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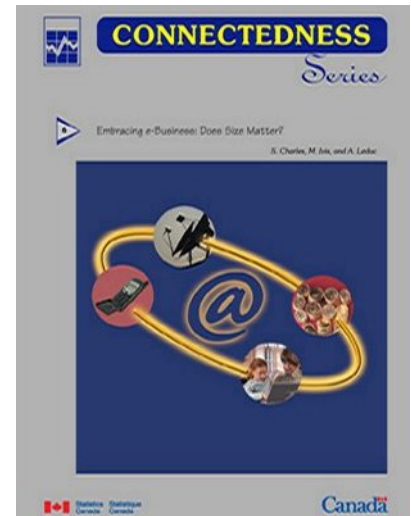
Embracing e-Business: Does Size Matter?

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Abstract

Using recent data, this paper examines the relationship between e-business and firm size. It finds that firm size matters and it matters more in basic connectivity, where large firms have already achieved high rates. In 2001, 68% of small firms accessed the Internet, compared with 91% of medium-sized and 94% of large firms. In addition, only 24% of small firms had a Web site compared with 57% of medium-sized and 74% of large firms.

While small and medium-sized enterprises (SMEs) also lag behind large firms in transacting on-line, *firms of all sizes* are slower to implement these more advanced e-business applications. In 2001, 6% of small businesses were selling goods and services on-line, compared with 12% of medium-sized firms and 15% of large firms. However, small firms sold relatively more to consumers than large firms - the business-to-consumer sales of SMEs accounted for 25% of their total Internet sales, compared with 18% for large firms. More firms engage in on-line purchases than sales, with 20% of small firms, 33% of medium-sized firms and 52% of large firms.

The analysis also identifies the significant effect of industry on e-business, consistent with earlier findings regarding the industry-related differences on firms' adoption of information and communications technologies and engagement in e-business activities. Leading and lagging sectors exist, regardless of firm size.

Finally, the paper investigates respondents' perceptions of barriers to e-business. The most common barrier, cited by 52% of respondents, is that the firm's goods or services do not lend themselves to Internet transactions, followed by resistance to alter the current structure of the firm and the preference to maintain the current business model, cited by 36% of respondents. A second tier of barriers includes security concerns (13%), high costs related to development (11%), uncertainty about the benefits (8%) and maintenance and lack of skilled employees (10%). These perceived barriers were true both among SMEs and large firms and they may be indicative of an information/knowledge gap.

Embracing e-Business: *Does Size Matter?*

By S. Charles, M. Ivis, and A. Leduc

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1. INTRODUCTION

The Internet is fundamentally altering the way in which businesses communicate, produce and trade. As a growing number of businesses access the Internet and employ e-business solutions, the traditional, linear supply chain is being transformed into networks of integrated, web-like links between business partners, suppliers and customers.

The key factor driving the implementation of e-business throughout the economy is the competitive advantage such technologies and applications offer. E-business allows organizations to streamline production, reduce operational costs, expand markets, enhance collaborative business partnerships and strengthen customer and supplier relationships. Individual firms are increasingly employing electronic applications to ensure competitiveness in the marketplace. At the global level, Canada stands to benefit by leveraging the potential of e-business to increase productivity and global competitiveness (Canadian E-business Opportunities Roundtable 2001, 2002).

Canada has made significant progress in driving connectivity. Based on the Conference Board of Canada's *Connectivity Index* (2001), it ranks second after the United States in overall connectivity. However, while a majority of Canadian businesses have Internet access, few are investing resources to explore more

sophisticated e-business applications¹. Results from the most recent Statistics Canada *Survey of Electronic Commerce and Technology (SECT, Statistics Canada 2002)*, indicate that while 71% of firms in Canada are connected to the Internet, only 7% are selling goods or services on-line. Moreover, the data reveal that small and medium-sized enterprises (SMEs) lag behind large firms in adopting e-business technologies and engaging in e-business activities, including using the Internet, owning a Web site and transacting on-line. To the extent that such information and communications technologies impact on productivity and competitiveness, this raises concerns given the economic importance of SMEs in Canada. As well, it underscores the need to measure and monitor SME e-business adoption to understand how this important segment of the economy is evolving in the increasingly competitive, global digital economy.

