

Determinants of the Global Diffusion of B2B E-Commerce

By: [Nir Kshetri](#) and Nikhilesh Dholakia

Kshetri, Nir and Nikhilesh Dholakia (2002), "Determinants of the Global Diffusion of B2B E-Commerce," *Electronic Markets*, 12(2), 120-129.

Made available courtesy of Springer Verlag: The original publication is available at <http://www.springerlink.com>

*****Reprinted with permission. No further reproduction is authorized without written permission from Springer Verlag. This version of the document is not the version of record. Figures and/or pictures may be missing from this format of the document.*****

Abstract:

Compared to business-to-consumer (B2C) e-commerce, business-to-business (B2B) e-commerce is larger, growing faster and has less unequal geographical distribution globally. In this paper, we examine the current stage of B2B e-commerce development across four global regions and propose a model to explain the magnitude and global distribution of B2B e-commerce activities. Our analysis indicates that increases in the freedom of the movements of goods, services, capital, technology and people coupled with rapid technological development resulted in an explosion of global B2B e-commerce. The share of the global B2B e-commerce a country is likely to receive, on the other hand, depends upon country level factors such as income and population size, the availability of credit, venture capital, and telecom and logistical infrastructure, tax and other incentives, tariff/non-tariff barriers, government emphasis on the development of human capital, regulations to influence firms' investment in REED, organizational level politics, language and the activities of international agencies.

Keywords: globalization, B2B e-commerce, multinational corporations, technology, diffusion

Article:

INTRODUCTION

Compared to business-to-consumer (B2C) e-commerce, business-to-business (B2B) e-commerce is larger, growing faster and has less unequal geographical distribution globally. An estimate suggests that B2B e-commerce accounted for 80% of all e-commerce in 2000 and the proportion would increase to 87% by 2003 (Nua Internet Surveys 2000a). Another study by Gartner Group indicated that the worldwide B2B e-commerce market registered a 189% growth in 2000, reaching US\$433 billion, and is estimated to reach US\$919 billion in 2001, US\$1.9 trillion in 2002, US\$3.6 trillion in 2003, and US\$6 trillion in 2004 (Nua Internet Surveys 2001b). Whereas the share of Africa, Latin America and the lagging Asian countries in the global B2C e-commerce in 2003 is estimated to be 0.1%, their B2B market share is expected to be slightly higher (Computer Economics 2000; Nua Internet Surveys 2000b).

For technology firms involved in international business, a clear knowledge of the mechanisms by which environmental forces affect B2B e-commerce diffusion is critical for making the country entry decisions and selection of business models. Without such knowledge, technology firms run the risk of suboptimizing their approach to international markets. Although some studies have analysed various environmental forces influencing the diffusion of the Internet and e-commerce in general (e.g., Hogan 1999; Kshetri 2001), unique aspects of the global diffusion of B2B e-commerce have not been examined. This paper seeks to fill the research gap by analysing the factors that influence the global diffusion and adoption of B2B e-commerce. We examine the factors that are fuelling the rapid diffusion of B2B e-commerce as well as factors that determine the share of global B2B e-commerce an economy is likely to receive.

Following WTO (1998) we define B2B e-commerce as any transaction carried out between organizations in which at least one of the following activities – production, distribution, marketing, sale or delivery – takes place

by electronic means. ‘B2B market’ on the other hand refers to all transactions (by electronic as well as conventional means) carried out between organizations. Magnitude of global e-commerce refers to the total monetary value of all B2B e-commerce transactions carried out across the globe. Geographical distribution of global e-commerce describes how the global e-commerce is divided among various regions and economies.

The rest of this paper has four sections. First, we briefly examine the global distribution of B2B e-commerce. Then a discussion on relevant theories and past research is provided. Next, an analysis of the forces that influence the diffusion pattern of B2B e-commerce is presented. Finally, some conclusions are provided.

GLOBAL DISTRIBUTION OF B2B E-COMMERCE

Estimating B2B and B2C e-commerce transaction volumes to a reasonable level of accuracy has been a challenge. Based on data triangulation from several sources, it appears that global B2B e-commerce is more evenly distributed than global B2C e-commerce (Computer Economics 2000; Nua Internet Surveys 2000b). Although North America dominates the global B2B e-commerce, the gap between North America and rest of the world is much smaller for B2B e-commerce than for B2C e-commerce (see Table 1). Moreover, the inequality is narrowing rapidly. For instance, North America’s share of the B2B market was 66%, twice the share of rest of the world in 1999 (BCG 1999). This is estimated to shrink to 39% by 2004 (Lewis 2000).

While the numbers in Table 1 point to the dominant but shrinking position of North America – in terms of B2B e-commerce – vis-à-vis the rest of the globe, there are also qualitative differences across the regions of the world. Table 2 provides our assessment of the patterns of B2B e-commerce in these four regions in terms of leading sectors driving B2B e-commerce, geographic focus (global/regional/local), driving forces, types of B2B transactions, and constraints.

