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# Measuring Electronic Commerce

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**COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY**  
**MEASURING ELECTRONIC COMMERCE**

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## MAIN POINTS

The purpose of this report is to begin to outline the issues associated with measuring electronic commerce, propose an initial framework and begin to compare some of the disparate data on the subject so as to form a mosaic which gives a clearer quantitative picture of the current status and future direction of electronic commerce. From this position a better sense of the relative importance of the various policy issues can be obtained.

### **Defining and measuring Electronic Commerce**

Measuring electronic commerce is difficult for a number of reasons including defining what constitutes electronic commerce, the speed of its growth and evolution and the fact that in many cases firms conduct both electronic commerce and traditional commerce simultaneously. Quantifying the value associated with electronic commerce activities can be challenging since many of its key qualities -- convenience, variety and ease of access to information -- are difficult to measure. This leads to a situation where it appears unlikely that official statistical offices will be able to provide accurate statistics on electronic commerce and quantitative insight into the nature of this activity will have to rely on private providers of data which suffer from a number of shortcomings, not the least of which is a transparent definition of what is meant by electronic commerce.

The definition of electronic commerce proposed in this paper is that of commercial transactions occurring over open networks, such as the Internet. Both business-to-business and business-to-consumer transactions are included. In order to make a better judgement of the economic impact of electronic commerce that portion of the network infrastructure primarily dedicated to this activity is also included. To date, the provision of hardware and software, as well as new intermediary services are major sources of the activity considered under the broad definition of electronic commerce.

### **The current, and likely, near-term structure of the demand-side of Electronic Commerce**

Nevertheless, it is the demand-side of electronic commerce where important policy issues such as privacy, consumer protection and taxation arise. By compiling statistics on the current and near-term structure of the demand-side of electronic commerce, the following conclusions are reached:

- **The volume of business-to-business electronic commerce greatly exceeds that between businesses and consumers.** Thus, while consumer issues are important and represent a potentially large market in the future, this should not obscure the importance of policy issues that are more business specific such as adapting commercial business codes to this new environment, transborder data flows between businesses, establishing new means for engaging in contracts (e.g. digital signature, authentication and certification) and improving the reliability of the infrastructure to meet the quality-of-service demands of businesses.

- **Within the business-to-consumer segment, the leading activity is entertainment.** This category is currently led by three activities : adult entertainment, online games which are frequently of a violent nature and gambling. Many of these segments raise cultural sensitivities and have been the source of discussion concerning their possible regulation. While these are important areas for political analysis and possible regulatory responses, the economic importance of these activities as a driving force of business-to-consumer electronic commerce should be acknowledged. Efforts to restrict these activities should be undertaken with some appreciation for the impact these actions could have on the development of electronic commerce.
- In the business-to-consumer markets, **digital products such as software, travel services, entertainment and finance are the leading electronic commerce products.** Their intangible nature forces a re-evaluation of exiting policies, rules and practices that were designed for tangible goods, or services that were traded locally.
- **Electronic commerce is currently relatively small and will continue to be so in the near future,** but it is growing very quickly (over 200 per cent annually). When compared to benchmarks such as mail-order shopping, credit card transactions and traditional retail trade, it is clear that while important, electronic commerce is at an embryonic stage where technology and the dynamics of the market are still casting its basic shape. **This suggests that policies should be crafted with caution and in recognition of the evolving nature of electronic commerce.**

## MEASURING ELECTRONIC COMMERCE

The potential of electronic commerce has caught the imaginations of politicians, journalists and business people who speculate about how it will transform commercial transactions by reducing transaction costs and challenge existing policies that govern commerce as firms become virtual and national boundaries are an artefact of an earlier era. Nowhere is the speculation more rife than with those firms that make a living providing advice and data about the current state and future direction of electronic commerce. In every case, they predict an order of magnitude growth in this activity by the year 2000. These firms are currently the sole source of data on the field, but since presumably they will sell more advice the bigger the electronic commerce market is, or might be, they may be expected to have an inherent bias towards suggesting that the electronic commerce market is large and is rapidly growing<sup>1</sup>. While this situation is problematic for businesses thinking about engaging in electronic commerce, they are usually seasoned consumers of such data and they benefit from their own internal data collection exercises that can act as a check on these estimates.

A different situation is faced by public policy makers who are fearful that the technical characteristics, fluidity and speed of electronic commerce weakens existing policy instruments ranging from establishing a business to taxing its revenues. Aside from concerns about the utility of existing policies or the need for new rules, policy makers also have a keen interest in outlining the impact that this new form of commerce will have on employment, productivity, trade and growth. Will electronic commerce lead to a large scale substitution of new, less labour intensive, intermediaries for traditional wholesale and retail trade? Will these savings be passed onto consumers and lead to a reduction in prices? Will electronic commerce further erode our ability to track international trade and thus weaken our ability to measure GDP and its growth? To begin to answer these questions, policy makers need data on electronic commerce to judge the size, speed and direction of this phenomenon.

The purpose of this report is to begin to outline the issues associated with measuring electronic commerce, propose an initial framework and begin to compare some of the disparate data on the subject so as to form a mosaic which gives a clearer quantitative picture of the current status and future direction of electronic commerce.

### Measurement Hurdles

Measuring electronic commerce is difficult for a number of reasons including defining what constitutes electronic commerce, the speed of its growth and evolution, the fact that in many cases firms conduct both electronic commerce and traditional commerce simultaneously. Quantifying the value associated with electronic commerce activities can be challenging since many of its key qualities -- convenience, variety and ease of access to information -- are difficult to measure.

## *Defining Electronic Commerce*

As with many new services, simply defining what constitutes “electronic commerce” is not clear and differs significantly according to the source (see Box A). To complicate the situation further, many of the sources never offer a definition and frequently fail to even specify the geographical coverage of their estimates of electronic commerce activity. Figure 1 presents a typology of electronic commerce definitions where the broadest include all electronic transactions including electronic fund transfers and settlements (EFT) and credit card transactions, then the infrastructure needed to support electronic commerce (e.g. equipment, access providers, special electronic commerce intermediary services). On top of this most definitions include business-to-business electronic transactions, then business-to-consumer and then most narrowly, business-to-consumer where the transaction includes an electronic payment of some type.

