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State of Advanced Manufacturing: A Canadian Perspective

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L'état du secteur manufacturier de pointe : Perspective canadienne

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Key Findings

- Manufacturing is a vibrant, highly innovative and technology-driven industry of the Canadian economy.
- The majority of Canadian manufacturers, regardless of firm size, are competing against multinational enterprises.
- More than twice as many manufacturers increased production (25%) and research and development (R&D) (7.9%) capabilities in Canada between 2007 and 2009 than reduced capabilities (11% and 2.1%, respectively).
- Among large manufacturers, firms with headquarters in Canada and firms with headquarters abroad opened a new production facility or expanded capacity in Canada between 2007 and 2009 at a comparable rate (34% and 28%, respectively).
- Of the large firms that closed an existing production facility or reduced capacity, 29% also opened a new production facility or expanded production capacity in Canada.
- New investment in manufacturing facilities in Canada is driven by the need to increase agility, expand mass customization capabilities, capitalize on market niches and optimize prototyping and new product introductions (NPI).
- Many large manufacturers expand other strategic activities in Canada when increasing their production capabilities, including R&D (27%), logistics (32%) and provision of services (28%).
- Manufacturing is increasingly about delivering value to customers through tangible goods, with a growing share of this value coming from non-production activities in the value chain, such as financing, logistics management, product design and development, engineering, and customer relationship management.
- The manufacturing sector outpaces all other industries in the introduction of process, organizational, product and marketing innovations in Canada.
- Best-in-Class manufacturers distinguish themselves by their implementation of process innovations and advanced technologies.

Background

As a critical component of the Canadian economy, the manufacturing sector plays a vital role in both the competitiveness and prosperity of the nation. Identifying best practices and distinguishing key drivers and trends of investment and innovation contribute to a better understanding of *advanced manufacturing* in Canada, a concept that entails both leading-edge methods of manufacturing new and existing products as well as improved approaches to designing and coordinating operations.

The research presented here is intended to facilitate understanding of the emerging business strategies in advanced manufacturing that lead to improved domestic and international competitiveness. Industry Canada partnered with the Canadian Manufacturers & Exporters (CME) and McMaster University to undertake this report.

This research provides insights on:

- Emerging trends in advanced manufacturing
- Investment in production and research and development (R&D) facilities
- Innovation trends and strategies
- Best-in-Class analysis

Emerging Trends in Advanced Manufacturing

Canadian manufacturers[i] are faced with the challenge of developing business strategies that enable them to compete in fundamentally different markets against competitors from both low-cost countries and developed economies. In general, Canadian manufacturers are responding to this challenge by designing their operations to deliver a suite of capabilities via increased agility, mass customization capacity, capitalizing on market niches and innovation.

Overall, companies that build flexibility into their manufacturing operations can respond more quickly and outperform their less agile competitors.[1] Manufacturers have taken several approaches to increasing their agility, including adapting production volumes efficiently based on changes in customer demand and profitability, varying their production mixes, and even adjusting the location of certain production within their production footprints.[2]

The ability to expand mass customization capabilities

[i] - *"Canadian manufacturers" refers to manufacturing firms operating in Canada and includes firms with headquarters outside Canada.*

creates a competitive advantage by enabling firms to deliver unique products based on customer specifications or needs while maintaining the general cost efficiency of large-scale production. Also, manufacturers are motivated to capitalize on market niches through a range of offerings including specialized products, or through their ability to provide a customer solution that can focus on products and services. These emerging drivers are among the key motivators for new investment in manufacturing facilities in Canada.[2]

Manufacturers are considering multiple locations for critical operations to avoid supply chain interruptions and raise their level of responsiveness and dependability. A developing trend among leading manufacturers is to structure their production footprints to balance the low cost of production in emerging economies with the lower logistical costs, greater industrial engineering capabilities and fewer risks that exist in the shorter supply chain of Canada or the United States (Table 1).

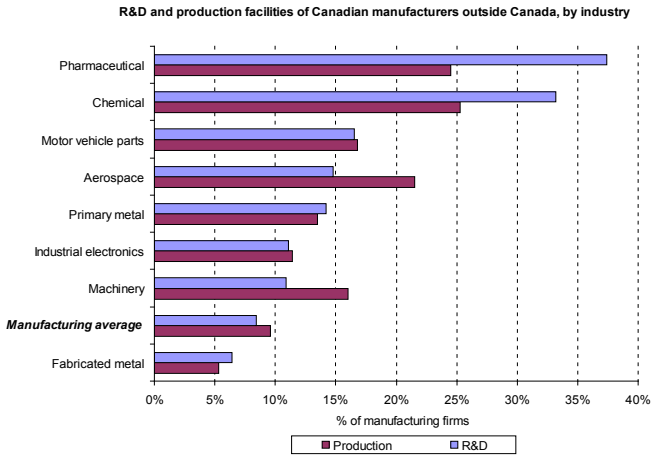
Table 1 3- Tier global production footprint framework[2,3,4]

Location	Velocity/ agility	Quality of logistics network	Industrial engineering capabilities	Production costs	Logistics costs
Canada/U.S.	High	High	High	High	Low
China	Low	Medium-low	Medium-low	Low	High
Mexico	Medium	Medium	Medium-low	Medium	Medium

Further considerations manufacturers must take into account when positioning their global operations include investment environment, access to markets, research capacity, and production and R&D incentives. As expected, large[ii] manufacturers are more likely to leverage their global presence to perform R&D and production internally outside Canada compared to smaller firms. Outside of Canada, more than twice as many large Canadian manufacturers (30%) perform R&D activities compared to medium-sized (14%) and small firms (5%).[5]

Also, the international production and R&D footprints of Canadian manufacturers vary by industry (Figure 1)[iii]. For example, the pharmaceutical industry's extensive drug development cycle leads to central coordination of their global R&D and production facilities.[2]

Figure 1 – R&D and production activities of Canadian manufacturers outside Canada, by industry [5],[iv]



Meanwhile, multinational customer requirements are spurring Canadian manufacturers to introduce organizational, process, marketing and product innovations that are critical for Canadian manufacturers to compete and participate in global value chains.[5] Overall, many manufacturers are utilizing their strengths in process innovation to drive change throughout their organizations and boost performance of other strategic business activities to ultimately increase their productivity and competitiveness.[2] Finally, successful advanced manufacturing strategies are linked to corporate leadership, innovative culture and highly skilled workforce at the operational, tactical and executive levels.[2]

Canadian Manufacturing — Global Competition

While Canadian manufacturers are creating innovative solutions for their customers, they are increasingly challenged to distinguish themselves from their competitors. With growing levels of globalization across the manufacturing sector, Canadian firms are facing heightened competition both domestically and internationally[5]

Among the sources of competition is the presence of multinational enterprises, which compels Canadian firms to identify ways to strengthen their position in current and future markets. Overall, 67% of manufacturers in Canada face competition in their main market from multinational

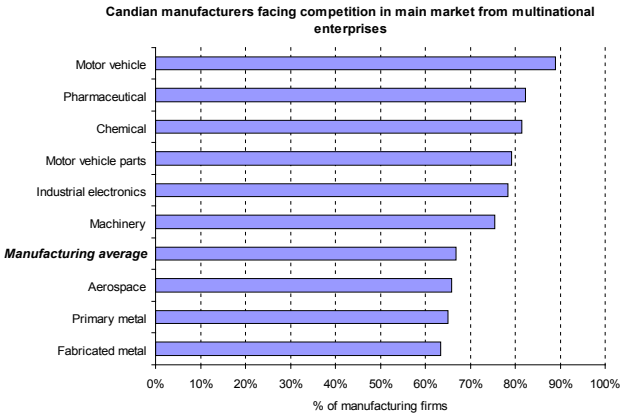
[ii] - *Small = 20–99 employees, medium = 100–249 employees, and large = at least 250 employees.*

[iii] - *For a detailed breakdown of data across many Canadian manufacturing industries, see Annex.*

[iv] - *The Survey of Innovation and Business Strategy is a joint project undertaken by Industry Canada, Foreign Affairs and International Trade Canada and Statistics Canada to better understand the market and policy factors that encourage or discourage the adoption of entrepreneurial and innovation-oriented business strategies. A sample of 6 233 enterprises (including 4 394 manufacturers) in Canada, each with more than 20 employees and revenues above CDN 250 000, and spanning 67 industries were surveyed with a response rate of over 70%.*

enterprises. The presence of multinational enterprises is a challenge for small and large manufacturers alike, as 64% of small manufacturers are competing against multinational enterprises in their main market (Figure 2).

Figure 2 – Canadian manufacturers facing competition in main market from multinational enterprises, by industry[5]

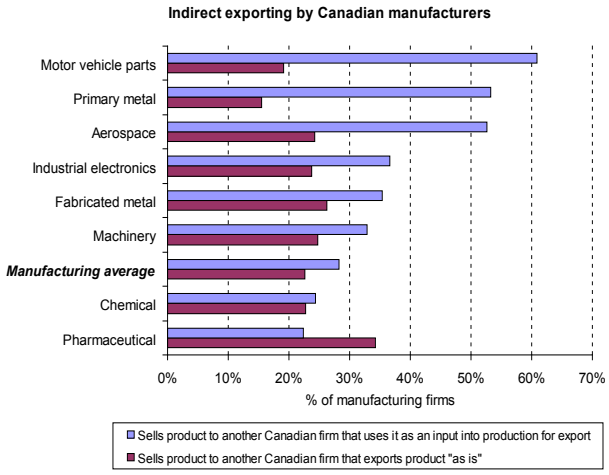


As Canadian manufacturers face domestic and global competition, a key strategy of many has been to drive out costs from their processes through enhanced cost reduction initiatives that allow them to reduce their price whiles maintaining margins.[2] In addition to reducing price (65% of firms), manufacturers responded to increased competition by adopting a new process (39%), changing marketing expenditure (39%) and introducing a new product or service (37%).[5]

An additional response to competition by Canadian manufacturers is to seek out new markets for their products. Across industries, Canadian manufacturers are engaging global markets directly and indirectly. As a whole, the Canadian manufacturing sector directly exported goods valuing $260 billion in 2010, up 11% from 2009.[6]

Even manufacturers that do not directly export goods are often tightly integrated into the global market. Overall, 28% of Canadian manufacturers sell products to other Canadian firms that use those products as inputs into production for export. Operating within a global supply chain is particularly common in some industries; for examples, the majority of motor vehicle parts, primary metal, and aerospace manufacturers produce intermediate goods that are incorporated into their Canadian customers' exported products (Figure 3).