Table 1. A Comparison of the Geographical Distribution of B2B and B2C E-commerce

<i>Region</i>	<i>B2C E-commerce</i>	<i>B2B E-commerce</i>
<i>North America</i> (5.6% of world population)	\$38 billion in 2000, and projected to reach \$184 billion by 2004 (1.2% of total retail revenue in 1999) Average per capita revenue: \$100 in 1999	59% of global B2B e-commerce in 2000 (projected 52% in 2001) B2B e-commerce was 7% of total North American B2B market in 1999, projected to be 24% in 2003 and 36% in 2006 Revenue: \$1.2 trillion in 2000, projected to reach \$4.8 trillion in 2004
<i>Europe</i> (13.5% of world population)	\$3.5 billion in 1999 (0.2% of total retail revenue)	17% of global B2B e-commerce in 2000 (projected 20% in 2001) B2B e-commerce was 3% of total European B2B market in 1999, projected to reach 11% in 2003 Revenue: \$3.75 billion in 1998, projected to reach \$174 billion in 2002
<i>Asia-Pacific</i> (60.2% of world population)	\$2.8 billion in 1999 (0.1% of total retail revenue) Average per capita revenue \$0.98 in 1999	22% of global B2B e-commerce in 2000 (projected 24% in 2001) B2B e-commerce was 2% of total Asia-Pacific B2B market in 1999, projected to reach 9% in 2003 Revenue: \$9.2 billion (excluding Japan) in 1999, projected to reach \$430 billion in 2003 and \$1 trillion in 2004
<i>Latin America</i> (8.3% of world population)	\$77 million in 1999, projected to reach \$3.8 billion by 2003	2% of global B2B e-commerce in 2000 (projected 4% in 2001) B2B e-commerce was 2% of total Latin American B2B market in 1999, projected to reach 7% in 2003 Online B2B transactions are predicted to total \$76 billion by 2004.

Source: Several studies of Boston Consulting Group (www.bcg.com), Forrester Research (www.forrester.com), EIU Ebusiness forum (<http://www.ebusinessforum.com>), <http://www.worldtrademag.com>, and authors’ research.

RELEVANT THEORIES AND PAST RESEARCH

Theoretical and empirical evidence suggests that the diffusion pattern of a strategy or a technology is influenced by the environment, characteristics of the adopting organization, and characteristics of the strategy or the technology (Chwelos et al. 2001; O'Neil et al. 1998). For instance, in an empirical study, Chwelos et al. (2001) found that external pressure (a component of the environment), organizational readiness (a characteristic of the adopting organization), perceived benefits of the technology (a characteristic of the technology) influenced EDI adoption among organizations in Canada.

Table 2. Qualitative Profiles of B2B E-commerce in Four Global Regions

Region	Profile of B2B E-commerce in the Region	Comments
North America	<p><i>Leading Sectors:</i> Automotive, computer and telecommunications, aerospace and defence, metals and mining, and chemicals.</p> <p><i>Geographic Focus:</i> Global.</p> <p><i>Driving Forces:</i> Internet-centric investment and IT spending focused on operating cost reduction and demand generation. Internet Tax Freedom Act stipulates that there should be no new taxes on the Internet.</p> <p><i>B2B Model Types:</i> Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement.</p> <p><i>Constraints:</i> Human capital, reduced financial market liquidity, weakened consumer confidence, and reduced capital and marketing expenditures.</p>	<p>Venture capita funds are driving IT business in the US.</p> <p>Covisint, a B2B e-marketplace formed by Daimler-Chrysler, Ford, GM, Renault, and Nissan, plans to funnel \$300 billion worth of supply and material purchases; and has driven B2B e-commerce in automotive sector.</p> <p>Cost saving has been a major motivation of B2B e-commerce adoption.</p>
Europe	<p><i>Leading Sectors:</i> Petrochemicals, motor vehicles.</p> <p><i>Geographic Focus:</i> Regional/national.</p> <p><i>Driving Forces:</i> Internet-centric investment and IT spending focused on operating cost reduction and demand generation for brick-and-mortars.</p> <p><i>B2B Model Types:</i> Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement.</p> <p><i>Constraints:</i> Budget, lack of right skills in-house, multiple languages, legal and business climate less favourable to entrepreneurs than US, lack of infrastructure.</p>	<p>Venture capital much less than in the US.</p> <p>Pre-Internet B2B systems, such as Minitel in France, continue to hold strong legacy positions.</p> <p>No central package tracking system.</p> <p>Europe's industrial selling experience, especially in dealing with small firms across highly divergent cultures, will help in developing regional B2B e-commerce.</p>
Asia-Pacific	<p><i>Leading Sectors:</i> Utilities, agriculture, construction.</p> <p><i>Geographic Focus:</i> Global.</p> <p><i>Driving Forces:</i> Region's strong manufacturing sector; market retrenchment during the 1997-98 recession, Internet-centric investment. Also, pressure from US-based firms to be on the Internet.</p> <p><i>B2B Model Types:</i> Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement. Most e-marketplaces are vertical and specific to industry sectors.</p> <p><i>Constraints:</i> Lack of logistical infrastructure, multiple languages and character sets, low credit card penetration, low Internet adoption rate.</p>	<p>Led by Japan (70% of B2B e-commerce in Asia Pacific).</p> <p>Broadband market, which is set to grow by nearly 600% by 2006, is expected to drive B2B.</p> <p>35-40% business transactions in Asia are conducted on cash basis compared to 3% in the US.</p> <p>Governments' initiatives to develop human capital and other policies are driving B2B e-commerce in some countries (e.g. Taiwan).</p>
Latin America	<p><i>Leading Sectors:</i> Financial services; maintenance, repairs and operations (MRO); agriculture.</p> <p><i>Geographic Focus:</i> Regional/national.</p> <p><i>Driving Forces:</i> Largely funded from abroad.</p> <p><i>B2B Model Types:</i> Mainly bilateral vertical portals. E-marketplaces less likely to be popular.</p> <p><i>Constraints:</i> Lack of intra-regional economic integration, differences in customs and tariff policies, weak technology infrastructures, red tape in dealing with local authorities, inadequate credits facilities.</p>	<p>Banks positioned to be leaders in e-marketplaces and in e-payment solutions.</p> <p>Currently dominated by Brazil. Mexico likely to dominate in future.</p> <p>Vertical portals are mainly established by brick-and-mortar companies.</p> <p>Dominant businesses hesitate to enter into ventures in which they do not have majority control.</p> <p>Businesses mainly conducted on cash basis.</p>

