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Enhancing the Productivity of Small and Medium Enterprises through Greater Adoption of Information and Communication Technology

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Executive Summary

Many economic observers agree that Canada's productivity would be enhanced if businesses increased their investment in information and communications technology (ICT). The research indicates this productivity can be enhanced at three levels. At the most basic level, equipping staff with computers and software increases firm and national productivity. OECD research, for example, indicates that every 10 percent increase in the number of staff using computers increases productivity in a firm by 1.3 percent. At a second level, connecting computers in networks and drawing on more than one type of technology can drive productivity even higher. Statistics Canada research indicates that firms using a greater number of advanced technologies experienced higher productivity gains. But the most significant benefit of ICT adoption can be its enabling of profound transformation of the firm through business process or organizational change or both. Research published by the US Census Bureau indicates that for ICT investment to be worthwhile, firms need to invest financial and managerial resources to changing production processes and training workers. Other research by Statistics Canada shows the positive impact of educated workers in effecting productivity gains from ICT.

While the research is not as widespread, it does indicate that small- and medium-sized enterprises (SMEs) can achieve productivity gains from the appropriate adoption of ICT. But SMEs, which are significant employers in Canada, tend less than larger businesses to draw on this productivity enhancement. The evidence indicates that this lower rate of investment is limiting productivity potential for SMEs. The challenge for industry stakeholders and public policy is to find ways to ensure that SMEs are making appropriate investments in ICT by identifying the barriers that can be removed or reduced.

In this paper we assess the lower adoption of ICT by Canadian SMEs through a systems view of innovation. The use of ICT to enhance productivity and improve innovation is driven by the supply of and demand for ICT linked by the financing of ICT. The strength of each element is driven by levels of pressure and support. All support and no pressure leads to a lazy environment in which innovation and productivity growth do not occur. Similarly, all pressure and no support leads to a harsh environment just as inimical to innovation and productivity.

On the supply side, we conclude that while Canadian SMEs are generally well supported by providers of ICT goods and services, many have not been completely persuaded of the benefits of ICT investments. A significant percentage of SMEs indicate that they have difficulty in seeing quantifiable benefits from their ICT investment. Other barriers include

the lack of specialized staff by SMEs and challenges in integrating new investments with existing systems. The challenge for suppliers is to increase their capability of reaching SMEs in a cost effective manner to communicate the benefits of ICT and to help implement solutions. In addition, greater competitive pressure among suppliers through smarter regulation of the industry would enhance the capability of ICT suppliers to meet the needs of Canadian customers, including SMEs.

On the demand side, the under education of managers and owners in SMEs is inhibiting support for ICT adoption. This is especially important given the research evidence that more complex use of ICT along with sophisticated management practices drives the benefits of ICT on productivity. Ongoing investments in post secondary education and creative solutions to the training needs of current managers and owners will help address this challenge. SMEs also have to overcome the challenge of limited scale. Smaller SMEs do not have the complexity of business operations for maximum benefit from ICT solutions. In addition, they lack the financial resources to implement solutions. As with ICT suppliers, greater competitive intensity among SMEs should increase their incentive to adopt ICT.

On the financing side, we recognize the potential benefits of special tax credits aimed at assisting SMEs adopt ICT being proposed by some. However, we think non-financial barriers are more critical and that tax reform needs to focus instead on reducing overall rates on business investment.

For SMEs the key skills implications are for the continued development of programs by colleges, universities, and others to deliver training and education that enhances managers' and owners' skills to assess the costs and benefits of ICT in their businesses. Longer term, a general increase in the educational attainment of Canadians will be a positive development for the management of SMEs.

For ICT suppliers the key implications for jobs and skills are for greater effort and more customized solutions to educating SMEs on the costs and benefits for ICT. The nature of SMEs means that technology suppliers will play the significant role in increasing ICT adoption. Most smaller SMEs have no choice but to outsource their ICT capabilities. Capitalizing on the potential of greater adoption of ICT by SMEs will require suppliers to create more jobs in selling and project management. But suppliers will also need to develop more economical ways to reach SME potential customers and to develop more standardized implementation processes. This may entail greater use of Internet enabled selling and more packaged solutions.

Adoption of Productivity Enhancing Information and Communication Technology by Small and Medium Enterprises in Canada

Information and Communications Technology (ICT) – typically defined as computers, communications equipment, and software – has led to radical changes in how businesses operate and, in fact, have enabled the creation of whole new industries. Many economists have credited the adoption of ICT as a key driver to productivity growth and wealth enhancement over the last several decades. Canada, like other countries, has adopted ICT and has reaped the productivity and wealth creation rewards. However, against the United States, Canadian businesses have invested less in ICT and this has been a contributor to the widening productivity and prosperity gap that has opened up between the two countries.¹

Within Canada, small and medium enterprises (SMEs) – defined by Statistics Canada as businesses with fewer than 20 employees (small) and between 20 and 99 (medium, although the upper limit is taken to 499 for manufacturing firms) – have lagged larger businesses in adopting ICT. Given the employment importance of SMEs in the Canadian economy – estimated at 64 percent of total employment² – and given the lower rate of investment in ICT there are undoubtedly significant benefits to be gained from greater adoption of ICT by SMEs.

The Information and Communications Technology Council engaged the Institute for Competitiveness & Prosperity to help deepen understanding of the issues related to the adoption of ICT by SMEs in Canada.

Impact of ICT on Productivity in the Economy Overall

The empirical evidence in Canada and elsewhere on the importance of ICT to an economy's productivity growth is solid. ICT has direct benefits on productivity as we see from

the evidence of how computer usage affects staff productivity. Its benefits are more pronounced with more complex implementation of several technologies and networks to connect them³. Finally, ICT has its most profound impact when it accompanies organizational and business process change. The research suggests that greater and more complex adoption of ICT will drive greater productivity growth in a firm. To be sure, much of the research is at the economy level or across larger organizations. However, as we shall see, there is evidence that SMEs in Canada have achieved productivity benefits from the introduction of ICT.⁴

Use of ICT by staff increases productivity. In a multi-country study, the OECD⁵ found that for every 10 percent increase in the number of staff using computers productivity increases by 1.3 percent. Further, it found that a company that has incorporated a series of ICT factors would have a 12 percent higher productivity level than one that has not adopted any ICT features. Dan Sichel and Stephen Oliner from the US Federal Reserve Board found that the sharp decline in the relative prices of computers and semi-conductors and the increased importance of their output to the US economy largely explained the acceleration in multi-factor productivity growth experienced through the 1990s.⁶ Multi-factor productivity growth refers to the productivity improvements that cannot be attributed specifically to improving the productivity of workers or the productivity growth resulting strictly from investments in more physical capital. It measures the joint effects of many factors including research and development (R&D), the new technology itself, economies of scale, managerial skill, and organization of production.⁷ Sichel and Oliner also found that IT was an important driver of labour productivity growth in the same period. Kevin Stiroh from the Federal Reserve Board of New York found that through the 1970s,

¹ Institute for Competitiveness & Prosperity, Report on Canada 2007, *Agenda for Canada's prosperity*, p. 27.

² 2005 results. Industry Canada, *Small Business Statistics*, July 2006, pp. 12-13.

³ Clearly the risks are higher with more complex applications and there are many unsuccessful installations – but the research indicates that on the whole more complex installations can generate greater benefits.

⁴ Much of the research reviewed in this section is based on Andrew Sharpe, "The Relationship between ICT Investment and Productivity in the Canadian Economy: A Review of the Evidence", Centre for the Study of Living Standards, December 2006, pp. 46-68.

⁵ OECD, *Does ICT Use Matter for Firm Productivity?*, May 2006

⁶ S.D Oliner and D.E. Sichel "The resurgence of growth in the late 1990s: is information technology the story?" *Journal of Economic Perspectives*, Vol. 14, No. 4, pp. 3-22.