This paper analyzes the performance of Canada's private sector in adopting e-business technologies and applications, by size of firm. It taps data from Statistics Canada's *SECT* to compare rates of adoption for basic connectivity, Web site development, selling on-line and on-line procurement among small, medium and large firms. The paper also identifies barriers currently impeding the more rapid adoption of e-business among Canadian firms, as well as policy implications.

¹ -- The degree of sophistication depends largely on the complexity of the underlying technologies. In this paper, sophisticated e-business activities refer to selling and purchasing on-line via the Internet.

NOTE TO READERS

The annual Survey of Electronic Commerce and Technology (SECT) collects information on the use of information and communications technologies (ICTs) and e-commerce among the private and public sectors. The findings are based on a sample of approximately 21,000 enterprises, which cover all industries with the exception of agriculture. The survey excludes businesses with very low revenues. Depending on the industry, the exclusion threshold typically ranges from \$150,000 to \$250,000.

The sample used for this survey covers industrial sectors as described by the 1997 North American Industry Classification System (NAICS) (Statistics Canada 1998). This report presents results for the highest level, which divides the economy into 20 sectors.

The SECT collects information on the number of full-time employees (FTE) of the enterprise, which is used to delineate business by firm size. It is recognized that firm size – small, medium or large – is industry-specific, and what may be considered a large firm in some industries may be small in others. Considering the detailed tabulations needed, constraints related to data confidentiality and quality do not permit the delineation of size categories for each industry. However, for the purposes of this paper, two general groupings are used:

	Small	Medium	Large
Manufacturing industries	0-19	20-499	500+
Other industries	0-19	20-99	100+

(Businesses with 0 FTE can be representative of a number of different types, such as self-employed workers, seasonal businesses or virtual firms).

2. E-BUSINESS ADOPTION

Internet adoption among Canadian firms is growing at a rapid pace. In 2001, 71% of private sector organizations had access to the Internet, up from 63% in 2000 and 53% in 1999². The continued increase in Internet adoption among Canadian firms demonstrates that the technology is becoming a standard business tool.

However, despite the relatively high and fast growing levels of business connectivity, Canadian enterprises are slower in implementing more advanced e-business applications, such as buying and selling on-line. To the extent that the much-talked about gains from information and communications technologies (ICTs) depend on these advanced applications, businesses may not be deriving the full benefits and

opportunities offered by the new networked economy. Overall, there is a negative correlation between adoption rates and the level of sophistication of e-business activities. The more sophisticated the activity, the lower the adoption rate (Table 1). Moreover, Canadian firms generally continue to lag behind their US counterparts in the adoption of sophisticated e-business applications. For example, recent reports show that US firms are more advanced in the integration of processing, fulfillment and supply chain management (IDC 2001)³. Thus, while high adoption rates with respect to basic connectivity are promising, the relatively slow implementation of sophisticated applications may impact negatively on Canada's ability to develop its economic potential.

2 -- As explained in the Note to Readers, all figures in this paper are based on SECT, which does not impose a response burden to businesses with very low revenues. Depending on the industry, the exclusion threshold typically ranges from \$150,000 to \$250,000.

3 -- However, the performance of Canadian firms is comparable to that of other countries. For instance, in Denmark, while more than half of Danish firms have a Web page to advertise and sell on-line, one out of five of these received orders over the Internet. Similar results are observed in Finland and Australia (OECD 2000a).

Table 1.
E-Business adoption in Canada

	Use of the Internet		Use of Email		Web site presence		Purchasing on-line		Selling on-line	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
	% of enterprises									
Private	63	71	60	66	26	29	18	22	6	7
Public	99	100	99	100	73	86	49	54	9	13

Since 1999, Canada's e-business adoption rates have grown steadily in all areas, except for selling on-line. In 2001, *SECT* results show that nine out of ten firms with more than 20 full-time employees had access to the Internet (Statistics Canada 2002). Again, this confirms that Canada has achieved a significantly high level of business connectivity.

3. BASIC CONNECTIVITY: SIZE MATTERS

For the purpose of this paper, basic connectivity is measured by *Internet use rates*⁴. Basic connectivity facilitates the way businesses correspond, share information and develop business relationships efficiently and at low cost. Basic connectivity is the precursor to more advanced uses of Internet-enabled technologies and, in this regard, provides insights to the state of e-business adoption in Canada.