Source: several publications of the EIU Ebusiness forum (<http://www.ebusinessforum.com>), McEwan (2001), BCG (2000) and authors' research.

Characteristics of the Environment

The environment consists of the 'conditions that foster contrasting orientations toward stability or search for change within organizations' (O'Neil et al. 1998, 102). The question addressed in this paper is: What are the 'conditions' that influence an organization's propensity to adopt B2B e-commerce technology?

The first set of conditions influencing the behaviour of a firm in general, and technology adoption behaviour in particular, are the 'country-level effects' or the 'societal effects' (Zaheer and Zaheer 1997). In this paper, the term 'country-level effects' is used to indicate political, cultural, economic and other environmental factors specific to a country that influence the adoption of new technologies by firms located in the country.

Various country-level factors affect innovations as well as their diffusion rates. For instance, the culture of a society is found to have strong influence on the perceived need for a technological change. Rothwell and Wissema (1986) point out that one of the important reasons why organizations in Ancient Greece did not proceed with industrialization, despite their expertise in technology and mathematics, was the easy availability of cheap slave labour, a cultural (and political) factor.

Another source of inter-country variation is the availability of information and skills required to use a new technology or 'inter-relatedness' among users and producers of the technology (Cassiolato and Baptista 1996). Organizations in a country with low degree of inter-relatedness with other complementary technologies often find it difficult to obtain the information and skills needed for the new technology (Allen 1998). Thus, countries with a small base of high technology and innovative capital goods are likely to experience lower rates of diffusion for emerging new technologies (Antonelli 1986).

Still another source of variation lies in the market and infrastructure factors controlling the availability of the technology to potential adopters (Brown et al. 1976). Manufacturers of new technological products are likely to give priority to large distributors (Gatignon and Robertson 1985), which are often located in developed countries. Compounded by other unfavourable environmental factors – including 'physical and social barriers' (Gatignon and Robertson 1985) – the perceived risk of ventures is likely to be higher in developing countries than in developed countries.

Institutions in a country can attack many of the barriers to technology adoption mentioned above by legal and non-legal influences such as new laws, investment incentives, foreign technology transfer, and other supply-push and demand-pull forces (King et al. 1994, Montealegre 1999). 'Successful' countries are found to be those that are able to attack the barriers related to skills, information, market and infrastructures by such means. For instance, Singapore has been able to develop itself as an IT hub of Asia by providing attractive infrastructure, skilled workers and a stable labour environment which attracted a large number of IT firms to locate there (Kraemer et al. 1992; Wong 1998). Similarly, strong university–industry linkages and a large pool of highly trained scientists and engineers, mostly supported by the defence sector, drive technology diffusion in Israel (Porter and Stern 2001).

International institutions can also help in attacking the barriers to technology adoption. For example, technical expertise provided by the United Nations Development Program (UNDP) played an important role in the initial phase of Peru's Internet adoption (Montealegre 1999).

In addition, innovations as well as their diffusion rates vary across fields. For instance, the US has been an attractive location for pharmaceuticals, while Scandinavian countries have experienced extraordinary rates of innovation in wireless technology (Porter and Stern 2001). Similarly, since the Internet originated in the US, firms based in the US are likely to enjoy 'location advantage' in the generation and use of B2B e-commerce technologies.

The set of conditions influencing technology adoption, not explained by country level effects, come under technological globalization. Roberts (1998) defines technological globalization as the 'international diffusion of

technologies not adequately explained by reference to nation states’.

European researchers have identified three processes driving the globalization of technologies (Archibugi and Michie 1997; Iammarino and Michie 1998). The first process relates to the ‘international exploitation of national technological capabilities’ by means of activities such as export, moving production activities abroad, and licensing. The second process is the collaboration among public and business institutions. Sharing of costs and risks of industrial research motivate such collaborations. The third process is the generation of innovations across more than one country. The research activities of Multinational Corporations (MNCs) in foreign locations and the amount of R&D financed from abroad empirically support this process (Iammarino and Michie 1998).

Several ‘linkages’ that are driving the global integration (Ostry 1998) fuelled the globalization of technologies. First, General Agreements on Trade and Tariff (GATT) rounds of trade liberalization resulted in sharp decline of tariffs on industrial products in the developed countries from 50% to 4% during 1948–99 (WTO 1999). Second, OPEC surpluses of the 1970s and the wave of deregulation of the 1980s resulted in increased financial flows. The investment-led globalization spawned global production networks that had a direct effect on the global diffusion of technology. These three linkages mainly increased the influence of large and powerful MNCs. Finally; the emergence of e-commerce on the Internet changed the existing structure and made it possible for even small and mid-sized enterprises (SMEs) to operate globally.

