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Information and communication technology use: Are small firms catching up?

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Mark Uhrbach and Bryan van Tol

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Summary

Small enterprises have reduced the gap between themselves and large enterprises in the use of basic technology such as PCs, e-mail and Internet. However, the next challenge for small firms will be to try to close new gaps that have appeared with advanced technology.

This paper examines Information and Communication Technology (ICT) adoption in small and large firms and the technology gaps that exist between them.

The latter half of the 1990s and the beginning of the new millennium marked the start of an economic revolution fuelled by the widespread business use of the Internet and other computer-based technologies. At one point, many people felt that if firms did not embrace the new technology and completely revamp their purchasing and selling strategies they would be left by the wayside.

The concern that small firms – this paper uses ‘firms’ and ‘enterprises’ interchangeably - would not be able to compete in this environment was a very real one, as new technologies were first adopted by large firms. This situation opened up a gap between small and large firms.

Initially, incorporating many ICTs was a challenge for small firms because of the cost of infrastructure and the inability to adjust business plans accordingly. However, recently, small firms have shown an ability to adopt basic technologies because of the growing ease of installation and lack of financial investment that is necessary to implement them.

The use of more complex technologies such as websites, Intranets and Extranets continues to be dominated by large firms. Large firms continue to add more functionality to their websites as they try to process transactions over the Internet. Advanced e-commerce such as selling online is also dominated by large firms because of the infrastructure that is necessary to conduct on-line sales.

Basic technologies: Small firms catching up

In today's highly advanced world, PCs, e-mail and the Internet have now become fundamental and basic technologies for the majority of firms. The gap between large and small firms using these technologies has narrowed over the past four years. Large firms have universally embraced these technologies while small enterprises have increasingly adopted them as they became more affordable and accessible.

Firms of all sizes have been able to make use of these technologies because of their functionality and ease of use. These basic technologies require relatively few resources, either financial or human, to implement while they provide the basis for e-commerce.

Overall, in 1999, 82% of private sector enterprises were using PCs, workstations, or terminals. By 2002, this had only risen to 86%. Such a slow rate of growth over this period would suggest that adoption of these technologies is already widespread. The percentage of small firms using PCs increased from 79% to 84% while the rate of use for medium and large firms did not grow over this period.

The use of e-mail by private firms increased substantially between 1999 and 2002. This was due largely to the prevalence of computer use and the increased ease of access. In 1999, 53% of enterprises were using e-mail. By 2002, this had increased to 71%.

The gap between the percentage of small firms using e-mail and large firms using e-mail continued to close. While only 56% of small enterprises used e-mail in 2000¹, by 2002, this had increased to 68%. In contrast, by 2000, large firms had almost universally adopted e-mail.

The Internet has recently become a common business tool that is a necessary precursor for engaging in e-commerce. The percentage of private sector enterprises connected to the Internet has risen from 53% in 1999 to 76% in 2002.

Again, small firms are starting to close the gap with large firms in regard to this basic technology. However, this may only be because the large firms have no room for growth now that virtually all large firms are using the Internet. Nonetheless, Internet use among small firms jumped from 59% in 2000 to 73% in 2002.

High-Speed Internet: Adopted quickly by large firms²

The move towards high-speed Internet or broadband technology has been quite noticeable across the private sector between 2000 and 2002. During this period, broadband Internet usage overall jumped from 35% to 58%. However, in 2002, the majority of the firms still using low speed dial-up access were small firms.

Moreover, large firms have created a technological gap between themselves and small firms by adopting high-speed Internet at a rapid rate. As with all ICTs, the largest firms make the most prevalent use of broadband access. In 2002, 84% of large firms used broadband compared to only 56% of small firms. This represented a 28 percentage point gap, down from a 36 percentage point gap two years earlier.

1 Information for 1999 is not available by size of firm.

2 "High Speed on the Information Highway: Broadband Use in Canada" Connectedness Series no. 10. Science, Innovation and Electronic Information Division, Statistics Canada.

Relying solely on dial-up access may serve as a constraint on the ability of small firms to participate in e-commerce, as broadband technology allows users to send large amounts of information at high rates of speed over networks.

However, projects across Canada that are partially funded by public resources are attempting to make it easier for small firms to have access to broadband Internet. These projects are attempting to remove some of the obstacles that have blocked its utilization, particularly among small firms. Broadband access and usage remains a crucial tool for all enterprises because of its role as an enabler for many other technologies including website hosting and data transfer.

The Survey of Electronic Commerce and Technology (SECT) identifies four ways that businesses may connect to the Internet and three of them are classified as high-speed. Cable connections, high-speed telephone (ISDN/DSL) connections and dedicated communication lines (T1/T3) are all identified as high-speed connections while dial-up modems are considered a low-speed connection.