Figure 3 – Indirect exporting by Canadian manufacturers, by industry[5]



Often, those manufacturers producing intermediate goods position themselves near their large customers to create a localized supply chain or cluster. Embedding themselves within clusters can provide several benefits for manufacturers, including access to specialized labour, economies of scale, agility and responsiveness, and transfer of market and technology knowledge.[2,7]

Investment in Advanced Manufacturing

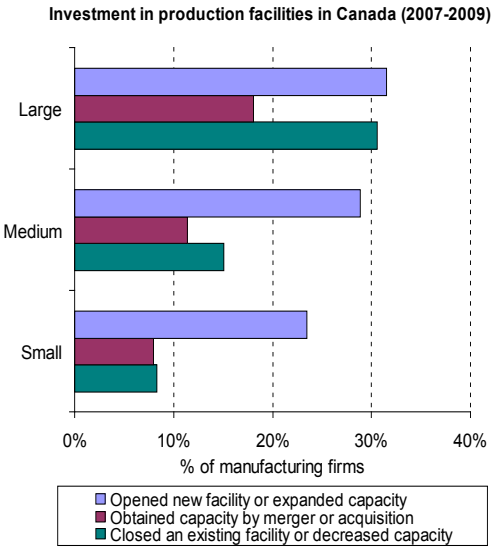
Investment in Production Facilities

Facing global competition and aiming to secure a strategic global footprint, manufacturers are investing in Canada. Both small and large firms across the manufacturing sector invested in new production facilities in Canada during 2007–2009 — a period of economic uncertainty (Figure 4). Overall, more than twice as many manufacturing firms increased production capabilities in Canada (25%) between 2007 and 2009 than reduced capabilities (11%).[5] Also, foreign direct investment (FDI) in the manufacturing sector in Canada increased by 36% in the period 2007–2009 compared to the previous three years, while Canadian direct investments abroad (CDIA) decreased by 3% in the same period.[8]

An emerging trend in manufacturers' investment in production facilities is the focus on new production models often based on flexibility, agility, prototyping and new product introduction (NPI) capabilities, and the ability to create customizable products based on customer requirements.

This new production footprint is structured with a greater emphasis on small batches that can fulfill customer needs in case of supply chain interruptions.[2] This shift in focus is reflected in the fact that 29% of the large manufacturers that closed an existing production facility or reduced capacity between 2007 and 2009 in Canada also opened a new production facility or expanded production capacity in Canada during the same period.[9] Among large manufacturers, firms with headquarters in Canada and those with headquarters abroad opened a new production facility or expanded capacity in Canada between 2007 and 2009 at a comparable rate (34% and 28% respectively).[9]

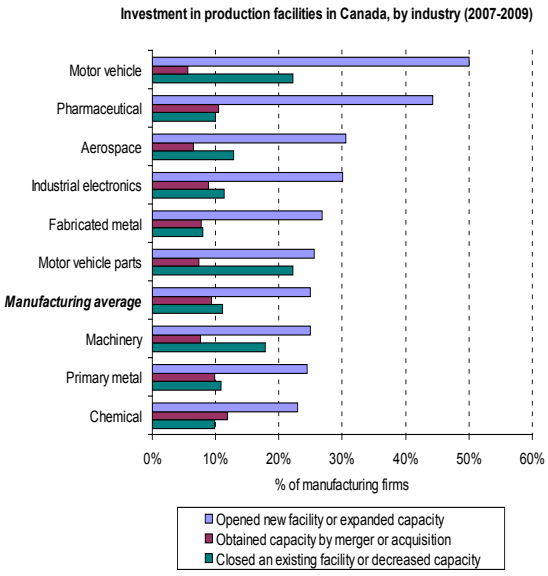
Figure 4 – Investment in production facilities in Canada, by size (2007–2009)[5]



An additional trend in production facility investment in Canada is the establishment of NPI facilities. Bridging the gap between prototyping and full-scale production, these facilities often require specific expertise and personnel. Some manufacturers dedicate certain production facilities to NPI in order to achieve product volume with speed and scale efficiency.[2]

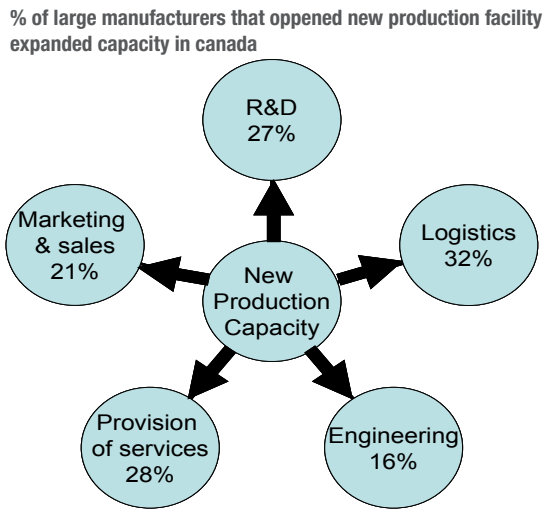
Across most manufacturing industries, more firms increased production capabilities between 2007 and 2009 than decreased capabilities (Figure 5). Canadian manufacturers were more likely to expand their production capabilities organically in Canada rather than via merger or acquisition. Among those the firms investing in production facilities in Canada, some manufacturers are motivated to shorten supply chains and maintain flexibility and responsiveness.[2]

Figure 5 – Investment in production facilities in Canada, by industry (2007–2009)[5]



Often, manufacturer investment in production facilities is not an isolated event as evidenced by many large manufacturers expanding other strategic activities in Canada at the same time. In particular, many large manufacturers that expanded production capabilities between 2007 and 2009 also expanded logistics (32%), provision of services (28%), and research and development (27%) capabilities during the same period (Figure 6).

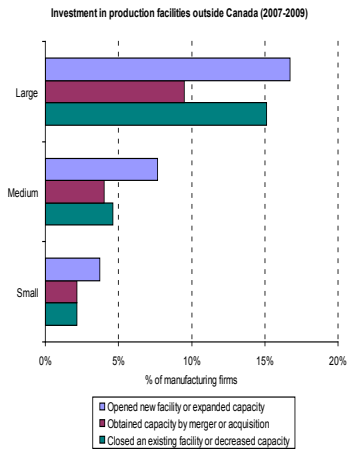
Figure 6 – Expansion of other activities coinciding with an expansion in production capabilities in Canada (2007–2009)[9]



Operating and competing in a global market has driven Canadian manufacturers to consider both their operations and supply chains on an international basis. Overall, the most important countries in which manufacturers made changes to their operational activities were the U.S., China, and Mexico.[5] Market related factors and the presence of suppliers/partners are two key considerations for manufacturers when selecting new global production locations.10 Manufacturers making decisions about their global production footprint often consider access to suppliers, quality of logistics network, political stability, currency, labour flexibility and corporate cultural compatibility.[2] Further considerations vary widely by industrial sector and may include access to skilled labour, raw materials availability investment attraction initiative as well as local market knowledge and responsiveness to changes in customer demand.[2]

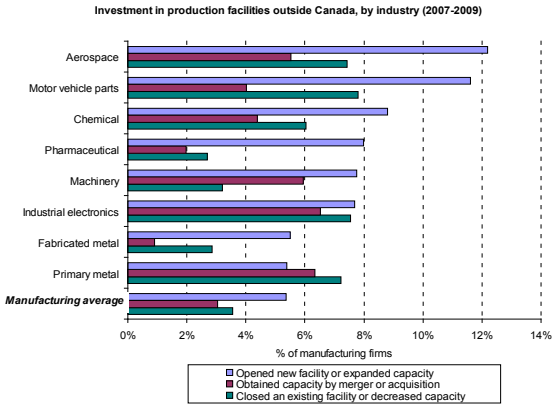
Large Canadian manufacturers are more likely than medium-sized or small firms to adjust their level of production by either increasing or decreasing capacity. Canadian manufacturers were nearly four times more likely to increase production capabilities in Canada between 2007 and 2009 than abroad. Also, large manufacturers increased and decreased production capabilities abroad at a similar rate between 2007 and 2009 (Figure 7).

Figure 7 – Investment in production facilities outside Canada (2007–2009)[5]



Access to international markets has contributed to the relatively high international production facility investment made by aerospace manufacturers between 2007 and 2009. In other sectors such as industrial electronics, Canadian manufacturers have restructured their global production footprints by opening and closing production facilities at similar rate outside Canada. This business strategy aims to increase the supply chain responsiveness while achieving the lowest total landed cost[v] (Figure 8).[2]

Figure 8 – Investment in production facilities outside Canada, by industry (2007–2009)[5]

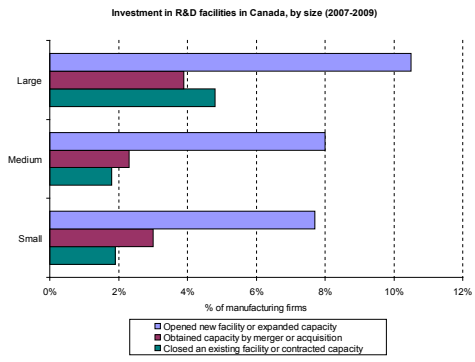


Investment in Research and Development Facilities

Intensified global competition is driving Canadian manufacturers to adapt their business processes and activities to effectively develop commercially viable products. The majority of Canadian manufacturers perform R&D activities in Canada, regardless of head office location.[9]

In Canada, between 2007 and 2009, more than twice as many Canadian manufacturing firms opened a new R&D facility or expanded capacity than contracted R&D capacity, with a greater percentage of large firms expanding compared to small and medium-sized manufacturers (Figure 9).

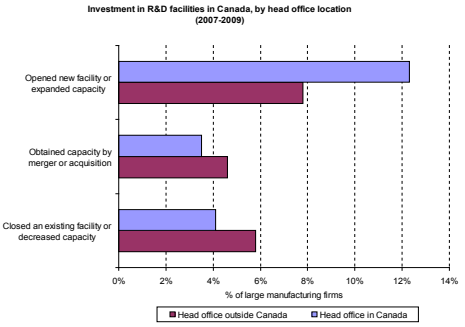
Figure 9 – Investment in R&D facilities in Canada, by size (2007–2009)[5]



From 2007 to 2009, a greater percentage of manufacturers opened new R&D facilities or expanded capacity than reduced R&D capacity, regardless of head office location. Meanwhile, a greater percentage of manufacturers with Canadian head offices expanded R&D capacity compared to their foreign counterparts (Figure 10).