Small firms lagging in basic connectivity

While more than two-thirds of Canadian firms are connected to the Internet, there is a noticeable difference in the rate of Internet connectivity between SMEs and large firms. Furthermore, there are even more acute discrepancies between small, medium and large firms within and across particular sectors.

In 2001, 70% of Canadian SMEs⁵ accessed the Internet, while an impressive 94% of large businesses accessed the Internet.

Considerable differences exist, however, within the SME category itself. In 2001, 68% of small firms had Internet access compared with 91% of medium-sized businesses. However, the gap between small and medium-sized firms lessens, from 28 percentage points in 2000 to 23 percentage points in 2001. This indicates that while small firms are lagging behind larger firms in terms of basic connectivity, they are catching up.

Medium-sized firms reported higher Internet access rates compared with small firms in most major sectors. With respect to basic connectivity, medium-sized firms resemble large firms. Based on the 2001 *SECT*, differences in Internet access rates between medium-sized and large firms did not exceed 17 percentage points, except for the Forestry and related services sector, while wider variances were recorded between small and large firms. In some sectors, notably consumer-oriented sectors like Accommodation and Food Services, Transportation and Warehousing, Real Estate, Rental and Leasing, the difference in Internet adoption rates between small and large firms exceeded 35 percentage points. Furthermore, intra-industry differences in Internet adoption rates between small and medium-sized firms averaged 19 percentage points compared with 25 percentage points between small and large firms. By contrast, the lag between medium-sized and large firms averaged only 6 percentage points, once again indicating that the behavior of medium-sized firms mirrors large firms rather than small firms with respect to basic connectivity.

4 -- Other indicators of basic connectivity may include e-mail usage and the percentage of employees with direct access to the Internet.

5 -- The overall results for each of the three size groups are calculated by merging the two samples - as explained in the Note to Readers. For example, medium-sized enterprises include firms that employed between 20-499 FTE in the manufacturing industries and firms that employed between 20-99 FTE in the other sectors.

Hence findings indicate that size of firm does matter when Internet adoption rates are concerned. The data reveal a positive correlation between size of firm and Internet access rates, that is, smaller enterprises have lower Internet access rates.

Leaders and laggards

While size matters, industry also matters. There are key exceptions to the overall finding that smaller enterprises have lower Internet access rates. In sectors that are clear leaders with respect to Internet adoption (Utilities, Information and Cultural Industries, Educational Services, and Professional, Scientific and Technical Services) even small enterprises exhibit very high basic connectivity rates. Thus, in these

sectors, the difference between small, medium or large firms is negligible (Table 2).

By contrast, Manufacturing Industries and sectors oriented towards business-to-consumer (B2C) transactions, such as Retail Trade and Accommodation and Food Services, recorded high variations of rates of adoption between size of firms, with small firms clearly lagging larger firms. In 2001, the difference in adoption rates in those sectors were 25, 27 and 38 percentage points, respectively. In turn, these industries are relative laggards with respect to basic connectivity compared with Information and Cultural Industries, Utilities, and Professional, Scientific and Technical Services, where differences in adoption rates were 7, 8 and 10 percentage points, respectively.

Table 2.

Percentage of enterprises using the Internet, by industry, 2001

	Small	Medium	Large	All
	%			
Forestry Logging and Support Activities	68	69	100	68
Mining and Oil and Gas Extraction	68	95	97	78
Utilities	92	98	100	94
Construction	67	98	99	71
Manufacturing	75	95	100	82
Wholesale Trade	79	95	97	82
Retail Trade	62	85	89	65
Transportation and Warehousing	55	78	95	57
Information and Cultural Industries	93	92	100	93
Finance and Insurance	76	100	97	82
Real Estate, Rental and Leasing	51	83	100	53
Professional, Scientific and Technical Services	90	100	100	91
Management of Companies and Enterprises	59	85	94	63
Administrative and Support, Waste Management and Remediation	77	97	94	80
Educational Services	92	98	89	93
Health Care and Social Assistance	68	92	92	70
Arts, Entertainment and Recreation	81	82	99	82
Accommodation and Food Services	40	83	78	48
Other Services	57	87	99	59
All industries	68	91	94	71

While, generally, there is a pervasive difference between small and large firms, the gap between medium-sized and large firms is more concentrated in some sectors – notably Real Estate, Rental and Leasing, Other Services, Transportation and Warehousing, and Accommodation and Food Services.

These findings demonstrate that while the size of firm matters in basic connectivity, there are identifiable differences among industries.