Characteristics of the Adopting Organization

Since organizations possess many unique characteristics, the impact of the environment is not the same across all organizations (O’Neil et al. 1998) and the likelihood of adopting a technology thus varies across them. For instance, firm size – a heterogeneous factor – is an important predictor of technology adoption by organizations (Mansfield 1961). Moreover, trading relationship between two firms is a function of the degree of ‘fit’ between the technologies used by them or what Ford et al. (1998) refer to as ‘technological distance’. Thus, for technologies such as B2B e-commerce, the adoption decision is influenced by interorganizational factors like the nature of relationships between the organization and its existing and potential trading partners.

In the case of electronic data interchange (EDI), for instance, organizational factors such as firm size, top management support, internal need, benefit potential and organizational readiness and interorganizational factors such as competitive pressure, customer support, relative power and trust between trading partners (Chwelos et al. 2001, Hart and Saunders 1998, Premkumar et al. 1997) are found to influence the adoption decision. Furthermore, weak bargaining position (UNCTAD 2001) is forcing companies from developing countries to adopt modern technologies that reduce the ‘technological distance’ to counterpart firms in developed countries. Another study found that some firms from developed countries accepted new suppliers only if they could demonstrate an EDI capability (Schware and Kimberley 1995).

Characteristics of the Technology

Not all technologies diffuse at the same rate. Researchers have identified several characteristics of a technology that influence its diffusion rate. They include relative advantage (benefits over the previous technology), compatibility (with existing beliefs, experience and needs), complexity (of installing, using), observability (by others of current users and uses of the technology) and trialability (the ability to try before formally adopting) (Chwelos et al. 2001; Rogers 1983).

The evaluation of a technology in terms of the above dimensions differs from organization to organization. The relative advantage and hence the adoption rate of the Internet, for instance, varies with firm size and business sector. Firms in service industries are more likely to adopt the Internet than those in manufacturing and mining (Coppel 2000). In Japan, for example, firms with more than 300 employees were found to be four times more likely to adopt the Internet than firms with less than six employees (Coppel 2000).

The Internet (the base technology for B2B e-commerce) fares better than electronic data interchange (EDI) in

terms of several of the above dimensions. For instance, the Internet is less expensive than EDI to implement (higher relative advantage) (UNCTAD 2000b, 11) and has higher observability (Coppel 2000).

FACTORS INFLUENCING THE DIFFUSION OF B2B E-COMMERCE

The previous section indicates that the ability to generate and use e-commerce technology is influenced by ‘globalization effect’ and ‘national level effect’. In addition e-commerce technology has some special features that make it different from other technologies. These features potentially have differential impact on firms in different sectors and with different sizes. Figure 1 presents the various factors influencing the global diffusion pattern of B2B e-commerce technology.

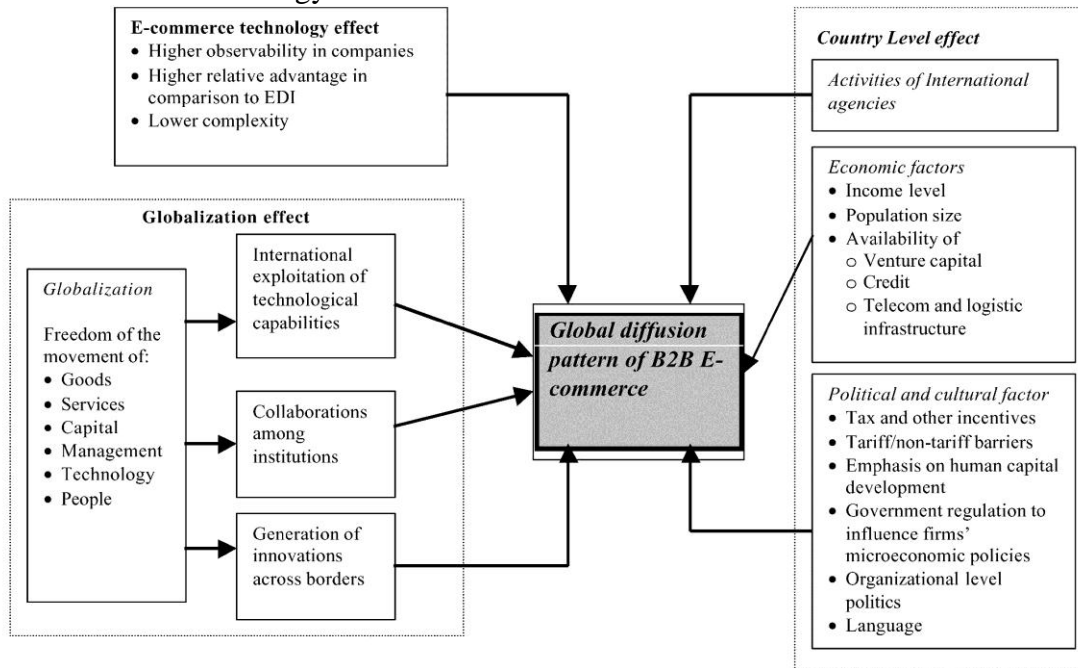


Figure 1. A Proposed Model to Explain the Global Diffusion of B2B E-commerce Technology

Globalization Effect

Rapid globalization following World War II resulted in a high degree of freedom in the movements of goods, services, capital, management, technology and people – increasing firms’ capability to exploit technological capabilities in international markets, collaborate with other firms and institutions, and generate innovations in foreign markets.

