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**IDENTIFICATION AND
PRELIMINARY ANALYSIS
OF THE FORCES AND PRESSURES
SHAPING THE CANADIAN ECONOMY**

**OVERVIEW DOCUMENT TO SUPPORT
INDUSTRIAL ANALYSIS RESEARCH**

FINAL REPORT

**Prepared by the
Industrial Analysis Centre
Industry Sector
With the Participation of
Derek Ireland
Chreod Ltd. Ottawa**

October, 2001

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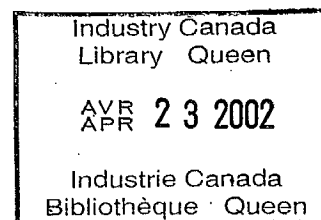
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Foreword

This final report is the result of a collective effort of the management and staff of the Industrial Analysis Centre (IAC), Industry Sector, Industry Canada, that took place over a three-month period from July to September 2001. The work on this report was facilitated by a consultant, Derek Ireland of Chreod Ltd. Ottawa and Shanghai, who held the pen and conducted most of the literature review. However, the ideas contained in the document are for the most part those of the management and staff of the Industrial Analysis Centre, as provided to the consultant in workshops, meetings, informal discussions, and e-mails.

The report was finalized after a final meeting with IAC staff that was held to receive their final comments on and contributions to this paper and to a slide deck that was prepared to assist in sharing the results of this work with a broader audience. The final version of this deck is provided as Appendix of this document.

Mr. Ireland would like to thank all members of IAC for their active participation in and support to the preparation of this document.

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1.0 Purpose and Context of this Overview Document

1.1. Study Purpose

The 2001-2002 Operational Plan of the Industrial Analysis Center (IAC) of the Industry Sector, Industry Canada, completed on June 13, 2001, sets out four core roles for IAC. The purpose of this overview document is to support the longer-term work program under Role 2 of the IAC Operational Plan. The purpose of Role 2 is:

To improve the Industry Sector's contribution to and awareness of industrial/sectoral analyses of the forces shaping the Canadian economy: industrial structure, organization and linkages; competitiveness etc., and to the sharing of this knowledge.

The Operational Plan also states (on page 7) that IAC's goals and planned deliverables in relation to Role 2 are modest for 2001-02, given that the Centre is not fully staffed. The major 2001-02 IAC priority under Role 2 is the current major work program with MEPA and other partners on North American Linkages.

The Centre decided that the first step in implementing the long-term work program under Role 2 would be to evaluate the forces and pressures that are influencing the Canadian economy over the longer term and to identify the implications for the industrial and sectoral analyses and related research designed to assist industry and government in responding effectively to these pressures. This overview document would then be used to help to guide the more detailed industrial research and analyses to be conducted under the longer-term work program for Role 2 in particular -- and more generally for the industrial analyses to be conducted and supported by IAC and the Industry Sector in the coming years.

1.2 Key Steps in Preparing this Document

These forces and pressures include strengths, weaknesses, opportunities and challenges, and thus the approach essentially involves at the outset a SWOT analysis. The major steps in this initial task under Role 2 included the following.

1. Conduct a quite detailed scan of the external environment to identify the key forces and pressures that over the longer term are shaping the Canadian economy, manufacturing sector, industrial structure and performance, and the strategies and performance of Canadian companies.
2. Assess in a preliminary manner the anticipated impacts on Canadian industries and companies.
3. Identify and assess in a preliminary manner the implications of these forces, pressures, and impacts for IAC and Industry Sector industrial analyses.

In order to complete this overview document, the extensive literature on this topic was reviewed in a summary manner, three workshops were held with IAC staff during July and August 2001, and informal meetings were held with selected partners and clients of

IAC and the Industry Sector. The results from these tasks are summarized in section 2 of this document.

1.3 Major Forces and Themes

The more specific pressures and impacts affecting the Canadian economy, manufacturing sector and producer services are analyzed in some detail in section 2 under four broad categories that attempt to capture the four most important all-encompassing forces – what some analysts have called “megatrends” -- that are driving Canadian economic and industrial performance. The four forces are:

1. **Globalization**¹ – of economies, markets (goods, services, financial/capital markets etc.), corporations, consumers – and the consequent imperative for most companies and industries, including nontradeable sectors such as government, to be globally competitive.
2. **Trade and Market Liberalization** – goods, services, technologies, investment and to a lesser degree human resources.
3. **Technological Change and the Information Revolution**, the emergence of new general purpose enabling technologies, falling transportation and telecommunications costs, new learning about management, organization and structures, and the growing importance of soft assets.
4. **Changing Role of Government** – diminishing in some areas and increasing others in response to environmental pressures and the public interest concerns raised by the new technologies, globalization and other forces.

Each of the more specific pressures, impacts and possible consequences of these forces are placed and numbered under one of these four headings. Each sub-section has at the end a listing of the three or four most important issues and implications from the perspective of the IAC work program. It must be recognized however that many of the more specific pressures are associated with more than one all-encompassing force or “megatrend”.

As a consequence, section 3 of this document attempts to integrate the analysis and findings from Section 2 around six key themes that were identified in the literature, workshops and meetings, and that could play an important role in future industrial

¹ Globalization is a concept that is often used but, from the author's experience, rarely defined. Globalization can be defined as the integration of national economies into a single international economy and market for a wide range of goods and services, technologies and investment capital. Globalization is now encompassing a number of countries such as China, India and Russia, that in the recent past were virtually isolated from the international economy, as well as a wide range of goods, services, technologies and investment instruments that in the recent past were traded only inside national borders. Globalization is associated with -- and in the view of some analysts caused by -- such developments as: falling tariff and non-tariff barriers to trade as well as investment and technology flows; improved communications; falling transportation costs; technological change; significant managerial/organizational learning; increasing homogeneity of consumer tastes; social learning on the limits of government; and growth in world income.

analysis conducted and sponsored by the Industrial Analysis Centre. Section 3 assesses the implications, impacts, and possible consequences of these forces and pressures for the following:

- a) Canada's ability to compete -- Changes in business organization and corporate behaviour and what these imply for industrial and market structure, industry performance and the competitiveness² of Canadian firms and industries in the face of globalizing world markets and other pressures described in Section 2.
- b) The more mature manufacturing industries – the so-called “non-high tech” sectors ranging from the automotive sector through metal fabricating and plastics to iron and steel, other metals, forest products and other resource industries.
- c) Emerging products and industries and the critical enabling technologies.
- d) Service industries – in particular producer/service industries, other innovative service industries and other services that compete in international markets.
- e) Commercialization of Canadian research and technology by Canadian companies – success stories, constraints, interactions with other policy agendas (e.g. climate change, biotechnology, other environmental and energy efficiency technologies and pressures) and changes in government policy and corporate strategy needed to fill the investment, innovation and commercialization gaps in Canada as identified in domestic and OECD studies.
- f) Supplier development in a North American and international market context, global out-sourcing and supply chains, the demands of first-tier companies for more complicated and technologically sophisticated parts and components, and the responses needed by Canadian manufacturers and producer service providers to respond to the supply requirements of global corporations and global supply chains.

² Competitiveness tends to be defined differently depending on the analyst and the context, and the reader will note that the definition tends to vary in this document as well depending on the context. Competitiveness in most cases in this paper is used in the context of the firm or less often the industry. In this context, competitiveness is defined as the ability of the firm or industry to increase revenues, market share, profitability and shareholder value. Competitiveness is also used in the context of industrial clusters where typically it is defined as the cluster's ability to attract new investment, technology and highly skilled people, to create new product and process innovations and to help member companies to increase revenues, profits, and shareholder value. Competitiveness as well can be defined in terms of competitiveness between regions within a country, in terms of e.g. the ability of one region to increase its share of national employment, GDP, exports, tax revenues and personal income.

For the country in total, competitiveness is typically defined in terms of export performance, productivity, innovation and the standard of living. Michael Porter uses a model of competitiveness which “posits that the standard of living of a nation depends on the productivity with which it uses its human capital and natural resources, manifested in the way in which its firms compete”. See: *Canadian Competitiveness: A Decade after the Crossroads*, Roger L. Martin and Michael E. Porter, 2001, page 1. In his studies, Mr. Porter stresses that national competitiveness is based on company competitiveness, and that the core issue is to learn why and how a country becomes the home base for successful international firms within an industry.

A final section will discuss in a preliminary manner some broader implications for the IAC and Industry Sector industrial and sectoral analyses under Role 2 and the IAC's longer-term work program.

2.0 Forces and Pressures Shaping the Canadian Economy

2.1 Globalization

This listing and preliminary analysis does not attempt to be a complete assessment of all forces and pressures important to Canadian regions, industries, companies, consumers and citizens. The following quite brief summary attempts to focus on those trends, impacts and consequences that appear to be most important to the preparation of the IAC and Industry Sector work program under Role 2. Under each sub-section, the specific pressure is described in summary terms, and then some aspects and impacts of the pressure/trend that could be important to future industrial analysis by IAC and others are outlined again in summary form.

2.1.1 Globalization and its links to Canadian productivity and innovation

The imperative to improve **Canadian productivity** and innovation performance in light of growing global competition, possibly slower growth in the US economy over the medium to longer term compared to the 1990s, and possible strengthening in the Canadian dollar (related in part to a less robust American economy).

Canada's productivity is below US productivity in most industries, there has been little convergence with US productivity levels since 1970 in most industrial sectors; and most of the improvement in Canadian competitiveness in the 1990s is the result of the devaluation of the Canadian dollar particularly in relation to the US dollar. Over the past decade, the lower Canadian dollar has allowed many Canadian companies and industries to be more competitive while at the same time the Canadian business sector and economy has on average become less productive. Competitiveness based on a low dollar can be fleeting particularly if it leads to wage and cost-push inflation as labour and suppliers try to make up lost ground.

Among many other issues, future analysis could address the reasons why many Canadian industries performed below their US counterparts in terms of productivity and innovation over the past 15 years, and could test scenarios of the future value of the Canadian dollar to illustrate how specific industries might respond to a higher dollar and other shocks to the external environment.

The role and impacts of Canadian dollar devaluation would be assessed as part of this analysis. While devaluation improved Canada's cost competitiveness, it also increased the costs of imported inputs. Perhaps more importantly in this context, devaluation has increased the cost of imported machinery and equipment (as well as perhaps the cost of

capital because of the foreign exchange risk³) and therefore perhaps is one reason for the relatively low level of business investment in Canada over the past decade. Since many new technologies are embodied in machinery and equipment, the consequence of lower investment is lower innovation and productivity growth.

Another issue important to corporate strategy and government policy would be to compare the productivity and innovation performance of foreign and domestically controlled firms in selected manufacturing industries, the total manufacturing sector and in producer services, in order to see whether and how the advantages in technology adoption and productivity enhancement apparently enjoyed by foreign firms could be brought to Canadian controlled companies through joint action of industry and government.

This information would as well allow us to test the hypothesis of whether integration into the global economy leads to higher productivity and innovation. The current evidence points in this direction. Past research by John Baldwin and others has indicated that foreign owned companies operating in Canada and larger Canadian companies with global operations perform more research and development than other Canadian owned companies. The critical variable appears therefore to be global orientation, alliances and other corporate linkages as well as company size and performance, rather than foreign ownership.

2.1.2 Vulnerability of Canadian Industry

Related to this is **the vulnerability of the Canadian manufacturing sector** and economy to the slowdown in the US economy, entry and growth of new competitors from Mexico and other countries, a stronger Canadian dollar (and perhaps a single North American currency in the future).

Vulnerability is associated with Canada's dependence on the US market and the relatively few industries and companies (outside the traditional resource sectors) that are internationally competitive – except for the cost competitiveness that results directly or indirectly from the low Canadian dollar. Moreover, even with the low Canadian dollar comparatively few Canadian companies, particularly very few small and medium sized enterprises (SMEs), participate in a major way in export trade.

One policy issue therefore would be to better understand why so few Canadian companies are major exporters, despite globalization, the low Canadian dollar, and the market access provided by the FTA, NAFTA and the Uruguay Round. Company strategy and government policy would benefit from expanded information that would allow Canadian companies, industries and their industry associations to benchmark their performance against those of other companies and industries in responding to globalization and capitalizing on the low Canadian dollar and our preferred access to the

³ The higher cost of capital in Canada compared to the US and other major trading partners particularly affects SMEs and has little impact on large Canadian companies with global operations and foreign owned operations, both of which have better access to international financial markets.

US market, and in identifying the reasons for our apparent difficulties in entering other markets and diversifying our export trade in terms of products and geographic markets.

Past work by the Industry Sector indicates that the investment and innovation strategies of many companies and industries in the past decade have emphasized cost reduction, often through cutting staff, over product and process innovation. Another factor is that many Canadian companies came out of the last recession in the early 1990s with very weak balance sheets. The need to rebuild financial strength could result in conservative, low-risk, low-investment approaches to research, technology, innovation, and product and market diversification. These may be two of the reasons for the limited improvement in Canada's trade and industrial structure during the 1990s.

2.1.3 The International Corporation and Global Strategic Alliances

The globalization of major corporations into **international (or stateless) corporations** and what this implies for Canadian suppliers to international corporations (given global sourcing by global corporations), and for the allocation of decision-making, R&D, other head-office type functions between Canadian subsidiaries and international parents.

Traditional Canadian subsidiaries behind high Canadian trade barriers are being replaced by regional operations in Canada that are one (typically small) part of integrated North American and international corporations. It is anticipated that the international corporation will have varying effects on Canadian industry and the corporate sector, depending on the industry and product line, company size, ownership structure, current export success and international competitiveness, and location within Canada. The implications would vary from opportunity to challenges and actual or perceived threats. These variances in implications and impacts will be true of many of the other forces and pressures discussed in this section.

One of the perceived threats from globalization and the emergence of the international corporation is the "hollowing-out" of corporate Canada. "Hollowing-out" is defined as the movement out of Canada of either corporate head office operations and management or, at least, the senior operating team (i.e. the major decision-makers) of a corporation or other organization. In a recent report, the Conference Board of Canada concluded that the hollowing-out of corporate Canada is not an immediate problem as currently the incidence of hollowing-out in Canada is low. However, the authors noted as well that there are reasons for concern over the longer-term, and that the potential consequences of hollowing out are too significant to ignore. These include the loss of high-paying, senior level jobs; reduced development opportunities for mid-level individuals in the corporation; job losses at the support level; the potential for reduced investment in Canada; and loss of prestige for Canada as a global player⁴.