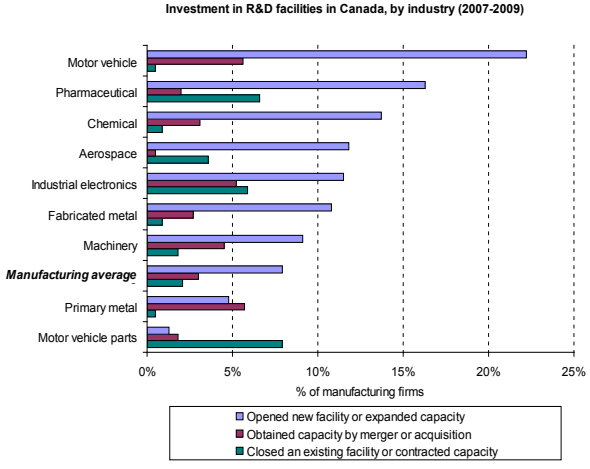
[v] - *Total landed cost comprises the actual cost of all goods, transportation costs, carrying costs, insurance and freight, custom duties and preferential rates, taxes, tariffs and any additional charges caused by depreciation and goods becoming obsolete.*

Figure 10 – Investment in R&D facilities in Canada, by head office location (2007–2009)[9]



Investment in R&D facilities and capacity in Canada varies by manufacturing industry. For example, 22% of motor vehicle manufacturers opened R&D facilities between 2007 and 2009, with some firms focusing on power train dynamometer research, fuel cell testing, and development of a broad range of advanced production and prototyping technologies.2 Conversely, the evolving business model in the auto parts manufacturing industry has led some firms to focus more on a build-to-print business model (Figure 11).[2]

Figure 11 – Investment in R&D facilities in Canada, by industry (2007–2009)[5]



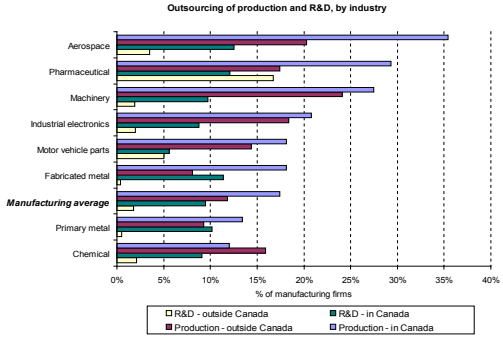
Firms in the aerospace industry have increased R&D capacity almost solely through organic expansion, while firms in the pharmaceutical manufacturing industry have expanded R&D capacity to focus on new drug discoveries. Industrial electronics manufacturers are expanding R&D capacity — in many cases with university collaboration — to focus on the development of next generation electronics such as micro-electromechanical systems for silicon chips and electrical and hardware design for products such as carrier-grade telecommunications equipment and embedded microprocessors.[2]

Outsourcing of Production and R&D Activities

The business of manufacturing is increasingly about delivering value to customers through tangible goods, with a growing share of this value coming from non-production activities in the value chain such as financing, logistics management, product design and development, engineering, and customer relationship management. Manufacturing business models increasingly rely on fragmentation of value chain activities and the outsourcing of some functions including production.[2,11]

To attain a complete view of advanced manufacturing in Canada, the role of contract manufacturers and the outsourcing of R&D activities both in Canada and abroad must be included. While outsourcing can introduce added risk regarding quality and continuity of supply, it is important for manufacturers to identify the strategic importance of each activity and whether they can benefit from the use of a contract manufacturer. Overall, manufacturers are more likely to outsource some production to contract manufacturers within Canada than abroad (Figure 12).

Figure 12 – Outsourcing of production and R&D, by industry[5]



Large Canadian manufacturers are twice as likely to outsource some production abroad than small manufacturers (21% and 10% respectively). Outsourcing of production by Canadian manufacturers often involves products that have reached the maturity phase in the product life cycle or non-core product groups in areas where contract manufacturers have specific capabilities.[2]

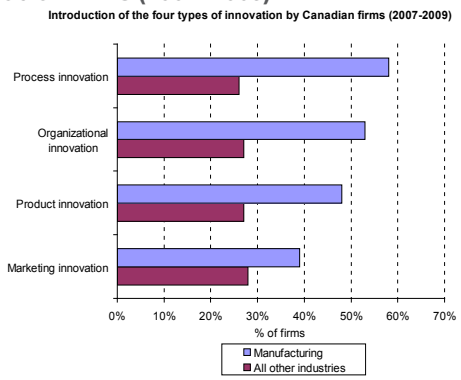
Meanwhile, Canadian manufacturers internalize core R&D activities to maintain ownership over project directions, timelines and outcomes, but may leverage external expertise or capability for specialized functions.2 Overall, less than 10% of manufacturers outsource R&D activities either in Canada or abroad.[5] Large manufacturers outsource R&D activities

to partners located in Canada and abroad at a similar level (10%). Medium-sized and small Canadian manufacturers with limited global footprints tend to favour local business partners in their R&D outsourcing strategies.[2,5]

Innovation in Advanced Manufacturing

Canadian manufacturers are investing in innovative solutions to boost their competitiveness. Innovation in manufacturing is not isolated to certain practices; it is integrated into activities across operations and aligns with the Organisation for Economic Co-operation and Development's (OECD) definition of the different types of innovation: process, organizational, product and marketing.[12] Overall, the manufacturing sector outpaces all other industries[vi] in the introduction of process, organizational, product and marketing innovation between 2007 and 2009 in Canada (Figure 13). However, the Canadian manufacturing sector lags behind key countries such as the United States in terms of business expenditures on R&D intensity.[13]

Figure 13 – Introduction of the four types of innovation by Canadian firms (2007–2009)[9]

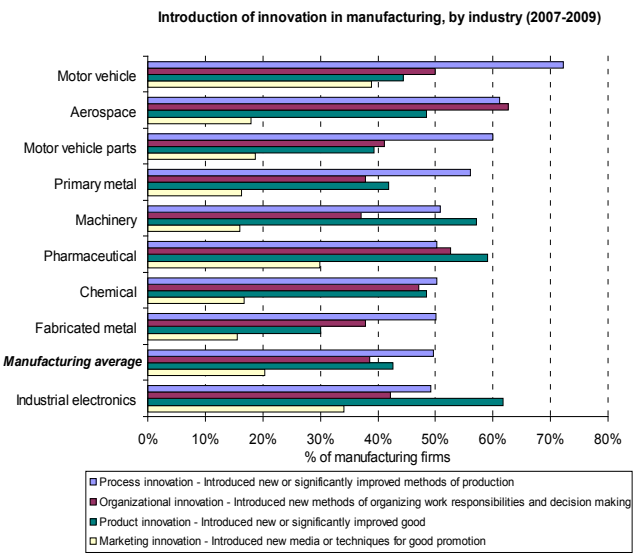


Manufacturers were twice as likely than the rest of the Canadian private sector to introduce process and organizational innovation between 2007 and 2009.[9] Process innovation may include the implementation of new methods, techniques, tools or software, as well as changes affecting logistics, procurement or maintenance. Overall, eliminating waste, improving efficiency of operations and reducing costs are the main drivers of process innovation.[2] In fact, 66% of Canadian manufacturers that introduced process innovations between 2007 and 2009 were able to reduce the average cost of their products by 11%.[5] Also, expanding lean concepts beyond fabrication and improving supply chain agility are key areas of process innovation within the manufacturing sector.[2]

Advancements in process innovation are driving manufacturers to be leaders of organizational innovation in Canada, which includes changes to business practices, workplace organisation or practices in external relations. Some 53% of Canadian manufacturers introduced organizational innovation between 2007 and 2009.[9] Reduced administrative costs, improved internal and external relations, and more efficient business practices are often the objectives of new methods of dividing tasks, handling procedures and dealing with stakeholders within the supply chain.[2]

Product innovation creates opportunities not only for commercialization of consumer products and industrial goods but also for the development of state-of-the-art machines and tools that directly impact the production process and related activities. Marketing methods and techniques are evolving to further integrate the use of information technologies and new media.[2] In all four types of innovation the manufacturing sector is leading with a significantly greater percentage of firms that introduced innovations between 2007 and 2009 compared to other industrial sectors.[9] Within different manufacturing industries, a mix of innovations — process, organizational, product and marketing — is being implemented by many firms to compete and succeed in the global marketplace (Figure 14).

Figure 14 – Introduction of innovation in manufacturing, by industry (2007–2009)[5]



[vi] *- All other industries includes: agriculture, forestry, fishing and hunting; mining, quarrying, and oil and gas extraction; utilities; construction; wholesale trade; retail trade; transportation and warehousing; information and cultural industries ; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management of companies and enterprises; and administrative and support, waste management and remediation services (20+ employees).*

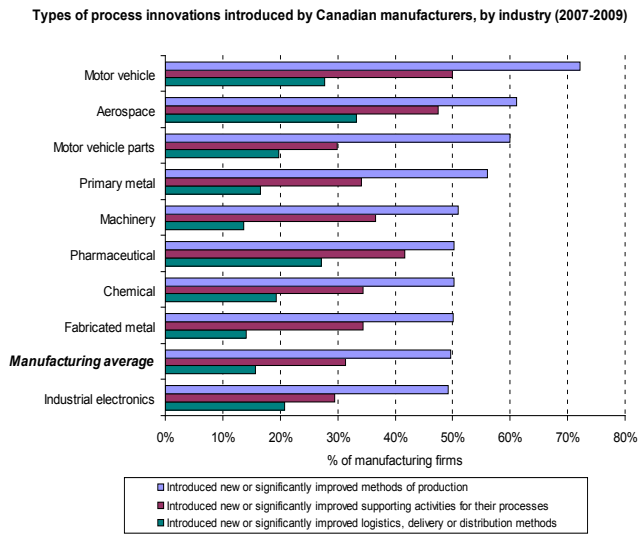
Overall, many manufacturers are implementing organizational innovation by establishing collaborative strategic partnerships with both customers and suppliers. Specifically, firms throughout the automotive sector made significant changes to their business model between 2007 and 2009, especially by streamlining the production processes and modifying their organizational structures. Some of the cost-saving strategies included the introduction of global vehicle platforms and the implementation of flexible assembly. The motor vehicle parts sector has improved the rationalization of the supply chain and strengthened the role of systems integrators.[2]

Meanwhile, more than half the firms in pharmaceutical manufacturing have introduced product, process and organizational innovation.[5] The adoption of new technologies and a more strategic specialization of production networks on a geographical basis have contributed to the improvement of overall plant utilization rates.[2] Finally, in industrial electronics, where product life cycles are relatively short, process and organizational innovation have been critical to reduce cost and time to market.[2]

As the manufacturing sector maintains its focus on process, innovations in that area are key enablers of competitiveness. While process innovation in production is the most common among manufacturers, many firms have embraced process innovation in a more holistic manner (Figure 15). Process innovation implemented by manufacturers often aims to reduce total landed cost by optimizing many operations including production, logistics, and customer relationship management.[5] Process innovations that generate measurable environmental benefits and significant savings have been successfully implemented in many industries.[2] Efficiency in production process often means lower energy and material costs and reduced waste. While for some firms, obtaining buy-in to implement environmental measures can be challenging — especially when the results sought are difficult to measure — manufacturers that have adopted process innovation that targets green supply chain management have successfully improved their business and environmental performance on many levels.[14]

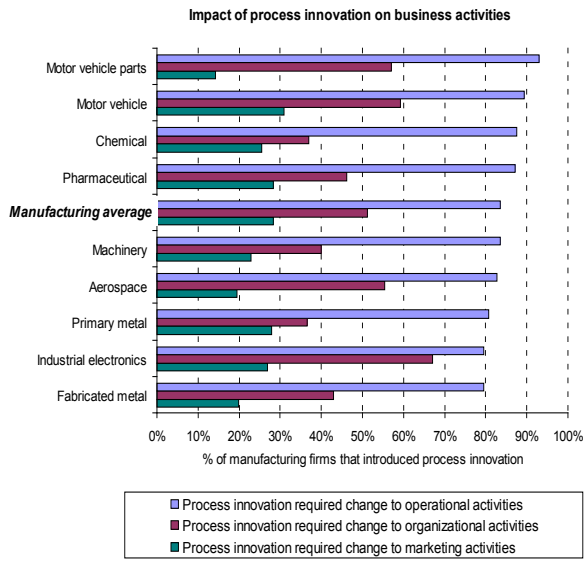
Overall, the introduction of the four types of innovation by manufacturers is similar by size of firm. Between 2007 and 2009 about half of all Canadian manufacturing firms have implemented process innovation for the production of goods or services (large firms: 54%; medium-sized firms: 53% and small firms 49%). Firms of large, medium and small size have consistently adopted product (52%, 50%, 40%), organizational (50%, 41%, 37%), and marketing (25%, 22%, 20%) innovations over this period.[5]

Figure 15 – Types of process innovations introduced by Canadian manufacturers, by industry (2007–2009)[5]



The broad scope of process innovation means that changes may be technical or purely procedural and their implementation may require different skills and knowledge. In addition, the reporting relationship may be altered, which can impact organizational structure and, in some cases, marketing activities. The majority of Canadian manufacturers indicated that process innovation led to changes in operational (84%) and organizational activities (51%) (Figure 16).