International Exploitation of Technological Capabilities and 828 E-commerce. Global trade is rising much more rapidly than the world economy. For instance, from 1948 to 1999, global trade increased by 15-fold compared to a six-fold increase in the size of the world economy (WTO 1999). A large proportion of the global trade is B2B in nature. An estimate suggests that the global value of goods and services traded among businesses exceeds US\$60 trillion (Durlacher 2000). Global B2B trade is dominated by MNCs, mainly based in the US, Europe and Japan (UNCTAD 2001), a significant portion of which is intrafirm in nature. For instance, US trade involving US parents, their foreign affiliates, or both accounted for 62% of all US exports and for 39% of imports in 1995 (Mataloni 1997). Similarly, over 25% of exports are estimated to be intrafirm, the global average being much higher for capital and technology-intensive industries (Ostry 1998).

These conditions have motivated MNCs to exploit B2B e-commerce capabilities on a global scale. The first mechanism used to exploit B2B e-commerce technology is technology transfer. Although no detailed study exists on international transfer of B2B e-commerce technology, past studies have found that the rate at which MNCs transfer technology to their foreign subsidiaries is increasing rapidly. For instance, the proportion of technology transferred to subsidiaries in developed countries by US-based MNCs increased from 27% during 1960–69 to 75% during 1969–78 (Mansfield et al. 1982, 209). The same study found that in 25% of the cases, the technology transfer hastened foreigners’ access to these technologies by at least two and a half years.

Similarly, Vernon (1982, 151) found that innovations are being transferred more rapidly than in the past and more so in firms with high R&D expenditures (the high tech firms).

Second, empirical evidence suggests that larger firms are more likely to use B2B e-commerce technologies (e.g., Coppel 2000). Thus, the huge offline revenues from B2B commerce between MNCs coupled with their higher capability to adopt e-commerce technologies set the stage for a rapid growth of online B2B e-commerce.

Third, an implication of the weak bargaining power of SMEs and firms from developing countries (UNCTAD 2001) is that such firms need to adopt the technology used by MNCs and firms from developed countries to reduce the 'technological distance' (Ford et al. 1998) with their trading partners. A lot of such technology is likely to be B2B e-commerce technology. For instance, American multinationals such as Wal-Mart and JC Penney require their foreign suppliers to transact on the Internet. Their suppliers, mainly from developing Asian countries, are adopting the Internet-based B2B transaction methods sooner rather than later because of such pressures (Woodall 2000).

Of the top 100 MNCs, all but three are from the US, EU and Japan (UNCTAD 2001), which explains the global dominance of B2B e-commerce by the US and Europe (Table 1) and the dominance of the Asian B2B e-commerce by Japan (Table 2). Moreover, with the exception of Wal-Mart, the top 10 MNCs (ranked by revenues) are either in the automobile or petrochemical sectors (Fortune.com 2001). This explains why leading sectors in B2B e-commerce in North America and Europe are the automobile and petrochemicals sectors.

Collaboration Among Firms and B2B E-commerce. B2B e-commerce is being driven by MNC collaborations to share the costs and risks of research (Iammarino and Michie 1998) and increase supply-chain efficiencies. For instance, to save money and improve supply-chain efficiencies, DaimlerChrysler, Ford, GM, Renault, and Nissan launched Covisint, a B2B e-marketplace, which is expected to facilitate the transactions of US\$300 billion worth of supply and material purchases, once the site is fully operational (Enos 2001). Similarly, 14 chemical and petroleum companies agreed to form a global e-marketplace. Their site, Envera, will link suppliers, customers, logistics service providers and financial institutions into a network enabling a variety of B2B e-commerce transactions among trading members, with expected savings of up to 80% of order processing and invoicing costs (Chang 2000).

Generation of Innovations in Foreign Countries and 828 E-commerce. Rapid increase in the availability and international flow of venture capital has resulted in the generation of e-commerce technologies in various locations in the world. In the US, total venture investment in Web-related businesses and other IT increased from \$35 billion in 1999 to over \$70 billion in the first nine months of 2000 (Fortune 2001). Many venture capitalists and high-tech companies are targeting locations such as Hong Kong, Taiwan, China, Singapore, Korea, Japan, India and Israel where returns on investment and market potential are high (Chan 2001). For instance, venture capital inflow in India and China amounted to US\$342 million and US\$84 million respectively in 2000 (UNDP 2001). Similarly, Taiwan's annual investment into new ventures for e-commerce technologies amounts to US\$20 billion (Chen and Lee 2001). Similarly, B2B e-commerce in Latin America is funded largely from abroad (Table 2).

Country Level Effect

Political and Cultural Factors. Government policies and regulations influence the generation and use of e-commerce technology by organizations. For instance, Asian countries such as Hong Kong, India, Malaysia, Singapore, Taiwan and Thailand are providing tax and other incentives for MNCs and are promoting high-tech districts (Omestad 2000). Tariff/non-tariff policies also influence the availability and price structures of IT products needed for B2B e-commerce systems. Higher tariffs and customs on IT products are hindering the growth of B2B e-commerce in Latin America. Availability of technical manpower required for B2B e-commerce is largely determined by governments' policies to develop human capital. For instance, Taiwan's emphasis on technology-oriented curricula and incentives to scholars and researchers (UNDP 2001) has made it a global leader in B2B e-commerce. Government regulation and macroeconomic policies may influence firms'

micro-economic policies and investments in technology and R&D. Again, with its 'macroeconomic linkages', the Taiwanese government has been able to steer firms' microeconomic policies related to technology adoption (Wade 1990).