### **Box A: Various Definitions of Electronic Commerce**

“Electronic commerce is the carrying out of business activities that lead to an exchange of value across telecommunications networks.” (EITO, 1997)

“Electronic commerce refers generally to all forms of transactions relating to commercial activities, including both organisations and individuals, that are based upon the processing and transmission of digitised data, including text, sound and visual images.” (OECD, 1997)

“Electronic commerce is about doing business electronically. It is based on the electronic processing and transmission of data, including text, sound and video. It encompasses many diverse activities including electronic trading of goods and services, online delivery of digital content, electronic fund transfers, electronic share trading, electronic bills of lading, commercial auctions, collaborative design and engineering, online sourcing, public procurement, direct consumer marketing, and after-sales service. It involves both products (e.g. consumer goods, specialised medical equipment) and services (e.g. information services, financial and legal services); traditional activities (e.g. healthcare, education) and new activities (e.g. virtual malls).” (European Commission, 1997).

The Internet will also revolutionise retail and direct marketing. Consumers will be able to shop in their homes for a wide variety of products from manufacturers and retailers all over the world. They will be able to view these products on their computers or televisions, access information about the products, visualise the way the products may fit together (constructing a room of furniture on their screen, for example), and order and pay for their choice, all from their living rooms. (US Executive Office of the President, 1997)

“What is Electronic commerce? Electronic commerce supports an entire range of activities -- product design, manufacturing, advertising, commercial transactions, settlement of accounts -- using a variety of kinds of computer networks.” (ECOM, 1996).

Every one of the definitions in Box A is quite expansive, including not only the actual commercial transaction between buyer and seller but also the upstream and downstream activities that made that transaction possible. If a similar definition was applied to traditional retail trade it would include all costs associated with constructing retail stores, the banking activity associated with retail commerce, all legal activity dedicated to legal issues involving retail commerce and in many cases the cost of transportation to and from the retail store. Electronic fund transfers, alone, account for over 2 \$US trillion worth of activity, daily. (OTA, 1995).

The need for such an expansive definition is a reflection of the embryonic state of electronic commerce today where recent surveys have found that over half of Internet users in the US and Canada had used the Internet to “shop” but in fact only 15 per cent had bought anything and in most cases “buying” meant faxing or calling the merchant with a credit-card number after placing the order over the Internet (CommerceNet, 1997). Currently only a few percent of even business-to-business electronic commerce web sites are designed for direct sales, and the business-to-consumer figure is probably lower (Anderson, 1997). As discussed below in the section on the speed at which electronic commerce is growing, this situation will change quickly as technology and the market make electronic commerce more widespread, easier and less foreign to use. Likewise, its growth is having a significant direct impact on upstream and downstream activities, making links to these activities less tenuous if the point is to capture the economic impact of Electronic commerce.

### *Separating Electronic Commerce from Traditional Activities*

As electronic commerce grows, the ability to identify electronic commerce merchants from traditional merchants is fading as traditional merchants start trading by electronic means as well. For example, Wal-mart, the large US retailer, has announced that it will offer over 80 000 of its products via its Web site. Likewise, Marks & Spencer of the UK, La Redoute of France, and Jusco of Japan have all opened up electronic commerce sites in addition to their traditional stores. In most cases, their electronic commerce activity is not separately identified from their traditional activity in their company accounts. A recent survey suggests that by 1999, 39 per cent of all US retailers plan to sell online<sup>2</sup>.

Those firms that are exclusively electronic commerce merchants tend to be new firms that are privately owned and thus not bound by the reporting requirements that bind publicly traded firms. In a vast majority of cases, these firms have yet to turn a profit<sup>3</sup>. This makes collecting data about their activity very difficult since it involves interviews with the firm, many of whom do not want to reveal sensitive information and many of whom may have an incentive to inflate their activity to ward off competitors and to “talk-up” their share price in anticipation of a future initial public offering (IPO) of their stock.

All the estimates of electronic commerce activity are based on revenues, not value-added, the preferred and appropriate variable for measuring the contribution to aggregate economic activity. Consequently, double-counting is occurring as “electronic commerce” revenue estimates include revenues from electronic commerce intermediaries such as Internet service providers whose cost is also reflected in part of the revenue stream generated by electronic commerce merchants selling to final consumers.

One method to account for these problems -- the mix of electronic commerce with traditional activity and the unavailability of information on privately traded firms and the focus on revenues-- has been employed by Amano and Blohm who applied an “Internet related” percentage to employment by publicly traded US firms, totalled the result and then doubled the total to make up for the fact that publicly traded firms only account for half of the total US employment (Amano and Blohm, 1997). By this



measure, the Internet added over three-quarters of a million jobs in the US during 1996 -- half of all US job growth (Table 1). Obviously this technique has a number of shortcomings, not the least of which is the rather crude assumption that privately held firms will exhibit the same activity as publicly held firms, but it has the advantage of being transparent -- a quality that many of the estimates in this field lack. By focusing on employment, the largest component of value-added in most service industries, it avoids the double counting problems inherent with revenue or gross output estimates.

### *Quantifying the Value of Electronic Commerce*

Tracking which firms add how much value at what point in the chain of activity that represents electronic commerce is a daunting task. The World Wide Web (WWW) whose key feature is the hyperlinks that allow users to quickly jump from site-to-site is likely to be the main application for electronic commerce on the Internet. A significant part of the attraction of many electronic commerce sites is based on this linking function (e.g. search engines, directories, advertisements, news services, travel agencies, etc.) But this linking function means that many different entities can be involved in the selling of a product, making attribution of value rather difficult.