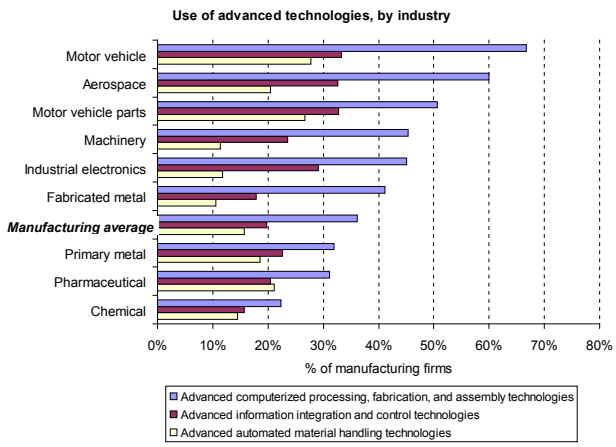
Figure 16 – Impact of process innovation on business activities, by industry[5]



Advanced Technology Adoption

To enable these potentially complex process, organizational, product and marketing innovations, Canadian manufacturers rely heavily on advanced technologies[vii]. Across industries, many manufacturers have implemented advanced production technologies in their efforts to reduce total landed cost. In particular, the majority of aerospace, motor vehicle and motor vehicle parts manufacturers utilize advanced computerized processing, fabrication, and assembly technologies (Figure 17).

Figure 17 – Use of advanced technologies, by industry[5]



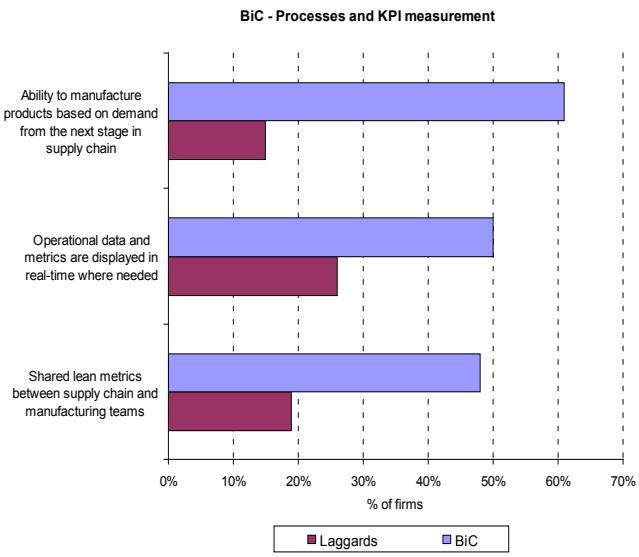
In general, large manufacturers (50%) are more likely to utilize advanced production technologies than medium-sized (43%) or small manufacturers (34%).[5] In addition to adopting direct production technologies, many manufacturers are adopting technologies that enable coordination and integration across multiple activities, consistent with their goal of becoming more agile and efficient.[2,5]

Best-in-Class Analysis

This section examines how Best-in-Class (BiC) manufacturers compare to Laggards regarding their use of demand-based production planning, key performance indicator (KPI) measurement and advanced technology adoption. BiC firms are defined as North American businesses that achieve positive results in five key year-over-year performance criteria: average deal size, average annual customer revenue, sales cycle time, time to quota, and sales administration time. BiC firms represent those North American manufacturers that constitute the top 20% of aggregate performance scorers while Laggards constitute the bottom 30%.[15]

Overall, BiC manufacturers utilize more demand-based production planning and KPI measurement in their manufacturing operations. One particular differentiating process is the ability to manufacture products based on demand from the next stage in the supply chain, which BiC manufacturers are four times more likely to possess than Laggards (Figure 18). This ability often stems from BiC manufacturers' general goal to execute lean strategies beyond manufacturing processes (i.e. sourcing and logistics activities). An additional focus for BiC manufacturers is to coordinate the optimization of the order-to-delivery process across teams by sharing operational data and metrics in real time. [15]

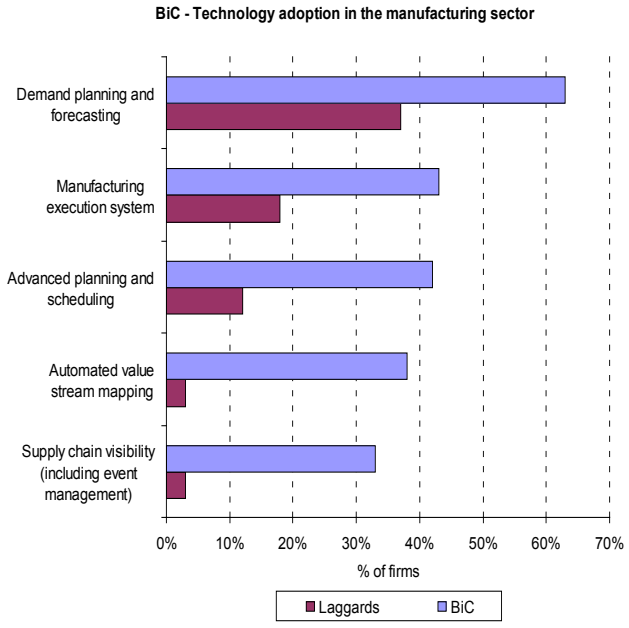
Figure 18 – BiC – Processes and KPI measurement[15]



A critical enabler of leading-edge processes and KPI measurement within manufacturers is technology. Overall, the use of advanced technology distinguishes BiC manufacturers. The use of technology that enables the modelling of inventory targets to optimize production schedules is important for firms aiming to increase their agility. BiC firms utilize specific technologies such as demand planning and forecasting, and manufacturing execution systems at a much higher rate than Laggards (Figure 19).

[vii] - *Advanced technologies are new technologies that perform a new function or improve some function significantly better than commonly used technologies in the industry or by competitors*

Figure 19 – BiC – Technology adoption[15]



An emerging trend among BiC manufacturers is the expansion of process visibility to include supply chain partners, enabling manufacturers to better respond to changes in customer demand. Some 33% of BiC manufacturers utilize technologies that enable supply chain visibility compared to only 3% of Laggards.[15]

Final Remarks

Overall, these research findings demonstrate that manufacturing is a vibrant and innovative sector that plays a strategic role within the Canadian economy.

The manufacturing sector outpaces all other industries in the introduction of process, organizational, product and marketing innovations in Canada. Also, many manufacturers are expanding their adoption of process innovations beyond new manufacturing methods to include other operations, creating both business and environmental benefits.

Canadian manufacturers were nearly four times more likely to increase production capabilities in Canada between 2007 and 2009 than abroad. In addition, manufacturers are investing in production facilities to increase agility, expand mass customization capabilities, capitalize market niches, and optimize prototyping and new product introductions. More than twice as many manufacturers increased production capabilities (25%) in Canada between 2007 and 2009 than reduced capabilities (11%).

This research also presents important linkages between emerging business models in manufacturing, investment in production facilities, and innovation and advanced technology adoption. These connections can help inform a continued dialogue between businesses, governments and academia.

ANNEX: Tables

Table A1

R&D and production activities of Canadian manufacturers outside Canada, by industry

	% of manufacturing firms	
	Production	R&D
Manufacturing average	**10%**	**8%**
Food manufacturing and beverage manufacturing	4%	5%
Food manufacturing	4%	4%
Animal food manufacturing	10%	8%
Fruit and vegetable preserving and specialty food manufacturing	9%	9%
Dairy product manufacturing	3%	3%
Meat product manufacturing	0%	0%
Seafood product preparation and packaging	2%	2%
Bakery and tortillas manufacturing	5%	6%
Beverage and tobacco product manufacturing	7%	6%
Beverage manufacturing	7%	7%
Tobacco manufacturing	-	-
Textile mills and textile product mills	12%	8%
Textile mills	12%	12%
Textile product mills	11%	5%
Clothing manufacturing	2%	1%
Cut and sew clothing manufacturing	2%	1%
Leather and allied product manufacturing	10%	5%
Wood product manufacturing	5%	1%
Sawmills and wood preserving	3%	0%
Veneer, plywood and engineered wood product manufacturing	13%	4%
Other wood product manufacturing	4%	1%
Paper manufacturing	15%	13%
Pulp, paper, and paperboard mills	16%	11%
Converted paper product manufacturing	14%	14%
Printing and related support activities	3%	3%
Petroleum and coal product manufacturing	23%	23%
Chemical manufacturing	25%	33%
Basic chemical manufacturing	23%	48%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	25%	43%
Pharmaceutical manufacturing	29%	37%
Paint, coating and adhesive manufacturing	15%	22%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	29%	31%
Plastics and rubber products manufacturing	11%	12%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	11%	11%
Motor vehicle plastic parts manufacturing	3%	18%
Rubber product manufacturing	15%	19%

Table A1 - cont.

Non-metallic mineral product manufacturing	14%	8%
Primary metal manufacturing	14%	14%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	15%	15%
Alumina and aluminum production and processing	23%	23%
Ferrous metal foundries	10%	10%
Non-ferrous metal foundries	4%	11%
Fabricated metal product manufacturing	5%	6%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	16%	17%
Architectural and structural metals manufacturing	3%	5%
Boiler, tank and shipping container manufacturing	9%	12%
Machine shops, turned product and screw, nut and bolt manufacturing	0%	0%
Coating, engraving, heat treatment and allied activities	1%	0%
Machinery manufacturing	16%	11%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	23%	16%
Mining and oil and gas field machinery manufacturing	12%	16%
Sawmill and woodworking machinery manufacturing	13%	6%
Rubber and plastics industry machinery manufacturing	16%	5%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	6%	0%
Metalworking machinery manufacturing	6%	2%
Computer and electronic product manufacturing	11%	11%
Computers and peripheral equipment manufacturing	18%	11%
Communications equipment manufacturing	13%	16%
Telephone apparatus manufacturing	11%	11%
Radio and television broadcasting and wireless communications equipment	19%	27%
Semiconductor and other electronic components manufacturing	9%	5%
Navigational and guidance instruments manufacturing	7%	11%
Electrical equipment, appliance and component manufacturing	18%	18%
Electrical lighting equipment manufacturing	9%	10%
Household appliance manufacturing	9%	9%
Electric equipment manufacturing	28%	18%
Other electrical equipment and component manufacturing	15%	23%
Transportation equipment manufacturing	13%	12%
Motor vehicle manufacturing	22%	22%
Motor vehicle body and trailer manufacturing	5%	4%
Motor vehicle parts manufacturing	17%	17%
Aerospace product and parts manufacturing	22%	15%
Railroad rolling stock manufacturing	18%	36%
Ship and boat building	3%	3%
Other transportation equipment manufacturing	13%	13%
Furniture and related product manufacturing	8%	3%
Miscellaneous manufacturing	9%	6%
Medical equipment and supplies manufacturing	18%	9%

ANNEX: Tables

Table A2

Canadian manufacturers facing competition in main market from multinational enterprises, by industry

	% of manufacturing firms
Manufacturing average	**67%**
Food manufacturing and beverage manufacturing	68%
Food manufacturing	67%
Animal food manufacturing	77%
Fruit and vegetable preserving and specialty food manufacturing	77%
Dairy product manufacturing	73%
Meat product manufacturing	55%
Seafood product preparation and packaging	55%
Bakery and tortillas manufacturing	56%
Beverage and tobacco product manufacturing	82%
Beverage manufacturing	81%
Tobacco manufacturing	-
Textile mills and textile product mills	66%
Textile mills	75%
Textile product mills	61%
Clothing manufacturing	63%
Cut and sew clothing manufacturing	63%
Leather and allied product manufacturing	66%
Wood product manufacturing	48%
Sawmills and wood preserving	-
Veneer, plywood and engineered wood product manufacturing	42%
Other wood product manufacturing	-
Paper manufacturing	81%
Pulp, paper, and paperboard mills	84%
Converted paper product manufacturing	80%
Printing and related support activities	62%
Petroleum and coal product manufacturing	69%
Chemical manufacturing	81%
Basic chemical manufacturing	88%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	88%
Pharmaceutical manufacturing	82%
Paint, coating and adhesive manufacturing	93%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	75%
Plastics and rubber products manufacturing	69%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	69%
Motor vehicle plastic parts manufacturing	82%
Rubber product manufacturing	66%
Non-metallic mineral product manufacturing	66%

Table A2 - cont.