Particularly affected, either positively or negatively, by the emergence of the international corporation could be Canadian companies that are traditional suppliers to

⁴ The Conference Board of Canada, "Restructuring in a Global Economy – Is Corporate Canada Being Hollowed Out", May 2001.

the larger international players. Canadian suppliers would benefit from information on how they have to adjust their product quality, technologies, marketing and other techniques to continue to supply to international corporations with global supply chains and thus continue to be competitive suppliers in the globalized world economy that is becoming dominated in many key markets by a relatively few international corporations.

A related trend is the growing potential for **strategic alliances**, partnerships, and other forms of collaboration between Canadian based and international companies. These can include mergers, acquisitions, and takeovers involving Canadian and foreign owned companies – both Canadian purchases of foreign companies (Canadian outward FDI) and purchases of Canadian companies by foreign owned companies (Canadian inward FDI) leading to changes in the ownership structure of Canadian-based companies.

2.1.4 Global Out-Sourcing

As companies return to their core businesses and the conglomerate form becomes less popular with investors, **companies are out-sourcing** rather than supplying intermediate inputs (including producer services) from within. Out-sourcing is now global and large “first-tier” companies are demanding more from their “second-tier” suppliers. More complex customer demands include integrated systems instead of parts; meeting ISO and other standards; application of more advanced technologies; and meeting environmental, consumer, human rights and other social obligations. Second-tier suppliers are placing similar pressures on third-tier suppliers and so on down the supply chain.

Companies, industry associations and governments need to apply a supply chain approach in assessing company and industry competitiveness, innovation and technology performance, and the implications for productivity and output growth. Since these supply chains are now global, the analysis would also assess the extent to which Canadian suppliers (including suppliers of producer services) are and must be globally competitive to remain within the supply chains of international corporations.

Corporate strategy would benefit from information on what suppliers must do to remain globally competitive in supplying to international corporations with operations in Canada and other countries. Greater understanding is also needed on the information, technical assistance and technology and other inputs that international corporations are providing, and can and should provide to their suppliers to assist the latter to meet the competitiveness needs of the international corporation and its customers. There is a concern that as out-sourcing goes global international companies – including those that are Canadian owned -- would provide less assistance to their Canadian suppliers because alternative suppliers in other countries are now readily available.

2.1.5 Current Structure of Canadian Industry

The company size structure of Canadian manufacturing and the Canadian business sector is characterized in many sectors by a **relatively few larger companies** (often subsidiaries of foreign companies), a **large number of small firms** most of which are family owned

and/or closely held, and comparatively **few medium sized companies**. It appears therefore that comparatively few Canadian companies successfully make the transition from small to medium scale. Canada thus appears very different from e.g. the German model where major portions of industrial production employment and export growth are generated by medium-sized companies.

Greater understanding is needed:

- of the impediments to the transition from small to medium scale faced by Canadian companies;
- of both the opportunities and dangers to significant and rapid company growth; and,
- of the roles of industry associations, financial institutions, governments, training and research institutes, industry clusters, and other groups and developments in helping to ease the transition to larger company size that is associated as well with stronger export, productivity and innovation performance by companies.

2.1.6 The Global Consumer

Increasing **similarity of global consumer tastes**, the result of improved and lower cost communication and transportation services, global markets and brands, and the globalization of the entertainment industry.

Consumer tastes are becoming similar not only across OECD countries with comparable standards of living but as well between OECD countries and emerging market economies with major differences in consumer purchasing power. The popularity of Macdonald's, Coca-Cola, Microsoft, Michael Jackson and Celine Dion in countries like China, India, Indonesia and Brazil are only the most obvious manifestations of a global phenomenon. A related trend is the emergence of better informed, more selective and **more demanding consumers** of Canadian manufactured products and services, encompassing industrial customers as well as final consumers in both domestic and foreign markets.

The more demanding consumer is associated in turn with the growing use of the Internet by industrial customers and the final consumer and the greater consumer choice and consumer sovereignty made possible by E-Commerce, lower trade barriers, and globalization more generally.

Some analysts are arguing that to some degree the homogeneity of consumer tastes may have reached its peak and that greater product diversification and differentiation to cater to the tastes of different countries, age groups and socioeconomic, cultural and income groups, will be the prevailing trend in the coming years. Evidence of the differentiation trend is found in the wide range of financial products now available to serve different age and income groups, and the many national and regional soft drinks and beers now on the market to compete with Coke and Budweiser.

The author's view is that both trends will be apparent in the coming years. Evidence of the strength of the similarity of tastes of the global consumer is readily apparent when one walks through a shopping centre or grocery store in China or Malaysia and sees

almost nothing but international brands and knock-offs of international brands. For the international traveler as well, once you enter the hotel or airline, you could be in any country, any international hotel, or any national airline.

For the global economy in general and in particular for the growing middle classes in the emerging market economies, it is not obvious which trend will prevail. Probably both will be important for the foreseeable future. This could mean for corporate strategy that the company would attempt to differentiate its product and market within the broad consumer standard and consumer requirements for price, quality and reliability established by international brands in the global marketplace. This means e.g. that a bottler can produce a soft drink that is different from Coke but it cannot be too different.

2.1.7 The Global Non-Government Organization (NGO)

In response to the emergence of the international consumer and environmentalist and of the stateless corporation and to globalization and international economic integration more generally, **international NGOs, ENGOs and civil societies** (e.g. Greenpeace) are emerging and are growing in visibility and in many cases in credibility and influence. These international NGOs have cross-country links, influence, organization and policy agendas; and facilitated by the international press, the Internet and other advances in telecommunications, these NGOs have already had a significant impact on the meeting and work agendas of international financial institutions, bilateral donors, the WTO and international corporations.

Industry associations are also expanding their cross-border links and effectiveness for the same reasons.

2.1.8 Similar Demographic Trends Across Many Countries

Demographic changes and aging of the population (and the consumer, corporate management, key government officials etc.) in Canada and virtually all of our major markets – the US, Europe and particularly Japan, as well as many developing countries starting with China.

Population aging affects product demands, consumer attitudes and tastes, human resource policies (e.g. the need to replace older workers which is particularly critical for the automotive and other well established industries), and corporate strategy and structure (e.g. transition and exit strategies for family owned and closely held companies where owners and key managers are becoming older and wish to retire comfortably). Globalization means that population aging is affecting all major trading countries and all companies.

There is evidence that demographic change and population aging are important factors in the poor performance of the Japanese economy over the past decade. Better understanding of the Japanese experience with and response to demographic change

could better prepare Canadian companies and governments for the demographic challenges and opportunities that we will be facing in the near future.

Demographic factors could be a common theme across much of the other industrial/sectoral analyses conducted and/or sponsored by the Industry Sector. The purpose should be to go beyond the population and economy-wide analyses of David Foot and others to explore the implications for different industries, companies of different sizes and ownership structures, and for different Canadian regions.

Industry would be assisted by better understanding of the impacts of demographic change, both positive and negative, on industry and company performance and on corporate strategy – including best practice examples of how e.g. Canadian companies capitalized on new market demands that emerged because of demographic change, and responded to the challenge of replacing aging workers, managers and owners. Government as well would benefit from a better understanding of the challenges for public policy that result either directly or indirectly from population aging e.g. the exit strategies of family owned and closely held companies often involve mergers with or takeovers by foreign companies.

2.1.9 Implications of Globalization for Canadian Corporate Strategy

Impacts of globalization, global out-sourcing, new materials, new suppliers, and more demanding customers on **corporate strategy, financial performance and the bottom line.**

These impacts vary greatly depending on the company and industry. For some companies such as Nortel, Bombardier, and some resource companies, globalization and more secure market access has meant expanded sales, the ability to upgrade technologies and products and establish global operations, and the capacity to capitalize on economies of scale and scope (the textbook results based on economic theory).

For many the result has been a price/cost squeeze leading to rationalization, cutbacks in employment and R&D spending, out-sourcing, other measures to cut costs and improve efficiency, and fighting to survive in an increasingly hostile marketplace – leaving little time and resources for product and process innovations, entering new markets and taking risks to add to long-term profits. For others that e.g. benefit from a low Canadian dollar, the companies are so busy meeting high customer demand that managers have no time or interest in adopting E-Commerce and other new technologies. In general, the literature has shown great differences in company strategy, performance, productivity, innovation etc. even across companies in the same industry and product line.

2.1.10 Key Issues and Implications of Globalization

- Globalization is having a substantial impact on most industries – including government and the non-profit sector – and nearly all companies including those that mainly sell in the domestic market. The ability to compete effectively with rivals in

other countries is critical to firms, government agencies and non-government organizations.

- As national and international economies become more integrated, the weakest competitive link in the supply and value chains of a company, industry or economy can have a disproportionate effect on company, industry and national performance and competitiveness. This is particularly true for a relatively small and very open economy like Canada, which is closely tied to the largest and most dynamic economy in the world, the United States.
- Corporate strategy and government policy would benefit from an improved understanding of how industry in general, as well different sectors, sizes of companies, companies with different ownership structures (e.g. foreign owned versus Canadian owned, widely held versus closely held), and industries and companies in different geographic locations are responding to the pressures of globalization, international market integration and liberalization, rapid technological change, and the need to be more productive and innovative.

2.2 Trade and Market Liberalization

2.2.1 Structure of Canada's Export Trade

As noted above, **Canada's growing dependence on the U.S. market** because of the FTA and NAFTA, the loss of European markets because of EU economic integration, and slow growth in the Japanese market for the last decade.

Growing dependence on the US market could increase our vulnerability and reduce our freedom of action to respond effectively to the negative aspects of the emerging economic policy agenda of the new US administration. In addition, Canadian exports continue to be dependent on a relatively few products – automotive, resource products, a relatively few high technology products such as telecommunications – and a comparatively few automotive, resource and telecommunications manufacturers account for a large portion of Canada's export trade, particularly to non-North American markets. With some important exceptions, Canadian manufacturers and exporters have in general displayed a limited capacity to move up the value chain and compete in more technology intensive goods and services.

2.2.2 North American Integration

North American economic integration and linkages, including the opportunities and challenges posed by Mexico's participation in NAFTA and its current economic reform program; these developments anticipate as well the opportunities and challenges to be posed by free trade and economic integration with the rest of the Americas under the FTAA initiative.

Growing competition from Mexico and other emerging market economies in more labour intensive, low to medium skill activities in automotive and other sectors, underlines the need for continuous upgrading of Canadian industry in terms of

innovation, technology, productivity, management and marketing techniques, and higher value products.

Related issues and developments encompass the **impacts of Mexico's free trade agreement with the European Union**, similar arrangements between the EU and Latin American countries, and preferred access that other emerging market economies have with the EU and Japanese markets through formal trade arrangements and corporate links. The Mexico-EU agreement could involve trade diversion from Canada to Mexico (as Canadian companies lose export markets in Europe or Mexico) but as well could provide Canadian companies with opportunities to invest in Mexico, assemble Canadian parts and components and apply Canadian technologies there, and enter the European market through the back-door provided by Mexico.

2.2.3 Future Role of Non-North American Markets

New markets e.g. re-emergence of Asia as an opportunity and challenge as Asian countries emerge from the financial crisis of four years ago, and the impacts for Canadian goods and services producers of WTO entry by China (now virtually guaranteed for early 2002).

It may also be timely to revisit the opportunities and challenges posed by continuing economic and political integration in Europe. High US growth, NAFTA, our preferred status in US and Mexican markets, the East Asian financial crisis, and the less pronounced devaluation of the Canadian dollar relative to other (non-US) currencies have meant that Canada's market position in many non-North American markets has fallen. As a result these markets have received relatively less attention from government and industry over the past half-decade.

China's entry into the WTO, ongoing economic reform in India, East Asia's slow recovery from the financial crisis of four years ago, expansion of the EU into central and eastern European countries, and possibly slower long-term growth in the American market will mean that non-North American markets and market trends could take on greater significance for Canadian manufacturers and exporters in the next decade. These markets could be important not only for Canada's traditional export sectors but also for emerging technologies, products and industries including biotechnology, information technologies, environmental technologies, equipment and services (including those linked to climate change), infrastructure facilities and services, and producer services.

2.2.4 Foreign Direct Investment

Growing concerns that Canada is losing ground to the US and Mexico as a preferred destination for the "right" kinds of inward **FDI** into North America. Since inward FDI is closely associated with technology and skill transfer and foreign-owned operations are typically more productive and innovative than Canadian owned firms, less FDI into Canada can have negative effects on innovation, productivity and our ability to compete in global markets.

At the same time, our ability to compete effectively in many geographic and product markets, particularly in emerging market economies, will depend in many cases on the ability of Canadian firms to establish significant operations in other countries, and their capacity to bring Canadian technology and management and marketing skills to their foreign operations. The growing linkages between foreign trade, investment and technology transfer require a different skill set than traditional export marketing, and may also require refinements in government policies and programs that in the past stressed inward FDI into Canada not the efforts of Canadian companies to invest overseas.

2.2.5 Trade Liberalization and Human Resources

Growing importance of **cross-border labour flows** especially for highly skilled workers and key personnel of international corporations.

Labour continues to face much higher mobility constraints across international borders than goods, services, technology and in particular capital/financial flows. This suggests that national and corporate competitiveness will be based increasingly on the ability to develop, attract and retain human resources. The ability to retain skilled human resources is crucial since as human resources become more skilled they also become more mobile.

As well, current regulations on cross-border labour migration e.g. the temporary non-resident visa under NAFTA, may involve procedures that are easier to satisfy by larger international corporations on both sides of the border than smaller Canadian companies exporting to the US and needing staff support at the point of sale in the American market. More generally, the work of Baldwin and others indicate that human resource strategies are closely linked to the innovation, Management and marketing strategies of corporation, and that human resource challenges and strategies can vary greatly depending on the industry, company size, ownership structure, and degree of international orientation.

More generally, while HRDC has the federal lead in human resource matters, the industrial analysis conducted and/or sponsored by IAC and the Industry Sector could add value to the policy debate through bringing the business perspective to the table. Emphasis could be placed on the human resource issues – skills shortages, training gaps, the skill sets important to innovation, cross-border human resource issues, access to higher education, links between the academic and business communities etc. – that are important to:

- different sizes of companies,
- different industries, industry groups, products and technologies,
- companies with various ownership structures and links to international corporations, and
- different geographic locations.