DSL – Digital Subscriber Line – a technology that provides high-speed Internet connection over regular telephone lines. The initial specification provides connections at speeds of up to 8 Mbps (megabits per second) for downloading data and 640 kbps (kilobits per second) for uploading data. However, normally speeds are about 1 Mbps for downloading data and 150 kbps for uploading data

Cable Modem – a modem which uses cable TV lines for connection to the Internet

ISDN – Integrated Services Digital Network – a high-speed connection service that uses existing phone wire, but replaces modems with special digital adaptors. ISDN lines are roughly 64 kbps to 128 kbps – up to 5 times faster than a conventional dial-up modem

T1 line – An Internet backbone that carries pulse modulation with rates of up to 1.544 Mbps over copper wires

Web presence: Large firms leap ahead

Small firms continue to lag behind large firms in establishing a presence on the World Wide Web. Between 2000 and 2002, the percentage of small firms with websites increased from 21% to 27%.

However, during this time period, the gap between small firms with a website and large firms with a website actually increased. While only 65% of large firms had a website in 2000, more than 77% had a website by 2002. This increasing gap is somewhat surprising since more friendly software and reduced technical barriers have made it easier for small firms to implement a website. The advent of broadband Internet and improved computer technology has made it easier than ever for firms of all sizes to create a website.

Although it might be surprising that small firms are not closing this technology gap, the fact that such a gap exists is not unexpected. There are larger barriers, both monetary and skill-related, to creating and maintaining a website as opposed to simply using the Internet or e-mail. In addition, having a website may not be relevant for all types of enterprises.

Many websites are now operating largely as a source of information. However, it is expected that they will also continue to become more transactional. This is a general trend occurring in e-commerce as enterprises are able to use their technology in a more functional manner.

While the sheer number of websites continues to rise, so does the number of features that a website can offer due to new technologies. Some websites may now offer such advanced features as wireless access, interactivity, information about employment opportunities and online payment for products. However, the majority are largely outlets for conveying information about the business, particularly those of small enterprises.

Once again, the largest firms tend to be the fastest to implement the new technologies and features into their websites. On the 2002 SECT, six such features were surveyed: online payment, interactivity, digital products or services, secure website, privacy policy statement, and access via a wireless device. In 2002, large firms were more likely to have each of these features on their enterprise's website than the private sector average. Large firms likely have the resources, both financial and knowledge-based, to implement such technologies. Also, in some cases, functions may only be applicable to firms that are above a certain size threshold.

Website designers have room to grow their business as websites do not appear to be at a point of saturation. One out of four large firms had not established a website yet by 2002 while three out of four small firms have not. There can be continued growth of this technological tool if smaller enterprises can find beneficial ways to use websites and implement them cost-effectively.

Purchasing online: Rapidly increasing for all sizes of firms

In the private sector, the proportion of enterprises that purchase online, with or without online payment, has continually increased between 1999 and 2002. Firms may choose to purchase online for many reasons. Two principal reasons are cost reduction and a greater selection of products.

The proportion of enterprises in the private sector that purchased online was 14% in 1999 and has increased to 32% in 2002. Related technologies such as increased broadband use are making buying online more accessible for firms of all sizes. In addition, many firms are now incorporating online purchasing into their business model, and adjusting buying patterns in order to become more cost-effective and efficient.

Small firms made important gains in on-line purchasing, starting to close the gap with large firms. In 2002, about 57% of large firms did so, twice the proportion of 29% among small firms, a 28-percentage point gap. Two years earlier, 51% of large firms were making purchases online, compared with only 16% of small firms, a 35-point gap. Since purchasing online is fairly simple and requires little infrastructure, it is available to firms of all sizes.

Even individuals are able to easily make purchases online. While households are not the major e-commerce users on the Internet, they continue to be increasingly important players. In 2002, business to consumer (B2C) sales accounted for 28% of the purchases that took place on the Internet. This has risen consistently from 22% in 2001 and 20% in 2000. This trend demonstrates the increasing ability of even the smallest buyers, individuals, to purchase online.

Online sales: Dominated by large firms

Between 1999 and 2002, sales over the Internet, with or without online payment, more than tripled from \$4.2 billion to \$13.3 billion.

This fast growth did not seem to motivate firms to start selling on-line. In fact, the proportion of firms selling on the Internet fell during this interval. In 1999, 10% of enterprises were selling on the Internet; the following year, this had declined to just over 6%. The proportion of firms selling online has risen incrementally since that time to almost 8% in 2002.

Although more large firms still sell over the Internet, large firms were more reluctant than small firms to start selling on-line. The percentage of large enterprises selling online has fallen since 2000 while the percentage of smaller firms has increased slightly. Small firms are catching up in this regard, but only by the smallest of margins.