Primary metal manufacturing	65%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	64%
Alumina and aluminum production and processing	45%
Ferrous metal foundries	80%
Non-ferrous metal foundries	69%
Fabricated metal product manufacturing	63%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	62%
Architectural and structural metals manufacturing	63%
Boiler, tank and shipping container manufacturing	59%
Machine shops, turned product and screw, nut and bolt manufacturing	71%
Coating, engraving, heat treatment and allied activities	56%
Machinery manufacturing	76%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	79%
Mining and oil and gas field machinery manufacturing	69%
Sawmill and woodworking machinery manufacturing	69%
Rubber and plastics industry machinery manufacturing	79%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	-
Metalworking machinery manufacturing	75%
Industrial electronics manufacturing	78%
Computers and peripheral equipment manufacturing	89%
Communications equipment manufacturing	82%
Telephone apparatus manufacturing	94%
Radio and television broadcasting and wireless communications equipment	84%
Semiconductor and other electronic components manufacturing	70%
Navigational and guidance instruments manufacturing	75%
Electrical equipment, appliance and component manufacturing	82%
Electrical lighting equipment manufacturing	100%
Household appliance manufacturing	78%
Electric equipment manufacturing	78%
Other electrical equipment and component manufacturing	80%
Transportation equipment manufacturing	68%
Motor vehicle manufacturing	89%
Motor vehicle body and trailer manufacturing	53%
Motor vehicle parts manufacturing	79%
Aerospace manufacturing	66%
Railroad rolling stock manufacturing	73%
Ship and boat building	54%
Other transportation equipment manufacturing	50%
Furniture and related product manufacturing	63%
Miscellaneous manufacturing	60%
Medical equipment and supplies manufacturing	67%

ANNEX: Tables

Table A3

Indirect exporting by Canadian manufacturers, by industry

	% of manufacturing firms	
	Sells product to another Canadian firm that exports product "as is"	Sells product to another Canadian firm that uses it as an input into production for export
Manufacturing average	**23%**	**28%**
Food manufacturing and beverage manufacturing	23%	17%
Food manufacturing	23%	19%
Animal food manufacturing	27%	28%
Fruit and vegetable preserving and specialty food manufacturing	29%	30%
Dairy product manufacturing	26%	15%
Meat product manufacturing	17%	13%
Seafood product preparation and packaging	-	26%
Bakery and tortillas manufacturing	22%	7%
Beverage and tobacco product manufacturing	12%	0%
Beverage manufacturing	13%	0%
Tobacco manufacturing	-	0%
Textile mills and textile product mills	25%	33%
Textile mills	26%	58%
Textile product mills	25%	21%
Clothing manufacturing	14%	2%
Cut and sew clothing manufacturing	11%	2%
Leather and allied product manufacturing	25%	15%
Wood product manufacturing	32%	28%
Sawmills and wood preserving	61%	0%
Veneer, plywood and engineered wood product manufacturing	18%	18%
Other wood product manufacturing	21%	23%
Paper manufacturing	19%	32%
Pulp, paper, and paperboard mills	21%	25%
Converted paper product manufacturing	19%	34%
Printing and related support activities	12%	17%
Petroleum and coal product manufacturing	17%	8%
Chemical manufacturing	23%	24%
Basic chemical manufacturing	31%	46%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	15%	40%
Pharmaceutical manufacturing	34%	22%
Paint, coating and adhesive manufacturing	24%	13%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	22%	19%
Plastics and rubber products manufacturing	33%	50%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	37%	51%

Table A3 - cont.

Motor vehicle plastic parts manufacturing	21%	61%
Rubber product manufacturing	17%	37%
Non-metallic mineral product manufacturing	17%	18%
Primary metal manufacturing	16%	53%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	22%	61%
Alumina and aluminum production and processing	14%	36%
Ferrous metal foundries	7%	50%
Non-ferrous metal foundries	10%	52%
Fabricated metal product manufacturing	26%	35%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	27%	0%
Architectural and structural metals manufacturing	21%	20%
Boiler, tank and shipping container manufacturing	32%	21%
Machine shops, turned product and screw, nut and bolt manufacturing	36%	0%
Coating, engraving, heat treatment and allied activities	7%	0%
Machinery manufacturing	25%	33%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	19%	32%
Mining and oil and gas field machinery manufacturing	29%	14%
Sawmill and woodworking machinery manufacturing	34%	31%
Rubber and plastics industry machinery manufacturing	26%	37%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	17%	12%
Metalworking machinery manufacturing	-	0%
Industrial electronics manufacturing	24%	37%
Computers and peripheral equipment manufacturing	17%	33%
Communications equipment manufacturing	32%	30%
Telephone apparatus manufacturing	47%	59%
Radio and television broadcasting and wireless communications equipment	24%	20%
Semiconductor and other electronic components manufacturing	17%	59%
Navigational and guidance instruments manufacturing	28%	30%
Electrical equipment, appliance and component manufacturing	29%	43%
Electrical lighting equipment manufacturing	19%	6%
Household appliance manufacturing	10%	14%
Electric equipment manufacturing	41%	56%
Other electrical equipment and component manufacturing	26%	54%
Transportation equipment manufacturing	15%	40%
Motor vehicle manufacturing	6%	6%
Motor vehicle body and trailer manufacturing	9%	15%
Motor vehicle parts manufacturing	19%	61%
Aerospace manufacturing	24%	53%
Railroad rolling stock manufacturing	27%	46%
Ship and boat building	0%	0%
Other transportation equipment manufacturing	19%	38%
Furniture and related product manufacturing	14%	7%
Miscellaneous manufacturing	14%	15%
Medical equipment and supplies manufacturing	5%	6%

ANNEX: Tables

Table A4

Investment in production facilities in Canada, by industry (2007–2009)

	% of manufacturing firms		
	Obtained capacity by merger or acquisition	Opened new facility or expanded capacity	Closed an existing facility or contracted capacity
Manufacturing average	9%	25%	11%
Food manufacturing and beverage manufacturing	10%	26%	6%
Food manufacturing	10%	25%	6%
Animal food manufacturing	18%	20%	5%
Fruit and vegetable preserving and specialty food manufacturing	12%	27%	9%
Dairy product manufacturing	6%	29%	6%
Meat product manufacturing	10%	21%	9%
Seafood product preparation and packaging	14%	12%	4%
Bakery and tortillas manufacturing	4%	26%	1%
Beverage and tobacco product manufacturing	13%	40%	5%
Beverage manufacturing	14%	39%	5%
Tobacco manufacturing	-	-	-
Textile mills and textile product mills	9%	19%	17%
Textile mills	12%	17%	18%
Textile product mills	7%	20%	16%
Clothing manufacturing	5%	6%	13%
Cut and sew clothing manufacturing	5%	4%	11%
Leather and allied product manufacturing	3%	22%	16%
Wood product manufacturing	9%	29%	14%
Sawmills and wood preserving	11%	29%	14%
Veneer, plywood and engineered wood product manufacturing	16%	24%	13%
Other wood product manufacturing	6%	31%	14%
Paper manufacturing	16%	17%	20%
Pulp, paper, and paperboard mills	16%	16%	27%
Converted paper product manufacturing	16%	18%	18%
Printing and related support activities	20%	27%	3%
Petroleum and coal product manufacturing	19%	35%	8%
Chemical manufacturing	12%	23%	10%
Basic chemical manufacturing	13%	21%	14%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	6%	21%	20%
Pharmaceutical manufacturing	11%	44%	10%
Paint, coating and adhesive manufacturing	9%	24%	12%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	13%	23%	7%
Plastics and rubber products manufacturing	11%	26%	11%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	10%	28%	9%
Motor vehicle plastic parts manufacturing	13%	24%	28%

Table A4 - cont.

Rubber product manufacturing	13%	15%	11%
Non-metallic mineral product manufacturing	16%	30%	9%
Primary metal manufacturing	10%	24%	11%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	11%	28%	13%
Alumina and aluminum production and processing	9%	14%	9%
Ferrous metal foundries	7%	23%	7%
Non-ferrous metal foundries	11%	27%	11%
Fabricated metal product manufacturing	8%	27%	8%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	12%	18%	19%
Architectural and structural metals manufacturing	6%	34%	4%
Boiler, tank and shipping container manufacturing	12%	36%	13%
Machine shops, turned product and screw, nut and bolt manufacturing	5%	26%	0%
Coating, engraving, heat treatment and allied activities	7%	12%	12%
Machinery manufacturing	8%	25%	18%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	8%	28%	21%
Mining and oil and gas field machinery manufacturing	8%	31%	19%
Sawmill and woodworking machinery manufacturing	22%	9%	3%
Rubber and plastics industry machinery manufacturing	10%	31%	10%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	18%	28%	15%
Metalworking machinery manufacturing	0%	15%	12%
Industrial electronics manufacturing	9%	30%	11%
Computers and peripheral equipment manufacturing	11%	27%	22%
Communications equipment manufacturing	10%	26%	12%
Telephone apparatus manufacturing	6%	22%	17%
Radio and television broadcasting and wireless communications equipment	17%	18%	16%
Semiconductor and other electronic components manufacturing	9%	34%	5%
Navigational and guidance instruments manufacturing	5%	31%	8%
Electrical equipment, appliance and component manufacturing	10%	25%	12%
Electrical lighting equipment manufacturing	0%	13%	18%
Household appliance manufacturing	9%	0%	18%
Electric equipment manufacturing	11%	41%	8%
Other electrical equipment and component manufacturing	12%	21%	12%
Transportation equipment manufacturing	7%	23%	17%
Motor vehicle manufacturing	6%	50%	22%
Motor vehicle body and trailer manufacturing	7%	12%	12%
Motor vehicle parts manufacturing	7%	26%	22%
Aerospace manufacturing	7%	31%	13%
Railroad rolling stock manufacturing	0%	27%	27%
Ship and boat building	3%	8%	8%
Other transportation equipment manufacturing	13%	38%	13%
Furniture and related product manufacturing	1%	18%	11%
Miscellaneous manufacturing	11%	26%	11%
Medical equipment and supplies manufacturing	6%	25%	11%