Likewise, the added value of many electronic commerce products is not necessarily reflected in the price -- in fact, current experience suggests that the total (delivered) price of many products sold electronically does not differ significantly from that sold through traditional means (Bailey, 1997 and Chait and Glass, 1997). Rather, the primary attraction of electronic commerce is the convenience of shopping from home at any time, the ability to access additional information about the product (e.g. other consumers' opinions), the pleasure of being part of a community (e.g. sharing travel tips), the greater variety to choose from (e.g. a book store with a million listings) and the ability to tailor a product to your individual needs (e.g. a PC configuration). While these qualities are key to the success of electronic commerce they are extraordinarily difficult to quantify.

### *The Speed and Growth of Electronic Commerce*

Complicating the measurement of electronic commerce further is its rapid growth. While the Internet and various versions of electronic-data interchange (EDI) have been around for over 25 years, the arrival of the WWW software such as browsers that allow easy access and manoeuvring across the Web is only four years old. A US trade association for electronic commerce businesses on the Internet claims that "there is no such thing as an Internet-based business more than two years old. In fact, almost all of the current estimated 250 000 commercial World Wide Web sites have been in operation less than a single year" (GIP, 1997). A Massachusetts-based software firm, Open Market, has released a directory of registered commercial Web sites. The firms numbered over 47 000 as of late November 1996, and were increasing by 800 to 900 a week. A similar situation appears to prevail in Japan where the number of virtual malls has risen from about 600 in late-1995 to over 2000 in late-1996 (MPT, 1997). In general the number of Internet hosts designated as being "commercial" (\*.com) represents the fastest growing segment of the Internet (Figure 2).

Combined with this speed of growth is the fact that the majority of the sites are small businesses: 80 per cent of the commercial Web sites have monthly sales figures of less than US\$ 10 000 (ActiveMedia, 1996). Even Amazon Books, one of the most well known electronic commerce traders only has 151 employees (SEC, 1997)

Combining all these measurement hurdles together -- the fast growth of small firms, many of whom are not publicly traded, engaging in an activity that is difficult to identify, track, value and define -- leads to a situation where it appears unlikely that official statistical offices will be able to provide accurate statistics on electronic commerce.

## **A Framework for Measuring Electronic Commerce**

On the assumption that the quantitative picture of the size and direction of electronic commerce will have to come from private sources whose methodology is at best poor and most likely unknown due to proprietary reasons, a question arises as to how this information can be interpreted for policy purposes. A framework is proposed for initiating this task that organises electronic commerce activity according to a scheme that is designed to add some empirical insight into some of the policy discussions surrounding electronic commerce.

### ***A Policy Driven Definition of Electronic Commerce***

For the purpose of this framework, the scope of what is considered to be electronic commerce is determined by the public policy issues confronting policy makers. In nearly every case, these issues arise as a consequence of conducting commercial transactions over an "open," unsecured network like the Internet which is in fact a connection of many different networks. The easy access to this network through a myriad of different types of connections is what fuels concerns about quality of service of the network; the potential for security problems, breaches in privacy and loss of audit trails. While the same concerns exist for "closed" networks (networks whose bounds are limited such as an "intranet", they tend to be of a smaller magnitude and more prone to private solutions. For example, there is relatively less concern about fraud between businesses engaging in electronic data interchange (EDI) over a proprietary network; likewise, few are concerned about tracking electronic-fund transfers (EFT) because EFT is not conducted over an open network and is accompanied by a "header" that provides authorities with audit information. The closed and open network distinction is unclear in the case of proprietary networks (such as America On Line or Minitel), bulletin boards or other kinds of connected networks which can operate as closed systems but with a "gateway" connection to the Internet that may or may not be fixed. Further work is needed to identify a definition that helps to guide policy analysis with the understanding that imprecision is the inevitable by-product of retaining flexibility and adaptability.

The working definition of electronic commerce adopted here is that of commercial transactions occurring over open networks, primarily the Internet. Both business-to-business and business-to-consumer transactions will be included. In order to make a better judgement of the economic impact of electronic commerce that portion of the network infrastructure primarily dedicated to this activity will also be included. Likewise for issues of access to the network and the technology driving this phenomenon, the development of the infrastructure is important. But for issues aside from overall economic impact (such as consumer protection, taxation and new commercial codes of business), a more narrow definition that focuses on the buying and selling of products over this infrastructure is needed so as to identify the correspondence between these policy issues and the current state and direction of electronic commerce.

## *The Infrastructure for Electronic Commerce*

Just as in traditional commerce, electronic commerce requires a substantial infrastructure composed of intermediaries that allow sellers to transact business with buyers. As in the US gold rush of the 1800s, many see the real winners of electronic commerce not to be the gold miners but the suppliers that outfitted the miners with food, clothes and pick axes. To date, this has in fact been the case. If one assumes that one-fifth of Cisco's 3.3 billion \$US in router sales are attributable to demand linked to electronic commerce, this exceeds most of the estimates of "total" electronic commerce (Table 2).

The infrastructure of electronic commerce may be broken down into four parts: 1) network service providers (e.g. Internet access), 2) hardware (e.g. PCs, routers, servers, etc.), 3) software to run this hardware and electronic commerce packages and 4) enabling services (e.g. e-payment, authentication/certification services, advertising). Of the four categories, hardware is estimated to have the largest sales currently, roughly 10 to 30 billion US\$, and in the future, where the total estimates range from 43 to 72 billion US\$. In most cases, though, estimates of hardware expenditures are for **all** Internet related hardware, not just that portion of Internet use dedicated to electronic commerce.

The software to run these PCs, servers and routers and support networks, is a smaller but not insignificant part of the market, ranging from 300 to 900 \$US million in 1996 to possibly 4 \$US to 5 \$US billion in the year 2000. On top of this is electronic commerce-specific software such as "turn-key" packages that allow merchants to set up a store-front online. Forrester estimates that this segment earned revenues of about 20 \$US million in 1996 and should grow significantly to 3.2 \$US billion by the year 2000.<sup>4</sup>

Providers of Internet service (ISPs) currently generate about 125 million \$US in revenues but this could drop as prices fall. Over the past year, the OECD average for 20 hours of Internet access has fallen from 68 \$US to 20 \$US.<sup>5</sup> But with expectations that in the near future 50 million people will pay an annual fee of 240 \$US for access, generating 12 \$US billion in revenues, it makes providing Internet access "...the largest revenue stream directly predictable for the Internet." (Lesk, 1997).

