

September 2003

Globalization and E-Commerce VI: Environment and Policy in Denmark

Kim Viborg Anderson
Copenhagen Business School, andersen@cbs.dk

Niels Bjørn-Andersen
Copenhagen Business School, nba@cbs.dk

Helle Zinner Henriksen
Copenhagen Business School, hzh.digi@cbs.dk

Follow this and additional works at: <https://aisel.aisnet.org/cais>

Recommended Citation

Anderson, K., Bjørn-Andersen, N., & Henriksen, H. (2003). Globalization and E-Commerce VI: Environment and Policy in Denmark. *Communications of the Association for Information Systems*, 10, pp-pp.
<https://doi.org/10.17705/1CAIS.01007>

This material is brought to you by the AIS Journals at AIS Electronic Library (AISeL). It has been accepted for inclusion in *Communications of the Association for Information Systems* by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.



Communications of the
Association for **I**nformation **S**ystems

GLOBALIZATION AND E-COMMERCE VI: ENVIRONMENT AND POLICY IN DENMARK

KIM VIBORG ANDERSEN
NIELS BJØRN-ANDERSEN
HELLE ZINNER HENRIKSEN
Department of Informatics,
Copenhagen Business School
KVA@CBS.DK

ABSTRACT

- The diffusion of e-commerce in Denmark is mainly a result of a partnership between government and industry initiatives, rather than being purely market- or government-led. While environmental factors are important enablers of e-commerce diffusion, government policy aims to be a key driving force.
- Although the size of government is substantial and the list of policy instruments is extensive, there is a serious question about whether the governments' efforts to stimulate use within the society (business, consumers, and government itself) are sufficient to stimulate diffusion of e-commerce adequately. Our analysis questions the effectiveness of the government-led approach because of its timing, its lack of coordinated actions, and the mixed motives of government actions, in particular at the European Community level.
- Our analysis also found serious structural barriers such as high marginal income taxation and a limited supply of qualified labor. Contributing to the limited labor supply are strict immigration policies and late entry into the labor market (college graduates enter the job market at the mean age of 29). Adding to the structural problems is the lack of large high-tech manufacturing companies that can function as locomotives, as well as an insufficient equity and venture funding market.
- The Danish national e-commerce strategy is focused on rapid adoption, implementation, and exploitation of e-commerce in all sectors of the economy, rather than a production-led strategy. The official goals of the Danish government are to make IT available to all citizens and to be among the top five IT-using nations in the world. Although our analysis points to a high level of diffusion of the technologies that, in principle could enable e-commerce, actual exploitation is lagging behind the lavish display of technology.

Keywords: e-commerce, globalization, regulation

I. INTRODUCTION AND FRAMEWORK

INTRODUCTION

Denmark is often considered among the o early adopters of IT-driven innovations. However, the data on e-commerce adoption in Denmark does not fully support this view. In Denmark, only 0.1 percent of the GDP in year 2000 was related to B-to-C e-commerce, whereas in the U.S. it is 0.4 percent of the GDP (Forrester Research, 2000). Thus, Denmark is not a world leader in B-to-C e-commerce but is positioned in the middle of the pack. In the B-to-B segment, Denmark is positioned at the top-end of the European B-to-B.

The Danish case is not interesting because of the advanced or widespread uptake of e-commerce. The Danish case is significant because conventional market drivers are relatively absent and government and business associations dominate. Yet, the Danish case is not about a strong, dominant government intervention to push e-commerce. Rather, the case involves a strong partnership between government and business associations for small and medium sized enterprises (SMEs) as the key driver for e-commerce. Although government influences the market significantly due to its share of the economy, the government is een reluctant to mandate that operations, companies, or citizens use e-commerce. Part of the reluctance to using a command strategy is explained by other (and for e-commerce possibly counterproductive) strategies, such as decentralization and constant budget reforms. Rather than using a stick, government seeks to fuel e-commerce diffusion with a carrot.

Similarly, business associations helped push e-commerce for a long time and are part of the knowledge networks. Yet, our analysis of various surveys suggests that SMEs are mostly immune to e-commerce awareness campaigns by business associations and the government. While government and business associations' joint action is the underlying paradigm, the variety of policy instruments applied is limited and the path of e-commerce is not steady.

Further, this paper points to the *contradicting set of push and pull factors* among the environmental drivers. Government is also dominant in shaping the environmental drivers, which makes the case intriguing. Policies not only attempt to shape the features and directions of environmental drivers, but government is also a dominating part of the environmental drivers. Government's role raises concerns about coordination costs, institutional disagreements, and lack of political commitment to fight structural barriers created in part by government.

In this paper on *Globalization and E-Commerce: Environment and Policy in Denmark*, we will discuss the main environmental drivers and the role of policy in shaping the course and magnitude of e-commerce. Our paper explores why Denmark seems to lead the way in Europe in the B-to-B segment, but lags in B-to-C. Is this a permanent pattern or is Denmark likely to catch up in the B-to-C markets? What are the arguments for past and possible future trends? We focus on national environmental factors as well as national and EU policies influencing the diffusion of e-commerce use. For each of these factors we will analyze the extent to which these policies are key explanatory factors on how e-commerce is evolving in Denmark

OUR FRAMEWORK

E-commerce is defined by the U.S. Department of Commerce as:

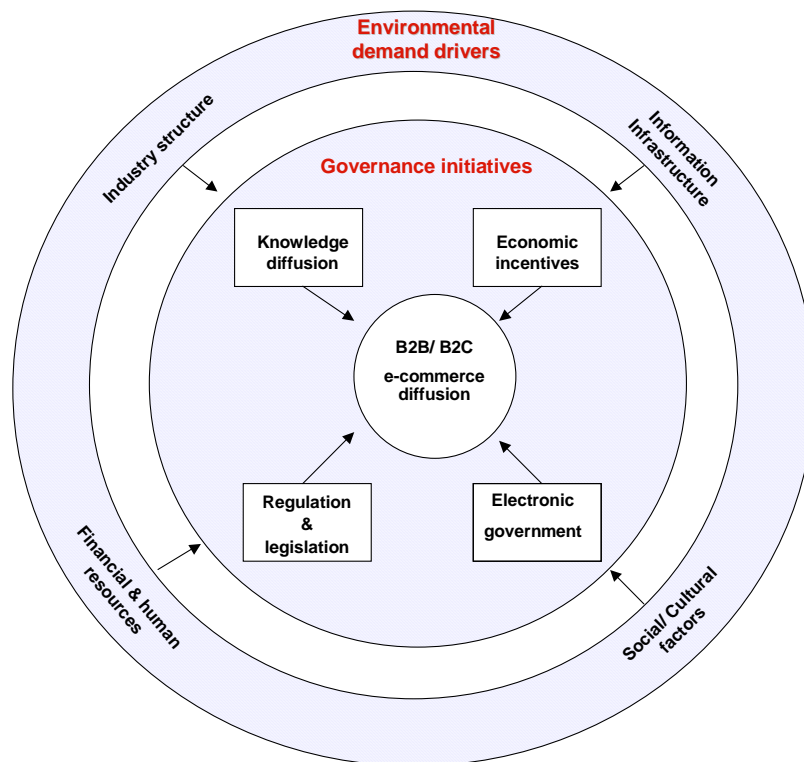
Sales of goods and services over the Internet, extranet, EDI or other online system. Payment may or may not be made online"

Thus, our research on the environmental drivers and the role of policy encompasses e-commerce in its broadest possible sense. In our research, we distinguish between business-to-business (B-to-B) and business-to-consumer (B-to-C) perspectives. Governmental digitalization in areas such as e-procurement, tax forms, and trade documents is included in our broad approach to e-commerce, but we do not treat it here as a separate dependent variable. Rather we argue that government-to-business (G-to-B) and government-to-consumer (G-to-C) transactions can be approached as mediating variables for addressing the overall research questions raised in this paper.

Furthermore, we argue that the factors influencing diffusion of e-commerce can be classified into two distinct categories: environmental demand factors and policy factors, as shown in Figure 1.

The underlying premise for the analysis in this section is that institutions influence and sometimes facilitate or retard processes of technical and structural change, coordination, and dynamic adjustment (King et al., 1994). Those institutions influencing innovation in organizations are therefore of great significance in relation to the diffusion process.

During the last few decades, governments and business associations throughout the world recognized the significance of information communication technologies (ICT) for business and public administration. This finding led to institutional initiatives, which attempted to support the diffusion of ICT among businesses and public agencies (i.e., Damsgaard and Lyytinen, 2001). The Singapore NII initiatives (Neo, King, et al., 1995; Wong, 1996), the Malaysian Information Rich Society plan (Raman and Yap, 1996), the Japanese Super Information Highway, the AI Gore Information Highway, and the European Information Society are some of the major recent policies highlighting governmental interest in ICT. E-commerce is an important part of these policy plans, and B-to-B e-commerce involved a high degree of policy saliency with various institutional initiatives to fuel the development and increase.



Source: Andersen, Bjørn-Andersen, and Dedrick, 2003.

Figure1. Framework for Analyzing Environmental Drivers and the Role of Governance Initiatives in the Diffusion of E-Commerce

Within the economics-oriented literature, one of the fundamental research issues is the importance of the market as the key driver for ongoing economic development, and the role of government within economic cycles (Keynes, 1936; Smith, 1776; and Williamson, 1975). The Danish case, as highlighted among others by the 1974 Nobel Laureate in Economics, Gunnar

Myrdal, is significant because the country transformed itself from a predominately agricultural-based economy to a highly industrial society, despite the lack of natural resources as input to the industrial revolution. A central factor in the transformation was collaboration between government and the business and labor market associations (Schmitter, 1974). Similar factors played a key role in the Scandinavian approaches to participatory design (Bjørn-Andersen, Earl, Holst, and Mumford, 1982; Greenbaum and Kyng, 1991), and the pursuit of humanistic values in IS development.

While government and corporatism might be key factors in the economic development in Denmark prior to e-commerce, this transformation paved the road for a very localized and regional orientation towards e-commerce, rather than a global market orientation. Companies looked for transaction-based efficiency gains from e-commerce, rather than expansion and global reach. However, with a market size of just above five million citizens, this strategy is not able to exploit more than a fraction of the potential of e-commerce. The strong dominance of government may also have led to a structural lock-in of the companies in the sense that their market orientation was domestic rather than globally competitive. With the emergence of e-commerce, Danish companies appear likely to be overrun by global competitors. In our analysis of how policies and environmental demand drivers play out, our research framework separates environmental demand drivers from e-commerce policies and actions, even though we acknowledge the key role of government actions in the overall shaping and regulation of society. Methodologically, it is indeed challenging but also potentially enlightening to separate the governmental e-commerce actions from other policy actions, since they might be motives or indirectly be part of the overall economic policies.

ENVIRONMENTAL FACTORS

Despite these difficulties, the environmental factors in our framework are separated from e-commerce policies. They are classified into industry structure, information infrastructure, financial and human resources, and social/cultural environmental demand factors:

- Industry structure includes industry concentration, sector distribution, vertical integration, size of firms, and value networks
- Information infrastructure includes telecommunication, wireless and Internet infrastructure, technology access and use, and technology acceptance;
- Financial and human resources includes payment mechanisms, venture capital, population, wealth, income distribution, age, education, and IT skills;
- Social/cultural demand factors include consumption patterns, consumer preferences, business culture, investment levels, and language.