ANNEX: Tables

Table A5

Investment in production facilities outside Canada, by industry (2007–2009))

	% of manufacturing firms		
	Obtained capacity by merger or acquisition	Opened new facility or expanded capacity	Closed an existing facility or contracted capacity
Manufacturing average	**3%**	**5%**	**4%**
Food manufacturing and beverage manufacturing	2%	3%	1%
Food manufacturing	2%	4%	1%
Animal food manufacturing	-	-	-
Fruit and vegetable preserving and specialty food manufacturing	-	-	-
Dairy product manufacturing	3%	1%	1%
Meat product manufacturing	0%	-	0%
Seafood product preparation and packaging	1%	7%	0%
Bakery and tortillas manufacturing	0%	3%	1%
Beverage and tobacco product manufacturing	1%	2%	4%
Beverage manufacturing	1%	1%	4%
Tobacco manufacturing	-	-	-
Textile mills and textile product mills	4%	5%	5%
Textile mills	2%	9%	7%
Textile product mills	5%	3%	3%
Clothing manufacturing	5%	4%	2%
Cut and sew clothing manufacturing	5%	4%	2%
Leather and allied product manufacturing	0%	11%	10%
Wood product manufacturing	0%	2%	3%
Sawmills and wood preserving	0%	1%	1%
Veneer, plywood and engineered wood product manufacturing	0%	2%	2%
Other wood product manufacturing	0%	2%	-
Paper manufacturing	6%	3%	3%
Pulp, paper, and paperboard mills	9%	3%	10%
Converted paper product manufacturing	6%	3%	2%
Printing and related support activities	1%	-	1%
Petroleum and coal product manufacturing	8%	0%	8%
Chemical manufacturing	4%	9%	6%
Basic chemical manufacturing	7%	15%	16%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	6%	18%	3%
Pharmaceutical manufacturing	2%	8%	3%
Paint, coating and adhesive manufacturing	11%	3%	2%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	1%	7%	5%
Plastics and rubber products manufacturing	3%	6%	4%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	2%	4%	2%
Motor vehicle plastic parts manufacturing	4%	9%	13%

Table A5 - cont.

Rubber product manufacturing	6%	11%	-
Non-metallic mineral product manufacturing	4%	2%	4%
Primary metal manufacturing	6%	5%	7%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	12%	7%	11%
Alumina and aluminum production and processing	5%	5%	5%
Ferrous metal foundries	0%	3%	3%
Non-ferrous metal foundries	0%	4%	3%
Fabricated metal product manufacturing	1%	5%	3%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	1%	-	9%
Architectural and structural metals manufacturing	0%	1%	1%
Boiler, tank and shipping container manufacturing	4%	11%	4%
Machine shops, turned product and screw, nut and bolt manufacturing	0%	-	0%
Coating, engraving, heat treatment and allied activities	3%	3%	1%
Machinery manufacturing	6%	8%	3%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	8%	10%	3%
Mining and oil and gas field machinery manufacturing	4%	7%	1%
Sawmill and woodworking machinery manufacturing	13%	0%	0%
Rubber and plastics industry machinery manufacturing	5%	26%	5%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	4%	5%	5%
Metalworking machinery manufacturing	2%	4%	4%
Industrial electronics manufacturing	7%	8%	8%
Computers and peripheral equipment manufacturing	7%	3%	0%
Communications equipment manufacturing	10%	15%	3%
Telephone apparatus manufacturing	6%	28%	6%
Radio and television broadcasting and wireless communications equipment	17%	17%	4%
Semiconductor and other electronic components manufacturing	8%	4%	11%
Navigational and guidance instruments manufacturing	2%	8%	3%
Electrical equipment, appliance and component manufacturing	4%	10%	5%
Electrical lighting equipment manufacturing	0%	0%	5%
Household appliance manufacturing	0%	0%	18%
Electric equipment manufacturing	7%	11%	1%
Other electrical equipment and component manufacturing	4%	16%	4%
Transportation equipment manufacturing	4%	9%	6%
Motor vehicle manufacturing	6%	6%	17%
Motor vehicle body and trailer manufacturing	3%	5%	1%
Motor vehicle parts manufacturing	4%	12%	8%
Aerospace manufacturing	6%	12%	7%
Railroad rolling stock manufacturing	0%	18%	0%
Ship and boat building	3%	0%	5%
Other transportation equipment manufacturing	6%	6%	13%
Furniture and related product manufacturing	3%	3%	4%
Miscellaneous manufacturing	3%	5%	5%
Medical equipment and supplies manufacturing	5%	3%	3%

ANNEX: Tables

Table A6

Investment in R&D facilities in Canada, by industry (2007–2009)

	% of manufacturing firms		
	Obtained capacity by merger or acquisition	Opened new facility or expanded capacity	Closed an existing facility or contracted capacity
Manufacturing average	**3%**	**8%**	**2%**
Food manufacturing and beverage manufacturing	2%	7%	0%
Food manufacturing	2%	7%	0%
Animal food manufacturing	7%	0%	0%
Fruit and vegetable preserving and specialty food manufacturing	9%	11%	3%
Dairy product manufacturing	0%	15%	0%
Meat product manufacturing	5%	7%	0%
Seafood product preparation and packaging	1%	0%	1%
Bakery and tortillas manufacturing	0%	11%	0%
Beverage and tobacco product manufacturing	0%	6%	0%
Beverage manufacturing	0%	6%	0%
Tobacco manufacturing	-	-	-
Textile mills and textile product mills	5%	8%	3%
Textile mills	5%	5%	5%
Textile product mills	4%	9%	2%
Clothing manufacturing	1%	7%	2%
Cut and sew clothing manufacturing	0%	6%	3%
Leather and allied product manufacturing	0%	5%	3%
Wood product manufacturing	4%	7%	2%
Sawmills and wood preserving	0%	6%	1%
Veneer, plywood and engineered wood product manufacturing	6%	7%	3%
Other wood product manufacturing	6%	8%	1%
Paper manufacturing	3%	3%	3%
Pulp, paper, and paperboard mills	0%	0%	3%
Converted paper product manufacturing	4%	4%	3%
Printing and related support activities	5%	2%	2%
Petroleum and coal product manufacturing	4%	4%	4%
Chemical manufacturing	3%	14%	1%
Basic chemical manufacturing	6%	3%	0%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	6%	15%	5%
Pharmaceutical manufacturing	2%	16%	7%
Paint, coating and adhesive manufacturing	2%	14%	0%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	2%	17%	1%
Plastics and rubber products manufacturing	3%	8%	1%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	2%	8%	1%
Motor vehicle plastic parts manufacturing	13%	6%	4%

Table A6 - cont.

Rubber product manufacturing	3%	8%	3%
Non-metallic mineral product manufacturing	4%	4%	1%
Primary metal manufacturing	6%	5%	1%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	6%	5%	1%
Alumina and aluminum production and processing	5%	0%	0%
Ferrous metal foundries	7%	4%	0%
Non-ferrous metal foundries	4%	10%	0%
Fabricated metal product manufacturing	3%	11%	1%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	1%	12%	0%
Architectural and structural metals manufacturing	5%	15%	0%
Boiler, tank and shipping container manufacturing	6%	16%	0%
Machine shops, turned product and screw, nut and bolt manufacturing	0%	5%	0%
Coating, engraving, heat treatment and allied activities	3%	3%	9%
Machinery manufacturing	5%	9%	2%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	3%	8%	2%
Mining and oil and gas field machinery manufacturing	5%	13%	1%
Sawmill and woodworking machinery manufacturing	13%	0%	0%
Rubber and plastics industry machinery manufacturing	5%	5%	0%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	14%	18%	3%
Metalworking machinery manufacturing	3%	6%	0%
Computer and electronic product manufacturing	5%	12%	6%
Computers and peripheral equipment manufacturing	0%	22%	7%
Communications equipment manufacturing	9%	18%	4%
Telephone apparatus manufacturing	6%	22%	6%
Radio and television broadcasting and wireless communications equipment	15%	14%	6%
Semiconductor and other electronic components manufacturing	7%	18%	4%
Navigational and guidance instruments manufacturing	4%	4%	9%
Electrical equipment, appliance and component manufacturing	3%	15%	4%
Electrical lighting equipment manufacturing	0%	24%	5%
Household appliance manufacturing	9%	0%	0%
Electric equipment manufacturing	3%	14%	7%
Other electrical equipment and component manufacturing	1%	18%	2%
Transportation equipment manufacturing	2%	4%	5%
Motor vehicle manufacturing	6%	22%	0%
Motor vehicle body and trailer manufacturing	1%	2%	5%
Motor vehicle parts manufacturing	2%	1%	8%
Aerospace product and parts manufacturing	0%	12%	4%
Railroad rolling stock manufacturing	0%	9%	0%
Ship and boat building	3%	0%	0%
Other transportation equipment manufacturing	6%	13%	6%
Furniture and related product manufacturing	0%	7%	4%
Miscellaneous manufacturing	1%	6%	6%
Medical equipment and supplies manufacturing	1%	6%	12%

ANNEX: Tables

Table A7

Outsourcing of production and R&D, by industry)

	Production		R&D	
	In Canada	Outside Canada	In Canada	Outside Canada
Manufacturing average	**17%**	**12%**	**10%**	**2%**
Food manufacturing and beverage manufacturing	8%	5%	9%	2%
Food manufacturing	7%	4%	8%	1%
Animal food manufacturing	9%	9%	16%	7%
Fruit and vegetable preserving and specialty food manufacturing	10%	6%	0%	0%
Dairy product manufacturing	9%	2%	8%	5%
Meat product manufacturing	4%	0%	13%	0%
Seafood product preparation and packaging	4%	2%	13%	2%
Bakery and tortillas manufacturing	4%	4%	3%	1%
Beverage and tobacco product manufacturing	13%	6%	21%	10%
Beverage manufacturing	14%	7%	23%	11%
Tobacco manufacturing	-	-	-	-
Textile mills and textile product mills	21%	20%	10%	3%
Textile mills	14%	21%	12%	4%
Textile product mills	25%	19%	9%	2%
Clothing manufacturing	26%	19%	11%	1%
Cut and sew clothing manufacturing	31%	19%	13%	1%
Leather and allied product manufacturing	11%	24%	6%	0%
Wood product manufacturing	8%	4%	11%	2%
Sawmills and wood preserving	9%	0%	13%	0%
Veneer, plywood and engineered wood product manufacturing	8%	0%	5%	0%
Other wood product manufacturing	8%	8%	11%	3%
Paper manufacturing	19%	13%	10%	2%
Pulp, paper, and paperboard mills	9%	7%	23%	6%
Converted paper product manufacturing	22%	14%	7%	2%
Printing and related support activities	17%	5%	6%	2%
Petroleum and coal product manufacturing	4%	12%	8%	8%
Chemical manufacturing	12%	16%	9%	2%
Basic chemical manufacturing	10%	13%	9%	5%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	3%	6%	6%	0%
Pharmaceutical manufacturing	29%	17%	12%	17%
Paint, coating and adhesive manufacturing	5%	5%	3%	0%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	16%	22%	12%	2%
Plastics and rubber products manufacturing	16%	13%	11%	2%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	14%	12%	12%	1%
Motor vehicle plastic parts manufacturing	24%	12%	11%	3%
Rubber product manufacturing	25%	17%	2%	10%

Table A7 - cont.