⁷ US Department of Labor, Bureau of Labor Statistics, *Multifactor Productivity*, www.bls.gov/mfp/peoplebox.htm#Q01

1980s, and 1990s those manufacturing firms who had invested more intensively in ICT experienced an acceleration in productivity growth of at least one percentage point higher than those who had invested less.

Two Bank of Canada economists, Hashmat Khan and Marjorie Santos⁸ assessed the impact of the three components of ICT – computer hardware, computer software, and telecommunications equipment – to Canadian labour productivity growth. They estimated that more than a quarter of Canada's labour productivity growth over the period 1996-2000 was the result of greater investment in ICT.

Statistics Canada economists Phillip Armstrong, Tarek Harchaoui, and colleagues reached similar conclusions about the importance of ICT in explaining labour and multi-factor productivity growth through the 1980s and 1990s.⁹

The Conference Board of Canada showed an increasing contribution from IT capital stock to labour productivity growth over the three periods, 1978-90, 1991-95, and 1996-99.¹⁰

International Monetary Fund economists, Roberto Cardarelli and M. Ayhan Kose, found that an important part of the Canada-US gap in productivity growth between 1995 and 2000 was in the ICT-producing sector and in sectors that were intensive users of ICT capital, especially wholesale and retail trade and finance insurance and real estate (FIRE).¹¹ They observed that Canada's non-ICT producing manufacturing industries performed as well as, if not better than, their US counterparts. Greater ICT adoption is clearly part of realizing Canada's prosperity potential.

It should be noted that a leading US economist, Robert Gordon of Northwestern University, has been arguing that the strong relationship between ICT investment and productivity has broken down. He observes that both IT spending and productivity growth in the US have slowed recently – IT capital investment has not yet recovered to its pre-2000

rates and US productivity growth has slowed since the second quarter of 2004. He is also concluding that the impact of computers is starting to plateau. Harvard economist Andrew McAfee who reports Gordon's views on his blog site¹² argues that the pace of economic transformation from ICT will not slow down – that ICT benefits may be showing up in other productivity measures resulting from “designing and deploying new structures for accomplishing work – data repositories, business processes, and entire ‘organizational blueprints’”. We discuss these more complex impacts below.

Adoption of computer networks and more than one type of ICT drive labour productivity growth.

Many studies point to the importance of networking computers together – a more complex use of ICT. US Census Bureau economists B.K. Atrostic and Sang Nguyen conducted firm level research to conclude that computer networks have positive and significant links with labour productivity in both the United States and Japan.

John Baldwin and his colleagues at Statistics Canada have assessed the impact of ICT on productivity growth in Canada through several studies.¹⁴ They have found a positive relationship between economic performance and advanced technology adoption. Those manufacturing establishments showing above-median labour productivity growth were more likely to be using at least one advanced technology. The highest productivity growth plants were using a greater number of technologies. Firms whose market share had increased over a decade tended to realize productivity growth through the use of ICT.

Baldwin and Sabourin from Statistics Canada measured the relationship between use of advanced technologies (the authors took 26 advanced technologies in the 1998 Survey of Advanced Technologies and developed three aggregates – software, network communications, and hardware technologies) and firm-level productivity growth in the manufacturing sector over the 1988-97 period.¹⁵ They concluded that advanced technology is positively related

⁸ H. Khan M. Santos, “Contribution of ICT use to output and labour productivity growth in Canada”, Bank of Canada, Working Paper No 2002-7.

⁹ Phillip Armstrong, Tarek Harchaoui, Chris Jackson, Faouzi Tarkhani, “A Comparison of Canada-U.S. Economic Growth in the Information Age, 1981-2000: The Importance of Investment in Information and Communication Technologies,” Statistics Canada, Analytical Studies Branch – Research Paper Series 11F0027MIE No. 001.

¹⁰ Conference Board of Canada, *IT and New Economy: The Impact of Information Technology on Labour Productivity and Growth*, Economic Services Group, November, 2000.

¹¹ Roberto Cardarelli and M. Ayhan Kose, “Economic Integration, Business Cycle, and Productivity in North America”, IMF Working paper WP/04/138, International Monetary Fund, August 2004, pp18-19.

¹² See Blog entry for December 15, 2006, “IT and productivity growth: it was nice while it lasted?” at <http://blog.hbs.edu/faculty/amcafee/>

¹³ B.K. Atrostic and Sang Nguyen, “Computer investment, computer networks and productivity”, Discussion paper, CES 05-01, US Census Bureau, Center for Economic Studies (2005)

¹⁴ J.R. Baldwin, T.M. Harchaoui and F. Tarkhani, “The Importance of Information Technology: A Canada-U.S. Comparison,” *ISUMA: Canadian Journal of Policy Research*, Volume 3, No. 1, Spring 2002, pp, 48-53.

to relative labour productivity performance. But they also found that use of only hardware or software had no statistical relationship with relative productivity performance. The use of network communications technology drove relative labour productivity performance.

This is not to say that there are widespread potential networking applications across SMEs – but rather the research points to more benefits accruing from more complex uses of ICT.

ICT investment can be an important catalyst for a “profound transformation of the firm”. ICT investments that drive or are accompanied by changes in organizational practices and business processes can have significant improvements in productivity. Professors Erik Brynjolfsson and Lorin Hitt¹⁶ argue that, for ICT investment to be worthwhile, firms need to invest financial and managerial resources to change production processes and train workers. ICT has supported significant reductions in inventory and been an important enabler of just-in-time production and development of supply chains. In this way computers and the Internet are “general purpose technologies” like the electric motor or telegraph. Most of the economic value is not from the technology itself, but from the power to enable advances in business processes such as operations, logistics, and organization. The application is more crucial than the technology.

Stanford economist Paul David¹⁷ compared the impact of ICT with earlier transforming technologies such as electricity. Both technologies disrupted existing business practices and required fundamental change in the way firms operated. In addition, the more substantial benefits of the electric motor were not harnessed until there had been advances in electrical generators and transmission. These factors help explain why productivity gains were so difficult to detect in the early years of the introduction of computers to the economy – and the acceleration of their measured impact once businesses transformed their operations and strategies to take full advantage of ICT. A study by the US National Research Council found that information technology promoted important restructuring and strategic

changes within existing US service industries and in fact created new industries as well as changing inter-industry relationships.¹⁸ The widespread use of IT in service industries disrupted employment patterns and changed production processes. Workers’ knowledge has become a much more important factor in firm performance.

Wulong Gu and his colleagues¹⁹ at Statistics Canada found a positive relationship between educated workers, IT intensity, and productivity growth which suggests a positive interaction between skills and IT in driving labour productivity growth. They also found that multi-factor productivity growth was an important contributor to overall productivity growth through the 1981-2000 period. This indicates that organizational improvements had some bearing on the productivity growth experience in the Canadian economy.

The work by Atrostic and Nguyen, cited above, also indicated that the impact of computer networks on labour productivity in new US manufacturing plants in 1997 was 12.4 percent while the impact of computer intensity was 5.1 percent. The impact of computer networks on plants of all ages was not significant while computers themselves still had a positive and significant impact. Thus, the benefits of technology are enhanced in firms that have more up-to-date equipment in general.

Dirk Pilat from the OECD concluded that ICT use and related organizational changes contributed 20 percent of Canada’s GDP growth over the 1990-95 period and 16.5 percent between 1995 and 2002.

While much of the research cited here is not specific to SMEs, it is safe to conclude that changing management processes and relying on greater worker knowledge can be an important contributor to the successful adoption of ICT by SMEs.

¹⁵ J.R. Baldwin and D. Sabourin (2001) “Impact of the Adoption of Advanced Information and Communication Technologies on Firm Performance in the Canadian Manufacturing Sector,” Statistics Canada, Analytical Studies Branch – Research Paper Series 11F0019MIE, No. 174, 2001.