Organization-level politics also plays a role in the diffusion of B2B e-commerce. For instance, labour union protests in 1999 stopped Hyundai Motors in South Korea from implementing its marketing plan to form a strategic alliance with an Internet company (Business Korea 2000). Finally, cultural factors, such as language, also play an important role in the diffusion of B2B e-commerce. For example, multiplicity of languages has been a major obstacle to the achievement of economies of scale in B2B operations in Asia-Pacific and Europe (Table 2).

Economic Factors. In general, larger firms that are more likely to adopt e-commerce technology tend to locate in bigger, high-income countries. This partly explains the dominance of global B2B e-commerce by the US- and EU-based companies; the dominance of Asian B2B e-commerce by Japan; and of Latin American B2B e-commerce by Brazil and Mexico. Furthermore, the largest MNCs are in the petrochemical and automobile sectors – which partly accounts for the dominance of global B2B e-commerce by automobile and petrochemical companies.

Market- and infrastructure-related factors influencing the profitability and relative advantage of B2B e-commerce include availability of venture capital, credit facilities and telecom and logistical infrastructure. The US ranks number 2 in the world in terms of technology achievement (UNDP 2001); it has solid delivery and logistical infrastructure; the credit card penetration rate is very high and the firms have easy access to venture capital. These factors explain the US dominance in B2B e-commerce. Europe, despite its better transportation infrastructures, lacks central package tracking systems and also has relatively low usage rates of credit cards. In Asia and Latin America, business transactions are mainly conducted on a cash basis and thus not readily convertible to electronic methods. In addition, lack of logistical and technological infrastructures is hampering the growth of B2B e-commerce in these regions. For instance, lack of a reliable domestic transport system to handle express documents and packages is found to be the major obstacle for China's B2B e-commerce growth (Cheung 2001).

International Institutions' Activities in a Nation. SMEs are at a disadvantage when adopting the Internet because of the gap between knowledge required for Internet-based operations and the existing knowledge base of SMEs (Gatignon and Robertson 1985), and because of economic factors such as expected profitability and investment (Mansfield 1961). Whereas about a quarter of the SMEs in the US are already using the Internet to provide customer services and support (Nua Internet Surveys 2001a), the proportion of SMEs using the Internet is very low in the rest of the world.

Several international institutions are helping SMEs to overcome such barriers to Internet adoption. For instance, in 1992 the United Nations Conference on Trade and Development (UNCTAD) launched Global Trade Point Network (GTPN) to facilitate SMEs' access to international markets using e-commerce technologies. As of 2000, GTPN's electronic trading opportunity (ETO) system connected more than 20,000 trade organizations worldwide. Through these trade points, SMEs can get access to the latest e-commerce technologies, enabling them to publicize their products to potential customers and to locate business partners worldwide. UNCTAD smart cards facilitate payment flows. Similarly, ITU launched the E-Commerce for Developing Countries (EC-DC) programme in 1998. Thanks to such programmes, SMEs in developing countries such as Bangladesh, China, Mexico, Pakistan, Russia, South Africa, and Thailand have already sold products online using secured payment systems (UNCTAD 2000a). An estimate by IDC suggests that businesses with fewer than 100 employees will generate 30% of global e-commerce by 2003, up from 17% in 1997 (Ah-Wong et al. 2001).

E-commerce Technology Effect

B2B e-commerce produces readily observable results such as lower purchasing costs, reduced inventory levels, and shorter cycle times (Gekos and Harper 1999), increasing its evaluation by organizations on the

'observability' dimension (Rogers 1983). In US industries, for example, cost savings from B2B e-commerce – as a percentage of total input costs – vary from 2% in coal to 40% in electronic components (Coppel 2000). In fact, such cost savings have been a key driver of B2B e-commerce in US companies.

Applications of B2B e-commerce such as Web-based procurement and 'eSynchronized supply chains' have enhanced relative advantage and observability of B2B e-commerce. Web-based procurement is changing companies' economic bases as well as the relationships with suppliers. Ad-hoc procurement of low value items is generating instant savings in the 5–15% range and offering a greater opportunity for efficiency (Anderson Consulting 1999), justifying the investments in B2B e-commerce. eSynchronized supply chains and e-marketplaces are linking 'suppliers' suppliers' and 'customers' customers' more closely and facilitating new levels of information sharing, interaction and supply chain integration (Anderson Consulting 1999).

Also the availability of user-friendly software has reduced complexity, making the adoption of B2B e-commerce easier even by SMEs.

CONCLUSIONS

In this paper, we have examined the current stage of B2B e-commerce development across four global regions and proposed a model to explain the magnitude and global distribution of B2B e-commerce activities. Our analysis indicates that increases in the freedom of movements of goods, services, capital, technology and people coupled with rapid technological development resulted in an explosion of global B2B e-commerce. The share of the global B2B e-commerce an economy is likely to receive depends upon: country level factors such as income and population size, the availability of credit, venture capital, and telecom and logistical infrastructure; tax and other incentives, tariff/non-tariff barriers, government emphasis on the development of human capital, regulations to influence firms' investment in R&D, organizational level politics, language and the activities of international agencies.