Non-metallic mineral product manufacturing	9%	9%	7%	3%
Primary metal manufacturing	13%	9%	10%	1%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	6%	7%	12%	1%
Alumina and aluminum production and processing	18%	14%	4%	0%
Ferrous metal foundries	7%	7%	14%	0%
Non-ferrous metal foundries	37%	14%	5%	0%
Fabricated metal product manufacturing	18%	8%	11%	0%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	30%	15%	15%	2%
Architectural and structural metals manufacturing	15%	8%	11%	0%
Boiler, tank and shipping container manufacturing	13%	7%	3%	0%
Machine shops, turned product and screw, nut and bolt manufacturing	17%	5%	11%	0%
Coating, engraving, heat treatment and allied activities	8%	0%	12%	0%
Machinery manufacturing	28%	24%	10%	2%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	32%	34%	7%	0%
Mining and oil and gas field machinery manufacturing	37%	12%	16%	9%
Sawmill and woodworking machinery manufacturing	31%	13%	6%	0%
Rubber and plastics industry machinery manufacturing	5%	5%	0%	0%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	12%	10%	7%	4%
Metalworking machinery manufacturing	21%	14%	16%	3%
Computer and electronic product manufacturing	21%	18%	9%	2%
Computers and peripheral equipment manufacturing	22%	18%	3%	3%
Communications equipment manufacturing	26%	34%	10%	1%
Telephone apparatus manufacturing	33%	44%	11%	0%
Radio and television broadcasting and wireless communications equipment	25%	26%	9%	2%
Semiconductor and other electronic components manufacturing	19%	18%	9%	1%
Navigational and guidance instruments manufacturing	14%	7%	8%	0%
Electrical equipment, appliance and component manufacturing	23%	17%	10%	4%
Electrical lighting equipment manufacturing	13%	21%	8%	0%
Household appliance manufacturing	32%	14%	9%	5%
Electric equipment manufacturing	26%	18%	7%	7%
Other electrical equipment and component manufacturing	20%	16%	15%	3%
Transportation equipment manufacturing	18%	12%	7%	4%
Motor vehicle manufacturing	0%	11%	22%	11%
Motor vehicle body and trailer manufacturing	12%	6%	6%	3%
Motor vehicle parts manufacturing	18%	14%	6%	5%
Aerospace product and parts manufacturing	35%	20%	13%	4%
Railroad rolling stock manufacturing	36%	18%	0%	0%
Ship and boat building	11%	0%	5%	0%
Other transportation equipment manufacturing	13%	25%	6%	0%
Furniture and related product manufacturing	18%	8%	9%	1%
Miscellaneous manufacturing	31%	21%	8%	1%
Medical equipment and supplies manufacturing	32%	26%	6%	2%

ANNEX: Tables

Table A8

Introduction of innovation in manufacturing, by industry (2007–2009)

	% of manufacturing firms			
	Organizational innovation — Introduced new methods of organizing work responsibilities and decision making	Product innovation — Introduced new or significantly improved good	Process innovation — Introduced new or significantly improved methods of manufacturing	Marketing innovation — Introduced new media or techniques for good promotion
Manufacturing average	**39%**	**43%**	**50%**	**20%**
Food manufacturing and beverage manufacturing	35%	38%	46%	20%
Food manufacturing	36%	37%	45%	20%
Animal food manufacturing	61%	43%	43%	34%
Fruit and vegetable preserving and specialty food manufacturing	45%	-	-	23%
Dairy product manufacturing	42%	45%	49%	38%
Meat product manufacturing	33%	30%	41%	15%
Seafood product preparation and packaging	28%	10%	36%	5%
Bakery and tortillas manufacturing	28%	35%	35%	8%
Beverage and tobacco product manufacturing	34%	56%	56%	22%
Beverage manufacturing	33%	-	-	22%
Tobacco manufacturing	-	-	-	-
Textile mills and textile product mills	29%	46%	50%	15%
Textile mills	31%	55%	60%	5%
Textile product mills	27%	40%	44%	21%
Clothing manufacturing	22%	35%	18%	14%
Cut and sew clothing manufacturing	21%	31%	13%	12%
Leather and allied product manufacturing	17%	62%	45%	16%
Wood product manufacturing	34%	34%	52%	19%
Sawmills and wood preserving	30%	32%	50%	18%
Veneer, plywood and engineered wood product manufacturing	48%	26%	50%	16%
Other wood product manufacturing	31%	38%	-	21%
Paper manufacturing	46%	34%	51%	10%
Pulp, paper, and paperboard mills	47%	44%	33%	11%
Converted paper product manufacturing	45%	32%	55%	10%
Printing and related support activities	49%	29%	52%	26%
Petroleum and coal product manufacturing	43%	50%	27%	15%
Chemical manufacturing	47%	48%	50%	17%
Basic chemical manufacturing	47%	43%	41%	12%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	48%	47%	67%	12%
Pharmaceutical manufacturing	53%	59%	50%	30%
Paint, coating and adhesive manufacturing	33%	58%	42%	38%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	51%	47%	52%	13%
Plastics and rubber products manufacturing	46%	58%	59%	24%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	46%	60%	59%	27%
Motor vehicle plastic parts manufacturing	52%	62%	69%	11%

Table A8 - cont.

Rubber product manufacturing	44%	42%	53%	12%
Non-metallic mineral product manufacturing	44%	38%	47%	23%
Primary metal manufacturing	38%	42%	56%	16%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	38%	46%	52%	18%
Alumina and aluminum production and processing	36%	37%	59%	18%
Ferrous metal foundries	40%	30%	56%	7%
Non-ferrous metal foundries	38%	48%	65%	19%
Fabricated metal product manufacturing	38%	30%	50%	16%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	38%	42%	52%	13%
Architectural and structural metals manufacturing	38%	31%	45%	24%
Boiler, tank and shipping container manufacturing	34%	42%	-	19%
Machine shops, turned product and screw, nut and bolt manufacturing	42%	19%	61%	9%
Coating, engraving, heat treatment and allied activities	30%	15%	39%	3%
Machinery manufacturing	37%	57%	51%	16%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	36%	60%	45%	13%
Mining and oil and gas field machinery manufacturing	36%	40%	41%	22%
Sawmill and woodworking machinery manufacturing	44%	50%	50%	13%
Rubber and plastics industry machinery manufacturing	47%	58%	74%	16%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	-	-	-	-
Metalworking machinery manufacturing	35%	-	70%	12%
Industrial electronics manufacturing	42%	62%	49%	34%
Computers and peripheral equipment manufacturing	31%	65%	39%	34%
Communications equipment manufacturing	37%	68%	34%	27%
Telephone apparatus manufacturing	33%	61%	22%	17%
Radio and television broadcasting and wireless communications equipment	39%	73%	48%	22%
Semiconductor and other electronic components manufacturing	44%	59%	59%	38%
Navigational and guidance instruments manufacturing	38%	62%	53%	32%
Electrical equipment, appliance and component manufacturing	39%	56%	56%	24%
Electrical lighting equipment manufacturing	32%	75%	58%	49%
Household appliance manufacturing	50%	73%	64%	41%
Electric equipment manufacturing	35%	47%	51%	14%
Other electrical equipment and component manufacturing	44%	53%	57%	20%
Transportation equipment manufacturing	40%	44%	54%	21%
Motor vehicle manufacturing	50%	44%	72%	39%
Motor vehicle body and trailer manufacturing	31%	48%	42%	26%
Motor vehicle parts manufacturing	41%	39%	60%	19%
Aerospace manufacturing	63%	48%	61%	18%
Railroad rolling stock manufacturing	64%	55%	46%	9%
Ship and boat building	27%	44%	41%	16%
Other transportation equipment manufacturing	19%	44%	50%	25%
Furniture and related product manufacturing	29%	38%	44%	25%
Miscellaneous manufacturing	46%	53%	57%	27%
Medical equipment and supplies manufacturing	-	70%	64%	27%

ANNEX: Tables

Table A9

Types of process innovations introduced by Canadian manufacturers, by industry (2007–2009)

	% of manufacturing firms		
	Introduced new or significantly improved methods of production	Introduced new or significantly improved supporting activities for their processes	Introduced new or significantly improved logistics, delivery or distribution methods
Manufacturing average	**50%**	**31%**	**16%**
Food manufacturing and beverage manufacturing	46%	26%	18%
Food manufacturing	45%	26%	18%
Animal food manufacturing	43%	26%	18%
Fruit and vegetable preserving and specialty food manufacturing	-	36%	23%
Dairy product manufacturing	49%	30%	24%
Meat product manufacturing	41%	25%	12%
Seafood product preparation and packaging	36%	20%	10%
Bakery and tortillas manufacturing	35%	26%	19%
Beverage and tobacco product manufacturing	56%	33%	26%
Beverage manufacturing	-	34%	27%
Tobacco manufacturing	-	-	-
Textile mills and textile product mills	50%	27%	15%
Textile mills	60%	33%	19%
Textile product mills	44%	24%	13%
Clothing manufacturing	18%	12%	8%
Cut and sew clothing manufacturing	13%	11%	8%
Leather and allied product manufacturing	45%	27%	22%
Wood product manufacturing	52%	27%	14%
Sawmills and wood preserving	50%	18%	6%
Veneer, plywood and engineered wood product manufacturing	50%	31%	19%
Other wood product manufacturing	-	31%	16%
Paper manufacturing	51%	33%	15%
Pulp, paper, and paperboard mills	33%	31%	19%
Converted paper product manufacturing	55%	33%	15%
Printing and related support activities	52%	41%	18%
Petroleum and coal product manufacturing	27%	23%	12%
Chemical manufacturing	50%	34%	19%
Basic chemical manufacturing	41%	27%	25%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	67%	39%	26%
Pharmaceutical manufacturing	50%	42%	27%
Paint, coating and adhesive manufacturing	42%	42%	16%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	52%	33%	18%
Plastics and rubber products manufacturing	59%	32%	15%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	59%	31%	14%
Motor vehicle plastic parts manufacturing	69%	57%	20%

Table A9 - cont.