This industrial analysis could also be used to increase our understanding of the links at the firm and industry level between human resource strategy, innovation strategy, productivity performance and export success. It is proposed that human resource issues

be a horizontal theme to be included in a range of IAC conducted and sponsored studies that address related issues discussed in this document.

2.2.6 Internal Trade Barriers

Growing attention being given to **trade barriers inside borders** compared to barriers at the border (e.g. tariffs and import quotas) – leading to pressures to harmonize domestic laws and regulations in product/technical standards, corporate, consumer, competition, other framework laws, tax policy, and environmental laws and regulations.

In some cases, barriers inside the border are associated with private barriers to trade that typically involve anti-competitive and unfair trading practices among one or more companies that are allowed or at least ignored by the governments of our major trading partners or by provincial governments within Canada. Private trade barriers have received a great deal of attention by the competition authorities in the European Commission, as well as by US trade authorities in their negotiations with Japan. Private trade barriers that are arranged by private or state-owned companies and allowed by governments are also a concern in emerging market economies such as China and Russia.

Inter-provincial trade barriers – Globalization and trade liberalization also place pressures on countries, especially federated states, to remove within country (i.e. inter-provincial) barriers to flows of goods, services, technology, capital and particularly labour within the country.

Trade barriers inside the border including inter-provincial trade barriers need to be addressed in at least two contexts:

- the removal of barriers within Canada to meet our international trade obligations; develop a true Canadian “common market”, and improve Canadian competitiveness; and
- the impacts of these barriers in other countries on our export sales and ability to invest, establish and transfer technology to support our exports and broader business interests.

The removal of internal trade barriers could be particularly relevant to opportunities in: China (related to WTO entry and economic modernization); India, Brazil and other federated emerging market economies now undergoing economic reform and modernization. This is also an issue in the expansion of the EU into Central and Eastern Europe (involving countries that were once part of the Soviet Bloc).

The impacts of barriers within the border are generally less well understood by industry and government, compared to barriers at the border; and Canadian companies, especially smaller firms, could be easily discouraged from following through with a market entry strategy when these kinds of complex internal trade barriers are encountered. Companies would benefit therefore from e.g. company and industry case study examples of how the removal of trade barriers inside the border would help company and industry performance, as well as best practice examples of how companies and industry

associations are coping with and helping to reduce inter-provincial trade barriers and other internal barriers within Canada and other countries.

Government policy formulation would benefit as well from company and industry specific information on the impacts of internal trade barriers in other countries; this information would be particularly helpful in setting priorities for future trade negotiations. More company and industry specific information on domestic barriers (related e.g. to current national framework laws and inter-provincial trade barriers) would as well be helpful to future efforts to modernize Canadian framework laws as well as negotiations with provinces. This information would include specific industry and company examples of how inter-provincial barriers are hurting the competitiveness and profitability of Canadian companies and industries.

As noted above, a growing number of trade policy issues now address barriers inside the border. However, the events of September 11 have raised some important security, immigration and border efficiency issues at the border between Canada and the United States. These issues may also become important for other trading partners that share borders. There is no consensus on whether the lengthy delays and other problems now being encountered at the Canada-US border are temporary or permanent. If the problems continue for an extended period, it would be expected that border delays and related border difficulties would add to the costs of exporting, would discourage particularly smaller companies from pursuing export opportunities in US markets, and would place at risk the reputation of Canadian companies as reliable and timely suppliers within cross-border supply chains.

In short, if border delays and related problems become a permanent part of the Canada-US trading relationship, the implications for many of the issues and themes described in this paper with respect to e.g.

- supplier/customer relationships in a world of just-in-time production and delivery,
- services exports including the tourism and hospitality industries,
- inward FDI into Canada,
- Canada's ability to import highly skilled labour from other countries in order to fill skill gaps particularly in high technology sectors such as biotechnology and information technologies,
- the ability of Canadian SMEs and our more mature industries to respond to the challenges of globalization and rapid technological change, and
- the ability of many Canadian companies and industries to remain competitive in the critical US market,

would be quite profound.

The Coalition for Secure and Trade-Efficient Borders⁵ and its members including the Canadian Chamber of Commerce, have argued that the current situation provides an opportunity for Canada and the United States to re-evaluate their border relationships and to take action on the complex border issues that pre-date the events of September 11.

⁵ See for example: Statement of Principles – Coalition for Secure and Trade-Efficient Borders, Rethinking Our Borders, October 2001.

Cross-border issues could be addressed as one aspect of some of the industrial analyses conducted and/or sponsored by IAC and the Industry Sector in the coming months, with special attention to whether and how these impacts vary depending on the industry, sizes of company, company ownership structures (e.g. Canadian versus foreign owned), and the geographic location of the company and industry.

2.2.7 Key Issues and Implications of Trade and Market Liberalization

- While Canada's trade performance in terms of product upgrading and geographic diversification is seen as disappointing, there are as well many examples of companies that have succeeded in Mexico, in Asian markets despite the East Asian crisis, in the EU despite Canada's overall weak performance in that market, and in other developed and emerging market economies. Their experiences and key success factors need to be documented and shared with a broader audience.
- As trade policy shifts from barriers at the border to barriers inside the border, the actual experiences of Canadian companies with these barriers in different geographic and product markets need to be documented and used in developing corporate strategy and government policy. Particular attention could be given to barriers that prevent market entry by smaller Canadian companies. Smaller firms, as well as Canadian suppliers participating in cross-border supply chains, could also be particularly affected by the border delays and related problems post September 11, 2001.
- A number of these barriers inside the border are in Industry Canada's areas of responsibility and expertise – intellectual property, corporate, competition, bankruptcy and other framework laws, consumer and environmental regulations and standards, technical standards, policies that affect investment and establishment, barriers specific to service exports, and internal trade barriers similar to those addressed in the Canadian Internal Trade Agreement. These barriers inside the border could be particularly problematic for SMEs that do not have the time and resources to assess these barriers (that typically are far from transparent) and to negotiate their removal with foreign governments (and with provincial and municipal governments in the case of Canadian internal trade barriers).

2.3 Technological Change

2.3.1 Emerging Technologies

The impacts, opportunities and challenges of the **major new enabling technologies** – information technologies, e-commerce (and electronic marketplaces – sourcing and selling through the Internet), biotechnology, environmental technologies, the new energy technologies, clean car technologies – and more generally the technologies, new business practices and corporate strategies that constitute the Knowledge-Based Economy (KBE).

A key policy and research issue is to better understand how in the Canadian context technology is translated into commercial success in the full range of industries, sizes of companies, ownership structures, and industrial locations that comprise the Canadian

manufacturing and producer services sectors. This is a research gap because most of the studies on this topic are based on US, (and to lesser extents) Japanese and EU experience.

As one aspect of this broader question, it is necessary to:

- better understand the low technology adoption rates and long technology adoption lags (between identification and adoption) of the under-performing companies in the innovation and productivity indicators,
- better understand how the strong innovators are structuring their companies to respond to the technology challenge and effectively implement their innovation programs, and
- develop a stronger appreciation of why there is so much industry and company variability in technology and innovation performance – given the strong evidence that investments in technology and innovation make significant positive contributions to corporate performance in terms of sales, profits, employment and global market share.

2.3.2 National and Global Innovation Systems

National and company competitiveness is based to an important degree on the strength of **national innovation systems** and their links to global innovation systems, and on the ability to **commercialize research** and bring new product and process innovations to market quickly. Canada's record in this regard is generally seen to be modest, particularly with respect to Canadian owned companies (foreign companies based in Canada generally are stronger innovators), SMEs, companies in the so-called traditional or mature non-high-tech industries, and companies outside the Canadian industrial heartland.

Company and industry competitiveness as well is based to an important degree on the ability to identify, anticipate, nurture, and capitalize on the **newest technologies and industries** (e.g. phototonics and tele-health) and on new product and process innovations that are barely visible at the present time. Another important capacity is to identify when an older technology becomes commercially valuable because of changes in the market and/or policy environment (evidently the fuel cell technology was developed in 1886), and when a sector specific technology has applications in other sectors (and thus becomes more like a general purpose technology).

A related matter is **the evolving role of government in supporting the innovation system** – from the past emphasis on direct subsidies and state entitlements to industries, companies and “national champions” to greater emphasis at the present time on

- (i) funding higher education,
- (ii) supporting basic and high risk, generally pre-commercial, research;
- (iii) providing an economic, legal and regulatory environment that encourages innovative activity;
- (iv) government leadership in selected areas such as cluster development and acting as an intermediary or convenor within or across industries and interested stakeholders in encouraging pre-competitive stage technologies, information

- exchange and other instruments to enhance rates of technology development and adaptation; and
- (v) facilitating linkages, partnerships and alliances with other national innovation systems.

2.3.3 Technology, Market Structure and Competition

Because of globalization, technological change and the information revolution, the **barriers to entry** in many (but not all) industries are now much lower⁶, the **speed of technology and product development** and obsolescence has increased greatly, and the time from **innovation to commoditization** has become much shorter. All industries and products, not just raw materials and semi-processed good and services, can become commodities e.g. computer hardware and copiers are now seen as commodities. Once a technology and its applications achieve commodity status, the potential for additional profit from product differentiation decreases significantly and profits are largely determined by process technologies and the ability to produce at lower cost.

In addition, technologies are becoming more complex – many now involve more than one scientific discipline and two or more enabling technologies – and process technologies are becoming as important as product technologies. The speed of technological change and its implications for market structure and firm and industry competitiveness affects different industries and products in different ways. For some, these pressures provide opportunities for easy market entry and higher profits. For others, shorter technology and product life cycles and the short time to commoditization reduce the returns and increase the risks from R&D, innovation, and technology development and adoption.

These pressures may help to explain why industries and companies vary so much in terms of R&D intensity, technology development and adoption, and product and process innovation. Short technology and product life cycles and the short time to commoditization are also important factors in explaining why governments now place more emphasis on framework policies for supporting innovation and technology and less on picking winners and losers (where short technology and product life cycles greatly increase the risk of policy failure).

In general terms, Schumpeter's process of "**creative destruction**, to company, industrial and national economic performance is becoming more important and relevant to both company strategy and government policy. Governments and industry groups that attempt to slowdown or reverse this process of entry and exit (called "churning" in the literature) will likely experience lower innovation, productivity growth, export sales and profits. One reason why some industries and economies enjoy strong productivity and innovation is because the weak performers have been forced to exit, thus raising the average

⁶ The major exception to this more general trend is the pharmaceutical industry where these forces -- combined with the high cost of R&D and of receiving government approval of new pharmaceuticals and the extensive use of patent and other intellectual property laws -- are leading to much higher entry barriers and industry rationalization, large-scale mergers, and concentration towards a very few major international pharmaceutical companies.

performance of the industry as a whole and allowing the more innovative and productive firms to profit from their investments.

Canadian competition and corporate laws to encourage market entry and bankruptcy and other laws to facilitate market exit by Canadian companies compare favorably with those of our major competitors. Governments however have at times intervened to prevent these laws and market forces from allowing the process of creative destruction and churning to have their full beneficial effect on company, industry and overall economic performance.

As illustrated in the past year by the meltdown in ICT (information and communications technologies) share prices, markets and corporate revenues, industries and companies that are doing well now can have a sudden reversal in their economic fortunes. Companies and economies that depend on a relatively few fairly specialized "niche" markets are particularly vulnerable – as demonstrated by the current downturn in the Taiwan economy because of its strong dependence on semi-conductor and other ICT sales to the US market. Company strategies and government policies must have the flexibility and resiliency to absorb shocks in the external environment and have the capacity to stay ahead of the curve and thus anticipate new technologies, products, industries and competitors from the ranks of the emerging market economies.

As noted above, rapid technological change, rapidly changing markets and products, and the emergence of new competitors argue for government policies that provide broad support to company performance through competitive taxes, competitive framework policies and laws, trade policies and innovations policies, and financial and other assistance to pre-commercialization research and technology transfer to and assimilation by companies particularly SMEs. These same pressures argue against direct government intervention through subsidies, state protection and entitlements to industries and companies, picking winners and losers, and supporting national champions.

2.3.4 Technology and Canadian Industrial Structure

The current structure of the Canadian economy (and most other industrialized economies) is characterized by a **small high tech sector that develops new technologies**, a much larger sector that attempts to compete largely by absorbing technology produced by other sectors, and the remainder of the economy that does little of either. This situation is found in both manufacturing and services.

Many industries and companies can and should buy technology from other industries. At the same time, a minimum internal R&D capability is needed to realize first mover advantages from innovative new products, services and production processes, and to efficiently assimilate technology from external sources. A major issue in Canada and most other OECD countries is that the high technology sector that develops new technologies accounts for a small portion of GDP and thus cannot carry the whole economy on its small shoulders. Higher growth and productivity requires that a much wider range of industries (including more mature manufacturing and service industries)

that account for a much larger share of GDP act like "high technology" sectors in terms of technology development and assimilation.

One major policy issue is to better understand the minimum internal R&D capability (sometimes called company receptor capacity) needed to support technology development and adoption. These minimum thresholds would likely vary depending on the industry, size of company, company structure (e.g. a Canadian branch plant of an international corporation with strong internal capability compared to a wholly Canadian owned company), and industrial location (e.g. companies that are part of an industrial cluster compared to companies in more remote locations). The high innovation performers would likely include both companies with substantial receptor capacities as well as companies that have successfully leveraged their relatively small internal R&D capability to develop new technology, successfully adopt and adapt purchased technology, and improve company competitiveness and performance.

2.3.5 Technology and Developing Countries and Regions

Globalization, the information revolution, rapid technological change, lower transport and telecom costs, and cross-border technology transfers allow **emerging market economies and poorer regions in industrialized countries to compete successfully in high tech industries**, applications and products e.g. Bangalore India in computer software, Taiwan and South Korea in semi-conductors, and probably very soon China in computer and telecom hardware and software.