The analysis of the environmental demand drivers is only performed at the national level; hence, there is a risk of underestimating the relative importance of strong international demand drivers. However, that is beyond the scope of this paper.

Governance Initiatives

These factors relate to governance initiatives on the part of government and private sector institutions to promote e-commerce. We used the term governance rather than government, since the former stresses the difficulty in distinguishing between government e-commerce policies and other policies, and since the Danish case also encapsulates the challenges in separating government actions from actions jointly initiated and/or implemented with the private sector, including business associations. Although various authors point to the role of institutions in IT diffusion (Chatfield and Bjørn-Andersen, 1996; Damsgaard and Lyytinen, 2001), the investigation of the content and instrument of institutions in the diffusion of e-commerce is unexplored in mixed economies. Thus, we focus on the activities in which government is involved (governance), rather than formal government initiatives. The methodological implication is that our data collection is not limited to formal laws from government. Instead, our framework proposes four sets of governance initiatives promoting e-commerce diffusion: knowledge diffusion, economic

incentives, regulation and legislation, and electronic government (Andersen, Bjørn-Andersen, and Dedrick, 2003):

- Knowledge diffusion includes dissemination of information, development of skills, and alliances with business associations designed to create a positive dialogue on e-commerce.
- Economic incentives involve the provision of favorable pricing for network services, tax breaks to help facilitate the purchase of home PCs, and direct government subsidization of e-commerce activities.
- Regulation and legislation include directives and legislation on (de)regulation, privatization, and/or liberalization of the telecommunications market, including various technical standards used in business transactions such as encryption and providing certification.
- Electronic government focuses on the work processes within the public sector's own organizations and on services provided to the public.

Figure 1 (above) illustrates our framework for analyzing the role of governance initiatives on the diffusion B-to-B and B-to-C e-commerce. The environmental demand drivers are in the outer circle. These demand drivers determine the potential magnitude of e-commerce diffusion. We placed the four sets of governance initiatives in boxes inside the environmental demand drivers. The boxes in Figure 1 illustrate that our framework is guided by the anarchical models of government decision-making processes, rather than holistic and coordinated initiatives. We apply the hypotheses of incrementalism and strategic analysis by Lindblom (1959, 1979), suggesting that government indeed is seeking informed and thoughtful methods of problem identification. However, government is not pursuing a rational and carefully planned set of initiatives. Instead, disjointed incrementalism and ad hoc policies form the dominant ways government is pursuing strategies. Thus, in terms of assessing the role of government and its actions, our aim is not to judge whether government was right or wrong, or will be proved wrong as measured by the ends. Instead, the approaches, the actions, and the processes of involving business associations in the policy design and implementation will be the focus of the analysis. Another relevant and critical model is the garbage can model (Cohen, March, and Olsen, 1972), suggesting that [e-commerce] policy "is a collection of choices looking for problems, issues and feelings looking for decision situations in which they might be aired, solutions looking for issues to which they might be the answer, and decision makers looking for work." Problems, solutions, participants, and choice opportunities flow in and out of a garbage can, and the way in which problems become attached to solutions is largely due to chance. In the line of arguments put forward by the garbage can model, politicians can make a difference by:

- Carefully timing issue creation;
- Being sensitive to shifting interests and involvement of participants;
- Recognizing the status and power implications of choice situations;
- Abandoning initiatives that get hopelessly entangled with others; and
- Realizing that planning is largely symbolic and an excuse for interaction.

Although we approach the study of governance initiatives from the body of literature on anarchic models, we do not imply that institutional or formal, rational policy models cannot provide insight into the nature of the governance approaches in the Danish e-commerce case. Yet, the analysis of the process initiatives is done here with reference to the anarchic model(s), since we depart from the (realistic) assumption that government can understand the e-commerce challenge, analyze the options carefully, and choose the best fit. Also, we do not subscribe to the assumption that strong institutional players would determine the course of policy.

Methodological Challenges

Applying the garbage can and muddling through models in an analysis of Danish e-commerce policies raises severe methodological challenges. The most critical is the time lag between the policies and e-commerce adoption. Thus, using the adopted definition of e-commerce, one would expect to find valid data back to the 1970s (although e-commerce had another label back then). Yet, statistics on e-commerce are few, and the term underwent various rounds of changes in definitions. Thus, longitudinal data are few and the data that is available is of low reliability overall. A critical dimension is that the data available shows an application bias, since more domestic data has been collected on EDI and less on web- and mobile-interface, since the latter reflect more recent business practices.

In this paper, we benefited from data collected by and provided by CRITO at the University of California, Irvine, as part of the NSF-financed GEC project. Also, the paper uses data from various studies we undertook with our Danish colleagues. In addition to these sources, we collected a substantial additional amount of quantitative and qualitative data for this paper. In particular, the policy aspects of e-commerce were the subjects of additional analysis. Primary data sources for assessing the EU policies are the conclusions from the council meetings, various policy reports, and the R&D efforts within the Information Society Technology (IST) 5th framework program.

We will first focus on the national environmental drivers (Section II) and then on the explicit role of e-commerce policy.