Lastly, there is the emergence of a new cadre of intermediaries that help buyers and sellers conduct business. Providing services such as directories, advertising, e-payment, insurance, network diagnostics, authentication and certification, these activities are at an early stage and many are just coming into existence. To date, the segment has been dominated by advertising which remains the primary business model of the Internet: give away your product but charge for placing advertisements on or near your product. Jupiter estimates that 1996 Web-based advertising revenue was 310 \$US million<sup>6</sup>. Of this, 10 sites -- most of them providing some type of intermediary service (browser, search engines) -- represent about half of the total (Table 3). Forrester projects that by the year 2000, advertising revenue on the Internet will hit 4.8 \$US billion (Lesk, 1997).

## **Buying and Selling Products over the Internet**

While the supply side of infrastructure for electronic commerce is currently a major source of economic activity, many expect the demand side -- the buying and selling of products over this infrastructure -- to be the key source of growth in the future. In terms of policy relevance, the demand side is where questions of consumer protection, taxation, payment security, parcel delivery and the need for an updated commercial code arise. For these issues, this more limited definition is preferable. These policy needs require that the acquisition of products by electronic commerce be separated into those that

are business-to-business transactions and those that are business-to-consumer transactions. In addition to this division, it is useful to further separate the activities into those that involve digital products (bits or intangibles) and those that are not (atoms or tangibles) (Negroponte, 1995).

### ***Business-to-business Electronic Commerce***

As Table 2 shows, one firm, General Electric (GE), did more business-to-business electronic commerce in 1996 than all the individual business-to-consumer activities and most of the estimated electronic commerce totals.<sup>7</sup> GE has announced plans to move all their procurement, worth 5 \$US billion, to the Internet by 2000<sup>8</sup>. The OECD's high-level private sector experts on electronic commerce suggest that this figure is conservative and point to two cases, a retailer and a European automobile manufacturer, that respectively already conduct over 10 \$US and 7 \$US billion worth of transactions electronically (OECD, 1997). While these cases do not necessarily use an open network like the Internet, many firms are exploring the use of the Internet as a cost-effective means of acquiring products from suppliers. NEC, one of Japan's leading electronics manufacturers, has recently announced that it will begin to use the Internet for 90 per cent of its procurement activities, valued at 17.3 \$US billion per year<sup>9</sup>.

Two of the key business-to-business sectors that do trade over the Internet are information technology products (routers, computers and software) and travel services. Cisco, the dominant supplier of network routers with over two-thirds of the market, reports that they will generate 2 \$US billion in revenue from their Web site this year (although this is orders to their Web site, payment occurs off-line).<sup>10</sup> Personal computer makers, such as Dell, are using electronic commerce to sell over a million dollars worth of products daily.<sup>11</sup> Since after sales technical support is a key component of many of these products, its provision online effectively constitutes electronic commerce. Hewlett-Packard reports that 65 per cent of its customer tech-support inquiries are now handled by the Web. Cisco claims that their Web site saves them 500 \$ million yearly in support costs. In total, Forrester estimates that computers and peripherals were accountable for about 323 \$US million worth of electronic commerce in 1996 and they predict that this will jump to 2.1 \$US billion by the year 2000. E-land estimates that computer products and services account for over a quarter of all electronic commerce.<sup>12</sup> Most of these transactions are business-to-business, although some unknown fraction of PC sales are to households.

As in the case of hardware, software is a leading product sold to businesses over the network, and like PCs, a small portion of sales are to consumers as well.<sup>13</sup> The Japanese Ministry of Posts and Telecommunications claims that half of all purchases of goods and services on the Internet in Japan are for software (MPT, 1997). The digital nature of software makes it possible to not only sell but also deliver the product over the network. While currently only a small fraction of software (1 to 2 per cent) is delivered this way, industry experts expect that by 1998 this ratio will have jumped to a third.<sup>14</sup> This translates into roughly 3.5 \$US billion, placing software into the top-tier of (non-infrastructure) electronic commerce products.

The other major category of business-to-business electronic commerce is travel services, particularly airline reservations<sup>15</sup>. A recent policy paper by the European Commission on electronic commerce credits travel services with over half of all electronic commerce.<sup>16</sup> Jupiter Communications estimates that revenues from online travel bookings (air, hotel, car rental, cruises, vacation packages, as well as advertising on travel-oriented sites) were 276 \$US million in 1996, which they estimate to be about one-third of all electronic commerce. They predict this will increase to 4.5 \$US billion in 2000.<sup>17</sup> Press accounts of individual firms such as Microsoft's Expedia and American Airlines Travelocity suggest

that this estimate may be conservative since these firms are generating annual sales of 30 to 50 \$US million each.<sup>18</sup> More recent estimates by Forrester Research place the market for online ticket sales at 10 \$US billion by 2001<sup>19</sup>. As in the case of software, these transactions are increasingly digital -- electronic tickets are issued over the network, replacing printed, hardcopy tickets.

While these are the dominant electronic commerce activities between businesses to date, a whole array of business services including payroll services<sup>20</sup>, data services such as credit reports or financial information<sup>21</sup> and even legal and medical services<sup>22</sup> are beginning to appear as electronic commerce businesses.

Although it is rare for any of the private suppliers of electronic commerce estimates to differentiate between business-to-business and business-to-consumer electronic commerce, most observers agree that business-to-business electronic commerce is "where the big money will be."<sup>23</sup> Given that roughly two-thirds of all gross output is business-to-business in traditional commerce, there is no reason, *a priori*, to think that electronic commerce transactions would be significantly different.<sup>24</sup>

### ***Business-to-Consumer Electronic Commerce***

Although electronic commerce infrastructure and business-to-business electronic commerce represent the bulk of all electronic commerce most of the attention and speculation about electronic commerce has focused on the business-to-consumer segment. With household transactions typically accounting for over half of all domestic final demand,<sup>25</sup> this is rationale; likewise, as PC and network saturation occurs in businesses, it is natural for the focus of attention to turn to the household.