For similar reasons, less developed countries and regions can move ahead rapidly based on the market and technology access provided by E-Commerce, the Internet, and other technological developments. For example, China with poor traditional telephone infrastructure and service is moving rapidly into mobile telephone systems and thus leaping over 50 years of western technology. The rapid emergence of Ireland as a highly prosperous technologically advanced country in a period of less than two decades indicates the opportunities provided by globalization, technology and the information revolution to reduce regional disparities within countries and other integrated (common market) economies such as the EU. Mexico could readily experience a similar process of rapid growth, development and technological change because of North American integration.

Emerging market economies pose challenges and threats to Canadian industries and companies because of their ability to successfully adapt more advanced technologies and produce more advanced goods and services that are competitive on international markets.

At the same time, the experiences of Ireland and other rapidly advancing countries and regions can provide lessons and benchmarks for Canadian regions, companies and industries outside the Canadian industrial heartland on how to successfully adopt and assimilate more modern technologies in order to improve products and processes, reduce costs and be more competitive in national and international markets.

2.3.6 Industrial Clusters

Clustering, the importance of social capital/infrastructure and related to this the expanding role of urban centres/city regions to Canadian and other countries' economic performance, and the growing connections between city regions that transcend borders.

It is important to better understand the role and importance of clusters to company strategy and growth, technology development, transfer and assimilation, and to industry competitiveness – with emphasis on SMEs, startup companies, and locations outside the Canadian industrial heartland. Industrial clusters can be based not only on the new enabling technologies – biotechnology in Saskatoon, information technologies in Ottawa etc. – but as well on more mature technologies used e.g. by the automotive industry. Both can be important to company and industry performance and the achievement of public policy goals. The potential role and importance of clusters are addressed in section 3.0 and in other research being conducted by IAC⁷.

2.3.7 Technology, Entrepreneurship and Smaller Firms

Growing importance of **individual entrepreneurship, small firms, and high growth companies** in a wide range of sectors -- including technology start-ups, smaller suppliers that emerge when large corporations decide to outsource rather than supply from within, and smaller companies that are spin-offs of larger firms.

The fastest growing companies in an industry are often the smaller and nimbler companies that are more eager to expand and have the ability to respond quickly to changes in the external environment. US research on high-growth companies indicates that these high growth firms can be found in all manufacturing and service industries and are often parts of an industry cluster. The research also indicates that most sales and jobs growth is accounted for by a relatively small number of firms called in the literature gazelles. Technology and innovation are major factors in their success.

High growth companies are found not only in the so-called high growth, high technology sectors. High growth companies are found as well in the more mature generally slower growth sectors. In addition, US research indicates that high growth companies are found both in rapidly developing regional economies as well as in regions that are experiencing lower growth and typically are less highly developed technologically and are less prosperous.

2.3.8 New Advanced Materials and Recycling

Challenges and opportunities for traditional producers from the **emergence of new advanced materials** and greater use of recycled materials as substitutes for Canadian resource and other products e.g. newsprint from recycled waste paper (so-called urban trees) instead of timber.

⁷ See in particular: "Review of Knowledge Intensive Industrial Clusters in Canada: Scoping Study", prepared by Kenneth White and Peter Gunther of Acton White Associates, August 31, 2001.

These developments pose particularly difficult challenges for many of Canada's more mature manufacturing industries and for regions dependent on these mature industries. These challenges can lead to market losses when the use of recycled materials is embodied in environmental regulations, which then act directly or indirectly as internal trade barriers.

2.3.9 Industry and Company Flexibility

With lower transport and telecom costs and new skills in management and building strategic alliances, **many industries and corporations are becoming more flexible and footloose**, and can readily change the geographic location of their operations and reduce their costs through relocating their factories or through shutting down their domestic factories and out-sourcing from factories in a lower cost country.

Company reorganization and relocation to e.g. a lower-cost country (or a country that offers a stronger national innovation system) can particularly affect traditional suppliers to that company and the company's traditional customers. This and other pressures related to the international corporation, speed of technological change and of technology and product obsolescence, and the emergence of new advanced materials and of recycled materials mean that industrial and national competitive and comparative advantage can be very fleeting. Therefore, companies and economies must continually upgrade their products, processes and technologies and remain knowledgeable about technology, industrial and market trends.

2.3.10 Managerial Improvements

Advances in **managerial and organizational learning** on e.g.

- how to apply the new technologies and benefit from global sourcing,
- how to manage multinational enterprises where production, administration, sourcing, and research and development are conducted in different countries, and
- the limits to firm size generally and of the conglomerate form of corporation more specifically (as some larger companies return to their core businesses).

Managerial and organizational improvements and corporate behaviour and culture are critical to and interrelated with strong export, productivity and innovation performance. Strong productivity and innovation without strong management and organization is probably impossible, and weak management and corporate organization are probably the major reasons for the failure to capitalize on innovation opportunities. It is important therefore to understand how advances in managerial and organizational learning interact with and support technology development and innovation and other aspects of company strategy and performance – including differences in impacts between industries, sizes of company and company ownership structures⁸.

2.3.11 Technology and Producer Services

A major development that is linked to information technologies, lower telecom costs and the Internet, is the **growing importance of the service sector** and in particular business, information and other producer or “quaternary” services to the competitiveness of the goods producing sectors and as important sources of exports, foreign direct investment and technology flows in their own right.

Related trends include:

- the emergence of **KBE services**;
- **expanding global trade in services**;
- the links between producer services, FDI and MNEs;
- differences between service providers and manufacturers in terms of R&D (including R&D spillovers), innovation strategies and investments, technology development and assimilation, and human resource development; and
- the bundling of goods and services in different ways to meet the needs of different customers and markets – many products now include both a goods component and a service component such as financing, training, warranties and after-sale service and maintenance; the services component in many cases is now critical to the sale and is more important than the goods component, which like copiers, computer hardware and perhaps to a lesser degree motor vehicles, has become a commodity.

Many of the forces and pressures described above particularly affect the productivity, innovation and competitiveness of service industries. These include global out-sourcing,

⁸ The term company ownership structure can cover a host of variables, including whether the company is publicly traded, closely held and/or family owned, and whether the company is Canadian or foreign owned.

the constraints to technology assimilation (where for service firms purchase of the technology and related machinery and equipment may be only a small portion of total technology investment cost), managerial improvements, and other pressures and forces under globalization, trade liberalization and technology. These issues are further addressed in section three.

2.3.12 Canada's Technology and Innovation Performance

Canada's generally weak performance in most technology and innovation indicators that are critical to success in the KBE – research effort/intensity, product and process innovations, technology transfer, commercialization of Canadian research by Canadian companies, investment in machinery and equipment, patenting, and new business start-ups.

Canada is behind the US in most of these indicators (even though American research is now concluding that US performance on a number of these indicators is also sub-optimal). As well, Canada is now reportedly behind a number of smaller economies – Finland, Sweden, Australia, Israel, Ireland, the Netherlands, Hong Kong and Denmark. Business spending on R&D, innovation and technology is particularly low in Canada outside of Ontario and Quebec.

It is important to know the reasons for Canada's generally weak performance and as well to identify the Canadian success stories in various industries (including in low growth lower technology sectors as well as producer services) and the reasons for their companies' success. Information is also needed on performance in other countries, including the major players, the US, EU and Japan, as well as smaller countries that reportedly have experienced stronger performance on the key research, technology and innovation indicators over the past decade.

What is needed is a more realistic and complete understanding of the weaknesses in Canada's technology and innovation systems and performance, of the links between technology, innovation, productivity and overall performance at the company and industry level, of the impacts of other pressures and factors such as Canadian industrial structure, North American integration and Canadian dollar devaluation on Canada's innovation performance, and of how government, industry and the science and research communities can work together to assist companies in different industries, of different sizes, with different company structures (e.g. subsidiary versus Canadian owned company) and in different locations to improve their technology and innovation performance.

2.3.13 Key Issues and Implications of Technological Change

- It is essential to develop a deeper understanding of the Canadian gaps in R&D, innovation and the commercialization of research – and an understanding of why so few Canadian companies are major innovators -- from the perspective of the

- companies themselves and based on the actual and perceived opportunities, challenges and threats that Canadian companies have faced over the past decade.
- A more comprehensive analysis would go beyond the standard R&D and innovation indicators to address the impacts on company innovation strategies of globalization, Canadian dollar devaluation, the aging population and its impacts on closely held and family owned companies with older owners and managers, and many of the other issues addressed in the first three sections.
 - Most revenue and employment gains in national and regional economies are accounted for by a relatively few high growth, innovative companies. At the same time, relatively few Canadian companies successfully move from small to medium scale. Company strategy and government policy would benefit from greater information on the major factors underlying the success of high growth companies and companies that moved successfully from small to medium scale (in many cases these are likely the same companies) as well as on the experiences of smaller companies that attempted to expand but failed.
 - The importance of rapid technological change together with the emergence of the better informed and more demanding international consumers and of international environmental and consumer groups underline the need for potential consumer, social, ethical and environmental concerns to be identified and assessed very early in the development of a newly emerging general purpose technology.
 - As the biotechnology experience of the past half decade points out, company and government promoters of the technology cannot afford to wait until the technology is ready to enter the market – or is already being marketed as in the case of genetically modified foods. Early warning systems to identify and assess consumer, social, ethical and environmental concerns should be built into national and global innovation systems.

2.4 Changing Role of Government

2.4.1 Limits to Government Intervention

There is a growing literature and practical experience on the **limits of government intervention** and where government initiatives are most and least effective for improving economic and business performance and achieving other socioeconomic goals.

The literature and actual experience point towards: greater dependence on markets; regulatory reform and deregulation; privatization and commercialization of state enterprises; promoting competition in infrastructure and other markets that in the past were served by state owned and/or regulated monopolies; decreasing direct subsidies to industry (which are also now under international trade rules and disciplines); and greater use of framework policies and laws and voluntary actions by companies over direct intervention to protect the public interest.

The literature and direct experience also indicate the importance of strong legal and regulatory frameworks and supportive tax policies to promote business development and efficient markets, of strong macroeconomic stabilization policies (monetary policies,

inflation control, deficit and debt reduction, competitive tax rates), and of policies and programs to promote human capital development, R&D, innovation, and strong physical and social infrastructure. The overall result is less government involvement in some areas (e.g. ownership and operation of infrastructure and other assets); and hopefully regulating smarter and more cost effectively (including international approaches to harmonization and mutual recognition) although not necessarily regulating less. It is hoped that as a result government's limited financial, human and technical resources would be better allocated to those sectors and activities such as education, health, social welfare and protecting the public interest where based on past experience government intervention has been shown to be both more needed and more effective.

2.4.2 The Business Environment

There are growing pressures on governments to provide a **competitive business and investment environment** – in terms of spending wisely, regulating smarter, competitive tax policies, and competitive business framework laws and policies in the areas of competition, consumer protection, corporate law, bankruptcy law, and intellectual property rights.

2.4.3 Government and the Public Interest

At the same time, there are increasing pressures on governments (from consumers, environmentalists, civil societies, and the general public) to **protect the environment**, and the health, safety, and human rights of its citizens, **to meet international obligations** on climate change, biodiversity, the ozone layer and other environmental issues, and protect consumers and businesses from the negative consequences of the new technologies – E-commerce, the Internet, biotechnology and so on. These pressures are now international in their scope and implications, as was discussed earlier.

These same pressures are leading as well to **growing environmental and other pressures** on companies – from domestic regulations, international treaties, and increasingly customers and markets (e.g. lumber and food biotech in Europe). These add to the regulatory, information and paper burdens placed on Canadian based companies.

Some of the more specific environmental pressures on government and industry include **climate change**, regulating sulphur in gasoline, regulating toxic substances, other environmental laws, regulations and policies, and more generally the growing policy and market pressures to use energy and other raw material inputs more efficiently and effectively. These environmental pressures appear to be more important to some industries than to others. The industries most affected are reported to be motor vehicles, steel and non-ferrous metals, pulp and paper, petroleum refining, electricity and other energy sectors, chemicals and chemical products, and transportation services.

However, while the direct consequences of environmental pressures vary greatly across industries and regions, inter-industry linkages and international economic integration mean that all industries, markets, companies and customers are affected to some degree.

For example, global out-sourcing, company relocation and changes in corporate strategy because of climate change and other environmental concerns can have a significant impact on the traditional suppliers and customers of the affected companies and industries.

As national and international markets become dominated by a relatively few major global players (e.g. Microsoft in computer software and operating systems) the location and investment decisions by one company in response to globalization, climate change or other forces, can have a strong ripple effect on supply and value chains in regional, national and international economies.

It is important therefore to know what these new pressures for regulation and re-regulation mean for different industries and sizes of companies and how environmental pressures interact with the other forces and pressures discussed in this document. One hypothesis is that regulatory changes are designed to accommodate and/or address the problems (i.e. negative externalities) generated by larger companies and industries that are the major sources of pollution, consumer protection and human rights concerns, new technologies and other public policy concerns stressed by the environmental and consumer groups and other civil societies. Analysis should go beyond the direct affects on these companies to identifying the indirect effects on suppliers, customers and other firms.

Information is needed as well on the mitigation and adaptation strategies and technologies that offer the most commercial promise and at the same time address climate change and other environmental pressures; and on how companies use technology, innovation and management improvements as well as market signals to address environmental pressures and economize on the use of energy, and other raw materials and intermediate inputs. In a market economy that is integrated with the highly competitive international economy, market incentives and commercial practices need to play a strong role in achieving environmental objectives.

2.4.4 Changes in Government and Industry Roles and Government/Industry Cooperation

Traditional boundaries between the government and private sectors are becoming blurred as **corporate governance agendas are expanding** to include the preparation and implementation of voluntary codes of conduct, ethics and related social frameworks, alliances with consumer, environmental, human rights groups, and other NGOs, privately financed development aid initiatives in developing countries, and other measures to demonstrate corporate responsibility and contribute to the achievement of environmental, human rights, consumer protection, competition and other broader public policy goals.

In addition, changes are taking place in the **relationship between governments and industry** and in the expectations each party brings to their negotiations and partnerships. This reflects the globalization of markets, industries, corporations and their associations, and the changing role of government with its more limited capacity to provide protection

and greater corporate profit through tariffs, non-tariff barriers, subsidies, directed procurement and state entitlements.

2.4.5 Social and Economic Objectives and the Public Interest

Growing interest and concerns with the **interactions and tradeoffs between social and economic objectives** e.g. regional development versus economy-wide improvements to efficiency, innovation and resource allocation – and whether government policy should stress wealth generation or wealth distribution.