II. NATIONAL ENVIRONMENTAL DRIVERS

POPULATION AND DEMOGRAPHICS

Population. With a population of just over 5.3 million, Denmark is among the smaller countries in Europe. The aging population and shrinking workforce is indeed a serious issue in Denmark, and is likely to have a severe impact on the national economic performance over the next several decades. In 1999, 14.45 percent of the population was older than 65, and 18.23 percent was under 15. Calculating the number of people in the 20-59 age group, and comparing this figure to the number of people in the rest of the population, Denmark's value was 0.77 for 2000. That is, at for every 100 people who are gainfully employed between the age of 20-59, 77 people who are not or only marginally contributing to the official GDP figures and must be supported. The forecast from Statistics Denmark is that this figure will increase to 0.91 by 2010, and 1.0 by 2030 (Statistics Denmark, 2002a). Other European countries report even higher values on this variable.

Immigration. Immigration is modest in Denmark, with 7.4 percent of the total population being first or second generation immigrants. This figure puts Denmark at the very bottom of the immigration level in Europe and well below the U.S. Due to the general global situation, immigration is expected to increase in the coming years. This increase could potentially counteract the shrinking work force, although most immigrants are not highly skilled. However, tighter anti-immigration policies were introduced recently, which may alter the growth of the immigration figures. Moreover, Denmark does not use a green card policy to attract highly skilled labor.

Urbanization. The data in Table 1 show an unusually high degree of urbanization, with over 85 percent of the population living in urban areas. Although urbanization is high, the population density is only 125 people per square kilometer.

Geography. Geographically, Denmark is about 44,000 km², encompassing the Jutland peninsula, two main islands, and 300 smaller inhabited islands. Ninety-five percent of the population is well connected with physical infrastructure, such as roads, bridges, and ferries. The Danish government pushes numerous means of affordable public transportation, providing efficient trains, buses, and subway. Except the bridges and ferries, all roads are toll-free. Half of all employed people live less than eight kilometers from their workplace, and the average commuting distance is only 15 kilometers.

This relatively low commuting distance impacts transportation methods in the sense that most employees either walk, ride bicycles, or use public transportation for commuting back and forth from work (Center for Transportation Studies, 2000).

The short commuting distances resulted in various e-commerce proposals targeting the delivery of goods purchased on the Internet to the workplace, based on an assumption that customers were willing/able to bring the goods home themselves. None of these solutions survived, which seems in part to be explained by the minimal travel distance and transportation methods. From a structural perspective, one explanation is the widespread network of local grocery shops. Most consumers live less than one kilometer from the nearest grocery shop, which makes it convenient to shop locally, compared to, for example, the U.S., where housing shops are located in malls distant from living areas. The governmental push for public transportation and the support of bicycle use by, for example, offering free bicycles within inner city-limits and remodeling all roads to have bike lanes, also carry e-commerce implications. These initiatives, motivated by environmental concerns, could be harmful to e-commerce, since Danes would not find it convenient to transport goods or to have household provisions delivered to their workplaces. They would prefer delivery at home. Yet, the problem is – as discussed later – that the labor market participation rate is high and household size is small. Thus, no one would be at home to receive the goods during the daytime. Limited competition in the transportation and freight markets implies that no one delivers at night except express courier services.

Table 1. Demographic Indicators

	Population 2000 ^a	Urban population (% of total) 2000 ^b	Size of household	% over age 65 1999 ^c	% under age 15 1999 ^c
Denmark	5,330,020	85.30	1.83	14.45	18.23
Scandinavia	19,386,552	78.81	n.a.	15.75	18.61
European Union	376,749,918	79.54	n.a.	15.97	16.83
United States	275,129,984	77.20	2.61	11.85	21.20
OECD	1,115,304,202	77.55	n.a.	12.63	20.43

Source: ^a) International Telecommunication Union, 2001. ^b) World Bank Group, 2000. ^c) World Bank, 2001.

Household composition. Table 1 indicates that the Danish household is rather small compared to the U.S. This small household size emerged since 1998. Other European countries, such as Germany, face a similar transition towards smaller households, but they kept the average number above 2.0. In Denmark, the size decreased from 2.2 in 1995, to 1.83 in 1998 (ITU Yearbook of Statistics, 2000).

An increasing number of children are now raised by single parents. Single parent families make up 18 percent of all families with children (Statistics Denmark, 2002a). For social equality reasons, single parent families are heavily supported by government funding, such as subsidized rent, childcare, and other extra expenses, on top of child support paid to all parents regardless of economic status by the government (approximately \$700 every three months). While the divorce rate increased, the biggest contributing factor to the increasing number of small households is that single parents often choose to be single. From 1999 to 2000, the number of divorces increased by 6.3 percent. (Statistics Denmark, 2001a). The decrease in the household size and increase in single-parent households could work either as a driver or as an inhibitor for B-to-C e-commerce. The number of smaller and single-parent households could lead to an increase in e-commerce because of a need for greater time/cost efficiency on products with substantial savings if bought on the Internet. Yet, the strained financial capability of the single parent could hinder e-commerce solutions. In the grocery sector, for example, most Danish products are more expensive on the Internet than when the consumer buys the products in a shop.

Table 2. Population, Number of Households, and Average Number of Persons Per Household In Denmark, 1995-1999

	1995	1996	1997	1998	1999
Population (N*1,000)	5,228	5,262	5,284	5,301	5,317
Number of households (N*1,000)	2,374	2,332	2,885	2,898	n.a.
Average number of persons per household	2.2	2.25	1.83	1.83	n.a.

Note: The data for population are mid-year estimates.

Source: International Telecommunication Union, 2001.

