
University Research Lab	4.5%	10.7%	0.0%
Another Business	27.3%	35.7%	75.0%
Other	45.5%	25.0%	25.0%

Table D7: Importance of Start-up Relationship Today			
	NL	NS	NB&PEI
Not As Important	46.2%	70.6%	100.0%
Just As Important	38.5%	29.4%	0.0%
More Important	15.4%	0.0%	0.0%

Stated Business Start-up as Other:

NL: Previous Government Employment, Field of Study/Interest (*),
Identified Opportunity (*), Industry Development, Marine Institute

NS: Identified Opportunity (*), Past Private Employment, Field of
Study/Interest

NB and PEI: Independent Invention, Identified Opportunity

(*): Multiple Responses

Appendix E
Estimated Provincial
Economic and Fiscal Impacts

Table E1: Ocean Technology: Direct and Indirect Economic Impact (\$)					
	Nfld. & Labrador	P.E.I.	Nova Scotia	New-Brunswick	Total
Direct GDP	72,614,787	2,115,783	69,380,434	8,672,824	152,783,828
Total GDP	96,217,993	3,014,523	90,774,234	14,295,911	204,302,661
Direct labour income	39,238,302	1,768,514	37,018,303	6,547,353	84,572,472
Total labour income	79,630,942	2,352,069	65,301,597	10,233,406	157,518,015
Direct employment	1,055	46	995	172	2,268
Total employment	1,888	65	1,603	283	3,839
Direct output	150,466,675	5,050,000	155,247,422	18,470,489	329,234,586
Total output	188,860,988	6,800,069	199,851,119	31,216,657	426,728,833
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.					

Table E2: Ocean Technology - Induced Economic Impact (\$)					
	Nfld. & Labrador	P.E.I.	Nova Scotia	New-Brunswick	Total
Direct GDP	0	0	0	0	0
Total GDP	34,432,444	1,475,769	33,876,240	6,765,704	76,550,157
Direct labour income	0	0	0	0	0
Total labour income	19,460,366	881,972	19,850,182	4,042,662	44,235,182
Direct employment	0	0	0	0	0
Total employment	672	31	622	134	1,459
Direct output	0	0	0	0	0
Total output	55,617,665	2,742,466	56,812,920	13,356,204	128,529,255
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.					

Table E3: Ocean Technology - Total Economic Impact (\$)					
	Nfld. & Labrador	P.E.I.	Nova Scotia	New-Brunswick	Total
Direct GDP	72,614,787	2,115,783	69,380,434	8,672,824	152,783,828
Total GDP	130,650,436	4,490,292	124,650,474	21,061,615	280,852,818
Direct labour income	39,238,302	1,768,514	37,018,303	6,547,353	84,572,472
Total labour income	99,091,308	3,234,041	85,151,780	14,276,068	201,753,197
Direct employment	1,055	46	995	172	2,268
Total employment	2,560	96	2,225	417	5,298
Direct output	150,466,675	5,050,000	155,247,422	18,470,489	329,234,586
Total output	244,478,653	9,542,535	256,664,039	44,572,861	555,258,088
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.					

Table E4: Indirect (supplier) Impact GDP at basic prices (\$) - Atl. Canada Top 5 Industries							
			Nfld. & Labrador	P.E.I.	Nova Scotia	New Brunswick	Total
Industries (Medium aggregation)							
42	5A0	Finance, Insurance, Real Estate and Rental and Leasing	3,662,622	143,906	4,250,806	718,769	8,776,103
43	541	Professional, Scientific and Technical Services	2,875,081	84,186	3,266,909	591,407	6,817,583
31	410	Wholesale Trade	1,573,385	97,245	2,674,797	552,251	4,897,677
36	48A	Other Transportation	2,387,913	11,214	978,027	210,686	3,587,840
40	513	Broadcasting and Telecommunications	1,521,212	47,818	1,003,074	221,826	2,793,930
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.							