Although much of the popular press has focused on electronic commerce merchants that sell tangible products (e.g. books, wine, flowers and computers), in fact, the largest segments (with the possible exception of computers) are in fact intangibles like entertainment and software. This corresponds with the lessons learned from France Telecom's Minitel service which has been engaging in electronic commerce (over a closed network) for over a decade. Here, the main beneficiaries have been intangibles.<sup>26</sup> This makes intuitive sense since the product can not be physically examined, traditional commerce has no advantage over the convenience of electronic commerce.

To date, the main tangible products sold electronically have been computers, clothing and food/drink, each generating about 120, 90 and 40 \$US million in 1996 respectively (Table 2). Many of these categories are dominated by traditional retailers that have established electronic commerce operations such as the USA's Dell, La Redoute of France, Marks & Spencer of the UK and supermarkets in the Netherlands. Behind these broader categories are a group of speciality-item merchants of books, flowers and CDs (music) that add value to a product by providing a wider selection, more information about a product or convenience of access. But any product could be sold via electronic commerce as evidenced by Wal-Mart's recent decision to make 80 000 items available online<sup>27</sup>. Even some of the most tangible of all household items -- houses and cars -- are now sold electronically over the Internet. Chrysler estimates that 1 to 2 per cent of all of its sales were done through on-line services in 1996<sup>28</sup> and predicts that by 2000, a quarter of its sales will be done online<sup>29</sup>.

The largest segment of business-to-consumer electronic commerce is for those intangible products that can be delivered directly to the consumer's computer over the network. This immediacy of ownership is one of the key attributes of electronic commerce. Entertainment, which includes activities such as adult entertainment, online games and music and video is the largest single product sold by businesses to consumers. Forrester estimates that adult entertainment alone accounts for 10 per cent of

all 1996 business-to-consumer electronic commerce (50 \$US million), just behind computer products and travel<sup>30</sup>. “Pay-for-play” online games generated a slightly lesser amount<sup>31</sup> while the online distribution of music is currently much less (approximately 10 to 20 \$US million) but is growing very rapidly with one UK firm, Cerberus, reporting a quadrupling of downloads from one quarter to another.<sup>32</sup> Jupiter Communications predicts that online music sales will increase to 186 \$US million by 2000<sup>33</sup>.

Another entertainment area where activity is large, but poorly understood, is on-line gambling since most of this activity is on sites located in off-shore havens such as Grenada, home of Sports International. One estimate places over 30 \$US billion worth of gambling being conducted online<sup>34</sup>. If true, this would make gambling the largest single electronic commerce activity. While this estimate seems high, one Internet gambling firm, Interactive Gambling and Communications Corp. had 1996 revenue of 58\$ US million.<sup>35</sup>

A number of electronic commerce activities such as software and travel are both business-to-business and business-to-consumer. Another category is finance. Because many of the firms engaged in this activity are also involved in providing traditional financial services, revenue estimates are difficult to obtain, but one firm, E\*Trade, reported 68 \$US million in revenues from 50 000 active accounts and 2.8 \$US billion in assets<sup>36</sup>. Since Forrester estimates that assets worth 111 \$US billion from 624 000 accounts are already managed online<sup>37</sup>, and the US bank, Wells Fargo, reports 250 000 online customers<sup>38</sup> and new entrants such as Intuit are entering the market offering everything from life insurance to home mortgages<sup>39</sup>, the real size of revenues from this segment probably makes it as large as any business-to-consumer activity. The prospects of growth in this area appear to be strong. Quicken reports that traffic at its InsureMarket site increases by 10 per cent monthly, sales have doubled in the last six months and new products such as auto and home insurance will be introduced<sup>40</sup>. A recent survey by Ernst & Young of 130 financial services companies in 17 countries found that 13 per cent of the firms were using the Internet for transactions with customers, but that 60 per cent expected to do so by 1999<sup>41</sup>.

## **Conclusions and Implications for Policy**

It is clear that measuring electronic commerce as accurately as conventional commerce is nearly impossible given the difficulty of defining it and adequately capturing the value associated with it. Nevertheless, for policy purposes such statistics are badly needed to focus the policy debate so that action is directed towards activities that truly reflect the electronic commerce phenomenon, and avoid a simple transplantation of the traditional commerce business model to what is a much different environment on the Internet. This is all the more important since there is some evidence that many policy makers may lack a clear technical understanding of the Internet<sup>42</sup>. This report has proposed a framework for pulling together the disparate estimates from private sources in such a way that a more coherent image of electronic commerce is formed and the relative importance of various aspects of electronic commerce can be compared.

From this comparison, it is clear that the volume of business-to-business electronic commerce greatly exceeds that between businesses and consumers. The business-to-business sales of a few firms such as Cisco and General Electric surpass all of business-to-consumer electronic commerce. Thus, while consumer issues are important and represent a potentially large market in the future, this should not obscure the importance of policy issues that are more business specific such as adapting commercial business codes to this new environment, transborder data flows between businesses, establishing new means for engaging in contracts (e.g. digital signature, authentication and certification) and improving the reliability of the infrastructure to meet the quality-of-service demands of businesses.

Within the business-to-consumer segment, the leading activity is entertainment. This category is currently led by three activities : adult entertainment, online games which are frequently of a violent nature and gambling. Many of these segments raise cultural sensitivities and have been the source of discussion concerning their possible regulation. While these are important areas for political analysis and possible regulatory responses, the economic importance of these activities as a driving force of business-to-consumer electronic commerce should be acknowledged. Historically, these activities have been technological and marketing leaders, paving the way for other sectors<sup>43</sup>. Within electronic commerce, the same experience appears to be happening as adult entertainment is an early pioneer in the use of electronic-payment schemes, certification/authentication techniques and self-regulation<sup>44</sup>. Efforts to restrict these activities should be undertaken with some appreciation for the impact these actions could have on the development of electronic commerce.