The trend towards an aging population, shrinking workforce, and urbanization, as outlined above, is similar to that of most other First World countries. One of the most significant examples of how this trend could be interpreted as a driver in the Danish context is in the areas of social security and care for the elderly, where local government pushed electronic grocery shopping as a means to reduce labor costs for public sector-supported homecare (Andersen and Henriksen, 2000). In the Ballerup municipality, the government provided personal digital assistants (PDAs) and teamed up with a high-end grocery chain store to receive digital orders and handle deliveries. The Ballerup initiative is also a good example of the special challenges government faces when implementing e-commerce. The government, for political reasons, was forced to provide its elder care clients with an option of choosing other suppliers than the one that supported the PDA solution. Since the price level at the high-end grocery chain chosen was about 10-15 percent higher than the discount stores, many elderly chose other suppliers, and the homecare helpers had to bring the goods anyway. Paranoia over violating the free market economy and the issue of choice at the individual level did not work in a constructive synergy with the initiative from the government. We take this example as an indicator of the incremental rationality outline discussed earlier in the paper. A more carefully prepared initiative would probably have foreseen the problems.

In summary, we see the high degree of urbanization as a driver for e-commerce, whereas the small and aging population -- with no attempt to increase population by, for example, liberalizing IT Green Card policies -- is viewed as an inhibitor.

ECONOMY AND WEALTH

GDP data for Denmark show a very high GDP per capita (\$30,470 in 2000), well above that of the other Scandinavian countries and Europe, but still about 15 percent less than the American GDP per capita figure for the same year. In Europe, the GDP per capita in 2001 was higher only in Luxemburg, Monaco, and Switzerland. The data displayed in Table 3 indicate that Denmark's economy is quite small economy, with an annual GDP of \$US 162 billion. This amount is approximately two percent of the total European annual GDP.

Yet, the GDP output increased less in Denmark than in other European countries during the late 1990s. Whereas GDP grew more than 4 percent/year in the U.S. and 3.2 percent/year in Europe, the Danish GDP growth was only 2.73 percent/per year during 1995-99. Studies by the OECD point to structural problems in the Danish economy that could explain the relatively smaller GDP increase. With an 80 percent labor market participation rate and an unemployment rate of 5.5 percent, it seems that the economy is at its full capacity with regard to labor supply (OECD, 2000a). OECD suggests that the low geographical mobility of the workforce and high marginal income taxation are the factors that created these structural barriers.

For e-commerce adoption, the high labor market participation rate for men and women could work as a barrier. Who can receive goods if they are delivered to the household? Nobody is at home during normal working hours. It should be emphasized that certain structural factors can hinder a more flexible distribution pattern. Even though Denmark has one of the strictest laws about opening hours, with most retail shops open from 9:30 am to 5:30 pm, the distribution of retail goods takes place during the same hours. This situation is mainly the result of general

Table 3. Total GDP (2000), GDP per Capita (2000) and Average GDP Growth (1995-99)

	GDP in billions U.S.\$ 2000 ^a	GDP per capita 2000 ^a	Average GDP growth, 1995- 1999 ^b
Denmark	\$162.41	\$30,470	2.73
Scandinavia	\$510.58	\$28,068	3.31
European Union	\$7,792.52	\$20,684	3.21
United States	\$9,962.65	\$36,211	4.17
OECD	\$25,461.49	\$22,829	3.22

Note: GDP data are current price data in national currency converted to United States dollars by applying the average annual exchange rate (from the International Monetary Fund, IMF) to the figure reported in national currency. GDP per capita is calculated by dividing GDP in United States dollars by the mid-year estimate of population obtained from the United Nations.

Source: ^{a)} International Telecommunication Union, 2001. ^{b)} UNDP, 2000, pp. 169-72. Dates for the data vary by country from 1987 to 1998.

protection agreements negotiated by the rather strong unions in Denmark. It is therefore not only a question of inducing consumers to shop on-line, it is also an issue of organizing work in new ways that allow alternative working hours. This issue creates a barrier for delivery of goods, especially those that need to be handled and stored with care shortly after delivery.

One of the strongest indicators that the economy is at full capacity is the high inflation rate, measured by changes in consumer prices. With a 2.5 percent inflation rate in 1999 and 2002, and salary increases at 4 percent in 2000, the capacity of and structural challenges in the economy remain serious issues (Ministry of Finance, 2001).

Data on foreign trade shows that the Danish export market is growing steadily, mostly in the area of industrial products exported to neighboring countries such as Germany, Sweden, and the U.K. Exports amount to 31 percent of GDP, whereas imports account for 28 percent (Statistics Denmark, 2002a).

Table 4. Unemployment Rate and Inflation

	Unemployment Rate (%) 1999 ^a	Inflation, Consumer Prices (annual %) 1999 ^b
Denmark	5.5	2.50
Scandinavia	6.3	1.38
European Union	8.1	1.52
United States	4.2	2.19
OECD	7.1	4.85

Note: Data is for 1998.

Source: ^{a)} International Labour Organization. ^{b)} World Bank, 2001.

The IT sector is gaining in national importance in terms of employment, turnover, and value generation. Yet, hardware production is at a modest level in Denmark, and insignificant on an international scale. However, in relation to the Danish GDP, the IT hardware export rate (including electronics) from Denmark is proportionally larger than in the U.S. and the other Scandinavian countries. Television and stereo equipment (Bang and Olufsen), mobile handsets, and components for mobile, satellite, network and modem devices, dominate the Danish IT manufacturing industry. The high export ratio is due to companies such as Alcatel Space Industries, Bosch (telecom), Hewlett-Packard, IBM e-business, Lucent Technologies., NCR Corporation, Dai Nippon Printing Co., Ltd., Oracle, Siemens, Nokia, and L. M. Ericsson with significant re-export and subcontracting activities in Denmark.