Table E5: Indirect (supplier) Impact GDP at basic prices (\$) - Nfld & Labrador Top 5 Industries							
			Nfld. & Labrador	P.E.I.	Nova Scotia	New Brunswick	Total
Industries (Medium aggregation)							
42	5A0	Finance, Insurance, Real Estate and Rental and Leasing	3,662,622	143,906	4,250,806	718,769	8,776,103
43	541	Professional, Scientific and Technical Services	2,875,081	84,186	3,266,909	591,407	6,817,583
36	48A	Other Transportation	2,387,913	11,214	978,027	210,686	3,587,840
30	339	Miscellaneous Manufacturing	2,195,886	6,688	58,139	73,299	2,334,013
31	410	Wholesale Trade	1,573,385	97,245	2,674,797	552,251	4,897,677
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.							

Table E6: Indirect (supplier) Impact GDP at basic prices (\$) - P.E.I. Top 5 Industries							
			Nfld. & Labrador	P.E.I.	Nova Scotia	New Brunswick	Total
Industries (Medium aggregation)							
42	5A0	Finance, Insurance, Real Estate and Rental and Leasing	3,662,622	143,906	4,250,806	718,769	8,776,103
31	410	Wholesale Trade	1,573,385	97,245	2,674,797	552,251	4,897,677
32	4A0	Retail Trade	1,394,916	85,677	1,076,791	204,943	2,762,327
43	541	Professional, Scientific and Technical Services	2,875,081	84,186	3,266,909	591,407	6,817,583
40	513	Broadcasting and Telecommunications	1,521,212	47,818	1,003,074	221,826	2,793,930
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.							

Table E7: Indirect (supplier) Impact GDP at basic prices (\$) - Nova Scotia Top 5 Industries							
			Nfld. & Labrador	P.E.I.	Nova Scotia	New Brunswick	Total
Industries (Medium aggregation)							
42	5A0	Finance, Insurance, Real Estate and Rental and Leasing	3,662,622	143,906	4,250,806	718,769	8,776,103
43	541	Professional, Scientific and Technical Services	2,875,081	84,186	3,266,909	591,407	6,817,583
31	410	Wholesale Trade	1,573,385	97,245	2,674,797	552,251	4,897,677
32	4A0	Retail Trade	1,394,916	85,677	1,076,791	204,943	2,762,327
44	561	Administrative and Support Services	893,244	38,569	1,036,510	384,295	2,352,618
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.							

Table E8: Indirect (supplier) Impact GDP at basic prices (\$) - New Brunswick Top 5 Industries							
			Nfld. & Labrador	P.E.I.	Nova Scotia	New Brunswick	Total
Industries (Medium aggregation)							
42	5A0	Finance, Insurance, Real Estate and Rental and Leasing	3,662,622	143,906	4,250,806	718,769	8,776,103
43	541	Professional, Scientific and Technical Services	2,875,081	84,186	3,266,909	591,407	6,817,583
31	410	Wholesale Trade	1,573,385	97,245	2,674,797	552,251	4,897,677
44	561	Administrative and Support Services	893,244	38,569	1,036,510	384,295	2,352,618
33	484	Truck Transportation	390,982	13,272	402,019	291,764	1,098,037
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.							

Table E9: Total Fiscal Impact (\$)					
	Nfld. & Labrador	P.E.I.	Nova Scotia	New-Brunswick	Total
Total federal	14,375,231	575,053	13,109,554	2,275,967	30,335,805
Income Tax	8,738,078	393,835	8,243,701	1,458,047	18,833,661
Sales Tax	2,596,158	80,948	2,075,868	340,435	5,093,409
Other Indirect Taxes	1,368,067	34,972	1,033,675	172,481	2,609,195
Corporate Tax	1,672,927	65,298	1,756,310	305,005	3,799,540
Total provincial	12,929,627	519,590	10,888,848	1,839,315	26,177,379
Income Tax	5,925,232	267,057	5,589,998	988,692	12,770,978
Sales Tax	4,138,089	181,602	2,846,991	456,182	7,622,863
Other Indirect Taxes	2,198,720	44,874	1,750,998	272,728	4,267,319
Corporate Tax	667,587	26,057	700,861	121,713	1,516,219
Total municipal	476,156	15,981	491,285	58,450	1,041,872
Total	27,781,014	1,110,623	24,489,687	4,173,733	57,555,056
Source: Canmac Economics Limited, Statistics Canada Input - Output Division.					