In the business-to-consumer markets, digital products such as software, travel services, entertainment and finance are the leading electronic commerce products. Their intangible nature forces a wholesale re-evaluation of existing rules and practices. For example, does a bug in a software programme (a nearly universal event) give consumers the right to a refund when in many cases, because of its digital nature, the consumer is likely to have made a perfect copy before returning the “defective” product? How about if the bug, in this case a virus, damages the users computer -- does the consumer have redress? Lastly, are “clickwrap” licenses<sup>45</sup> negotiated by electronic agents binding? These are but a few of the policy questions that digital products raise.

The ability to deliver intangibles over the network effectively by-passes the traditional distribution channels that gave tax authorities an audit trail. This could make the collection of taxes such as value-added taxes or customs duties very difficult. While discussions are underway to identify a remedy to this problem, the failure of efforts dedicated to shutting down software pirates who distribute more than 5 \$US million of pirated software daily across the Internet suggests that re-establishing such an audit trail in cyberspace may be impossible<sup>46</sup>. Simply establishing jurisdiction for the application of tax law is difficult given that the “store”, in this case modems, servers and routing equipment, can be located in multiple locations as Internet service providers expand their reach and web pages and servers can be mirrored or cached in locations, sometimes without the knowledge of the merchant. In some countries such as the United States, the use of licensed software to place orders has been ruled to be insufficient for constituting a physical presence or “nexus” for the purposes of administering taxes<sup>47</sup>.

Lastly, the use of networks not only to sell but also to distribute products requires that attention be paid to the functioning of the network infrastructure and its ability to transport files that require significant bandwidth. Already, some merchants who rely on the Internet for the distribution of their products are complaining about the performance of certain components of the system<sup>48</sup>. Public policies need to continue to monitor the access to, and supply of, sophisticated connections that provide adequate bandwidth, or the development of electronic commerce, much of which is based on digital products, will be constrained<sup>49</sup>.

While these issues gain prominence in the electronic commerce policy agenda, others that focus more on tangible products such as parcel delivery policies and custom clearance procedures might not warrant the same immediate attention.

The last segment of Table 2 lists the estimates by a dozen private firms of the total electronic commerce market as of “today” (roughly 1996) and in the “future” (usually the year 2000). The wide variance in estimates underscores the difference in definition and methodology. Nevertheless, a common conclusion is clear: electronic commerce is currently relatively small and will continue to be so in the near future, but it is growing very quickly (over 200 per cent annually). If no attempt is made to reconcile

definitions or geographical coverage and the median is calculated and compared to benchmarks such as total US catalogue sales<sup>50</sup>, credit card purchases<sup>51</sup> or US retail sales<sup>52</sup> -- electronic commerce in the year 2000 will be about two-thirds of the 1996 level of US catalogue sales, 12 per cent of Visa's 1995 credit card business and about 2 per cent of all 1997 US retail sales. While important, these benchmarks indicate that electronic commerce is at an embryonic stage where technology and the dynamics of the market are still casting its basic shape. This suggests that policies should be drafted with caution and in recognition of the evolving nature of electronic commerce.



## NOTES

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Figure 1. Typology of Electronic commerce Definitions

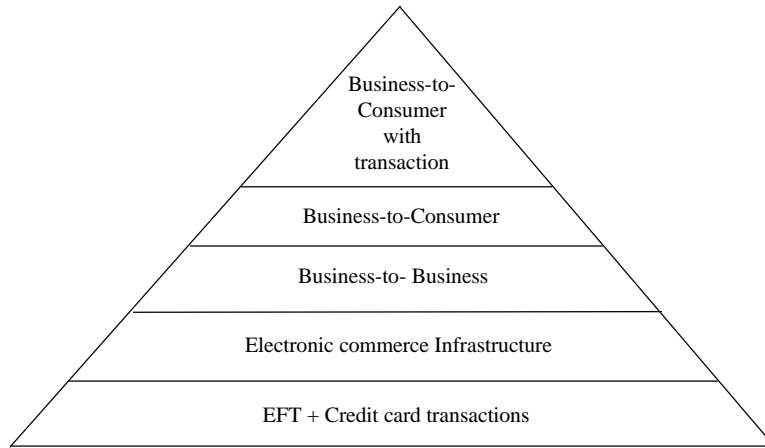
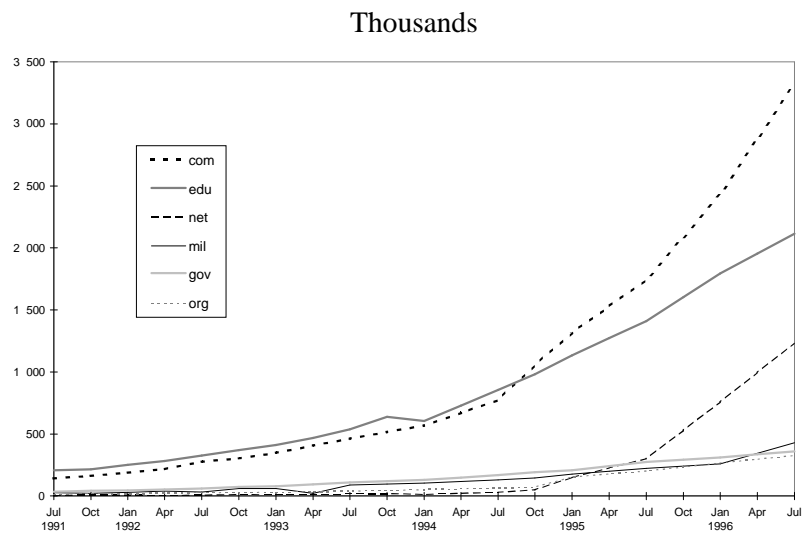


Figure 2. Shift in the mix of users, number of hosts by domain names



Source: Merit, September 1996, <http://nic.merit.edu/nsfnet/statistics/>.