Larger firms are still more likely to sell on-line than small firms. In 2002, 16% of large firms sold online, more than double the proportion of only 7% among small firms. This is likely because of the more sophisticated web technology of larger firms and their ability to take advantage of economies of scale. It is far more viable for a large firm to invest capital in building an infrastructure to sell online since they will likely see a larger return on that investment because of the volume they can potentially sell.

Interestingly, large firms sold the smallest proportion of goods to individual consumers. Only 15% of sales by large enterprises were sold to consumers. Meanwhile, about 42% of sales in companies classified as small were bought by individual consumers. Such information may suggest that the largest enterprises are using online sales to conduct business with other enterprises. At the same time, smaller enterprises are attempting to expand their product reach by attracting consumers through online sales.

In 2002, online sales in Canada accounted for less than 1% of the value of overall sales.

Intranets, Extranets and EDI: The exclusive domain of large firms

Many people do not think of these three technologies when discussing how the Internet has changed business purchasing patterns. However, they are an important way for businesses to complete transactions.

While these three technologies have penetrated Canadian enterprises, for the most part they are used by larger firms and have not experienced high growth rates. This is likely because these technologies are not applicable to smaller firms and would offer very few benefits to many of them. Therefore, it is unlikely that small firms would close this technology gap even if they had the resources to do so.

Intranets allow employees at an enterprise to gather information and communicate over an internal network. As a result of the nature of Intranets, large enterprises are more likely to use this technology. In 2002, 65% of large enterprises used an Intranet, compared with only 11% of small enterprises.

An Extranet is a private network which can be used to grant certain people access to a business' supply catalogue, information or operations. They are most commonly used by enterprises to enable communication with suppliers, vendors or customers.

Extranets have also proven to be a phenomenon of large firms. In 2002, only 5% of firms used an Extranet. This is only a marginal increase from 2000 when 4% of enterprises used an Extranet. However, 30% of large firms used an Extranet in 2002.

Electronic Data Interchange (EDI) systems not on the Internet are electronic transactions that occur over a proprietary network. Many larger firms implemented these systems before the Internet was commonplace. These systems offer many of the same benefits of Internet-based transactions, reducing transaction and inventory carrying costs but are more costly to implement.

Some large firms are reluctant to move to Internet-based technology because these EDI networks were so costly to implement initially. In 2002, just over 10% of firms used an EDI, virtually the same number as in 2000. This is likely because very few enterprises are inclined to install such systems, instead choosing to conduct business activity over the Internet.

While these three technologies remain relatively isolated within large firms, all are important ways of furthering e-commerce in enterprises with certain characteristics, particularly Extranets. These can be used to further reduce transaction costs and ease the supplier and vendor relationship through more conducive communication.

In conclusion, this study shows that since 1999, the desire of enterprises within Canada to implement ICTs has continued to expand. It also demonstrates small firms have managed to close the technological gap with large firms in using basic technologies.

However, not all small firms have the resources or ability to implement more complex technologies, such as online sales or websites. Large firms continue to expand their advantage in using such technologies. This may result in a competitive disadvantage that is difficult for small firms to overcome.

Information and Communication Technology (ICT) use by enterprise size

Type of ICT	Survey year	Size of enterprise ¹			Gap between large and small ²
		Small	Medium	Large	
		%			
Use of PCs	2000	79	98	100	21
	2001	82	96	98	16
	2002	84	97	100	16
Use of e-mail	2000	56	85	98	42
	2001	62	89	96	34
	2002	68	90	99	31
Use of the Internet	2000	59	87	97	38
	2001	68	91	94	27
	2002	73	92	99	26
Website	2000	21	55	65	44
	2001	24	57	74	50
	2002	27	62	77	51
Purchase online	2000	16	30	51	35
	2001	20	33	52	31
	2002	29	47	57	27
Sell online	2000	6	10	23	18
	2001	6	12	15	9
	2002	7	13	16	10
High-speed access	2000	33	34	68	36
	2001	46	57	84	38
	2002	56	71	84	28

1. See the table below for definitions of enterprise size.

2. Small discrepancies may exist due to rounding.

Source: Survey of Electronic Commerce and Technology for 2000, 2001 and 2002

Size of enterprise is based on the number of full-time employees

	Small	Medium	Large
Manufacturing sector	0–19 ¹	20–499	500+
All other sectors	0–19 ¹	20–99	100+

1. The category 0 full-time employees includes firms that only hire part-time workers; firms that contract hiring of employing to another firm which in turn pays the employees; firms in joint ventures whose partner(s) hire employees and some self-employed individuals.

Source: Charles, S., M. Ivis and A. Leduc (2002) "Embracing e-Business: Does Size Matter?" *Connectedness Series*, Statistics Canada, Catalogue no. 56F0004MIE, No. 6.