¹⁶ Erik Brynjolfsson and Lorin Hitt (2000) “Beyond Computation: Information Technology, Organizational Transformation and Business Performance,” *Journal of Economic Perspectives*, Vol. 14, No. 4, p. 23-48.

¹⁷ Paul A. David, “Understanding Digital Technology’s Evolution and the Path of Measured Productivity Growth: Present and Future in the Mirror of the Past”, in E. Brynjolfsson E. and B. Kahin (eds.) *Understanding the Digital Economy: Data, Tools and Research*, MIT Press, Cambridge, 2000.

¹⁸ National Research Council, *Information Technology in the Service Sector: A Twenty-First Century Lever* (Washington, DC), 1994.

¹⁹ Wulong Gu and Weimin Wang (2004) “Information technology and productivity growth: Evidence from Canadian industries,” in Dale Jorgenson, ed. *Economic Growth in Canada and the United States in the Information Age* Research Publications Program, Research Monograph, Industry Canada, Cat. No C21-26/2-2004.

The Impact of ICT on the Productivity of SMEs

While SMEs lag their larger counterparts in the adoption of ICT, there are success stories. An Internet search reveals a range of successful ICT applications by SMEs, for example,

- Restaurant owners use electronic dashboards to track inventories, track order times for multiple establishments, monitor workers in real time, and adjust menus more quickly in response to shifting demand.²⁰
- Vancouver-based 1-800-Got Junk achieved growth through sophisticated software allowing call centre operators to pinpoint customers' exact locations and schedule a pickup. Customers can log into the company's Web site to schedule an appointment with considerable cost savings. The company also developed its own proprietary administrative and accounting software (Junkware) and an intranet system linking all franchise partners and employees (JunkNet) to download daily schedules, post sales and expenses and to allow head office to handle payables, receivables, payroll, and up-to-date balance sheets²¹.
- Blue Falls Manufacturing, an Alberta manufacturer of portable hot tubs and spas, purchased a 3-D rapid-prototyping system that allowed the company to use computer-aided design (CAD) software to create full-sized plastic prototypes of jets, controls and other spa parts. Using 3D modeling, the company was able "virtually" to test variations in seating positions, jet configurations and equipment placement. Developing their own prototypes in-house gave the company better control over quality and significantly reduced the time required to bring new products to market. The new system has since resulted in the development of several patented applications, including one for a new jet.²²
- Soapstone Artists of Sanikiluaq, Nunavut designed and launched its own Web site to offer its popular carvings directly to customers who pay good prices for quality work, whether the customer is the general public or a business wanting to resell the products. The Web site is e-enabled, allowing customers to purchase products with credit cards and to arrange shipping.²³
- Compugen, a medium-sized systems integrator and IT solution provider, implemented e-procurement to link its

internal inventory and pricing system with those of its suppliers to access their suppliers' inventory and pricing information through their ERP systems. Customers and suppliers are linked to Compugen's system through the eMerge web portal. When an order is created, it enters Compugen's legacy ERP system for fulfillment. From there, the supplier receives the order and a confirmation on the shipping status is sent to the customer. Information regarding freight costs is factored into the price of the goods ordered in order to eliminate unexpected costs.²⁴

These examples indicate that SMEs can benefit from a range of ICT applications – from the simplest Web-based selling to more complex e-procurement linking inventory and pricing systems.

SMEs who have adopted ICT have experienced the kinds of productivity growth consistent with the findings of the empirical research across the economy. It is important to remember that productivity is the result of increased output from a given level of labour and capital inputs. Productivity growth is not simply the results of efficiency. It can be the result of generating higher sales or margins or both from an existing business.

In its 2004 report, *Net Impact Canada IV*, the Canadian e-Business Initiative (CeBI) reported its findings on the impact of ICT on SMEs' productivity. Its research indicated the positive impact of ICT adoption, specifically Internet business solutions, on revenue growth, costs of goods sold reduction, and administrative costs reduction. More specifically CeBI found²⁵ that:

- Revenue growth from adoption of Internet business solutions was 8.5 percent. This result was fairly robust ranging between 6 and 10 percent across different company sizes and industry sectors (retail vs wholesale vs manufacturing). Nearly two thirds of Internet business solution adopters agreed that attracting new customers was a cause of this revenue growth while a third agreed that increasing buying frequency from existing customers increased revenues and a third agreed that increasing volume from existing customers increased revenue. Less than 10 percent agreed that increasing prices was the cause of revenue growth.

²⁰ Robert Atkinson and Andrew McKay, *Digital Prosperity*, The Information Technology and Information Foundation, March 2007, p. 30

²¹ Industry Canada Web site, http://strategis.ic.gc.ca/epic/site/mfbs_gprea.nsf/en/lu00060e.html

²² Ibid., http://strategis.ic.gc.ca/epic/site/mfbs_gprea.nsf/en/lu00061e.html

²³ Government of Canada Innovation in Canada Web portal, <http://innovation.ic.gc.ca/gol/innovation/stories.nsf/veng/ss01097e.htm>

²⁴ *E-procurement Case Studies: Another Tool in the Toolbox*, Conference Board of Canada, 2004, p. 33. Downloaded from http://www.cebi.ca/Public/Team1/Docs/e-procurement_report_june_2004.pdf

²⁵ Canadian e-Business Initiative, *Net Impact Canada IV*, 2004, pp. 9-14. Available at www.cebi.ca/Public/Team1/net_impact_english.pdf

- Cost of goods sold fell 1.8 percent although this result varied by company size (companies with 100 to 500 employees experienced greater reductions than companies with fewer than 50 employees) and by sector (retailers tended to have lower reduction in cost of goods sold than wholesalers and manufacturers). Some groups – small retailers and manufacturers – reported slightly higher costs of goods sold. CeBI concluded that internet business solutions adoption had a more favourable impact on larger SMEs because of greater leverage from purchasing power and the reduction of communications and coordination costs across multiple locations for wholesaler and manufacturers.
- Sales, general, and administrative (SG&A) costs fell on average by 2.6 percent with more positive results increasing with company size – SMEs with more than 100 employees reduced SG&A costs by 4.5 percent; firms with 50 to 99 employees reduced SG&A costs by 1.8 percent, and firms with fewer than 50 employees reduced SG&A by 1.4 percent. These reported reductions were the net effect – taking into account increased IT expenditures.

Taken together, the CeBI results indicate that revenue growth is a much more significant part of productivity growth for SMEs than reduction in costs (Exhibit 1). However, cost reduction is more important to larger SMEs. CeBI modeled the net profits of a small- and medium-sized