4. AVAILABILITY OF WEB SITES

Web site development represents a higher level of e-business sophistication compared with basic connectivity. Businesses use Web sites to market goods and services, share information and perform transactions. In 2001, 29% of Canadian businesses owned a Web site, up from 26% in 2000. Once again, the data indicate that firm size matters with respect to Web site, as smaller firms are less likely to own one. Moreover, firms with Web sites accounted for 81% of Canada's economic activity in 2001 (as measured by gross business income), which confirms that large firms continue to dominate the Internet market.

In 2001, 28% of SMEs owned a Web site compared with 74% of large firms. Once again, there is a significant difference within SMEs, with 57% of medium-sized firms owning a Web site, compared with only 24% of small firms. The average difference in ownership rates between small and large firms, across all industries, was 50 percentage points, whereas the average gap between medium and large firms, across all industries, was 17 percentage points (Table 3).

The average gap between small and large firms is higher with respect to Web site ownership compared with basic connectivity. Small firms are less likely to use the Web to post information and market their products than they are to use the Internet to communicate or conduct research. This is true even in key business-to-consumer oriented sectors, such as the Retail and Wholesale Trade sectors, where differences in Web site ownership between small and large firms are substantial, 27 and 52 percentage points, respectively.

Mirroring the results of Internet access rates, industries in Educational Services and the Information and Cultural sector remain leaders in Web site ownership for small firms.

The low rates of Web site ownership among small enterprises indicate that not everyone perceives benefits - at least not yet. However, while the percentage of firms owning a Web site grew only slightly, these firms accounted for 81% of Canada's economic activity (as measured by gross business income) in 2001 compared with 64% in 2000. Again, this confirms that leading enterprises do value the opportunity offered by Web site presence over the Internet to expand their market and disseminate information between clients and partners.

Table 3.

Percentage of enterprises with a Web site, by industry, 2001

	Small	Medium	Large	All
			%	
Forestry Logging and Support Activities	15	18	84	15
Mining and Oil and Gas Extraction	16	72	90	39
Utilities	32	82	95	45
Construction	22	41	F	24
Manufacturing	33	66	89	46
Wholesale Trade	33	62	85	38
Retail Trade	23	51	50	27
Transportation and Warehousing	8	34	68	11
Information and Cultural Industries	60	76	98	65
Finance and Insurance	34	91	76	48
Real Estate, Rental and Leasing	19	66	99	22
Professional, Scientific and Technical Services	30	62	95	32
Management of Companies and Enterprises	7	41	93	14
Administrative and Support, Waste Management and Remediation	35	64	73	40
Educational Services	59	75	78	62
Health Care and Social Assistance	16	41	49	19
Arts, Entertainment and Recreation	43	65	83	46
Accommodation and Food Services	15	42	37	20
Other Services	22	59	95	25
All industries	24	57	74	29

F = too unreliable to be published

5. E-COMMERCE

The perceived benefits of e-business are widely associated with the implementation of sophisticated applications, such as completing transactions over the Internet – both e-sales and on-line procurement. The leveraging of network-based technologies enable firms to control production costs, manage inventories and improve customer and supplier relationships at a significantly lower cost. However, Canadian businesses, *of all sizes*, have been slower to adopt sophisticated applications than basic ICTs.

Selling on-line

In 2001, 6% of small businesses were selling goods and services on-line, compared with 12% of medium-sized firms and 15% of large firms. The difference in adoption rates for this application is relatively smaller than the gap in both Internet use and Web site ownership in terms of percentage points, but remains significant. Clearly, the narrowing in the difference of adoption rates is not attributable to aggressive implementation initiatives among SMEs, but rather to the general slowness of Canadian businesses in adopting sophisticated e-business applications. The findings demonstrate that while medium-sized and large firms are quick to adopt the Internet and Web sites relative to small businesses, *firms of all sizes* are slower to implement sophisticated e-business applications.

One interesting result from the *SECT* is that while the percentage of firms

selling on-line decreased from 10% in 1999 to 7% in 2001, indicating consolidation in the market, the dollar amount of on-line sales has been steadily increasing – from \$4.2 billion in 1999 to \$10.4 billion in 2001. Of this \$10.4 billion, 22% were business-to-consumer (B2C) transactions, while the remaining 78% were business-to-business (B2B) transactions. While the percentage of firms selling on-line remains low, Internet transactions are growing rapidly. This also suggests that e-commerce continues to grow strongly and consolidation and rationalization are occurring in the electronic marketplace. While the market remains volatile, the findings indicate that its volatility is beginning to subside. For example, in 2001, for every five firms who started to sell over the Internet, four stopped. This is an improvement over 2000 when, following the dot.com turmoil, for every two firms that started to sell online, five stopped (Peterson 2001).