Table 5. IT Hardware Production and Exports Relative to GDP, 2000

Country	IT Hardware Production		IT Hardware Exports	
	US\$ Millions	US\$/GDP	US\$ Millions	US\$/GDP
Denmark	128.5	0.1%	894.4	0.5%
Scandinavia ^a	1,399.2	0.2%	2,997.6	0.4%
European Union ^a	57,978.5	0.7%	83,810.6	1.0%
United States	38,488.0	0.9%	37,967.0 ^a	0.4 ^a %
OECD ^a	221,159.2	0.9%	169,573.8	0.7%

a)1999 data.

Source: Reed Electronics Research, 2000.

The small, open economy is very dependent on foreign export markets' demand for Danish products, and it tends to follow the economic cycle of the German economy. Denmark is in no position to dominate IT development of Europe by using demand-side economics. However Denmark was successful in creating a supply push for boosting domestic production. The downside to the Keynesian economics policy practiced during the 1970s was a substantial increase in the foreign deficit. During the last half of the 1990s, however, the economy profited not only from an internal economic boom, but also from an expansion of government spending due to an increased tax base.

The annual consumption expenditures in Denmark increased throughout the last half of the 1990s, but, in line with other European economies, slowed down recently. It is worth noting that the high level of taxation reduces the total consumption expenditures relative to the household income. The most recent poll indicated that while the average Danish household income was DKK 357,853 gross, the actual amount available for consumption was a mere DKK 200,178. In the section on consumer preferences later in the paper, we will elaborate on consumption spending.

Income distribution is relatively uniform, with only 34.5 percent consumed by the richest 20 percent of the population, and 9.60 percent consumed by the poorest 20 percent of the population. Approximately 80 percent of the labor force and a similar percentage of the employers are organized. Thus, salaries and working conditions are highly unionized and standardized. The Danish labor market model was successful in implementing new production technologies and major industrial restructuring without frequent and major strikes. Instead, labor unions are extremely cooperative and view technology as a driver for improving working conditions and thereby increasing overall income levels. While the focus on equality in income levels is extremely positive in many ways, it also creates problems attracting high-skilled foreigners and in increasing marginal labor output. With the government employing about one third of the work force, that segment is significant when calculating the equal income split.

Table 6. Income Distribution

	Share of income or consumption, richest 20%, 1987-1998	Share of income or consumption, poorest 20%, 1987-1998
Denmark	34.50%	9.60%
Scandinavia	35.15%	9.73%
European Union	38.40%	8.29%
United States	46.40%	5.20%
OECD	40.19%	7.71%

Source: UNDP, 2000.

With comprehensive welfare services, six weeks' annual vacation for all employees, a 37-hour working week, early retirement plans from age 60, and twelve months paid maternity leave, the push to use ICT to replace human labor and boost efficiency is intense. High income taxes and the world's highest sales tax of 25 percent are the primary sources for financing public sector spending. The high, progressive taxation is generally found to reduce the incentives for increased marginal labor supply. Studies by the Danish Economic Council found that: "Taxation of labor

income reduces earners' after-tax income and consequently the labor supply. The Danish income tax is characterized by high tax rates on wage income, with marginal tax rates of 44 per cent on low income, 50 per cent on medium income and 63 per cent on high income" (The Danish Economic Council, 2001).

The government has not yet taken the initiative to reduce the high income and sales taxes, although "no further increase in taxes" is one of its key platform planks of the new liberal government that took office in November 2001. While Denmark the income tax (average and marginal) and sales tax rates are among the highest, corporate taxes are among the lowest in Europe. The latter is believed to lead to an influx of capital and foreign investments in Denmark.

Given the relatively high degree of wealth among most groups in the Danish society, the potential for adopting e-commerce should be a high, especially when considering that the population is generally well educated and familiar with ICT. One of the major issues, however, is whether the suppliers are ready to provide the goods and services. As mentioned above, Denmark is under pressure with respect to recruitment of skilled IT workers. A condition for widespread e-commerce is that businesses and the public sector are able to establish and maintain efficient forums, such as marketplaces and portals, for e-commerce. The question raised is therefore whether Denmark is waiting for the customers or for the suppliers, which have to provide convenient solutions to the customers.

In summary, we view the high GDP per capita, the growth in foreign investments, and the equal income distribution as overall drivers, whereas the slow GDP growth, the regional rather than global orientation of the economy, the full-capacity economy, and generous welfare benefits as inhibitors.

INDUSTRY STRUCTURE

Overall, we find five unique characteristics of the Danish industry structure that could determine the direction and impacts of e-commerce: 1) The dominance of SMEs; 2) A lack of MNCs, global brand leaders, and powerful upstream companies; 3) The heavy presence of government and a strong tradition of collaboration between industry and government players; 4) The small fraction of the population employed in the ICT cluster; and 5) Agriculture, fishing, food processing, and manufacturing, rather than the high-tech/IT-industry, dominating the private sector, both in composition of the industry structure and in exports.

The industry is almost exclusively dominated by SMEs (small to medium size enterprises). Sixty percent of the *private sector* labor force is employed by companies with fewer than 100 employees. SMEs employ about one third of the *total* work force. This trend applies in particular to the ICT service sector, where close to 70 percent of the employees work in companies with fewer than 100 employees. For the international-oriented companies (those firms with a substantial part of their turnover generated through exports), this is critical. A recent survey on e-commerce in the Danish industry demonstrated that the early adopters of e-commerce using strong vertical value chain integration tend to be the larger and more established companies, rather than the smaller and relatively newer companies (Pedersen, Petersen, and Jespersen, 2002).

In Table 7, we show the percentages and ages of companies with the highest degree of digitalization. The size of the companies within the industry segment, their age, and their degree of internationalization is significant for the digitalization.