There is as well an increasing recognition of the importance of social organization, social cohesion, and social infrastructure to international competitiveness – associated with shared goals; efficient, honest and accountable government; well developed and open education systems; entrepreneurship; and a strong social identity defined by high levels of health and safety and a fair distribution of income. Social infrastructure is seen to be particularly important to innovation and successful industrial clusters.

2.4.6 Key Issues and Implications of the Changing Role of Government

- Government, industry and non-government groups will need to be innovative and proactive, and often will need to work in partnership, in order to effectively address environmental, consumer and human rights challenges, while at the same time improving Canadian productivity, innovation and overall economic performance.
- Voluntary codes of conduct and ethics and other frameworks adopted and implemented by industry, the preparation of environmental audits, as well as partnerships with consumer and environmental groups, are proving to be effective mechanisms for industry to achieve improved business performance, maintain and enhance market share in domestic and international markets, and as well to contribute to broader public policy goals. These mechanisms are likely to play major roles in many companies' corporate strategies in the coming years.
- More analysis and information are needed on the impacts of framework policies and laws and of environmental, consumer protection, and other regulations on different sizes and structures of companies, industries, and geographic locations within Canada. Particular attention could be given to regulatory impacts and burdens on smaller companies with less than 100 employees.

3.0 More Detailed Analysis of Six Key Themes

As discussed in section 1.3, the purpose of this chapter is to further assess the forces, pressures, impacts and their implications for corporate strategy and government policy in terms of six key horizontal themes that were identified during the course of this investigation and that could play important roles in future industrial analyses conducted and/or sponsored by the Industrial Analysis Centre and the Industry Sector. These six key themes are associated with pressures that cut across the four forces/megatrends used to organize the material in chapter 2.

These six themes are highly interrelated. In particular themes two through six on Canada's more mature manufacturing industries, emerging products and industries, services, the commercialization of Canadian research and technology, and supplier development and global out-sourcing, all feed into and help to determine the ability of Canadian firms and industry to compete in the new highly competitive international environment that is now emerging.

3.1 The Ability of Canadian Firms and Industries to Compete in the New International Environment

There is growing evidence and consensus that Canada's strong export performance over the last decade was based to an important degree on the devaluation of the Canadian dollar, Canada's preferred access to the US market, and the strong growth experienced by the American economy over the period up to 2000. The role of devaluation is especially evident. A devaluation of 20% is the equivalent of a similar rise in tariff rates and thus partially shielded Canadian businesses from the full effects of globalization and international market integration, the tariff cuts under the FTA, NAFTA and Uruguay Round, and the substantial reductions in government subsidies and state entitlements during the 1990s.

Devaluation as well may have shielded many Canadian exporters from the full effects of the changes now taking place in national and industrial markets and corporate structure – of which the emergence of international corporations, global out-sourcing and returning to core businesses by multi-nationals may be the most significant. It is difficult to predict whether the Canadian dollar will become stronger in the future – although many economists believe it is currently undervalued by ten to fifteen percent. However, the likelihood that Canadian companies will benefit from another 20% devaluation in the Canadian dollar (to about 50 cents) over the next decade appears limited. Simply stopping the decline in the Canadian dollar will mean a more competitive environment for Canadian business.

The standard response to these pressures by many Canadian manufacturers was to reduce production and overhead costs, not to upgrade processes and products and adopt more advanced technology. These cost reductions further improved Canada's cost competitiveness in the short to medium term, but their long-term effects on our ability to compete in international markets remains unclear. Finally, there is the danger that the improvements in our cost competitiveness provided by the devalued dollar will be eroded by wage and cost-push inflation in the future, as e.g. Canadian workers and suppliers attempt to recover the losses in real purchasing power and profitability that resulted from devaluation.

One consequence is that the convergence in productivity and innovation performance between Canada and the US that was expected to result from the FTA, NAFTA, and North American economic integration more generally, has not yet taken place. The pressures that globalization and market integration would be expected to place on Canadian firms to be more productive and innovative have been offset to some degree by

devaluation and the greater adoption of information and other advanced technologies by American firms. However, these opportunities for productivity improvement and technology advances are still available to Canadian companies, and could be capitalized on in the coming years given the necessary changes to the external environment, market incentives, and corporate strategy.

In sum, the current evidence suggests that the strong exports of the past decade should not be interpreted as representing a fundamental long-term improvement in Canadian competitiveness in international markets. The core issue therefore is how Canadian exporters will respond to e.g. slower growth in US markets and a potentially stronger Canadian dollar.

The hope is that over the past decade government and industry have laid the foundation that will allow exporters to respond appropriately and effectively to these and other changes and shocks to the external environment. Based on the analysis in section two, the literature review and consultations conducted for this document, and the work of Michael Porter and other industrial organization and corporate strategy experts, appropriate responses would require the development and implementation of long-term global strategies by companies to:

- (i) improve their capacity to identify and assimilate more advanced technologies, and the complementary management, HRD, organizational, marketing and finance improvements needed to support more aggressive innovation strategies⁹;
- (ii) enhance productivity, competitiveness, sales and market share largely through product and process upgrading rather than through cost reductions and a devalued dollar;
- (iii) establish global distribution systems and a global brand; and,
- (iv) differentiate company products from those of competitors in order to establish a sustainable competitive advantage.

Responses to specific pressures as suggested by the analysis in section 2.0 above could include the following:

- (i) Upgrading of products and processes, developing higher value added products and services, making greater investments in research and development, innovation, securing ISO and other international standard accreditation, conducting related machinery and equipment and human resource investments, and sharpening market promotion programs in response to the fiercer international competition that would result from a stronger dollar.

⁹ Recent research by John Baldwin and others have stressed that innovative firms, which typically are more successful than non-innovative firms, place greater emphasis on management, human resources, marketing, finance, production efficiencies, and effectively accessing government programs and services. Innovative firms therefore attempt to excel in several different but related areas of business performance. The same body of research has indicated that innovation is the single most important determinant of firm success across a wide range of industries – not just the high technology industries – and thus improving the performance of the more mature industries in transition requires an increase in the number of innovative companies within each of these industries. This issue is addressed in the next sub-section.

- (ii) Making the necessary investments in innovation, product development, marketing, new operations and partnership building in order to enter new export markets and reduce dependence on the US market – in response to slower US growth over the decade, stronger growth in other regional and country markets, and new opportunities emerging from recent and future trade negotiations.
- (iii) Building stronger links with key suppliers and customers – including less formal partnerships as well as more formal alliances, joint ventures, and other business arrangements – in order share and/or transfer technology, information, and other assets and thus better meet each others' needs and build the core competencies of suppliers and customers.
- (iv) Developing and beginning implementation of strategies for continuous improvement in products, processes, technology, human resources and other core capabilities – in order to stay ahead of Mexico and other emerging market economies, and respond quickly to technological changes and new technology opportunities.
- (v) Establishing stronger links with university and government labs (and related government agencies), science and research institutes, and national and international innovation systems, as part of the company's long-term commitment to innovation and productivity improvement.
- (vi) Developing and implementing innovative strategies with government and NGOs to meet environmental, consumer protection and other policy objectives in a way that also enhances company productivity, innovation and profitability.

These responses would benefit both company and national economic performance in closing the many gaps in innovation, productivity, commercialization of research, and export performance between Canada and our major trading partners as identified above and in other documents.

Many (but not enough) Canadian companies, both large and small, are already responding in this manner to the pressures of globalization, technological change, the international corporation, and changing industrial and market structures. There is also evidence of significant improvements in productivity, investment, technology adoption and other innovation indicators between 1998 and 2000. Therefore, the key challenge may be to expand the number of industries and companies, including companies in so-called mature, non high-tech industries, which are responding effectively to the challenges of globalization, international market integration and technological change.

More information and analysis is needed on the experiences of and benchmarks provided by these company success stories, on how Canadian companies can be expected to change their corporate strategies in response to changes in the external environment and external shocks, and on whether company responses will be consistent with the positive responses outlined above or will involve more negative consequences:

- slower growth in the company's Canadian operations,
- bankruptcy,
- shutting down plants and the entire Canadian operation,

- takeover by an international corporation which results in the loss of Canadian decision-making and jobs and in greater company investment and growth outside Canada, or
- relocation to a lower cost or otherwise more desirable location from the company's perspective.

The analysis could summarize the pressures affecting specific industries now at risk, the likely responses to these pressures, and the government policies, corporate strategies, and government-industry partnerships needed to maximize the potential for positive responses and outcomes.

3.2 Challenges Faced by Canada's More Mature Manufacturing Industries

Canadian industry includes not only the strong high technology performers such as computer hardware and software, telecommunications equipment, other electrical and electronic products, pharmaceuticals and scientific equipment and other industries where research intensity is high and innovation and continuous improvement to products and processes are essential to company and industry competitiveness. The industrial sector also includes the more mature industries that have been with us for a long time and will continue to be important to Canadian industrial and economic performance for the foreseeable future¹⁰.

This industry grouping covers a wide range of industries:

- from the automotive sector which is highly integrated with the global industry and economy,
- to clothing, textiles and footwear that are very labour intensive and are not major users of advanced technology,
- to forest products, minerals and other the resource sectors with their high capital intensity, mature technologies and strong dependence on international markets,
- to a number of industries such as printing and publishing and non-metallic mineral products that are strongly oriented towards local and regional markets within Canada and export relatively small portions of their output.

¹⁰ This sub-section is based to an important degree on the March 2000 Report of the Industry Sector, Manufacturing and Processing Technologies Branch: "Performance of Canada's Manufacturing Sector; Summary Report". By definition, the more mature industries exclude those industries and products that are termed high-technology in Canadian and OECD documents. The OECD definition of high-technology industries (called the sectoral approach) encompasses aircraft and parts, computers, office, store and business machinery, communications and pharmaceuticals. These high-technology industries when combined together account in Canada for about 10% of manufacturing employment, manufacturing GDP, and manufacturing value added, about 10% of total Canadian merchandise exports, and over 70% of total R&D expenditures in manufacturing. It is recognized that this sectoral approach to assessing high technology has its merits, but it must be recognized as well that every industry contains some "high technology" companies and product lines and that to be competitive all industries and companies need to become "high-tech". In addition, as noted below, it is possible that industries like industrial machinery that are "high-technology" under the OECD definition and in other countries are "medium-technology" within Canada in terms of productivity, innovation, and R&D intensity.

Some of the major characteristics of these industries, based on the past research of the Industry Sector, MEPA and other groups, are summarized in the following paragraphs.

In many of these more mature industries, **smaller firms** that are closely held and/or family owned account for significant portions of shipments. Demographic change and population aging are particularly important to these industries. Industry performance and even survival in some product lines in the future will depend on company success in attracting younger owners and managers. Companies and industries with below average productivity and profits and weak balance sheets, may encounter significant difficulties in attracting new owners and managers.

Many of these industries such as plastics, the rubber industry, fabricated metals and intermediate chemicals produce **intermediate goods**, sell most of their production to other industries and therefore significantly influence the competitiveness of their major customers.

Many of the more mature industries place in the lower rank of Canadian industries in terms of **productivity** levels, productivity growth and innovation. These industries, and most companies within these industries, are characterized by:

- high labour intensity,
- lower work force skills,
- smaller company size,
- weak technology adoption and receptor capacity,
- weak links with universities, research institutes and training institutes,
- limited involvement in the global economy,
- limited access to FDI and foreign technologies,
- below average investment in machinery and equipment,
- limited ability to control production and administrative costs as markets become more competitive, and below average shipments growth.

These poorly performing industries continue to account for significant portions of Canadian manufacturing and therefore depress the overall performance of the sector and Canadian economy.

Some of these industries, such as wood products, chemicals and textiles, experienced **large gains in shipments** and exports during the 1990s. However, these gains appear to be more related to the low value of the Canadian dollar and cost reduction during the recession, than in product and process improvements that would lead to lasting improvements in firm and industry competitiveness.

The overall perspective from the available data is that **productivity gaps** between industry groups are increasing. Therefore, many industries that now have below average levels of labour and total factor productivity are falling further behind other manufacturing industries, their US counterparts, and the total Canadian economy in terms of productivity performance.

This could be a particular concern for the future performance and competitiveness of food products, plastics, leather and allied products, wood products, furniture and fixtures, printing and publishing, fabricated metals and other manufacturing. Industrial machinery¹¹ and refined petroleum and coal products may also warrant special attention, particularly when their modest productivity levels and advances are compared with the dramatically better performance of the same industries in the United States.

Combined together, these ten industry groups, which could be considered to be "at risk" based on productivity and innovation performance, accounted in 1997 for nearly 40% of total manufacturing shipments, and for 957,000 jobs or 52% of total manufacturing employment of 1.84 million in the same year. These industry groups combined to account for close to 7% of total (manufacturing and non-manufacturing) employment in Canada in 1997.

Many of the companies in these "at risk" industry groups supply equipment, components and other production inputs to other manufacturers. Over time, weak productivity performance in supplier industries will dampen productivity, sales and profits in their customer industries. Many of these industries as well are concentrated in the slower growing regions of Canada, and therefore their comparatively sluggish performance impedes government efforts to reduce regional disparities in this country.

At the same time, there are likely high company performers within each of the "at risk" industries and some of the more mature industries have performed quite well in past years. For example, primary textiles and clothing experienced above average gains in productivity from 1983 to 1997, associated with measures to control costs (including decreases in employment) and major advances in export sales as a proportion of total shipments. These two sectors place near the bottom of the industry ranking in nearly all of the technology adoption indicators, and thus improvements in productivity and export sales appear to be based on other considerations not covered among the typical technologies used by manufacturing industries. Greater research on the high performing companies in low performing industries and on the mature industries that performed better than average in recent years would benefit both company strategy and government policy.

The challenge for Canada is that while the high technology industries such as electrical and electronic products and telecommunications equipment performed much better than other Canadian manufacturing industries in productivity, innovation, and investment, the Canadian performance in the high technology sectors was well below the US performance in the same sectors. The implication is that for Canada to perform as well as or better than the US in productivity and innovation, the more mature industries in Canada must make a stronger contribution to Canada's overall industrial and economic performance in the key indicators of investment, productivity and innovation.

¹¹ As noted in an earlier footnote, industrial machinery is typically considered to be a high technology industry but in Canada it appears to operate more as a medium technology performer.