Rubber product manufacturing	53%	28%	18%
Non-metallic mineral product manufacturing	47%	27%	14%
Primary metal manufacturing	56%	34%	17%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	52%	42%	17%
Alumina and aluminum production and processing	59%	36%	23%
Ferrous metal foundries	56%	21%	17%
Non-ferrous metal foundries	65%	24%	10%
Fabricated metal product manufacturing	50%	34%	14%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	52%	34%	13%
Architectural and structural metals manufacturing	45%	46%	24%
Boiler, tank and shipping container manufacturing	-	36%	6%
Machine shops, turned product and screw, nut and bolt manufacturing	61%	21%	6%
Coating, engraving, heat treatment and allied activities	39%	22%	7%
Machinery manufacturing	51%	37%	14%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	45%	35%	11%
Mining and oil and gas field machinery manufacturing	41%	35%	17%
Sawmill and woodworking machinery manufacturing	50%	28%	16%
Rubber and plastics industry machinery manufacturing	74%	47%	31%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	-	-	25%
Metalworking machinery manufacturing	70%	-	11%
Industrial electronics manufacturing	49%	30%	21%
Computers and peripheral equipment manufacturing	39%	46%	30%
Communications equipment manufacturing	34%	26%	24%
Telephone apparatus manufacturing	22%	33%	22%
Radio and television broadcasting and wireless communications equipment	48%	28%	27%
Semiconductor and other electronic components manufacturing	59%	40%	28%
Navigational and guidance instruments manufacturing	53%	26%	12%
Electrical equipment, appliance and component manufacturing	56%	35%	17%
Electrical lighting equipment manufacturing	58%	54%	29%
Household appliance manufacturing	64%	18%	14%
Electric equipment manufacturing	51%	28%	14%
Other electrical equipment and component manufacturing	57%	40%	15%
Transportation equipment manufacturing	54%	33%	17%
Motor vehicle manufacturing	72%	50%	28%
Motor vehicle body and trailer manufacturing	42%	33%	7%
Motor vehicle parts manufacturing	60%	30%	20%
Aerospace manufacturing	61%	48%	33%
Railroad rolling stock manufacturing	46%	46%	0%
Ship and boat building	41%	22%	6%
Other transportation equipment manufacturing	50%	19%	19%
Furniture and related product manufacturing	44%	27%	11%
Miscellaneous manufacturing	57%	34%	22%
Medical equipment and supplies manufacturing	64%	39%	34%

ANNEX: Tables

Table A10

Impact of process innovation on business activities, by industry

	% of manufacturing firms that introduced process innovation		
	Process innovation required change to marketing activities	Process innovation required change to operational activities	Process innovation required change to organizational activities
Manufacturing average	**28%**	**84%**	**51%**
Food manufacturing and beverage manufacturing	31%	86%	45%
Food manufacturing	31%	86%	46%
Animal food manufacturing	-	92%	-
Fruit and vegetable preserving and specialty food manufacturing	-	82%	-
Dairy product manufacturing	13%	90%	-
Meat product manufacturing	-	-	-
Seafood product preparation and packaging	-	-	-
Bakery and tortillas manufacturing	-	93%	-
Beverage and tobacco product manufacturing	-	89%	-
Beverage manufacturing	-	88%	-
Tobacco manufacturing	0%	-	-
Textile mills and textile product mills	27%	77%	45%
Textile mills	13%	80%	43%
Textile product mills	37%	75%	-
Clothing manufacturing	-	-	-
Cut and sew clothing manufacturing	-	-	78%
Leather and allied product manufacturing	9%	86%	37%
Wood product manufacturing	20%	82%	49%
Sawmills and wood preserving	-	-	-
Veneer, plywood and engineered wood product manufacturing	2%	85%	-
Other wood product manufacturing	-	-	-
Paper manufacturing	34%	92%	55%
Pulp, paper, and paperboard mills	-	-	-
Converted paper product manufacturing	33%	94%	57%
Printing and related support activities	37%	84%	56%
Petroleum and coal product manufacturing	18%	-	27%
Chemical manufacturing	26%	88%	37%
Basic chemical manufacturing	-	77%	37%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	25%	92%	51%
Pharmaceutical manufacturing	28%	87%	46%
Paint, coating and adhesive manufacturing	12%	85%	-
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	26%	90%	34%
Plastics and rubber products manufacturing	37%	88%	56%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	41%	91%	58%
Motor vehicle plastic parts manufacturing	33%	95%	-

Table A10 - cont.

Rubber product manufacturing	12%	-	-
Non-metallic mineral product manufacturing	31%	84%	50%
Primary metal manufacturing	28%	81%	37%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	23%	82%	40%
Alumina and aluminum production and processing	-	87%	13%
Ferrous metal foundries	28%	67%	40%
Non-ferrous metal foundries	-	85%	-
Fabricated metal product manufacturing	20%	80%	43%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	13%	-	-
Architectural and structural metals manufacturing	12%	-	-
Boiler, tank and shipping container manufacturing	-	100%	-
Machine shops, turned product and screw, nut and bolt manufacturing	-	81%	-
Coating, engraving, heat treatment and allied activities	-	-	-
Machinery manufacturing	27%	80%	67%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	-	82%	-
Mining and oil and gas field machinery manufacturing	14%	-	-
Sawmill and woodworking machinery manufacturing	24%	83%	59%
Rubber and plastics industry machinery manufacturing	21%	93%	71%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	-	-	-
Metalworking machinery manufacturing	-	82%	80%
Industrial electronics manufacturing	23%	84%	40%
Computers and peripheral equipment manufacturing	-	-	-
Communications equipment manufacturing	28%	80%	39%
Telephone apparatus manufacturing	33%	83%	17%
Radio and television broadcasting and wireless communications equipment	18%	-	37%
Semiconductor and other electronic components manufacturing	32%	87%	-
Navigational and guidance instruments manufacturing	14%	88%	29%
Electrical equipment, appliance and component manufacturing	37%	87%	48%
Electrical lighting equipment manufacturing	63%	95%	28%
Household appliance manufacturing	-	-	-
Electric equipment manufacturing	27%	91%	45%
Other electrical equipment and component manufacturing	-	87%	-
Transportation equipment manufacturing	26%	85%	54%
Motor vehicle manufacturing	14%	93%	57%
Motor vehicle body and trailer manufacturing	35%	88%	51%
Motor vehicle parts manufacturing	19%	83%	56%
Aerospace manufacturing	31%	89%	59%
Railroad rolling stock manufacturing	17%	100%	67%
Ship and boat building	36%	58%	35%
Other transportation equipment manufacturing	-	100%	-
Furniture and related product manufacturing	32%	87%	-
Miscellaneous manufacturing	41%	87%	58%
Medical equipment and supplies manufacturing	-	89%	-

ANNEX: Tables

Table A11

Use of advanced technologies, by industry

	% of manufacturing firms		
	advanced computerized processing, fabrication, and assembly technologies	advanced information integration and control technologies	advanced automated material handling technologies
Manufacturing average	**36%**	**20%**	**16%**
Food manufacturing and beverage manufacturing	20%	16%	19%
Food manufacturing	20%	16%	19%
Animal food manufacturing	23%	15%	11%
Fruit and vegetable preserving and specialty food manufacturing	11%	27%	25%
Dairy product manufacturing	24%	12%	24%
Meat product manufacturing	26%	21%	8%
Seafood product preparation and packaging	9%	9%	9%
Bakery and tortillas manufacturing	11%	11%	17%
Beverage and tobacco product manufacturing	21%	17%	25%
Beverage manufacturing	20%	16%	24%
Tobacco manufacturing	-	-	-
Textile mills and textile product mills	25%	11%	8%
Textile mills	24%	18%	17%
Textile product mills	25%	7%	2%
Clothing manufacturing	20%	11%	9%
Cut and sew clothing manufacturing	20%	10%	10%
Leather and allied product manufacturing	13%	9%	8%
Wood product manufacturing	41%	14%	18%
Sawmills and wood preserving	26%	13%	16%
Veneer, plywood and engineered wood product manufacturing	37%	18%	21%
Other wood product manufacturing	-	13%	18%
Paper manufacturing	23%	18%	16%
Pulp, paper, and paperboard mills	27%	28%	20%
Converted paper product manufacturing	23%	16%	15%
Printing and related support activities	32%	19%	18%
Petroleum and coal product manufacturing	19%	16%	19%
Chemical manufacturing	22%	16%	15%
Basic chemical manufacturing	21%	15%	21%
Resin synthetic rubber and artificial synthetic fibres and filaments manufacturing	29%	40%	11%
Pharmaceutical manufacturing	31%	21%	21%
Paint, coating and adhesive manufacturing	25%	16%	16%
Pesticide, fertilizer and other agricultural chemical manufacturing, soap, cleaning compound and toilet preparation manufacturing, and other chemical product manufacturing	21%	12%	13%
Plastics and rubber products manufacturing	41%	28%	20%
Plastic product manufacturing except motor vehicle plastic parts manufacturing	42%	29%	20%
Motor vehicle plastic parts manufacturing	48%	45%	28%

Table A11 - cont.

Rubber product manufacturing	30%	19%	19%
Non-metallic mineral product manufacturing	28%	23%	30%
Primary metal manufacturing	32%	23%	19%
Iron and steel mills and ferro-alloy manufacturing; steel product manufacturing from purchased steel; non-ferrous metal (except aluminium) production and process	33%	22%	19%
Alumina and aluminum production and processing	36%	36%	27%
Ferrous metal foundries	30%	10%	10%
Non-ferrous metal foundries	27%	28%	20%
Fabricated metal product manufacturing	41%	18%	11%
Forging and stamping; cutlery and hand tool manufacturing; hardware manufacturing; spring and wire product manufacturing; other fabricated metal product manufacturing	40%	21%	19%
Architectural and structural metals manufacturing	46%	21%	7%
Boiler, tank and shipping container manufacturing	42%	32%	9%
Machine shops, turned product and screw, nut and bolt manufacturing	46%	9%	12%
Coating, engraving, heat treatment and allied activities	12%	7%	4%
Machinery manufacturing	45%	24%	11%
Machinery manufacturing except mining and oil and gas field machinery manufacturing; sawmill and woodworking machinery manufacturing; rubber and plastics industry machinery manufacturing; ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing; and metalworking machinery manufacturing	36%	22%	7%
Mining and oil and gas field machinery manufacturing	39%	20%	3%
Sawmill and woodworking machinery manufacturing	57%	13%	16%
Rubber and plastics industry machinery manufacturing	63%	37%	32%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	-	17%	13%
Metalworking machinery manufacturing	73%	33%	25%
Industrial electronics manufacturing	45%	29%	12%
Computers and peripheral equipment manufacturing	19%	20%	8%
Communications equipment manufacturing	46%	15%	9%
Telephone apparatus manufacturing	39%	28%	11%
Radio and television broadcasting and wireless communications equipment	49%	14%	9%
Semiconductor and other electronic components manufacturing	60%	44%	15%
Navigational and guidance instruments manufacturing	42%	27%	5%
Electrical equipment, appliance and component manufacturing	37%	32%	17%
Electrical lighting equipment manufacturing	20%	30%	17%
Household appliance manufacturing	50%	23%	23%
Electric equipment manufacturing	41%	34%	24%
Other electrical equipment and component manufacturing	35%	33%	8%
Transportation equipment manufacturing	46%	25%	18%
Motor vehicle manufacturing	67%	33%	28%
Motor vehicle body and trailer manufacturing	34%	11%	9%
Motor vehicle parts manufacturing	51%	33%	27%
Aerospace manufacturing	60%	33%	21%
Railroad rolling stock manufacturing	55%	27%	9%
Ship and boat building	19%	8%	0%
Other transportation equipment manufacturing	50%	25%	13%
Furniture and related product manufacturing	38%	17%	14%
Miscellaneous manufacturing	50%	20%	20%
Medical equipment and supplies manufacturing	-	20%	19%

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