Table 7. Industry Companies with the Highest Degree of Digitalization

	Companies with the highest degree of digitalization (10%)	Other 90% of the companies
Age of the company	158 years	89 years
Number of employees	2,724	1,014
Export share	74%	66%

Source: Pedersen, Petersen, and Jespersen, 2002.

For the other part of the industry segment -- local wholesalers and producers -- the issue of size has not been found to be critical. In a survey in 2001 on steel and manufacturing wholesale

producers, as well as a survey in 2002 on the grocery sector, we found that size did not hold any explanatory power for an increase in B-to-B e-commerce.

The Danish industry structure *lacks* MNC (multinational corporation) presence in e-commerce diffusion. *In particular, there is a lack of strong upstream players* in the value chain, as well as a lack of *global brand leaders*. The exceptions are within shipping logistics, biotech, and manufacturing. With *shipping logistics*, the key player has been Maersk-Sealand. The companies in the Maersk-Sealand industry group have pushed to stay competitive and expand their activities, which in turn have had an impact on the other sea-cargo carriers. The *biotech industry* is growing in prominence within the manufacturing industry, with the Novo Nordic Group (health care and enzymes) in the forefront as a leading IT user pushing development. Novo Nordic Healthcare is a world leader in insulin production and development, as well as diabetes care. They have pushed e-commerce by promoting diabetic products to both new and existing diabetes patients via the Internet. Novozymes is the world's largest producer of industrial enzymes. They have established their own very successful B-to-B e-market (Privat Trading Exchange) for a range of their enzymes. Finally, there are several foreign biotech companies located in Denmark. The most recent new production companies are ACADIA, Ferring Pharmaceuticals, Genmab, Nutri Pharma, and Structural Bioinformatics. In *manufacturing*, the globalization of Danfoss, Grundfos, Carlsberg Breweries, and the Lego Group has also meant a greater push for development and implementation of e-logistics. In particular, Lego has been pushing B-to-C e-commerce globally from the late 1990s through Lego Worldshop.

In Denmark, early *collaboration between the small industry players* on e-commerce (and the previous technologies for digital collaboration) is a more appropriate picture of the diffusion within the agricultural, banking, retail, and health care sectors. Thus, collaboration from the early 1970s has to some extent compensated for the highly scattered picture and lack of strong players. *The agricultural sector* in Denmark has contributed to shaping the national environment for e-commerce, as it was one of the first sectors to digitize many functions in its supply chain. This has been achieved by streamlining the work processes in the production units, and the document exchange with the meat and fish processing units, including the health inspection offices. Thus, the agricultural sector shows a high level of EDI use and an eagerness to exploit new e-business opportunities, such as online consulting. Also, digitalization of the internal and external work processes is the central explanation for the increasing value generation in the agricultural sector, which has comparatively few employees.

The *financial sector* employs close to one quarter of the private sector workforce. Danish banks have always been in the forefront regarding IT use, from as early as the mid-1950s, and the first on-line, real-time system with cashier terminals in the branches was introduced in 1969. IBM played a strong role in motivating the use and adoption of IT, and in many cases Danish banks were the guinea pigs for new applications. Danish banks in those days were quite willing, since employee salaries were among the highest in Europe.

An even stronger influencing force was the government introduction of the 'pay-as-you-earn tax' in 1970, which made it necessary for almost every salary earner to have a bank account where their after-tax salary was deposited. The Dataløn (a joint salary system offered by all banks) was introduced in 1969. Furthermore, the government-enforced personal identification number made identification easy, and public restrictions on maximum interest margins and a ceiling on loans (to avoid overheating the economy) in the mid 1980s strongly reduced competition among banks to a question of service, including the number of banking outlets. This highly regulated banking market also made it easy to establish a joint infrastructure, with collaboration between the several hundred banks for any kind of transfer. In addition to the joint salary system in 1969, a joint electronic transfer payment system was introduced in 1974, and debit cards (Dankort) were introduced in 1983. Before the end of the 1980s, the number of Dankort transactions had surpassed the number of transactions using personal checks, and for all practical purposes, nobody uses checks today.

In the last decade, national and international mergers have been the overall trend. But there have also been an increasing number of mergers and acquisitions within and between the banking and

real estate markets. The dominant players today are Danske Bank and Nordea. The financial sector is aggressive in using e-commerce as a strategic tool and as a means of reducing processing costs. From 1999 to 2000, the number of customers using the Internet to complete banking transactions doubled (Ministry of Information Technology and Research, 2000). The number of customers who handle all their banking transactions via the Internet varies from 10-30 percent among the various banks. With its more than ten million Internet users, the Nordic Nordea bank, which covers all of Scandinavia, has approximately the same number of Internet users as Bank of America, but it has more Internet transactions than any other bank in the world, including Bank of America.

In the retail sector, two large chains dominate the market. Between these two chains, the "cooperation" is the most interesting. Through an already established structure with membership and dividends for the 1.4 million members (about one quarter of the population) and mail orders, the co-op has introduced e-commerce. This has not been done in the conventional way, by offering Internet sales of the same products carried in the supermarkets. This would have caused channel conflict, and, as one of the directors said: 'I cannot see why we, who have the best locations in the physical world, should undertake the task of teaching the customers to buy on-line!' Instead, the co-op is using its monthly magazine to promote special offers in the durable consumer goods category (bicycles, carpets, lamps, kitchenware, etc.), shown in the magazine and on the web. If a member/customer wants to buy, the ordering transaction is done on the web, but the product is picked up at a later time in the shop, where it is also paid for using the direct debit card. This strategy has turned out to be a tremendous success, with huge volume, more customers coming to the shop to pick up (plus do the rest of their shopping), and no supply chain problems.