More needs to be known about the major performance characteristics and challenges faced by these more mature industries, particularly those that are in the “at risk” category indicated in previous Industry Sector research. Some of the information and analysis that could be helpful would include the following:

- benchmarking the performances of foreign and domestically controlled firms in selected mature industries to identify why the former typically out perform domestically controlled companies;
- more detailed industry group studies to learn why many Canadian “mature” industries performed below their US counterparts;
- case studies of high company performers in low performing industries in order to identify experiences, lessons and achievements that could be applied more widely throughout the industry group;
- analysis of whether and how first tier companies (i.e. major customers) in supply chains are assisting their suppliers in more mature industries to upgrade their products, processes and management in order to continue to be a preferred supplier;
- research on the reasons for low technology adoption and lengthy technology adoption lags in industries that are under performing in innovation and productivity growth;
- the importance of human resources, management and organizational structure in determining the receptor capacity of SMEs in selected industries;
- impacts of population ageing on ownership and management in various mature industries in transition; and
- the possible conflicts between investment and innovation strategies and cost reduction strategies in selected industries and manufacturing more generally.

In some cases, the required research and study results may already be available in the literature and completed surveys; in others the research will require digging deeper into existing studies and databases. However, in some cases new surveys and research will likely be needed, to be conducted in partnership with relevant industry associations and other groups in and outside the federal government. These areas for further research should be the subject of consultations and networking with other interested parties in the coming months.

3.3 Emerging Products and Industries and Critical Enabling Technologies

These products and industries pose a different set of opportunities and challenges compared to the mature industries in transition discussed in the previous section but in some cases the issues are similar. Enhancing Canadian productivity, innovation and overall economic performance will require improved performance by the mature industries. Improved performance will require as well that Canada and its various regions and industries capturing a greater share of the global economic benefits from the current enabling technologies and from the new technologies, industries, products and innovations that are on the horizon.

As noted above, capturing more of the benefits from technological change will require improvements to Canada’s national innovation system and its links to global systems, building the innovation competencies and strategies of Canadian companies large and

small, and promoting changes to corporate culture and strategy to focus less on cost reduction from staff cutbacks and more on innovation and continual upgrading of products and processes.

The industrial analyses conducted and/or sponsored by IAC and the Industry Sector could make a significant contribution to our understanding of these technology trends and challenges through assessing their impacts and implications for different sizes and types of companies and industries, and for various industrial locations within Canada. Particular emphasis would be placed on digging deeper to learn what these technologies can mean on the shop floor and for the day-to-day operations of Canadian industry and companies large and small.

The technologies to be addressed would cover the full range of current and emerging enabling technologies: information technology, biotechnology and genomics, materials engineering, smart materials, nanomaterials, nanotechnology, integrated microsystems, and molecular manufacturing and nanorobots. In assessing these and other technologies, the work of IAC and others could assess in particular how technologies developed and applied in one industry (or set of industries) could be modified for adoption in a broader range of Canadian industrial sectors.

In assessing these impacts and implications, developing conclusions and policy recommendations, and sharing this information with a broader audience, IAC could draw on the extensive expertise and industry contracts of many parts of the Industry Portfolio, including the Industry Sector Branches, the Industry and Science Policy Sector, the Spectrum, Information Technologies and Telecommunications Sector, NRC, NSERC, SSHRC, the Canadian Biotechnology Secretariat, as well as outside partners such as other federal departments with strong science capabilities and/or interests (e.g. Health Canada, Agriculture Canada and Environment Canada) and the Conference Board of Canada. IAC may wish to explore the potential for some kind of informal mechanism with these groups to meet on a fairly regular basis, share information and insights on technology studies, discoveries and trends, and explore through discussion and study what these trends and opportunities mean for Canadian industry and the competitiveness of Canadian firms and regions.

Building on its current work (see footnote 12 below), IAC as well could give particular attention to the role of clusters in promoting Canadian innovation. There is growing evidence from the work of Porter, the OECD and others that cluster development could play a major role in enhancing Canadian innovation performance and the development and assimilation of critical enabling technologies¹². Governments working closely with industry, universities and the science and research communities, could be a major force in

¹² Our understanding of these issues from a Canadian perspective is being expanded by the completion of the following study conducted for the Industrial Analysis Centre: "Review of Knowledge Intensive Industrial Clusters in Canada: Scoping Study", prepared by Kenneth White and Peter Gunther of Acton White Associates, August 31, 2001. This sub-section briefly summarizes the major theses from this study and the work of Porter and the OECD. The interested reader should refer to these documents for further discussion of these complex issues. The White and Gunther paper provides a quite lengthy bibliography of academic research on clusters, as well as a review of the cluster-related initiatives of key organizations.

cluster development in Canada. This requires that governments develop a better understanding of the key factors in cluster development that require government investment, policy support and other forms of government engagement. These include:

- (i) the specialized factor requirements of clusters, specialized training and research institutions, and other specialized infrastructure;
- (ii) the role and importance of social capital and social infrastructure;
- (iii) the role of government (through investment attraction programs, science and technology policies, programs and targeted investments, tax policies, intellectual property and other framework laws, procurement policies and other instruments) in attracting key related and supporting industries to co-locate in a cluster;
- (iv) the high levels of externalities and spillovers associated with clusters, which individual firms will not invest in; (this is a classic example of market failure that requires government investment to complement and enhance private investment);
- (v) the global strengths, weaknesses and challenges faced by current Canadian clusters in biotechnology and information technology as well as more mature sectors such as automotive and the steel and chemical industries;
- (vi) the development of strong links between Canadian clusters and related clusters in other countries starting with the United States (in some cases Canadian and US clusters could be becoming a single cluster as the result of North American integration – certainly this appears to have taken place already for the automotive cluster as the result of the Automotive Pact of the mid-1960s);
- (vii) role of clusters in supporting the establishment and growth of not only companies in the so-called high technology sectors (as defined above) but as well companies in more mature manufacturing industries and in producer and other innovative service industries;
- (viii) the links between cluster development and current government initiatives in the areas of framework laws and policies (e.g. on competition and intellectual property rights), investment, science and technology, innovation, trade, and regional and industrial development; competition and other market framework laws should be designed and implemented to both promote rivalry among competing companies in a cluster and as well to facilitate mutually beneficial strategic alliances, technology partnerships, sharing and transfer, and other business collaborations that support company performance, cluster development and overall economic welfare; and,
- (ix) potential roles and contributions of existing government programs to Canadian cluster development, how these programs can be better coordinated and targeted to achieve maximum benefits for Canadian clusters; and the program gaps that need to be filled for governments to make their full contributions to cluster development; existing programs relevant to cluster development and success include: IRAP and other programs that support technology development, transfer and information dissemination; the Industry Portfolio's regional agencies, the Business Development Bank of Canada, Technology Partnerships Canada and other potential sources of risk capital; EDC, the Canadian Commercial Corporation, PEMD, Team Canada and other programs to support exports from the cluster; CIDA Inc. and other CIDA programs to help to develop links with

markets and related clusters in developing countries; and the current infrastructure investment programs between the federal and provincial governments.

Governments and industry must as well develop a better appreciation of the benefits to companies from locating within a cluster. These benefits can include better access to:

- pools of highly skilled labour that can be drawn upon as a company expands through e.g. winning a new contract over its competitors in the same cluster,
- new technologies, universities, research and training institutions, and financial and other support services, and other specialized factors of production important to innovative companies,
- information on science and technology developments, management improvements and methods to improve operational effectiveness, including learning from competitors, suppliers and customers that are co-located with the company in the same cluster,
- lower cost suppliers, preferred customers, physical and social infrastructure, and key government offices, programs, infrastructure facilities and other government services, and
- incubator sites, networks including national and international innovation systems; industry associations, chambers of commerce, community facilities and other forms of social capital and infrastructure that are important to both cluster and business success.

Improved access to these facilities and factors of production can in turn lead to lower cost production, upgrading of products and processes, and the development of distinctive and sustainable competitive advantage in global markets. Locating within a cluster can as well enhance the innovation capabilities of companies through co-locating with universities, research institutes and training institutions, learning from the high company performers producing the same or different products, and mutually beneficial collaborations with other companies as well as universities, government labs, research institutes, and other groups within the cluster.

Cluster development is of course only one of many instruments that can be employed by government working with industry in order to promote improved Canadian performance in innovation and in the development and assimilation of critical enabling technologies. However, clusters can provide a useful focus and organizing paradigm for integrating government policy and corporate strategy in a mutually beneficial manner. Cluster development is also recognized as an important regional development tool that, properly supported and developed, holds the potential to meet both regional and national economic goals.

It can be argued as well that government investments in cluster development are less likely to draw the attention of our major trading partners under international trade regimes. This is because the externalities, R&D, knowledge and other spillovers, and other market failures that require government investments in cluster development are well recognized in the literature as well as in the policies and programs of many of our trading partners.

A great deal of work has been done already on clusters in Canada; this work includes the various studies of Michael Porter and his colleagues, and the current consulting study of the Industry Sector on "Knowledge Intensive Industrial Clusters". The existing body of work should be used to develop an action plan for government policy and engagement and to conduct more detailed research and action plans on clusters in specific industries, technologies and locations -- starting perhaps with biotechnology to support related work under the Canadian Biotechnology Strategy, and the Pathways to Growth Strategy for Biotechnology and the Life Sciences.

3.4 Producer and Other Innovative and Exportable Services

The service sector, and in particular producer services, are making a growing contribution to output and employment in all OECD countries and many emerging market economies, and as well is becoming increasingly important to international trade¹³. Services account for over 65% of GDP and total employment in most OECD countries. The percentages for Canada are 67% for GDP and 74% of the work force. The most rapid growth has been in producer services, which encompass business services, communications, finance, insurance and real estate, and trade, transportation, logistics and storage.

The transition to a services based economy in OECD countries and more advanced emerging market economies parallels to a significant degree the transition to a more knowledge-based economy. The major sources of service sector growth include:

- the emergence of new technologies particularly information and communications technologies,
- out-sourcing of services by the business sector and government,
- increasing business demand,
- trade liberalization where services are now addressed at the WTO and in many regional trade agreements, and
- higher prosperity, the aging of the population and related changes in lifestyle, which are resulting in strong growth in tourism, the restaurant sector, and many other personal services.

The distinctions between goods and services are now becoming blurred as successful companies bundle together goods and services into a single product in order to increase market share and meet customer needs. In many sales, markets and companies, the service component is more important than the goods component to the actual sale. This is found in a wide range of industries such as the computer industry, copiers, as well as aircraft and motor vehicles where financial services, warranties, after-sales service and in some cases training are critical to company success and sustainable competitive advantage.

¹³ The first paragraphs in this sub-section are largely derived from two existing documents: "The Role of Services in the Knowledge-Based Economy: A Conceptual Framework", prepared by Dennis DeMello (Industry Canada, October 2000); and " 'Canada a Smart Country' The Role of Services", Presentation to DMDB, February 12, 2001.

A number of the forces and pressures outlined in section 2 are particularly important to the Canadian service sector. These are summarized under several headings below.

Competitive Strategy

- The size, quality and depth of the Canadian service sector, particularly producer and other innovative and exportable services, will be increasingly important to Canadian productivity, innovation, our ability to compete in international markets and our efforts to diversify our export sales in terms of both products and geographic markets. Therefore, the responses to globalization discussed in this document are equally important to suppliers of producers' services as to manufacturers.
- DeMelto and others have pointed out that, while there are large variances between industries, the productivity performance of the services sector in Canada has generally been weaker than in manufacturing. The major investments made in information, internet-based and related technologies have not yet been captured in major productivity advances by producer services and other service firms. One consideration is that the receptor capacity, innovation strategies and ability to assimilate and make effective use of new technologies, could be limited in many service firms particularly smaller companies.
- Analysis of innovation strategies and the commercialization of research should give major attention to the challenges faced by producer service firms in benefiting from technological change and new product and process innovations, and to the strategies adopted by more successful service firms and industries to use technology to improve profits and shareholder value. There is the danger that innovative service firms and industries are enhancing the productivity of manufacturers and other service firms but capturing little of the benefit for themselves and their shareholders.
- Barriers to entry into service markets are often lower than the barriers faced by manufacturers, the copyrights, proprietary information, and other intellectual property and soft assets of service firms can be easily copied by competitors (either legally or illegally), and like manufactured goods new services can readily become commodities and then obsolete very quickly because of rapid technological change.
- Service firms can be more flexible and footloose than manufacturers, and as the experience of Bangalore India underlines, emerging market economies can quickly become major players in global markets for services. Continuous upgrading of products, processes, skills, marketing programs and other core competencies, as part of a long-term strategy for sustainable competitive advantage, is probably more important for many service providers and services exporters than for typical manufacturers.

Service Exports

- In some cases e.g. for major international infrastructure projects financed by the World Bank, the Asian Development Bank, other international financial institutions as well as commercial banks, exports of machinery, equipment and other goods will follow the export of services. Therefore Canada's ability to secure major contracts for machinery, equipment and other goods will depend on the quality of the Canadian services provided in engineering, architecture, management consulting, project planning, project design, financing, construction contracting, procurement, transport,

logistics, and other service fields. The provision of services is the forerunner for major equipment sales in other industries as well, such as the aircraft and the computer industries.

Services, Investment and the Global Corporation

- Exports of service providers are closely linked to broader developments in foreign direct investment, the emergence of international (or stateless) corporations, and the restructuring now taking place in major international firms. The following explores some of these inter-relationships in greater depth.
- Global out-sourcing provides both challenges and opportunities for Canadian providers of financial, engineering, architectural, accounting, management consulting, planning, transportation, computer, IT and other producer services to businesses. Canadian service providers that in the past provided their services to domestic firms behind high non-tariff barriers are now very much a part of the global marketplace.
- This means competition from foreign service providers in the domestic market as well as exciting opportunities for Canadian service firms in export markets. The factors that influence Canada's ability to compete as set out in section 3.1, are as important to many service industries as for manufacturers.