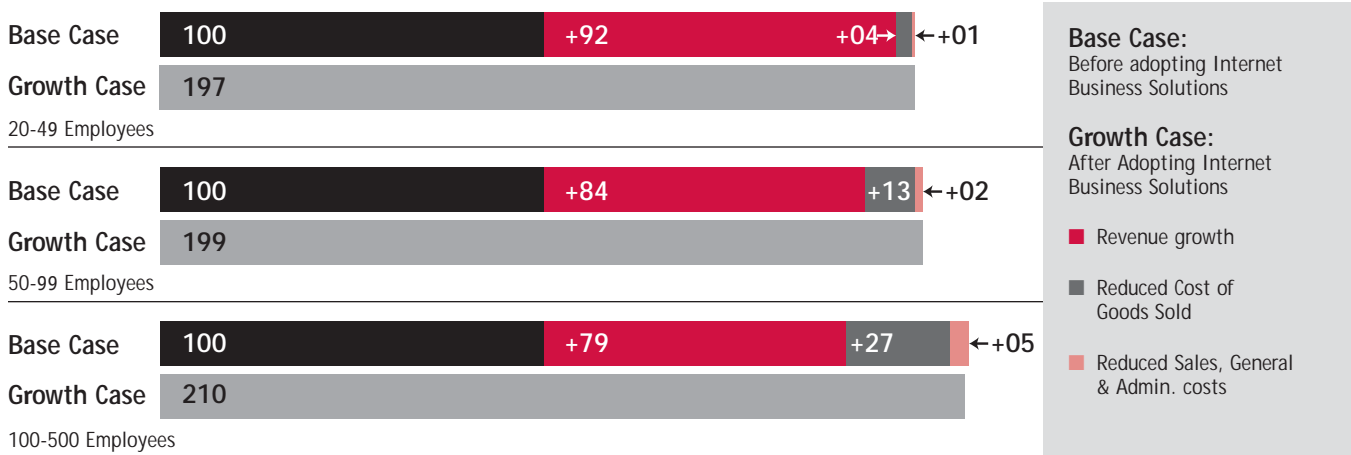
business under a base case before adoption of Internet business solutions and a growth case after adoption. Net profit doubled – but cost reductions were more important for businesses with 100 to 500 employees than for those with 50 to 99. Cost reductions were less important to businesses with 20 to 49 employees.

In summary, ICT has been shown to improve productivity of SMEs – and the evidence indicates that this productivity enhancement comes from greater effectiveness in generating revenues from the existing base and less from reducing unit costs. It also indicates that for SMEs costs reductions are less important to productivity growth and that greater scale is necessary to achieve these cost reductions.

A study conducted by CIBC found that small firms with a high level of web connectivity saw their revenues rise 2.25 times faster than firms with no web connectivity. The study concluded that “increased connectivity and the adoption of e-commerce enabling technologies work to improve and strengthen customer relationships, enhance information availability and exchange, improve the company’s image, and, in some cases, level the playing field with large corporations.”²⁶ The study did not address impact on costs through greater connectivity. However, the CeBI work referred to above does indicate that SMEs adopting ICT show higher profits – meaning that revenue increases exceeded cost increases.

Exhibit 1 Revenue growth is the key driver to SME productivity enhancement among SMEs adopting Internet business solutions; but cost benefits are important to larger SMEs

Impact on Net Profit of SMEs from adoption of Internet Business Solutions by Company Size



Source: Based on Canadian e-Business Initiative, Net Impact Canada IV, 2004

²⁶ CIBC Small Business, “Secrets to Small Business Success” 2004, p. 3. Available at www.cibc.com/ca/pdf/sb-secrets-for-success-en.pdf

SMEs Lag in Adoption of ICT

Most research indicates a lower adoption of ICT by SMEs. Statistics Canada's *Survey of Electronic Commerce and Technology* (SECT) is a key source of information in this regard. In both basic and more advanced uses of ICT, smaller firms are less likely to incorporate them into their business model. (Exhibit 2) Although the gap in usage of basic applications such as PCs, e-mail, and the Internet has been declining, it has widened or held steady among more advanced applications, such as using a company's own Web site, selling online, and purchasing online.

Evidence in the health care sector indicates the importance of enterprise size on ICT adoption. A 2003 study by Industry Canada indicates that hospitals' average IT expenditures per clinical full-time employee (FTE) rise with the size of the hospital. For example, the largest hospitals (with average annual operating expense exceeding \$300 million) spent \$4,500 per clinical FTE in IT in 2002. The smallest hospitals (operating expense below \$75 million) spent \$2,400.²⁷ But this is not a purely Canadian pattern. In its paper assessing the under investment by Canadian firms in ICT, the Centre for the Study of Living Standards cited other empirical evidence from Australia, Italy, and the UK that SMEs are less likely to adopt ICT.²⁸

While Canada's economy has a greater proportion of smaller firms compared to the United States, this difference is not a key factor in explaining Canada's overall lower investment in ICT. In the same paper, the Centre for the Study of Living Standards estimated that the higher proportion of SMEs in Canada (based on the 60 percent of Canadian paid workers in firms with fewer than 500 employees versus the 51 percent of US workers in 2002) accounts for between 1.6 and 2.8 percentage points of the 43.7 percent Canada-US gap in ICT investment per worker. Similarly, this higher proportion accounts for 2.6 to 4.5 points of the 70 percentage point difference in ICT investment as a percentage of GDP.²⁹

In summary, SMEs tend less to invest in ICT than larger firms and a higher proportion of Canada's economy is accounted for by SMEs. This under investment by Canadian SMEs limits their own productivity performance, and by extension, the productivity performance of the Canadian economy. This under investment by SMEs in ICT is the result of various elements in the pressure and support they face for adopting these productivity enhancing technologies.

²⁷ Industry Canada (2003), *Key Indicators on ICT Infrastructure, Use and Content*, p. 36.

²⁸ Centre for the Study of Living Standards, *What Explains the Canada-US ICT Investment Gap?*, December 2005, Ottawa, pp. 85-87.

²⁹ *Ibid.*, pp. 88-89.

Exhibit 2 Smaller firms tend less to adopt basic and advanced ICT applications

		2000	2001	2002	2003	2004	2005
Use of PCs	Small	79%	82%	84%	86%		
	Medium	98	96	97	98		
	Large	100	98	100	99		
	Small – Large gap	(21)	(16)	(16)	(13)		
Use of e-mail	Small	56	62	68	71		
	Medium	85	89	90	93		
	Large	98	96	99	96		
	Small – Large gap	(42)	(34)	(31)	(25)		
Use of the Internet	Small	59	68	73	76	79	79
	Medium	87	91	92	94	96	96
	Large	97	94	99	97	99	98
	Small – Large gap	(38)	(26)	(26)	(21)	(20)	(19)
Website	Small	21	24	27	29	32	33
	Medium	55	57	62	66	69	71
	Large	65	74	77	77	79	82
	Small – Large gap	(44)	(50)	(50)	(48)	(47)	(49)
Purchase online	Small	16	20	29	35	40	40
	Medium	30	33	47	50	59	63
	Large	51	52	57	61	62	68
	Small – Large gap	(35)	(32)	(28)	(26)	(22)	(28)
Sell online	Small	6	6	7	6	7	6
	Medium	10	12	13	14	12	10
	Large	23	15	16	16	13	16
	Small – Large gap	(17)	(9)	(9)	(10)	(6)	(10)
High speed access	Small	33	46	56	64		
	Medium	34	57	71	77		
	Large	68	84	84	94		
	Small – Large gap	(35)	(38)	(28)	(30)		

Note: 2004, 2005 results not readily available for certain applications.

Source: Statistics Canada, Survey of Electronic Commerce and Technology, reports for 2000 to 2005

ICT Adoption and Pressure and Support

Assessment of the reasons for SMEs' under investment in ICT needs to be informed by a systematic view of innovation. The "innovation system" is based on the interaction of three elements – the supply of innovation, the demand for innovation, and the link between them, financing of innovation. The strength of each element is driven by levels and balance of support and pressure. Each element needs to have support to make its task easier but also pressure to provide incentives to move ahead. (Exhibit 3) All support and no pressure creates a cushy and lazy environment inimical to innovation and upgrading while all pressure and no support creates a harsh and barren environment, equally inimical to innovation and upgrading.

The **supply of innovation** includes the activities and resources dedicated to increasing the stock of innovation. *Support* for the supply of innovative ICT includes the availability in the Canadian market of ICT solutions and qualified people to market and implement these solutions. High quality supply is also driven by the *pressure* from the beneficial impact of competition between suppliers of ICT here in Canada.

The **demand for innovative ICT** benefits from the *support* from managers and owners who are skilled enough to understand the benefits of ICT to their organizations, without necessarily having deep technical expertise. *Pressure* on the demand side comes from competition between SMEs and from sophisticated customer demand for SMEs to adopt ICT.