An interesting result is that, small firms sell relatively more to consumers than large firms. The proportion of B2C sales decreases with firm size (Table 4). In 2001, SMEs' B2C sales accounted for 25% of their total Internet sales, compared with 18% for large firms. This finding may point to a comparative advantage for SMEs in this area. Smaller businesses can be more nimble and flexible, and therefore able to move more quickly and take advantage of market opportunities, and to customize their operations to satisfy market needs. As such, the dynamic and ever-changing on-line environment may suit the agility of smaller organizations.

Electronic commerce is defined as sales over the Internet, with or without on-line payment (OECD 2000b). Included are orders received over the Internet, Extranets and electronic data interchange (EDI) on the Internet. Excluded are sales via EDI over proprietary networks and other electronic networks. Automatic teller machines are excluded, as are the volume of financial transactions conducted over the Internet. Included are service charges received for conducting transactions over the Internet.

Table 4.

Adoption rates of selling on-line, by size of firm, 2001

	Small	Medium	Large
	%		
Enterprises selling on-line			
Manufacturing	12	11	19
Other industries	6	13	15
All industries	6	12	15
B2C sales			
Manufacturing	54	8	14
Other industries	23	35	19
All industries	24	27	18

Table 5.
Adoption rates of selling on-line, leading industries, 2001

	Small	Medium	Large	All
	% of enterprises			
Information and Cultural Industries	20	20	24	20
Educational Services	13	16	18	14
Wholesale Trade	11	24	18	13
Manufacturing	12	11	19	12
Administrative and Support, Waste Management and Remediation	11	6	11	11
Retail Trade	9	21	27	11
Arts, Entertainment and Recreation	9	12	41	10
All industries	6	12	15	7

It is already known that the sector of activity matters significantly when it comes to on-line sales (Peterson 2001). Information and Cultural Industries lead again, followed by Educational Services, Wholesale Trade and Manufacturing. The difference in these sectors and the rest of the lagging sectors is significant. Table 5 shows that the interplay between sectors and firm size is rather complex. While there is a substantial gap between small and large firms in Retail Trade as well as Arts, Entertainment and Recreation, this is not the case in the other sectors. Indeed, there are industries, such as Administrative and Support and Information and Cultural, where the percentage of small firms selling on-line is comparable to that of large firms.

Small firms in sectors with high percentages of on-line sales also recorded high ratios of B2C sales and, with the exception of Educational Services, high ratios of export sales.

Purchasing on-line

On-line purchasing or 'e-procurement' is considered a sophisticated application of e-business, and one that holds tremendous promise to improve production processes, lower production costs and time, and improve supplier relations. Although the proportion of businesses engaging in e-procurement is low compared with indicators of basic connectivity, it is higher than the proportion of firms that sell over the Internet. Moreover, unlike on-line sales, the proportion of firms with on-line purchases increased from 18% to 22% between 2000 and 2001.

The difference between small and large firms is significant (Table 6). In 2001, 20% of small enterprises purchased on-line compared with 33% of medium-sized firms and 52% of large firms. Mirroring the findings of Internet use and Web site ownership, a much higher percentage of medium-sized enterprises purchased goods and services on-line compared with small firms. Both medium and small firms are clearly lagging behind larger firms.

Table 6.
Adoption rates of purchasing on-line, by size of firm, 2001

	Small	Medium	Large
	%		
Enterprises purchasing on-line			
Manufacturing	22	41	61
Other industries	20	31	51
All industries	20	33	52

Significant differences are observed among sectors regarding on-line purchases (Table 7). Findings confirm that Information and Cultural Industries and Educational Services are again leading sectors. Interestingly, these two sectors also recorded significant differences in rates of adoption between size of firms. While both sectors recorded a high percentage of small firms purchasing on-line, the differences in rates of adoption between small and large firms were substantial, at 23 percentage points in the Information and Cultural Industries, and 31 percentage points in Educational Services. This is contrary to the findings on basic connectivity where the rates of adoption of small firms were closer to those for medium and large firms. Professional, Scientific and Technical Services was also a leading sector in on-line procurement, however the difference between small and medium firms was larger than the difference between small and large firms.