Trade Barriers

- Producer services are particularly affected by trade barriers inside the border and by inter-provincial/inter-state trade barriers in federated nation states. Barriers within Canada as well as within other countries negatively affect the performance of Canadian based producer service firms. Trade barriers inside the borders of large emerging market economies can be expected to be particularly important to Canadian providers of producer services in the future.
- The right to establish in export markets under the same terms and conditions as enjoyed by domestic firms is critical to the success of Canadian service exporters wanting to enter export markets in a major way. In this regard, the quality and enforcement of framework laws in the host country – particularly intellectual property, corporate and competition laws – will be important to Canadian service exporters. Exporting, investment and technology transfer are particularly closely inter-related for service exporters, and government programs to support service exporters must take account of these critical inter-relationships.

Technology and Clusters

- As noted above, a company's ability to develop and assimilate information technologies and other more advanced technologies now plays a major role in the competitive position of producer service firms.
- Company capacity to benefit from technology could be enhanced if it is located within a cluster. Successful clusters are likely to include producer and other service providers that both support the manufacturers and research facilities in the cluster and are important drivers of the cluster in their own right.

Public Policy Issues

- Service industries are less affected by climate change and the other environmental, consumer and human rights pressures described above. Furthermore, in some cases these environmental and other pressures, through altering the relative prices and competitiveness of services versus goods in favour of service activities, will further accelerate the transition of OECD and other countries towards service-based economies.
- Having said that, E-commerce and buying and selling on the Internet are raising major issues with respect to consumer protection, and information technologies linked to biotechnology are raising privacy, ethics, human rights and consumer protection issues. More generally, developers of new services and technologies to support service development will need to anticipate potential public policy issues that could hinder future development and adoption of the technology and resulting service provision.
- More needs to be known about the importance and impacts of current tax policies, competition, intellectual property and other market framework policies and laws, current trade and investment policies and related negotiating positions at various international trade fora, and of other government policy instruments and programs, on the creation and growth of producer service and other innovative service firms.
- Major issues for innovative service companies include the treatment of goodwill and other intangible assets under current tax law, whether the current R&D tax credits are properly designed to fully meet the needs of innovative service providers particularly smaller companies, and the extent to which PEMD, EDC, CIDA, the Business Development Bank of Canada, Industrial Research Assistance Program (IRAP), the regional agencies of the Industry Portfolio, TPC, IPC, and other trade, investment and innovation programs of government – which in many cases were originally designed to serve manufacturers – fully meet the needs of innovative service firms. The current anecdotal evidence is that improvements have taken place in recent years but more needs to be known and done regarding government support to service sector expansion and related innovation and exporting by service firms.
- Many of these agencies and programs are under the Industry Portfolio and thus a Portfolio approach to service sector development and other potential priorities identified in this document may be warranted. (About two years ago, an Industry Portfolio approach was applied by Portfolio partners to explore the business and industry challenges and possible responses posed by climate change.)

More information is needed on the importance to producer services and other service firms of the forces and pressures discussed in this document. Therefore, in addition to separate work on services now being undertaken by IAC, the Industry Sector, Industry Canada, and other members of the Industry Portfolio¹⁴, producer and other KBE¹⁵ services should play a major role in horizontal analyses of technology, company strategy,

¹⁴ This work is being led by the Industry Services Branch and is proposed to cover North American linkages, taxation, skills, innovation and management practices, outsourcing, spillover effects, and measurement from a service sector perspective.

¹⁵ KBE is the acronym for "Knowledge-Based Economy".

industry performance, and industrial cluster development. As well, the Industry Sector and IAC should continue to support broader Industry Portfolio initiatives to improve the statistical, analytical and other information bases on producer, KBE and export services.

Improved data, information and research findings on producer and other exportable services, including comparisons across different producer service industries and between producer services and manufacturing, and benchmarking Canadian producer service industries with their counterparts in the United States would be helpful to service firms, their associations and to manufacturing firms that are selling to, buying from, and/or establishing joint ventures and alliances with service providers.

These data and research findings, which would address the full range of forces and pressures described above including R&D, innovation, productivity, out-sourcing, positions in supply chains, other performance indicators, and corporate strategy, would also be of interest to many manufacturers that also sell services either separately or bundled with manufactured goods.

Improved information will also be important to the formulation of government policies, programs and services tailored to the special needs of service providers. Because of data constraints and limited research in the past, producer and other exportable services have received comparatively less attention by governments in policy formulation and program development. This is starting to change.

Research that captures how producer service firms compete in the marketplace, the differences across various service industries, and the differences between producer services and manufacturing in a wide range of performance indicators, will further help governments to better tailor policies and programs to the specific needs and characteristics of producer and other exportable and innovative services, which as noted above will continue to be major growth sectors in the Canadian economy in the future.

For these and other reason presented in other IAC and Industry Sector documentation, producer and other innovative services will likely continue to be a priority of IAC and the Industry Sector for an extended period.

3.5 Commercialization of Canadian Research and Technology

The gaps in Canadian performance in terms of innovation and the commercialization of research are well documented. The literature and consultations suggest a number of possible reasons or hypotheses to be tested in company case studies and other micro-economic research. A partial listing, divided between external pressures and pressures internal to the firm, might include the following:

External Pressures

- With a devalued Canadian dollar plus cost reduction measures during the early 1990s recession, investments in innovation and technology were not needed to increase sales, market share and profits.

- The balance sheets of many Canadian companies were weak as Canada came out of the recession, and the first priority of companies during the most of the 1990s was to rebuild their financial positions. The company's own financial resources for investment in product and process innovations were limited, and such investments by financially weakened companies were viewed as high risk by venture capitalists, banks and other financial institutions.
- Consistent with this view, Baldwin and other researchers have noted that because of the pressures of the recession, the adoption of advanced technologies was quite limited in the first half of the 1990s, but improved significantly in the second half of the decade in response to higher economic growth, stronger markets, and stronger company balance sheets.
- The devalued dollar raised the prices of imported machinery and equipment compared to Canadian supplied labour and other inputs. Since technology is often embedded in machinery and equipment, lower investment rates by the business sector may have further reduced innovation and the commercialization of Canadian research and technology.
- While Canada's R&D tax credits are among the most generous in the world, the commercialization of Canadian research and technology by specific companies and industries may be impeded by Canadian tax policies, government regulations and standards (based on a recent study by John Baldwin¹⁶).

Pressures Internal to the Firm

- Demographics may be a factor for some companies. Closely held and family owned companies where the owners and key managers are nearing retirement may be more interested in protecting their financial positions than in making risky investments in new untried technologies.
- More generally, concerns are expressed that shareholders, investors, managers and banks in Canada have short time horizons and prefer investments that are low risk and provide high returns in a short period. Investments in new technology rarely meet the investment criteria of companies, investors and banks with "impatient capital".
- There may be limited receptor capacity especially in SMEs to adopt and modify technology to meet company requirements. This would typically be related poor organization and weak corporate commitment to innovation.
- The lack of appropriate and affordable technologies that meet the specific needs of Canadian industry and companies may be a consideration particularly for smaller companies. It is possible that technologies available in the US, EU and/or Japan do not fully meet Canadian requirements. If major investments are needed to modify these technologies for Canadian conditions, these investments may be viewed as high risk; adapting technologies can be high risk particularly for small firms that are early-adopters.
- Companies may have limited information, knowledge and understanding of available technologies, their characteristics and their potential impacts on and benefits to company performance. As well, the information provided by vendors and other

¹⁶ "Impediments to Advanced Technology Adoption for Canadian Manufacturers", by John R. Baldwin and Zheng Xi Kin, Statistics Canada Research Paper #173, August 2001.

outside parties may be inadequate or not properly tailored to meet specific company and industry information needs.

- More specifically, technologies that are strongly linked to one or a few sectors may not be well known to other industry sectors. Government, industry and the science and research communities need to work together to enhance the portability of technologies across sectors of the economy.
- As technologies become increasingly complex and science-based, information and understanding can become particularly important impediments for smaller firms that are not connected through ownership, joint ventures, alliances or partnerships with larger international companies – or that are not located within an industrial cluster with a strong R&D and science community to support them.
- Technologies that are untried can be particularly problematic – there are costs and risks to companies from being the early adopter of a new technology that is untried in a Canadian context.
- There is an adoption lag between the time that a new technology is first identified by a company and when it is actually adopted. This lag varies between industries and appears longer in Canada than in the United States. Work of John Baldwin and others suggests that this adoption lag depends on company perceptions of the benefits and costs of the technology, the company's overall technology competency and receptor capacity, geographical access to suppliers, and company size.
- A major constraint can be the high costs of new technologies and related machinery, equipment, software development, staff training in the new technology, and maintenance after the technology investment has been made. The consequence can be low returns on investment that are below the investment hurdle rates of many firms and industries.
- Human resource factors can also play a role. Skilled labour critical to technology adoption and assimilation may be in short supply. Training can be costly and problematic, and existing labour contracts, worker and management attitudes and organizational structures may also be impediments.

More information is needed on: (i) the key factors that are affecting Canadian business performance in innovation and the commercialization of research, (ii) the extent to which changes in the external environment will influence these factors, (iii) how the impacts of these factors vary by industry, size and ownership of company, geographic location, and whether the company is located in an industrial cluster (iv) how the successful innovators in Canada have effectively addressed these and other issues, and (v) the changes in corporate strategy and government policies and programs that need to be explored to improve Canadian performance in innovation and the commercialization of research.

3.6 Supplier Development and Global Out-Sourcing

The international or stateless corporation, trade liberalization, lower transport and telecommunications costs -- together with corporate rationalization in order to return to their core businesses – have combined together to produce global out-sourcing and supply chains of major companies that span the international economy. Loyalties to

traditional suppliers in home markets are being replaced by sourcing from any part of the world economy in order to reduce costs, improve quality and meet customer needs.

Global sourcing and international supply chains affect not only high tech suppliers but as well most of the more mature industries and producer service firms described earlier. These industries and companies must be globally competitive and be able to respond to the increasingly complex demands of their customers in terms of technology, service, and just-in-time delivery, in order to maintain customers and sell to new customers at home and in foreign markets.

It is arguable whether Canadian suppliers to other industries have yet experienced the full force of global out-sourcing and international supply chains. Many Canadian suppliers in the mature industries, higher technology sectors, as well as producer services have been protected to date by high growth in the US market, Canada's preferred access to that market under NAFTA, the low Canadian dollar, and the remaining often informal trade barriers and state entitlements provided by governments (many of which will likely be disappearing in the future).

To the extent that the future external environment is likely to be quite different than in the past ten years, many Canadian industries and companies that supply to other business, could face the full effects of these pressures and trends in the not-too-distant future. How companies respond to those pressures could decide the fate of some product lines in this country, and will play an important role in the country's future industrial and economic performance. Some of the appropriate responses for supplier firms competing for business in international supply chains are described in section 3.1.

As noted in sub-section 2.1.4, companies and governments need to apply a supply chain approach in assessing company and industry competitiveness, innovation and technology performance, and their implications for productivity and output growth¹⁷. This requires that supply chains in all of their complexity must be carefully defined, and need to take account of those components of the supply chain that are located outside the home country. The supply chains of most major Canadian companies and industries have large foreign components, but this is also becoming increasingly true for major American industries as well such as automotive and computers.

The implication is therefore that, as vertical integration becomes less popular as a corporate model, the competitiveness of many North American firms is now dependent on the technological advances and quality of goods and services produced by offshore companies including companies in emerging market economies. The methods used by the first-tier (buyer) companies to transfer technology and other information on their requirements to foreign suppliers would provide useful insights on the improvements that Canadian suppliers need to make to maintain their positions in international supply chains.

¹⁷ This section is based in part on: "R&D Trends in the U.S. Economy: Strategies and Policy Implications", by Gregory Tasse, Senior Economist, National Institute of Standards and Technology, U.S. Department of Commerce, April 1999.

This information may also be helpful to major Canadian companies that are first-tier companies within their international supply chain. The supplier development programs of government must also adopt a global focus to develop sustainable competitive advantage among Canadian suppliers to the major international players.

Recent studies of specific industries and markets could provide some useful insights important to other industries, markets and situations. In particular, the Charles River study, which compares Canada and Mexico in terms of automotive investment, provides findings and insights of more general application to other industries and to the competitive challenges from other emerging market economies.

For example, compared to emerging market economies, Canada has a clear advantage as a supplier of parts, components and services that are less labour intensive and that require more capital, skilled labour and technology. Suppliers producing goods and services for first-tier companies that continue to apply more traditional technologies and require substantial labour will likely need to upgrade their products, processes and technologies to continue to supply to their traditional customers.

The Charles River consultants reported that Canadian suppliers are positioned in the mid-range between developing countries and the US in terms of capital and technology intensity but that the successful ones are closer to the US performance in these indicators. Canada is also more competitive than Mexican suppliers in parts and components that build on traditional Canadian strengths in e.g. plastics, specific natural resources, or the quality of Canadian transportation and other infrastructure facilities.

4.0 Concluding Comments

Based on the IAC workshops and final meeting on this document, other consultations and the literature review, the following preliminary conclusions are offered for the consideration of IAC management and staff.

4.1 Possible Focus of IAC Industrial Analysis

Research conducted and/or sponsored by IAC and the Industry Sector under Role 2 and the IAC work program more generally would cover all sectors, sizes and locations. At the same time, the research would be designed to ensure that issues important to the following industries and enterprise groups are addressed: more mature industries in transition; manufacturers that supply to other industries; producer and other exportable and innovative services that face import competition and can sell to other markets; SMEs particularly those with strong innovation and growth potential; and companies outside the Canadian industrial heartland from Montreal to Windsor.

IAC and the Industry Sector have a strong contribution to make in the areas of microeconomics, industrial organization and business strategy. Accordingly, IAC can complement and add value to the research of others (MEPA, Statistics Canada etc.)

through focusing on the impacts and implications of the trends, forces and pressures identified in this document for corporate culture, behaviour, strategy and performance in Canada.

The resulting research would both assist companies in preparing their plans and strategies and achieving their strategic goals, and as well would help to ensure that government policy and program development is better grounded on marketplace realities and company requirements as viewed from the perspective of the business sector and their representatives, the industry associations. Research priority should be given to horizontal/cross-cutting issues that affect many manufacturing and service industries. Work on a specific sector should clearly provide experience, lessons and benchmarks that could be applied to other sectors¹⁸.

IAC and Industrial Sector industrial analyses would be designed to increase our understanding of how the product and process innovations that result from research and development are actually assimilated by Canadian companies to increase profits and market share, and of how technology, process and product innovations, production organization methods, and new learning in management and organization are influencing the day-to-day operations of Canadian firms, and are being applied on the "factory floor" of Canadian manufacturers – including SMEs and more mature manufacturing industries – and producer service providers.