References

- Ah-Wong, Jacqueline, Gandhi, Puja, Patel, Heena and Shah, Urvi (2001) 'E-commerce Progress: Enablers, Inhibitors and the Short-term Future', *European Business Journal* 13(2), 98–107.
- Allen D. (1998) 'New Telecommunications Services: Network Externalities and Critical Mass', *Telecommunications Policy* September, 257–71.
- Andersen Consulting (1999) e-Europe Takes off, online at: <http://www.ac.com> [accessed 29 November, 1999].
- Antonelli C. (1986) 'The International Diffusion of New Information Technologies', *Research Policy* 3, 139–47.
- Archibugi, D. and Michie, J. (1997) 'Technological Globalisation or National Systems of Innovation?', *Futures* 29(2), 121–37.
- BCG (1999) New BCG Research Re-evaluates Size, Growth and Importance of Business-to-Business E-Commerce, Boston: Boston Consulting Group, 21 December, online at: www.bcg.com [accessed 20 June 2000].
- BCG (2000) B2B E-commerce in Australia and New Zealand, Boston: Boston Consulting Group, online at http://faculty.darden.edu/gbus885-00/Documents/ANZB2B_12-00.pdf [accessed 1 October 2001].
- Brown, Lawrence, Malecki, Edward and Spector, Aron (1976) 'Adopter Categories in a Spatial Context: Alternative Explanations for an Empirical Regularity', *Rural Sociology* 41, 99–118.
- Business Korea (2000) 'Traditional Retailers Feel Threatened by Rise of E-commerce', *Business Korea* 17(4), 24–6
- Cassiolato, Jose E. and Baptista, Margarida A.C. (1996) 'The Effects of the Brazilian Liberalization of the IT Industry on Technological Capabilities of Local Firms', *Information Technology for Development* 7(2), 53–73.
- Chan, Lotte (2001) 'Asia's Second Venture Wave', *Far Eastern Economic Review* 164(5), 48–9.
- Chang, Joseph (2000) 'Chemical Makers Plan Internet Service', *Chemical Market Reporter* 27 March, 257(13), 5.
- Chen, Nicholas V. and Lee, Michael D. (2001) 'Taiwan: Asia's Venture Capital', *International Financial Law Review (Supplement: Private Equity and Venture Capital)*, 98.
- Cheung, Eddie (2001) 'China's B2B Market Revisited', *EIU Ebusinessforum*, 15 May 2001 online at <http://>

www.ebusinessforum.com [accessed 1 October 2001].

Chwelos, P., Benbasat, I. and Dexter, A.S. (2001) 'Empirical Test of an EDI Adoption Model', *Information Systems Research* 12(3) (forthcoming).

Computer Economics (2000) 'The Global Economy is not so Global', *Internet & E-Business Strategies* 4(4), 1–3.

Coppel, Jonathan (2000) 'E-Commerce: Impacts and Policy Challenges', Economics Department Working Paper no. 252, Organization of Economic Cooperation and Development (OECD), online at:

[http://www.olis.oecd.org/olis/2000doc.nsf/c5ce8ffa41835d64c125685d005300b0/c12568d1006e03f7c12569070052efe3/\\$FILE/00079760.PDF](http://www.olis.oecd.org/olis/2000doc.nsf/c5ce8ffa41835d64c125685d005300b0/c12568d1006e03f7c12569070052efe3/$FILE/00079760.PDF) [accessed 24 December 2000].

Durlacher (2000) B2B e-Commerce, Durlacher Research.

Enos, Lori (2001) 'DaimlerChrysler Forms E-Business Subsidiary', online at: www.EcommerceTimes.com [accessed 1 October 2001].

Ford, David, Gadde, Lars-Erik, Hakansson, Hakan, Lundgren, Anders, Snehota, Ivan, Turnbull, Peter and Wilson, David (1998) 'How Companies Relate to Each Other', in *Managing Business Relationships*, Chichester, England: John Wiley & Sons, 17–40.

Fortune (2001) 'Venture Sweepstakes', *Fortune* 142(12), 202–4.

[Fortune.com](http://www.fortune.com/indexw.jhtml?channel=list.jhtml&list_frag=list_global500.jhtml&list=19) (2001) 'Global 500: The World's Largest Corporations', online at: http://www.fortune.com/indexw.jhtml?channel=list.jhtml&list_frag=list_global500.jhtml&list=19 [accessed 1 October 2001].

Gatignon, Hubert and Robertson, Thomas S. (1985) 'A Propositional Inventory for New Diffusion Research', *Journal of Consumer Research* 11, 849–67.

Gecos, George W. and Harper, James W. (1999) 'Early Returns from Government Regulations of Electronic Commerce: What is New is What is Old', *Administrative Law Review* 51(3), 768–808.

Hart, P. and Saunders, C.S. (1998) 'Emerging Electronic Partnership: Antecedents and Dimensions of EDI Use from the Supplier's Perspective', *Journal of Management Information Systems* 14(4), 87–111.

Hogan, Sarah B. (1999) 'To Net or Not to Net: Singapore's Regulation of the Internet', *Federal Communications Law Journal* 51(2), 429–47.

Iammarino, Simona and Jonathan Michie (1998) 'The Scope of Technological Globalisation', *International Journal of the Economics of Business* 5(3), 335–53.

King, J.L., Gurbaxani, V., Kraemer, K.L., McFarlan, F.W., Raman, K.S. and Yap, C.S. (1994) 'Institutional Factors in Information Technology Innovation', *Information System Research* 5(2), 139–69.