It is also interesting to note that although firms of all sizes in Manufacturing industries were leading on-line procurement when compared with Other industries (Table 6), they did not end up near the top when compared with individual industries in Table 7. It is argued that Manufacturing industries are most likely to benefit from on-line procurement, to streamline production processes and/or manage their "just-in-time" inventories⁶. While it is difficult to accurately quantify the return on investment (ROI) of such an application, it is argued that cost savings could reach approximately 15% to 40% of total inputs cost for the US manufacturing sector (Coppel 2000). Clearly, further research on ROI should be undertaken to improve our understanding of how e-business impacts Canadian enterprises and to help us identify sectors that would benefit the most from specific e-business applications.

6 -- It is not known to what extent this may be due to EDI transactions over proprietary networks, which is not reflected in the data used here.

Table 7.
Adoption rates of purchasing on-line, by industry, 2001

	Small	Medium	Large	All
	<i>% of enterprises</i>			
Forestry Logging and Support Activities	11	3	69	11
Mining and Oil and Gas Extraction	7	18	36	15
Utilities	25	40	70	32
Construction	14	34	F	17
Manufacturing	22	41	61	29
Wholesale Trade	24	34	65	26
Retail Trade	16	24	41	17
Transportation and Warehousing	9	24	57	12
Information and Cultural Industries	48	60	71	52
Finance and Insurance	19	43	45	25
Real Estate, Rental and Leasing	12	30	75	13
Professional, Scientific and Technical Services	41	61	45	42
Management of Companies and Enterprises	7	5	51	8
Administrative and Support, Waste Management and Remediation	29	34	57	31
Educational Services	35	60	66	39
Health Care and Social Assistance	19	30	41	20
Arts, Entertainment and Recreation	23	23	49	23
Accommodation and Foods Services	7	18	39	9
Other Services	14	31	69	15
All industries	20	33	52	22

F = too unreliable to be published

6. BARRIERS HAMPERING E-COMMERCE

The fact that businesses have generally embraced basic connectivity while they are reluctant to engage in more sophisticated applications deserves further attention. Thus, the survey sought to identify the key barriers inhibiting electronic commerce among Canadian firms. It is interesting to note that results from both *SECT 2000* and *SECT 2001* were very similar, indicating that barriers to e-commerce remain key issues to be addressed in order to accelerate Canada's e-business adoption.

Canadian organizations, regardless of their size or sector, identified two major barriers to e-business implementation. In 2001, the most common barrier, cited by 52% of respondents, is that the firm's goods or services do not lend themselves to Internet transactions. The second largest barrier, cited by 36% of respondents, is resistance to alter the current structure of the firm and the preference to maintain the current business model. These two issues are clearly the most influential barriers in the eyes of Canadian business. This is true for both SMEs and large firms.

Following these two reasons, there is a significant drop in perceived barriers, creating a 'second-tier' of barriers impeding the use of electronic commerce. Security concerns (13%), high costs related to development (11%), uncertainty about the benefits (8%) and maintenance and the lack of skilled employees (10%), round out the top barriers cited by Canadian firms. This 'second-tier' set of barriers was identified as such by both SMEs and large firms⁷.

The respondents' demarcation between the first- and the second-tier barriers is interesting and potentially very telling. The two first-tier barriers clearly relate to the fact that many organizations do not believe that electronic commerce is either applicable or beneficial to their business. In turn, if one believes electronic commerce is not applicable to them, then all the other barriers listed will seem irrelevant and, therefore, will not be reflected in the survey results. This could explain the

large gap between first- and second-tier barriers

It thus appears that there is a preconceived notion among Canadian businesses that do not sell or purchase on-line, that the Internet is not a germane sales and/or procurement channel. While this may certainly be true in some instances, much of the recent literature argues that the Internet is an extremely effective sales and procurement tool that is applicable to virtually every firm, in every sector of the economy, regardless of size and location (Canadian Chamber of Commerce 2001). Therefore, the fact that firms of any size and sector cite that 'their goods do not lend themselves to Internet transactions' as the number one barrier to the use of e-commerce,⁸ may indicate that there is an information/knowledge gap across the Canadian economy regarding the potential utility and applicability of the Internet for sales and procurement.