In **financing of innovative ICT**, the important considerations are the *support* from tax treatment of investments and the *pressure* from investors requiring adequate returns from SMEs making ICT investments.

It is this pressure and support in each element of the innovation system that link the three and ensure ongoing upgrading of capabilities. If one element lacks the necessary pressure or support, then the whole system will not perform to its potential. Having an imposing strength in one element will not make up for weakness in another. A robust supply or availability of ICT, but with weak demand, will mean lower adoption of ICT and lower productivity performance among SMEs. This is a system in which the chain is only as strong as the weakest link. Public policy related to ICT adoption by SMEs needs to be built on assessment in each of the areas – and should seek to fill gaps, where appropriate.

Supply of Innovative ICT

The evidence indicates that suppliers of ICT have been able to reach out to SMEs and support them in its introduction – although some research is less positive on this factor. In the area of competitive pressure, the recent Telecommunications Policy Review Panel indicates that excessive regulation of ICT has reduced the pressure for suppliers to innovate and meet customer needs.

Support from suppliers of ICT goods and services.

Available information indicates that Canadian SMEs have access to as wide a range of ICT products as in the United States. Comparing the membership of the Information and Technology Association of Canada with the list of ICT suppliers in the Fortune 1000 reveals no significant gaps in availability of leading products and services. To assess the availability of people who can assist SMEs in implementing ICT solutions we turn to cluster employment data.

Exhibit 3 Pressure and Support drive all three elements of the Innovation System
The Innovation System



The organizations and individuals who support the implementation of ICT can be seen in the size of certain sub-clusters in the “business services” cluster.³⁰ Drawing on US data from Michael Porter’s Harvard-based Institute for Strategy and Competitiveness and comparable Canadian data from the Institute for Competitiveness & Prosperity, we see that in Canada for 2004 there were 2.76 employees across the three relevant sub-clusters – computer programming, computer services, and management consulting – for every 100 in the labour force. In the United States there were 2.45 in these sub-clusters. (Exhibit 4)

It should be noted that many leading suppliers of ICT products and services are headquartered in US centres. Based on Porter’s research into clusters, this closer proximity may be benefiting US SMEs more than in Canada. Existing data can only point to similar quantity of suppliers – not the quality of the interaction.

Results from Statistics Canada’s *Survey of Electronic Commerce and Technology* suggest that few SME managers and owners are unaware of the benefits of e-commerce. Only 8 percent of respondents in small firms (fewer than 20 employees) in 2003 indicated that uncertainty about the benefits was a barrier to their adoption of e-commerce.³¹ To be sure, this percentage falls to 2 percent for large firms. Nevertheless, this provides some indication that ICT suppliers have successfully communicated the benefits of technology.

In its study for the Information Technology Association of Canada (ITAC), IDC Canada³² found that a “large percentage” of business managers from SMEs (with employment up to 999) held positive views on the impact of ICT on their

business. More specifically, 82 percent agreed that the “senior executives in their firm see ICT as critical to their business success”. Fully 77 percent agree that “ICT investments will significantly improve productivity in their firm over the next 5 years”. And 65 percent agreed that “previous ICT investments have clearly produced the expected return on investment”.

This high level of awareness and reported good experience with ICT indicate that suppliers of ICT goods and services are providing a good level of support to SMEs.

Yet SMEs have not been completely persuaded of the benefits of ICT investments. In its study for ITAC, IDC Canada found that among SMEs with relatively low spending on ICT, fully 43 percent indicated that “difficulty in seeing quantifiable ICT benefits/ROI” represented a barrier to adopting ICT solutions. Even among relatively high investors in ICT, 32 percent indicated seeing quantifiable benefits as a barrier.

The two other most significant barriers identified in the IDC Canada study were “lack of staffing resources” and “lack of integration with existing systems”.

Other evidence points to improvement opportunities for ICT suppliers. In its *Net Impact Canada IV* report, CeBI concluded from its review of survey and focus group data that,

“...SMEs reported that they did not perceive there to be a shortage of available trusted advisors. Examination of focus group comments indicated though that many found their “trusted” advisor from friends and family and that they were effective for simple implementations. More problematic were the concerns expressed

Exhibit 4 Canada has slightly more employees per capita than the US in sub-clusters that can provide ICT support

Sub-cluster	Canada		United States	
	2002 employment (000)	% of total employment	2004 employment (000)	% of total employment
Computer programming	95.0	0.77	991.3	0.88
Computer services	100.8	0.82	539.2	0.48
Management consulting	<u>194.7</u>	<u>1.17</u>	<u>1,222.1</u>	<u>1.09</u>
ICT-related Business Services sub-clusters	340.4	2.76	2,752.6	2.45

Source: Institute for Competitiveness & Prosperity and Institute for Strategy and Competitiveness, Harvard Business School

³⁰ For background on the concept of traded clusters and the employment in these clusters in Canada and the United States, see Institute for Competitiveness & Prosperity, Working Paper 5 *Strengthening structures*, July 2005, pp. 17-29.

³¹ Anthony Noce and Catherine Peters, “Barriers to Electronic Commerce in Canada: A Size of Firm and Industry Analysis”, Industry Canada, p. 10.

³² IDC Canada, “Does ICT Matter to SMBs in Canada?”, Available at <http://itac.ca/PolicyandAdvocacy/06OctSMBExecutiveSummary.pdf>

by some participants that they were often faced with the choice between expensive consulting companies or less established and less dependable vendors.”³³

In summary, support for the supply of ICT to SMEs would be enhanced if suppliers strengthened their selling effort to provide more information on the economic benefits of ICT and worked alongside customers to identify and implement specific solutions.

Competitive pressure on suppliers. With respect to competitive *pressure* among suppliers of ICT products and services, we are aware of no evidence that suggests that competitive intensity is any more or less prevalent than in other sectors of the Canadian economy. However, our research indicates that the general lack of this pressure, relative to the US, accounts for some of Canada’s productivity and prosperity gaps.

One of Canada’s key challenges is to create an environment in which companies can and must innovate and commercialize – and this applies to suppliers of ICT products and services. If business leaders in these areas do not face the same competitive intensity as their US peers they will be less effective in creating favourable supply conditions for the adoption of ICT by our SMEs. More effective suppliers will also increase customer sophistication – raising expectations and demands by SMEs which in turn will enhance pressure among suppliers, and so on in a virtuous circle.

In 2006, the Telecommunications Policy Review Panel recommended a significant change in how that part of ICT is regulated and implementation of these recommendations should increase competitive pressure among affected suppliers.

The Panel was appointed to “review Canada’s telecommunications policy framework and recommend on how to modernize it to ensure that Canada has a strong, internationally competitive telecommunications industry.” One of its specific mandates was to make necessary recommendations on changes to its regulatory framework.

In summary, the Panel concluded that “it is time for significant changes in Canada’s current policy and regulatory approaches... [Its] proposals seek to accelerate the pace of deregulation of competitive telecommunications markets and will rely more on market forces to achieve Canada’s economic goals.”

We concur with the Panel that the rapid adoption of Internet Protocol (IP)-based networks, broadband and wireless technology, and by the convergence of previously distinct

information and communications technologies is revolutionizing the telecommunications market. This transformation is making it clear that the current regulatory approach is outdated. This current approach starts with the presumption that telecommunications services should be regulated unless the CRTC forebears regulation. Instead, as the Panel recommends, policy ought to be informed by the principle that services should not be regulated unless there is compelling evidence that market forces will unlikely achieve telecommunications policy objectives within a reasonable time period and that the costs of regulation do not exceed its benefits.