Table 1. Internet Market - Capitalisation and Employment in First Quarter 1997

Internet grew at an annualised rate of 70 per cent

Company	Employment 1997/01/21	Internet Related (%)	Internet Related Market Cap (\$m)	Internet Related Domestic Employment
@Home <sup>1</sup>		100		
3COM	5 190	20	2 544	1 038
AccentSoftware	133	35	25	47
Adobe	2 319	15	401	348
Adtran	748	20	369	150
AdvncMicro	12 797	15	701	1 920
Amdahl	8 000	15	207	1 200
Ameritech	65 345	5	1 638	3 267
AMP	40 800	10	933	4 080
Analog Dev	6 000	10	333	600
AOL	5 828	30	1 113	1 748
Apple	17 615	15	320	2 642
Ascend	304	50	4 894	152
AST	6 066	15	43	901
AT&T	3 00 000	10	6 380	30 000
Bay Networks	5 758	25	1 107	1 440
BBN	2 000	50	272	1 000
Bell Atlantic	61 800	5	1 467	3 090
Bell South	87 600	5	2 181	4 380
Boca Research	386	25	18	97
Borland Institute	938	15	31	141
Cabletron	5 377	15	821	807
Camelot	82	15	2	12
Cascade Company	423	50	2 752	212
CirrusLogi	3 151	15	155	473
Cisco	8 782	25	12 231	2 196
CKS Group	202	25	97	51
CMG Info	237	25	40	59
Comdisco	2 100	15	253	315
Comp USA	11 152	10	156	1 115
Compaq	23 884	15	3 171	3 583
CompuServe	3 650	30	281	1 095
Comp Assoc	8 800	15	2 517	1 320
ComputriSci	33 600	10	578	3 360
ConcentNet <sup>1</sup>		100		
Connect	---	50	53	---
Corning	40 000	20	1 675	8 000
CyberCash	59	100	200	59
Cyrix	389	25	118	97

**Table 1. Internet Market - Capitalization and Employment, First Quarter 1997 (cont'd)**

Company	Employment 1997/01/21	Internet Related (%)	Internet Related Market Cap (\$m)	Internet Related Domestic Employment
Data Gen	5 000	10	69	500
DEC	59 100	15	815	8 865
Dell	8 400	15	1 684	1 260
DiaMultMed	747	35	175	261
DigiCash <sup>1</sup>		100		
DigitalLnk	211	35	59	74
Documentum	---	35	173	---
DSC Com	5 860	35	836	2 051
E-Trade	245	100	488	245
EDS	100 000	20	4 622	20 000
EMC Corp.	4 100	15	1 361	615
Find SVP	236	50	6	118
First Data	36 000	10	1 579	3 600
FirstVirtH	---	100	---	---
Frontier Tech <sup>1</sup>		35		
FTP Software	740	50	113	370
Fulcrum Tech	250	25	16	63
Gateway 2000	9 300	15	680	1 395
GenInstrum	12 300	15	483	1 845
Global Village	297	25	14	74
GTE	106 000	5	2 224	5 300
HaynesMicro <sup>1</sup>		50		
Hewlett Packard	102 300	25	13 802	25 575
HumngBdCom	211	50	223	106
I/Pro <sup>1</sup>		100		
IBM	290 215	15	13 042	43 532
InaCom	2 196	25	93	549
Incontext <sup>1</sup>		100		
InfoResEng	90	35	19	32
Infomix	3 219	25	896	805
Intel	41 600	25	30 375	10 400
Intergraph	8 400	10	48	840
Interleaf	647	35	12	226
InterVisa <sup>1</sup>		35		
Intuit	3 184	10	160	318
Learning Company	775	25	190	194
LexmarkInt	7 500	10	196	750
Livingston <sup>1</sup>		50		
LSI Logic	3 870	25	1 094	968
Lucent	131 000	5	1 707	6 550
Lycos	28	100	259	28

**Table 1. Internet Market - Capitalization and Employment, First Quarter 1997 (cont'd)**

Company	Employment 1997/01/21	Internet Related (%)	Internet Related Market Cap (\$m)	Internet Related Domestic Employment
Macromedia	396	75	320	297
McAfee Assoc.	250	35	953	88
MCI	50 000	40	9 667	20 000
MicroElec	1 955	15	326	293
MicronTech	9 900	15	936	1 485
Microsoft	20 561	25	28 417	5 140
Molex Inc.	9 500	15	285	1 425
Motorola	142 000	15	6 070	21 300
NatSemicon	20 300	15	509	3 045
NETCOM	508	60	91	305
NetManage	618	50	112	309
Netscape	725	100	3 582	725
Newbridge	3 400	35	1 012	1 190
NorTel	59 900	5	909	2 995
Novell	7 272	25	979	1 818
Nynex	65 800	5	1 108	3 290
OpenMarket	257	60	261	154
Oracle	23 113	25	6 861	5 778
PacTel	48 889	5	808	2 444
Paper Software <sup>1</sup>		75		
Premenos	193	35	36	68
Premisys	183	15	106	27
Prog Network <sup>1</sup>		100		
PSINet	629	100	456	629
Quantum	7 036	15	275	1 055
Quarterdec	532	15	26	80
Raptor	58	100	287	58
ReadRite	19 507	15	222	2 926
Santa Cruz Op	1 128	25	76	282
SBC	59 300	5	1 730	2 965
SCI System	15 524	15	240	2 329
Scopus Tech	161	15	82	24
Seagate Tech	53 000	15	1 840	7 950
SecureComp	276	35	22	97
Security Dyn	162	35	394	57
Shiva	486	50	299	243
SiliconGra	10 485	15	712	1 573
SoftQuad	105	35	10	37
Solectron	11 049	15	473	1 657
Sprint	48 300	20	3 526	9 660
Spyglass	73	100	141	73
Starwave <sup>1</sup>		50		

**Table 1. Internet Market - Capitalization and Employment, First Quarter 1997 (cont'd)**

Company	Employment 1997/01/21	Internet Related (%)	Internet Related Market Cap (\$m)	Internet Related Domestic Employment
Storage Tech	10 000	15	450	1 500
StratusCmp	2 441	15	116	366
Sun Micro	17 400	20	2 452	3 480
Sybase	5 865	15	211	880
Tandem	8 380	15	253	1 257
Terisa <sup>1</sup>		100		
Texas Instr.	59 574	20	2 375	11 915
Trusted Inf.	203	25	36	51
Unisys	37 400	15	198	5 610
US Robotics	3 347	50	3 242	1 674
US West	61 047	5	794	3 052
VanstarCor	4 100	15	125	615
Verisign <sup>1,2</sup>		100		
Verity	216	50	84	108
Vermeer Tech <sup>1</sup>		100		
Western Digital	9 628	10	309	963
WorldCom	7 500	30	5 019	2 250
Worlds Inc. <sup>1</sup>		25		
Xircom	500	25	141	125
Yahoo!	20 000	100	845	20 000
Zenith	18 100	15	112	2 715
Zoom Telephone	309	15	11	46
<b>TOTAL</b>	<b>2 675 017</b>	<b>18</b>	<b>218 523</b>	<b>378 977</b>

1. Figures unavailable.

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Source: Amano, Takuma and Robert Blohm (1997), A First Approximation of Internet's Economic Impact, mimeo.