Barriers remain constant across sectors

While, overall, the top six barriers cited by businesses were consistent, regardless of firm size or sector, there were a few interesting exceptions. The starkest exception to the general trend was in the Mining, Oil and Gas Extraction sector, where 'uncertainty about the benefits' was ranked extremely high for smaller businesses, while relatively low for larger businesses. With respect to smaller businesses, 10% of businesses with 1-9 FTE and 48% of businesses with 10-19 FTE cite 'uncertainty about the benefits' as a barrier to e-commerce. Conversely, it was not cited as a barrier for businesses with 100-299 FTE and for businesses with 300-499 FTE, while only 1% of businesses with 500+ FTE cite this issue as a barrier.

Another exception was in Finance and Insurance, where the level of concern regarding security, an obvious challenge in this sector, appears to be related to firm size. Smaller firms indicate security as a significant barrier: 24% of businesses with 1-9 FTE and 39% of businesses with 10-19 FTE. By comparison, only 5% of

Respondents (both users and non-users of the Internet) were provided with a list of ten potential barriers and asked to check all the applicable "reasons why (their) organization does not buy or sell products over the Internet."

7 -- The correlation between the barriers of 'goods not lending themselves to Internet transactions', 'lack of perceived value' and 'uncertainty regarding benefits' is noted in several private sector studies (e.g. SES 2000). The barriers discussed above also mirror the findings of private sector studies such as EKOS (2001) and IDC (2001), as well as the conclusions of the Canadian Chamber of Commerce (2001) in its overview of available research regarding e-business adoption among small and medium-sized enterprises - completed for the *Canadian e-Business Opportunities Roundtable*.

8 -- The one exception here is the Retail Trade sector, which ranked the barrier of 'preference to maintain current business model' (44%) marginally higher than 'goods do not lend themselves to Internet transactions' (41%).

businesses with 100-299 FTE, 1% of businesses with 300-499 FTE and 5% of businesses with 500+ FTE cite security as a barrier to using electronic commerce.

These exceptions illustrate the diverse experiences of different sectors and different firm sizes. While there are still significant barriers facing Canadian firms with respect to adopting electronic commerce, the largest ones appear to be related to businesses' cultural rather than technical or financial matters.

7. CONCLUSIONS

This paper has analyzed data from *Statistics Canada's* most recent *Survey of Electronic Commerce and Technology*, to compare rates of adoption for basic connectivity, Web site development, selling on-line and on-line procurement among small, medium and large firms in Canada. The paper also identified barriers currently impeding the rapid adoption of e-commerce among Canadian firms. This analysis has documented the following key findings:

- Small firms are less likely to have access to the Internet when compared with both medium and large firms. With respect to basic connectivity, medium-sized firms more closely resemble large firms than small firms.
- While size of firms matters in basic connectivity, the industry dimension is also very important. There are identifiable differences across sectors – i.e. there are clear leaders and laggards.
- Medium-sized and large businesses are quick to adopt the Internet and Web sites relative to small businesses, but when it comes to sophisticated e-business applications, such as buying and selling on-line, businesses of *all sizes* are slower to implement.

An information/knowledge gap appears to exist across the Canadian economy regarding the potential utility and applicability of the Internet for sales and procurement.




The continued increase in Internet adoption among Canadian firms is promising. While small firms lag behind large ones, they are catching up. This demonstrates that the technology is becoming a standard business tool. It thus appears that public and private sector initiatives (Industry Canada 1998) aimed at stimulating connectivity are proving successful. On the other hand, expansion of e-commerce has been rather lukewarm. In facilitating the expansion of e-commerce, it is important for policy-makers, the high-tech community and industry associations, to focus their resources on explaining and demonstrating its applicability and benefits to *all* Canadian firms, small or large. In pursuing such an initiative, it will be necessary to garner more refined research on how firms in different industries and of different sizes perceive and engage in e-business activities. While the barriers may be the same, organizational perceptions and approaches to e-business may differ depending on the size of firm and its line of business.

Moreover, while this study focused on four main types of Internet-based activities, the authors recognize that e-business adoption includes many other types of applications. Further analysis of other e-business applications such as collaborative partnership, e-financing and EDI transactions over the Internet could greatly enhance the knowledge of e-business adoption in Canada and its potential impacts on Canadian firms and the economy.

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