The Panel recommended that the onus be on the CRTC to establish the existence of significant market power by a service provider rather than starting with the assumption that such power exists and ought to be curtailed through regulation. It may be that in the past telephone companies were natural monopolies whose actions needed to be restricted. This is certainly no longer the case. In general, regulatory bodies restrict competition, not enhance it, and we think the Panel has made a persuasive case that Canada’s current approach to regulating telecommunications is no exception. As Don McFetridge of Carleton University has argued, in a January 30, 2004 brief to the CRTC, “It is seldom the case, perhaps never the case, that inhibiting competition increases competition.”

The Panel’s recommendations also remove barriers to future innovation in the telecommunications sector by recommending that downstream transmission, discretionary, and retail services be free from the presumption of regulation. Instead, these should be unregulated and open to customer or competitor challenges to uncompetitive behaviour for adjudication on their merits.

In summary, the panel’s report represents an important opportunity to enhance the pressure among suppliers of ICT products and services. There is every reason to believe that a more competitive and innovative supplier base will benefit SMEs and should have a positive effect on their adoption of appropriate ICT.

Demand for Innovative ICT

The key factors affecting demand of ICT by SMEs are the under education of Canada’s managers, particularly in SMEs, the lack of scale in SMEs which may preclude positive returns on initial investments, and the lack of competitive pressure stimulating adoption.

³³ *Net Impact Canada IV*, p. 21

Under educated Canadian managers. Canadian managers have lower educational attainment overall than their US counterparts³⁴; only 32 percent of our managers possess a university degree versus 48 percent of US managers (Exhibit 5). Our research indicates that productivity increases significantly with the attainment of university degrees, especially graduate degrees.³⁵ While Canada compares very well with OECD countries, including the United States, in attainment of post secondary diplomas and degrees, a key challenge is in raising attainment of university-level degrees. It is also important to ensure that more Canadians are graduating from high school to avoid severe isolation from the work force and that more high school graduates consider post secondary education at the college level to ensure they have relevant skills.

Within Canada, managers in firms with fewer than 20 employees are only 67 percent as likely to have university degrees as managers in firms with more than 500 employees. For firms with 20 to 99 employees this likelihood rises to 75 percent; and firms with 100 to 500 employees are 90 percent as likely as firms with more than 500 employees to have a university degree.

If the link between education and innovation can be drawn, it is quite apparent why we are less demanding of innovation in Canada. The more educated managers are – whether or not it is in management or technical disciplines – the more likely they are to think innovatively and strategically and to operate more effectively. Our lower education level of human capital resources means that we are less able to compete in a technology-based knowledge economy, as well as to serve sophisticated and demanding customers in the domestic and global marketplaces.

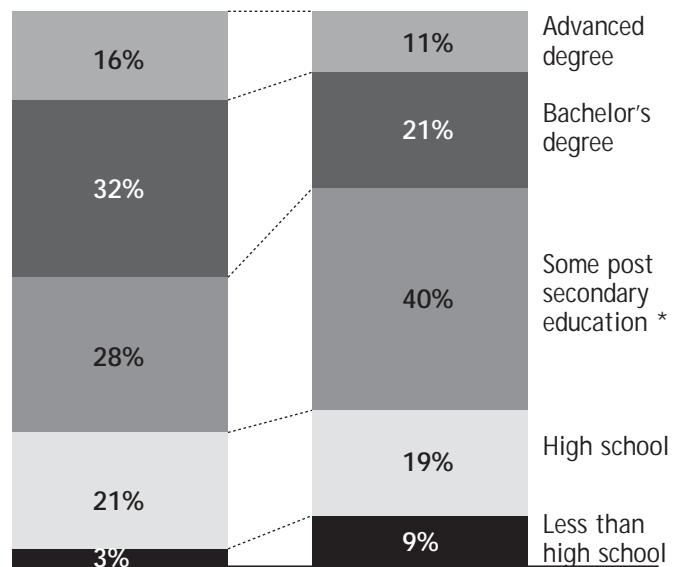
The complexity of new technologies alone would necessitate a higher level of education to understand the benefits of ICT and to implement specific solutions. But the research also points to other complexities in ICT. First, as we have seen, ICT can achieve more benefits when a variety of solutions are implemented – not just one element of ICT. Second, ICT solutions work better when complemented by significant organizational change.

To the extent that SME managers are more educated in any discipline, we would expect a higher rate of adoption. And where adoption had been attempted we would expect a higher success rate.

In its study “Secrets to Small Business Success”, CIBC found that a high level of education plays an important role in determining the level and growth of small business revenues. Small firms run by individuals with at least post-secondary education achieved a revenue increase about two and a half times more than those run by individuals with less than high school education. The study concluded that “higher education may work to increase the ability of an entrepreneur to cope with problems and seize opportunities.”³⁶

In summary, interest in and successful adoption of ICT by some SMEs is limited by the capabilities of their owners and managers. Educational and training programs provided by colleges, universities, and others can supplement these skills gaps. As discussed above, ICT suppliers can help fill this gap through selling efforts aimed at educating SME

Exhibit 5 Canadian managers are less well educated than their US counterparts
Managers' educational attainment, average 1997-2004



* includes individuals who did not complete post secondary education and those who completed “a certificate (including a trade certificate) or diploma from an educational institution beyond the secondary level. This includes certificates from vocational schools, apprenticeship training, community college, CEGEP and school of nursing. Also included are certificates below a Bachelor's degree”, Statistics Canada definition.

Source: Institute for Competitiveness and Prosperity based on Statistics Canada, Labour Force Survey, and U.S. Bureau of Labor Statistics, Current Population Survey

³⁴ According to Statistics Canada, management occupations “are primarily concerned with carrying out the functions of management by planning, organizing, co-ordinating, directing, controlling, staffing, and formulating, implementing or enforcing policy, either directly or through other levels of management. Supervising is not considered to be a management function.” Available at: <http://stds.statcan.ca/english/soc/1991/soc91-class-search.asp?cretaria=A>

³⁵ Institute for Competitiveness & Prosperity, Report on Canada 2007, *Agenda for Canada's prosperity*, March 2007, p. 33

³⁶ CIBC “Secrets to Small Business Success”, p. 2.

managers and owners of technology benefits and through greater implementation support.

Lack of economies of scale in SMEs. Another factor reducing the demand for ICT by smaller firms is the lower economic benefit to them from this adoption. Larger firms tend to have more locations and differing operations – this complexity lends itself to greater benefits for larger firms. An empirical study of US firms³⁷ points to much stronger productivity gains among firms using ICT to reduce the number of hierarchical levels in the organization. Work done by the Australian Productivity Research Commission³⁸ relates the number of business locations, a proxy for size and complexity, with computer usage in a number of industry sectors.

SMEs who don't have the same organizational, logistical, and strategic complexity as larger businesses will not have the same return on investment from adopting ICT unless the cost of applications and solutions can be scaled down for SMEs. Further research aimed at identifying costs differences based on firm size would shed light on this issue.

SMEs are less likely to use advanced management practices. In its *Survey of Electronic Commerce and Technology*, Statistics Canada asks respondent managers if they have in place, or have introduced in the last three years, eight management practices that have been indicated in previous surveys to be potential contributors to firm growth. Results indicate, not surprisingly, that larger firms are more likely to

use these management practices than medium-sized firms. Small firms are least likely to use any of the practices (Exhibit 6).

While some may disagree with the importance of the management practices selected by Statistics Canada, the results confirm that SMEs have less complex and sophisticated management practices than larger firms. This likely indicates less complex organizations and business models – thereby reducing the benefits of ICT relative to larger firms. In addition, it indicates less sophisticated management which is less likely to implement ICT solutions in their organization. Either way, the evidence indicates less support for the demand for ICT among SMEs.