IAC and Industry Sector research should be designed as well to enhance our understanding of the Canadian gaps in investment, productivity, innovation and commercialization of research, and of our limited success in growing small companies into medium sized companies – through bringing to the policy formulation table and other forums the company perspective. These insights from IAC/Industry Sector research and interactions with companies and their representatives, would include the perspectives of smaller firms and companies in more mature manufacturing industries now in transition as well as producer and other more innovative services. The workshops and final meeting stressed that these voices are at times not heard in federal policy debates.

¹⁸ For example, one IAC workshop held in August 2001 proposed that the forces and pressures described in section 2.0 could be explored in-depth by focusing on a single sector in partnership with the relevant Industry Sector Branch, industry association(s) and other stakeholders. The automotive sector was raised as one sector that could be the subject of more detailed, futures oriented research and industrial analysis. This research would build on the Charles River study on Mexico, and the joint work with industry conducted by the Industry Sector in preparation for Cabinet deliberation on motor vehicle tariff policy and related issues. Compared to past work on the automotive sector, this research program would take a longer term perspective, consistent with the overall approach for IAC industrial analyses suggested earlier.

Senior management of the Industry Sector had evidently expressed interest in using the automotive sector as a case study for exploring the longer-term pressures and opportunities faced by Canadian industry and the Canadian economy. Given the size, complexity, industry and trade linkages, national importance and international integration of this sector – and the environmental, energy, consumer, globalization and other pressures that the automotive sector is now facing -- it is expected that findings from detailed work on the automotive sector would be of benefit to other Canadian industries.

Further Exploration of the Databases and Analyses of Statistics Canada/John Baldwin

The first priority in exploring existing databases and research could be the Statistics Canada database called the "Longitudinal Census of Manufacturers (LCM)" and the many research papers prepared by John Baldwin and his colleagues based at least in part on this database -- supplemented by the results from the Innovation Survey and other databases and surveys. The LCM database is created from annual versions of the Census/Survey of Manufactures for the years from 1970 to 1997 and is designed to facilitate longitudinal analysis of changes in the manufacturing sector. The database has been used in particular to assess the dynamics of competition and has resulted in the preparation of better than 25 research papers as well as other studies by Mr. Baldwin and his colleagues. A brief review of these papers suggests that the following themes and findings from the database and research papers -- which represent only a few examples from a rich literature -- could be explored in greater detail in future industrial analysis that uses LCM as well as other databases and surveys. Some of these themes are also noted in the main text.

Impediments to Technology Adoption

- Labour shortages do not appear to block the adoption of advanced technology by Canadian companies. Companies that are the most technologically advanced have a greater requirement for skilled labour but apparently they have the capacity as well to solve any labour shortage problems that arise.
- More generally, users of more advanced technologies face much greater impediments to technology adoption than non-users. However, once these impediments are known, the users of more advanced technology adopt strategies to remove these impediments and thus ensure that impediments do not become impenetrable barriers to innovation and to the adoption of the advanced technology needed for company success.

Foreign versus Domestically Owned Companies

- Compared to Canadian owned companies, foreign owned firms are more active in R&D and are more often involved in R&D collaboration projects both in Canada and in other countries. These include links with local universities and other local innovation consortia. Foreign owned firms are also more likely to use world-first innovations rather than more imitative innovations. However, in these measures, Canadian owned corporations with a strong international orientation are similar to foreign subsidiaries, suggesting that international orientation rather than nationality of ownership is the key determinant of R&D performance.

Key Factors in Company Success

- Successful new entrants that achieve the most growth are those that develop strengths in one or more innovative activities -- introduction of new products, emphasis on technology, or human resource development. For these companies, innovation to be successful must be complemented by strong emphasis on human resource capabilities particularly training.
- Innovative firms, which typically are more successful than non-innovative firms, place greater emphasis on management, human resources, marketing, financing, government programs and services, and production efficiencies, and thus try to excel at several different but related areas of business performance.
- A considerable amount of market share is transferred from declining to growing firms over a decade. Over the same period, growing firms that are increasing their market share improve their productivity more than declining firms. The companies that achieve the highest productivity gains have adopted information and communications technologies or a number of technologies from different technology classes. Generally speaking, innovation is the most important determinant of firm success across a wide range of industrial sectors.
- Trends from 1973 to 1993 illustrate that with respect to rates of growth in labour productivity the differences between large and small and foreign and domestically owned plants in Canada are becoming greater. Greater research is needed on whether these differences in productivity growth are related to differences in the adoption of more advanced technology.

Industrial Structure and Marketplace Dynamics

- High technology firms can be located across a wide range of industries, including lower technology industries, and high technology industries are not comprised totally of high technology firms.
- Churning as measured by job growth and job destruction and by business entry and exit is very important to a healthy dynamic economy. The industrial structure of Canada and its regions is in a state of constant change.

Workshop attendees stressed that there are important interactions between the trends, forces, and pressures, as well as the six key themes, in this document. These should be addressed in designing research programs and individual studies. The comments made during the sessions stressed as well that in order to project the future, it is essential to better understand the past – in particular the period since the signing of the FTA in 1988.

The challenges in forecasting the future were also recognized. The development and testing of alternative scenarios of Canada's future were noted as one approach to address future uncertainty and to explore the interactions between forces, trends and pressures. The scenarios should be both realistic and challenging (a simple extrapolation of trends and developments of the past decade would not satisfy anybody and would not provide the appropriate guidance to researchers, analysts and our business clients).

Scenario development as well should capture the objectives, initiatives and visions of Industry Canada, the Industry Portfolio, the Government of Canada and of key provinces such as Ontario that have recently completed their own visioning exercises. Preparation of alternative scenarios at an early stage of work program implementation could then support and inform subsequent industrial analyses conducted and supported by IAC and the Industry Sector.

4.2 Analytical Techniques Relevant to IAC and its Partners

Based on the past and current work of Statistics Canada, MEPA, the Industry Sector, other Industry Portfolio partners, other government departments and agencies, the Conference Board, the academic community and other non-government groups, there is now a very impressive body of work that is readily available and can be drawn upon and integrated together to support company strategy and related government policies and programs. This body of work includes statistics, survey data and interpretations of survey results, microeconomic research, productivity and innovation analyses, trade data and research, and other analyses.

One challenge for IAC and its partners is to dig much deeper into this body of work to:

- develop the linkages between forces and pressures,
- identify the implications for different industries, industry groupings and technologies, different sizes of companies with various ownership structures, and various geographic locations, and
- develop the implications for company strategy and performance.

Based on this integrative cross-sectoral work, IAC and its partners would then be in a solid position to propose, conduct, and sponsor with other partners more specific industrial analyses, surveys, company case studies and other research that complements and augments the existing body of work and fills key gaps in our knowledge of company strategy and performance and of industry performance. (See the box on the previous page for one illustration of how existing research can be explored in this manner).

At the same time, during the workshops, IAC staff clearly indicated that the existing literature, databases and survey findings will meet only a portion of IAC and Industry

Sector client and partner requirements. Therefore, original research and primary data collection will also be needed. These could involve a variety of analytical tools. However, given the emphasis suggested earlier on corporate behaviour and strategy, industry performance and industrial and market structure, and the insights these provide to government policy formulation, it is expected that the following analytical tools could be prominent in the research designs of many IAC conducted and sponsored studies.

1. Case studies of specific companies complemented by consultations with industry associations and industry experts from government, the research institutes and the academic community.
2. Separate surveys – perhaps added to the existing surveys of Statistics Canada and other groups – to explore in greater detail corporate behavior, strategy and performance in e.g. responding to globalization and international market integration, implementing innovation strategies and investments, improving productivity, and preparing and implementing corporate strategies.
3. Conducting separate runs on the Statistics Canada/John Baldwin and other existing databases – over time this could involve joint work with US groups to bring a North American and international perspective and provide comparisons between Canadian, US and e.g. Mexican performance and strategy.
4. Taking existing research conducted at the two-digit SIC level and extending the analysis to the three- and four-digit sub-industry level to the extent allowed by confidentiality and other data availability problems as well as the results from other available research, databases and surveys on the same sub-industries and product lines.
5. Micro-economic research and the application of micro-economic theory, the new growth and trade theories, industrial organization economics, and game theory in order to better determine how Canadian companies compete and succeed in domestic and international markets and how industries and markets might evolve and grow through time in response to the forces and pressures outlined in this document.

The results from applying these analytical techniques would complement the research findings from the macro-economic analysis and the economy-wide and industry level analyses of MEPA and other groups. These industrial analyses would bring to the policy debate a better understanding of what current policies, forces, and pressures mean for different kinds of industries, companies, and geographic locations¹⁹, and would better ensure that new policies and programs that are nation-wide and industry-wide in their scope and purpose are based on a shared understanding of their implications for a wide range of industries, companies and locations in Canada. Fewer policies and programs are sector specific but all policies and programs would benefit from a shared understanding of sectoral, business and locational impacts.

¹⁹ Different groups of industries would include e.g. more mature industries as defined in this paper compared to the higher technology industries, and between manufacturing industries and producer services. The approach would be to develop and test hypotheses to identify how the results would vary depending on the type of company, industry and geographic location.

At the same time, sharing the research findings with the Industry Sector Branches, other government partners, industry associations and directly with businesses -- through information products (hard copy as well as electronically through a sophisticated IAC Website on Strategis that is exciting, easy to use and up-to-date), conferences, workshops and informal meetings and other methods -- will help businesses to develop corporate strategies, and assist all of IAC's partners and clients to prepare and implement joint strategies that are mutually beneficial and fully grounded on business and marketplace realities²⁰. As well, the positive and negative responses of IAC's business clients and other clients and partners to the research findings and policy conclusions, will further enrich the Industry Sector's contributions to the policy debates within the Government of Canada.

The workshops and final meeting with IAC staff stressed the importance of working closely with Industry Sector Branch officials in developing and implementing research programs and in facilitating and maximizing this two-way flow of information between IAC/the Industry Sector and other parties in and especially outside government.

Perhaps most important, IAC workshop attendees stressed that IAC research and our research partnerships with other groups should focus on pressures and trends where Industry Canada, the Industry Portfolio, and the Industry Minister can clearly have an impact on government policy and economic performance. The author of this document fully concurs with this firmly expressed view.

4.3 Horizontal Issues to be Addressed in IAC Industrial Analysis

The workshops with IAC staff as well identified themes that may not be the subject of separate research at this time but rather would be addressed as part of other research funded or partnered under IAC's work program. These crosscutting themes would include:

- Impacts and implications for different industries, company sizes and structures and geographic locations of tariff and non-tariff barriers to trade, including those inside the border as well as new border problems that are emerging post-September 11.
- Impacts of framework policies and laws and of environmental, consumer protection and other regulations on various companies, industries and locations within Canada -- with emphasis on regulatory impacts on and burdens for smaller companies with less than 100 employees.
- Changing relationships between government and industry -- given the changing role of government (less subsidies and state entitlements but mounting pressures for new regulation and re-regulation to protect the public interest) as well as dramatic changes in the Canadian business sector because of globalization, trade liberalization and technological change.

²⁰ The interactions and sharing of information and ideas between IAC staff and other parties would be further enhanced through IAC officials conducting joint studies, research and surveys with researchers from industry associations, research institutes, the academic community, provincial government agencies, and other outside groups.

- The growing interactions between economic and social objectives, and the increasing visibility and influence of domestic and international NGOs (e.g. on issues like free trade, globalization, biotechnology, and lumber exports to the EU).
- Implications of forces and trends for various sizes of companies and for different Canadian regions and provinces.
- Demographic changes and population aging.
- Ownership structures – differences between Canadian subsidiaries/branch plants and wholly Canadian owned companies; as noted earlier, there is the view that the Canadian operations of international companies of today are quite different from the branch plants built behind high Canadian trade barriers in the past.
- Opportunities, challenges and threats from Canadian companies that are overly dependent on “niche” products and markets.
- The company size structure of the Canadian business sector with a few large international corporations (with few of them Canadian owned), a very large number of small closely held and often family owned enterprises, and comparatively few medium-sized enterprises that have grown from small to medium scale.
- Impacts of the current tax system for different industries including services, different sizes of companies, companies at different stages of their life cycle (e.g. startups, mature, in decline), and different ownership structures (foreign versus domestic, publicly traded, privately held, family owned etc.).
- Human resource issues including training, retraining and retaining skilled personnel, the NAFTA non-resident visa system, the loss of highly skilled people to the US, the impacts of Canadian immigration policies with respect to bringing in skilled people from other countries, and the interactions between the human resource and innovation strategies of Canadian companies and industries.
- Relevant experience and lessons from other countries, not just the US, EU and Japan but as well smaller countries such as Ireland, Finland, and Sweden that in many areas related to higher education, innovation, commercialization of research, productivity, and investment performance are reportedly now out-performing Canada.

4.4 Final Comment

To summarize, the work on this document suggests that IAC and Industry Sector industrial analysis can best add value to the research and industrial analyses of other groups:

- through focusing on microeconomic research, business strategy, the more mature industries in transition, producer and other more innovative and exportable services; Canadian owned and managed firms, and SMEs, and
- through bringing to government and industry a better understanding of how Canadian businesses in various industries, of varying sizes and with different ownership structures are actually responding -- through their innovation, corporate, marketing and other strategies -- to the challenges of globalization, international market integration, rapid technological change and the changing roles of government.

The final meeting with IAC officials on this paper suggested that the next step would be to explore and decide on with IAC partners and clients the best mechanisms for structuring an IAC/Industry Sector industrial analysis research program under Role 2; to

consult and decide on the core research issues and deliverables to be given priority in the short to medium term; and to test and refine these mechanisms through developing, carrying out, sponsoring, and facilitating appropriate industrial analyses on these core issues over the next 18 months -- as the first major industrial analysis work program, deliverable and set of events under Role 2 of the IAC Operational Plan.

It is the hope of the IAC officials and consultant who jointly prepared this paper that the current document will provide a major part of the foundation that will help to ensure progress and success for Role 2 of the overall IAC operational plan in the coming months and years.

APPENDIX A

**SLIDE DECK ON
FORCES AND PRESSURES
SHAPING THE CANADIAN ECONOMY**

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