Table 2. Comparison of various Electronic commerce estimates

(Millions of US\$)

Activity	Today	Future
<b>Infrastructure</b>		
<b>Hardware</b>		
total	500 <sup>53</sup>	2500 <sup>54</sup>
computer products	140 <sup>55</sup>	2105 <sup>56</sup>
Cisco	3300 <sup>57</sup>	
network hardware	29000 <sup>58</sup>	72000 <sup>59</sup>
total	10950 <sup>60</sup>	43000 <sup>61</sup>
<b>Network Services</b>		
total	300 <sup>62</sup>	5000
ISP revenue	125 <sup>63</sup>	12000
<b>Software &amp; Comp. serv.</b>		
total	300 <sup>64</sup>	4000 <sup>65</sup>
e-comm apps	22 <sup>66</sup>	3200 <sup>67</sup>
total	900 <sup>68</sup>	5100 <sup>69</sup>
<b>Enabling Services</b>		
total	20 <sup>70</sup>	1000 <sup>71</sup>
total	500 <sup>72</sup>	10000 <sup>73</sup>
total	0 <sup>74</sup>	3600 <sup>75</sup>
ads	55 <sup>76</sup>	5000 <sup>77</sup>
ads	80 <sup>78</sup>	5000 <sup>79</sup>
ads	37 <sup>80</sup>	2570 <sup>81</sup>
ads	32 <sup>82</sup>	2800 <sup>83</sup>
ads	74 <sup>84</sup>	4800 <sup>85</sup>
aggregation	1850 <sup>86</sup>	17000 <sup>87</sup>
<b>E-Comm: B-to-B</b>		
GE	1000 <sup>88</sup>	
retailer	10000 <sup>89</sup>	
auto manuf.	7000 <sup>90</sup>	
computers	12 <sup>91</sup>	
computers	300 <sup>92</sup>	
computers	323 <sup>93</sup>	2105 <sup>94</sup>
software	212 <sup>95</sup>	3498 <sup>96</sup>
software	250 <sup>97</sup>	4600 <sup>98</sup>
travel	126 <sup>99</sup>	1579 <sup>100</sup>
travel	276 <sup>101</sup>	4500 <sup>102</sup>
travel	600 <sup>103</sup>	3000 <sup>104</sup>
travel	457 <sup>105</sup>	10000 <sup>106</sup>

Table 2. Comparison of various Electronic commerce estimates (cont'd)

(Millions of US\$)

Activity	Today	Future
<b><i>E-Comm: B-to-C</i></b>		
apparel	46 <sup>107</sup>	322 <sup>108</sup>
gifts/flowers	45 <sup>109</sup>	658 <sup>110</sup>
books	16 <sup>111</sup>	
food/drink	39 <sup>112</sup>	336 <sup>113</sup>
clothing	89 <sup>114</sup>	322 <sup>115</sup>
other	37 <sup>116</sup>	329 <sup>117</sup>
misc.merchandise	5	
misc.merchandise	348 <sup>118</sup>	
entertainment	85 <sup>119</sup>	1250 <sup>120</sup>
subscription services	120 <sup>121</sup>	966 <sup>122</sup>
pornography	52 <sup>123</sup>	
music	9 <sup>124</sup>	186 <sup>125</sup>
images	4 <sup>126</sup>	
news	6 <sup>127</sup>	
online games	127 <sup>128</sup>	1013 <sup>129</sup>
online gambling	6 <sup>130</sup>	
online gambling	160 <sup>131</sup>	8600 <sup>132</sup>
consumer finance	68 <sup>133</sup>	
consumer insurance	39 <sup>134</sup>	1110 <sup>135</sup>
<b><i>Total</i></b>		
IDC	1000 <sup>136</sup>	117000 <sup>137</sup>
VSAComm	48 <sup>138</sup>	3500 <sup>139</sup>
VeriFone	350 <sup>140</sup>	65000 <sup>141</sup>
Actif Media	436 <sup>142</sup>	46000 <sup>143</sup>
Killen & Assoc.		775000 <sup>144</sup>
Yankee	850 <sup>145</sup>	144000 <sup>146</sup>
Jupiter	45 <sup>147</sup>	580 <sup>148</sup>
e-land	450 <sup>149</sup>	10000 <sup>150</sup>
EU		228000 <sup>151</sup>
USA	200 <sup>152</sup>	
EITO	363 <sup>153</sup>	200000 <sup>154</sup>
AEA/AU	200 <sup>155</sup>	45000 <sup>156</sup>
Hambrecht & Quest	1170 <sup>157</sup>	23200 <sup>158</sup>
Forrester	518 <sup>159</sup>	6579 <sup>160</sup>
mean value	469	134906
median value	399	46000

**Table 3. Top Advertising Revenue by Internet Site 1996**

(Million of US\$)

1. Netscape	27.7
2. Yahoo!	20.6
3. Infoseek	18.1
4. Lycos	12.8
5. Excite	12.2
6. CNET	11.4
7. ZD Net	10.2
8. WebCrawler	7.3
9. ESPNET Sports Zone	6.5
10. Pathfinder	5.8

Source: <http://www.e-land.com> 29-Apr-97.

## TABLE NOTES

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