Another aspect of limited scale is the inability of smaller firms to hire dedicated staff to support ICT adoption. In its study for ITAC, IDC Canada found that fully 32 percent of firms with 20 to 49 employees had no in-house ICT staff. Among firms with 50 to 99 employees, 24 percent had no ICT staff. For firms with 100 to 499 employees, 16 percent had no ICT staff. Only 5 percent of firms with more than 500 employees had no ICT staff.

The scale challenge for SMEs is more significant in Canada than in the US as the number of employees per SME in 2004 in Canada was 6.4 compared to 11.6 in the US.³⁹

In summary, a key challenge for ICT adoption by SMEs is their lack of scale. Smaller SMEs lack the scope of opportunities for effective use of ICT. In addition, they are simply

Exhibit 6 Small- and medium-sized firms are less likely to use selected management practices
% of private sector firms using selected management practices by size, 2004

Management practice	Small	Medium	Large
Organizational structures	35.3%	67.8%	75.6%
Employee feedback services	11.4	34.7	50.3
Mentoring or coaching programs	14.5	36.6	50.3
A written marketing strategy or plan	17.0	45.7	57.0
Written policy, strategy or plan for managing growth	14.7	40.6	48.9
Written policy, strategy or plan for the commercialization of intellectual property	5.9	19.9	30.7
Written policy, strategy or plan for succession management	9.1	28.4	42.8
Written policy, strategy or plan for risk management	9.8	31.7	49.0

Source: Louise Earl, "Are Small Businesses Positioning Themselves for Growth? A Comparative Look at the Use of Selected Management Practices by Firm Size", Statistics Canada, 2006, Table 3.

³⁷ T.F. Bresnahan, E. Brynjolfsson and L.M. Hitt (2002) "Information Technology, Workplace Organization, and the Demand for Skilled Labour: Firm-level Evidence," *Quarterly Journal of Economics*, 117, P339-376.

³⁸ Australia Productivity Research Commission (2004), *ICT Use and Productivity: A Synthesis from Studies of Australian Firms*, retrieved from <http://www.pc.gov.au/research/crp/ictuse/>.

³⁹ Industry Canada, *Key Small Business Statistics*, July 2005 and US Census Bureau, *Statistics of U.S. Businesses*, 2004

not large enough to afford hiring their own ICT expertise. Part of the solution is to strengthen the technical knowledge of SME managers; but a greater part of the solution is likely to come from suppliers' sales and support capabilities. They need to find cost effective ways to reach SMEs and to help them in implementing solutions.

Lack of pressure to adopt ICT. The other key element of demand is the presence of competitive and customer pressures to adopt ICT. As we discussed above, Canada generally lacks the beneficial effects of this pressure. But several pieces of evidence point to a lack of pressure for SMEs to demand more ICT solutions.

Research conducted in *Net Impact Canada IV* explored motivations by SMEs for Internet business solutions. On the one hand respondents agreed most that the "opportunity to be more competitive" was their reason for adopting Internet business solutions. However, less than half agreed that a reason for adoption was "our customers wanted it". And less than a third indicated that the "pressure from our competition" was a reason for adopting Internet business solutions. (Exhibit 7)

Statistics Canada's *Survey of Electronic Commerce and Technology* also provides some evidence that SMEs face less pressure to demand ICT solutions. When asked to identify the reason why their organization does not buy or sell goods over the Internet, the most important reasons given are "goods or services that you produce do not lend themselves to conducting Internet transactions". This reason

is selected most often by respondents in small, medium, and large companies. But, it is cited less in small and medium enterprises than in large ones – and so is not likely a key factor in the lower rate of e-commerce adoption by SMEs. The second most selected reason is "prefer to maintain current business model". In a sense this reflects lack of pressure to adopt e-commerce. This lack of pressure represents the largest gap between large and small businesses. Fully 36 percent of respondents in small businesses and 33 percent in medium businesses selected this reason – versus 23 percent in large businesses (Exhibit 8).

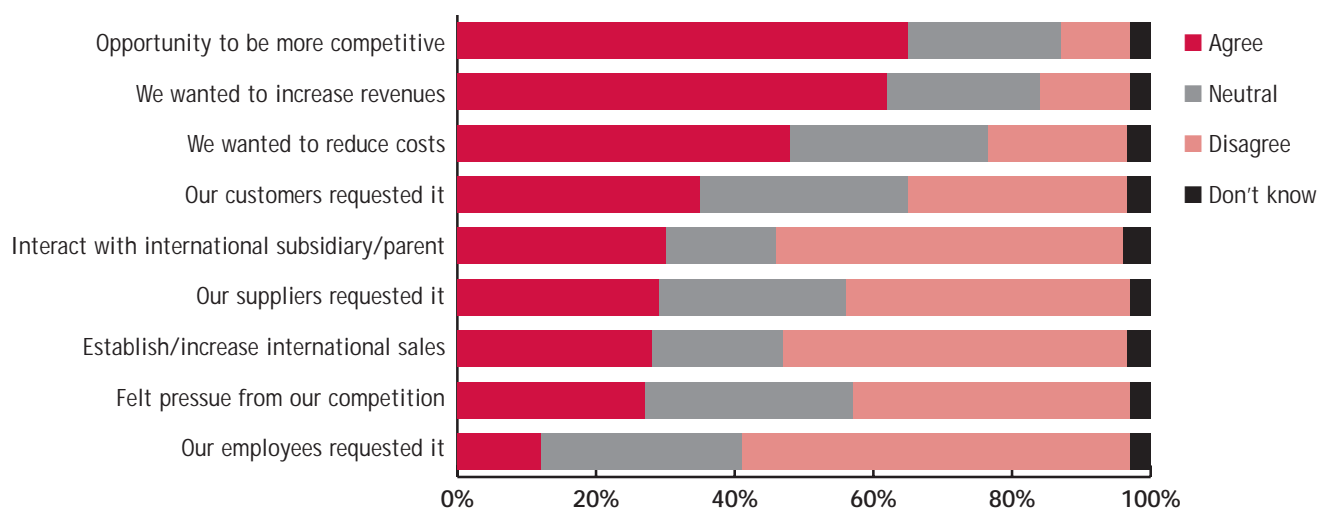
Financing of ICT

The linkage of supply and demand is the financing of innovative ICT. As we have seen, SMEs do not have the benefit of economies of scale and so financial considerations may be more important to their decisions. However, the evidence indicates these are not the critical challenges constraining SMEs in adopting ICT.

In the previously cited study by Statistics Canada, managers and owners of small businesses were no more likely to indicate that "development and maintenance costs are too high". In fact, 13 percent of small business respondents agreed that this was a reason compared to 16 percent in medium-sized businesses, and 17 percent in large businesses.

In *Net Impact Canada IV* CeBI explored the reasons why SMEs had not adopted Internet business solutions. The reason "We cannot afford them" ranked seventh of ten reasons

Exhibit 7 Pressure from customers and competitors are less important reasons for adopting Internet business solutions
Reasons for Adopting Internet business solutions (Agree/Disagree) by Small Medium Enterprise managers and owners



Source: Canadian e-Business Initiative, Net Impact Canada IV, 2004, Figure 4, p. 8

tested. While just over 20 percent of non adopters agreed that this was a reason, nearly twice as many disagreed.⁴⁰

As a way to stimulate ICT adoption by SMEs, some have recommended special tax credits for SMEs to adopt ICT. The Telecommunication Policy Review Panel recommended the introduction of an ICT adoption tax credit targeted at small and medium-sized industries. More specifically these tax credits would be designed to encourage investments in ICT assets, including computers, communications equipment, software and computerized manufacturing equipment, and expenses related to ICT adoption, including training, organization change and process re-engineering.