Kraemer, Kenneth L., Gurbaxani, Vijay and King, John Leslie (1992) 'Economic Development, Government Policy, and the Diffusion of Computing in Asia-Pacific Countries', *Public Administration Review* 52(2), 146–56

Kshetri, Nir (2001) 'Determinants of the Locus of Global E-commerce', *EM- Electronic Markets* 11(4), 250–7.

Lewis, S. (2000) 'Asia embraces B2B e-commerce' *Asian Business* 36(4), 24.

McEwan, Lee (2001) 'Lessons Learned the Hard Way: The Development of Web-based Business Networks', BIG Conference, online at: <http://www.mori.com/pubinfo/pdf/lee5.pdf> [accessed 1 October 2001].

Mansfield, Edwin (1961) 'Technical Change and The Rate of Imitation', *Econometrica* 29(4), 741–66.

Mansfield, E., Romeo, A., Schwartz, M., Teece, D., Wagner, S. and Brach, P. (1982) *Technology Transfer, Productivity, and Economic Policy*. New York: W. W. Norton.

Mataloni, Raymond J (1997) 'US Multinational Companies: Operations in 1995', *Survey of Current Business* 77(10), <http://www.itcilo.it/english/actrav/telearn/global/ilo/multinat/usmoper.htm>

Montealegre, Ramiro (1999) 'A Temporal Model of

Institutional Intervention for Information Technology Adoption in Less-Developed Countries', *Journal of Management Information Systems* 16(1), 207–32.

Nua Internet Survey (2000a) 'Nortel Networks: Infrastructure Spending Set to Quadruple', 1 February.

Nua Internet Surveys (2000b) 'E-commerce Bypasses Developing World', 25 February.

Nua Internet Surveys (2001a) 'The Kelsey Group: US Small Businesses Move Online', 7 February.

Nua Internet Surveys (2001b) 'Worldwide B2B to reach US\$8.5 trillion in 2005', 15 March.

Omestad, Thomas (2000) 'Building a High-Tech Magnet: Is This Cybercity a Bold Move or a Boon Doggle? Cyber Jaya Malaysia', *US News and World Report* 25 September.

O'Neil, Hugh M., Poudel, Richard W. and Buchholtz, Ann K. (1998) 'Patterns in the Diffusion of Strategies

Across Organizations: Insights from Innovation Diffusion Literature', *The Academy of Management Review* 23(1), 98–114.

Ostry, Sylvia (1998) 'Technology, Productivity and the Multinational Enterprise', *Journal of International Business Studies* 29(1), 85–99.

Porter, Michael E. and Stern, Scott (2001) 'Innovation: Location Matters' *Sloan Management Review* 42(4), 28–36.

Premkumar, G., Ramamurthy K. and Crum, M.R. (1997) 'Determinants of EDI Adoption in the Transportation Industry', *European Journal of Information Systems* 6(2), 107–21.

Roberts, Simon (1998) 'Economic Globalisation: A Break from the past?', *International Review of Applied Economics* 12(2), 311–15.

Rogers, E.M. (1983) *The Diffusion of Innovations*, 3rd edn, New York: Free Press.

Rothwell, Roy and Wissema, Hans (1986) 'Technology, Culture and Public Policy', *Technovation* 4, 91–115.

Schware, R. and Kimberley, P. (1995) 'Information Technology and National Trade Facilitation', *World Bank Technical Paper No.317*, World Bank: Washington DC, p. 19.

UNCTAD (1998) *World Investment Report, 1998: Trends and Determinants*, New York: United Nations.

UNCTAD (2000a) 'ETO Surveys', Geneva: United Nations Conference on Trade and Development, online at: <http://www.untpdc.org/untpdc/etosurvey/> [accessed 23 March 2000].

UNCTAD (2000b) *Building Confidence: Electronic Commerce and Development*, Geneva: United Nations Conference on Trade and Development.

UNCTAD (2001) *World Investment Report 2001*, Geneva: United Nations Conference on Trade and Development, online at: http://www.unctad.org/en/docs/wir01ove_a4.en.pdf [accessed 1 October 2001].

UNDP (2001) *Human Development Report 2000*, United Nations Development Program, New York, online at: <http://www.undp.org/hdr2001/completnew.pdf> [accessed 11 July 2001].

Vernon, R. (1982) 'Technological Effects on International Trade: A Look Ahead', in Giersch, H. (ed.), *Emerging Technologies: Consequences for Economic Growth, Structural Change and Employment*, Tübingen: J.C.B. Mohr.

Wade, Robert (1990) *Governing the Market*, Princeton: Princeton University Press.

Wong, P.K. (1998) 'Leveraging the Global Information Revolution for Economic Development: Singapore's Evolving Information Industry Strategy', *Information Systems Research* 9(4), 323–41.

Woodall, Pam (2000) 'Survey: The New Economy: Falling Through the Net?', *The Economist* 23 September, S34–S39.

WTO (1998) *Declaration on Global Electronic Commerce*, Ministerial Conference, Second Session, Geneva, 18 and 20 May, WT/MIN(98)/DEC/2, World Trade Organization, Geneva.

WTO (1999) *Trading Into the Future*, Geneva: World Trade Organization, online at: http://www.wto.org/english/res_e/download_e/tif.pdf [accessed 2 February 2001].

Zaheer, Srilata and Zaheer, Akbar (1997) 'Country Effects on Information Seeking in Global Electronic Networks', *Journal of International Business Studies* 28(1), 77–100.