No doubt these are worthy objectives. As we have seen in this paper, research by the Institute for Competitiveness & Prosperity and others has consistently shown that Canada's productivity is impaired by businesses' under investment in machinery, equipment, and software. The Panel received impressive submissions by experts pointing to under investments by Canadian businesses, specifically in ICT. Like the Panel, we are persuaded that we need to find ways to address this under investment. And tax measures are part of the solution. But the key tax challenge facing Canada is reducing the marginal effective tax rate on business investment overall. Canada's governments tax new business investment at a rate higher than in any other developed economy. The elimination of the federal capital tax in the 2006 budget and the acceleration of federal capital cost

allowances in 2007 were welcome improvements. But more needs to be done, particularly in reducing corporate tax rates, eliminating provincial capital taxes, and harmonizing all provincial sales taxes with the federal GST. We are concerned that new tax credits will reduce the affordability of these broader measures.

Tax credits aimed at stimulating business investment in research and development do not appear to have improved Canada's poor record in this area. The Report of the Technical Committee on Business Taxation chaired by Jack Mintz, for example, recommended that tax policy to stimulate innovation should focus on lowering overall rates thereby improving the environment for business investment.

Any review of tax policy in Canada needs to assess the long-term impact of the favourable treatment of small business. As pointed out by tax experts, Jack Mintz and Duanjie Chen,

"This policy can encourage investment by small business but in the end has a perverse result in penalizing their growth, as companies that expand their profitability and lose the benefits of preferred tax and regulatory regimes. Federal and provincial authorities need to examine more carefully the widening gap between small business tax rates and those applied to companies with more than \$5 million in capital"⁴¹

Exhibit 8 Small and medium businesses are more likely to prefer to maintain their current business model than to adopt e-commerce
Barriers to E-Commerce by size of firm, 2003

Barrier	Small	Medium	Large	Small – Large gap
Goods and services do not lend themselves well to Internet transactions	44%	48%	53%	(9)
Prefer to maintain current business model	36	33	23	+13
Customers not ready	9	16	20	(11)
Suppliers not ready	4	8	14	(10)
Lack of skilled employees	11	8	8	+3
Concerns about competitors analysing information	7	10	11	(4)
Available Internet is too slow	5	6	2	+3
Uncertain about the benefits	8	6	2	+6
Security concerns	17	19	22	(5)
Development and maintenance costs too high	13	16	17	(4)

⁴⁰ *Net Impact Canada IV*, p.19.

⁴¹ Duanjie Chen and Jack Mintz, "Business Tax Reform: More Progress Needed, *CD Howe Institute e-brief*, June 2006, p. 5.

Key Conclusions and Public Policy Implications

Based on this diagnosis of the situation regarding the adoption of ICT by SMEs, some policy prescriptions can be identified for further consideration.

In the supply of ICT to SMEs:

- Public policy needs to ensure that the supply sector of ICT – goods manufacturers and service suppliers – is vibrant. Our analysis indicates that employees in the sub-clusters related to this sector are present in proportions similar to the US economy. But some observers conclude that some shortcomings exist in the development of quality and trustworthiness among suppliers to SMEs. Human resource analyses need to identify the skills level in this area to determine improvement opportunities that will support greater adoption of ICT by SMEs, thereby improving Canada's productivity and innovation performance. Among the skills required are building and maintaining customer relationships, training and education, and problem solving.
- The enhancing of competitive pressure among suppliers should be encouraged. In the paper we review the recommendations of the Telecommunications Review Panel and we conclude that its recommendations to reduce regulations are sound. The Panel found that the current regulatory regime is hindering the development of innovation enhancing competition in this important sector of our economy. Individuals and groups with the responsibility to develop public policy related to SMEs should review the Panel's recommendations and consider supporting them. They should also monitor other opportunities for deregulation – inter-provincial barriers, for example, – from the perspective of identifying improvement opportunities in the innovation in the supply of ICT to SMEs.

In the demand of ICT by SMEs:

- Provincial and federal governments should continue their efforts to strengthen post secondary education in Canada so that more of our managers and workers have post-secondary education, particularly from university. It is an unassailable conclusion in a knowledge economy that more highly skilled owners, managers, and employees are critical to global and local success. The evidence indicates that application of ICT is more than simply buying PCs. Productivity enhancing adoption of ICT can involve application of more than one technology and is accompanied with changes to organizational structures and production processes. Implementation of these changes requires skilled human resources and the evidence indicates this is a challenge for Canadian business in general and for SMEs in particular.

- Organizations responsible for skills policy and provision need to identify further opportunities for programs to strengthen the skill level of current SME managers and owners. Increasing educational attainment of younger Canadians still in the educational system will pay long-term dividends, but creative ways to work with post secondary institutions to strengthen the management and e-essential technical skills of those currently in the labour force, including small business owners and managers, need to be found. In management, the types of skills would likely include financial evaluation of ICT applications, human resource planning, and strategy. Relevant e-essential technical skills would likely include spreadsheet and word processing applications, and basic understanding of the potential from web applications and networking. Future research needs to deepen the understanding of the precise management and technical skills required for successful ICT adoption by SME owners and managers. We did not assess the existence or quality of existing programs, but would encourage human resource policy individuals and groups to ensure that such programs exist and that they are evaluated for success.
- Local ICT cluster development initiatives across Canada need to determine ways to increase the understanding of ICT benefits among SME managers and owners. Outreach programs by suppliers and other stakeholders should be developed to develop broader and deeper understanding of the benefits from ICT investment.
- The competitive intensity faced by SMEs should not be overlooked. As we discuss in this paper, there may be opportunities to strengthen competition in sectors supplying ICT to SMEs. It is likely that SMEs themselves would benefit from greater competition to encourage adoption of ICT. Further research should be conducted to identify the SME-intensive sectors which currently have structures in place to stultify competition. Provincial governments can explore reduction of barriers to inter-provincial trade – thus expanding market opportunities for SMEs and enhancing the competitive pressure they face. The recently signed BC-Alberta Trade, Investment, and Labour Mobility Agreement is a good example. Among other things, it opens up municipal and provincial government procurement to suppliers in both provinces. It ensures that occupational standards in one province applies in the other and eliminates local presence requirements.

In the financing of ICT adoption by SMEs:

- We do not agree that special tax incentives should be put in place to encourage ICT adoption by SMEs. Our research points to non-financial factors as the critical barriers to overcome. To be sure, there is some evidence that an SME may not have the scale to make the economic case for adopting ICT. In our judgment, the need to reduce Canada's overall tax rates on business investment is a higher priority for increasing Canada's productivity.

Canada's productivity gap versus the United States indicates that we are not reaching our full economic potential. This is problematic for our generation and for generations to follow. Among the many factors that can help close this productivity gap, the evidence indicates that increasing our investment in ICT can play a role. Canada's economy is characterized by many small and medium enterprises and the evidence is clear that they invest less in ICT than their larger counterparts. To the extent we can find public policy and industry-based initiatives to provide the support and pressure for SMEs to develop required managerial and technical skills and to invest in appropriate ICT we will help Canada achieve its prosperity potential.

The Information and Communications Technology Council (ICTC) is a non-profit sectoral council dedicated to creating a strong, prepared and highly educated Canadian ICT industry and workforce. ICTC is a catalyst for change, pushing for innovations that will provide labour market intelligence, life-long professional development and quality education and training for the Canadian ICT industry, educators, governments and the ICT workforce. We forge partnerships that help develop the quantity and quality of ICT professionals needed to improve Canada's position as a leader in the global marketplace.

To achieve its goals, ICTC focuses on four areas that are proven building blocks of a healthy, forward-looking sector:

- **Skills Definition** – defining the skills required to be a professional in the ICT sector.
- **Labour Market Intelligence** – providing up-to-date statistics and analyses of human resource developments in the ICT sector.
- **Career Awareness** – providing programs and tools to explore the career possibilities in Canada's ICT sector.
- **Professional Development** – dedicated to continuous learning for ICT workers so they can maintain and improve their skills sets and increase their opportunities within the sector.

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