Contradictory as it may seem, the only strong industry player in Denmark is government. With approximately 800,000 employees in the public sector and 1,900,000 employees in the private sector, the government's sizeable share of employment is a potential driving force for e-commerce. Adding to the potential of government is the content of governmental operations in Denmark. On the negative side is the lack of military development. In other countries, such as France, Sweden, the U.K. and the U.S., the military is key in explaining the importance of industry as a demand driver. Also, the Danish government has partly nullified the power inherent in its size by splitting itself into various self-governing bodies and many layers of governments, making any top-down or coordinated set of actions impossible.

On the positive side, we find the introduction of the "pay-as-you-earn" tax in 1970 (which required all citizens to have a personal identification number and a bank account for electronic transfers of salary) and extensive government-supported welfare reforms. From the early expansion of the modern welfare state in the 1960s, the ability to compute has been a necessary prerequisite for redistributing still larger parts of GDP through the public sector. About 70 percent of the annual GDP is reallocated through the public sector either by its own consumption (30 percent) or by income transfers and subsidies. From the early 1970s, government has been automating its internal operations and data collection for taxes and information from companies and citizens. Yet it is remarkable that this is not due to a top-down command strategy but in large part due to *collaboration between many small municipalities* through the formation of the Kommunedata (Local Government Data Processing) organization in the early 1970s, and a data processing center for central government (Datacentralen). The collaboration was formalized through shared co-ownership, and in most cases the government was more digitalized than the private sector. A downside emerged in the late 1990s, with the increase in globalization and requirements for a still more open IT architecture that supports economies of scale rather than small, proprietary solutions. Thus, the organization of IT services for the government has been criticized as promoting monopoly and hindering innovation and system integration with global, leading brands.

The fifth area of focus is value generation in terms of GDP and exports by sector. A relatively large (but in actual number rather small) part of the labor force (5 percent) is employed in the *agricultural, hunting, forestry, and fishing* sector. Yet it accounts for nearly 20 percent of total exports. Whereas in other contexts a high proportion in the primary sector is unlikely to be interpreted as an e-commerce driver, the high productivity as well as the ability to increasingly

innovate production and use IT can be seen as a neutral or even potentially positive driver. It is also remarkable that the transportation, storage, and communication sector account for a large share of the GDP (about twice the size of this sector in the U.S.).

Table 8. GDP Distributed by Industrial Sector, Denmark and United States (%)

Sector	Denmark	United States
Agriculture, hunting, forestry, and fishing	5.3%	1.9%
Mining and quarrying	1.1%	1.7%
Manufacturing	25.1%	19.6%
Electricity, gas, and water	2.5%	3.1%
Construction	6.9%	4.5%
Wholesale and retail trade, and restaurants and hotels	16.8%	18.1%
Transportation, storage, and communication	11.4%	6.4%
Finance	23.9%	30.8%
Community, social, and personal services	7.0%	12.4%
GDP total US\$ (Billions)	174.9	8,230.4

Source: United Nations National Accounts, 1999.

The ICT sector grew more rapidly than the other sectors during 1995-1998, primarily in services. The ICT manufacturing sector has decreased since 1995. The increase has taken place in wholesale, telecommunications, and consultant services.

Table 9. Employment in the ICT Sector, 1993-98 (Index 1995=100)

Year	ICT manufacturing	ICT services			Total ICT services	Total private sector
		Whole sale	Tele-communication	IT consultant		
1993	96	90	87	122	99	94
1994	95	94	100	95	96	96
1995	100	100	100	100	100	100
1996	102	99	116	108	106	101
1997	101	106	105	117	109	103
1998	99	114	127	135	124	106

Note: NACE 15-37, 45, 50-74, 92, 93.

Source: Statistics Norway, 2001.

In summary, the demand drivers related to the structure of the industry play an important role for the intra- and inter-governmental areas of e-commerce, and for B-to-B e-commerce in areas such as agriculture, health care, and finance, primarily due to collaborative efforts in the pharmaceutical industry. In shipping and logistics, it is primarily due to competitive pressure. The lack of strong MNCs and large companies explains the deficiency of a major push for e-commerce diffusion. The ITC sector has grown more than the rest of the private sector. Yet, the growth is primarily in the consultancy area rather than in production. This makes it unlikely that the ITC sector can create a strong push for e-commerce. Rather, the Danish ITC sector is highly dependent on the ongoing digitalization of other sectors, such as the government, which commands the lion's share of employment and GDP. Also, the retail and manufacturing industry structures lack strong global brand leaders, which is interpreted as the major explanation for the lack of B-to-C e-commerce usage. Only in the banking area do we find Denmark leading global B-to-C e-commerce.

HUMAN RESOURCES

By international standards, the degree of participation in the Danish labor market is high for both males and females, regardless of age group; 81.4 percent of the male and 73.6 percent of the female population in the age group 16-66 are part of the labor force, with only a very small fraction as part time workers (Statistics Denmark, 2002a). During the 1990s, the Danish economy was able to boast an even higher percentages of Danes in the workforce (Table 10) In 1993, the

unemployment rate was 12.1 percent. By the year 2000, it had dropped to a mere 5.3 percent. The Ministry of Finance predicts that this figure will decrease to 4.6 by the year 2010. Part of the explanation for the growth in the labor force is longer vacations (six weeks) and reduced work hours per week (37). Attractive retirement arrangements from age 60 also reduce the workforce. A substantial part of the population over 60 has left the workforce. One of the major concerns in future labor market policy is to make the so-called "Grey Gold" segment continue to be part of the workforce, because the Danish society can hardly manage without this group, which, given their experience, is a strong resource.

Table 10. Unemployment rate and accumulated work hours, 1993-2035

	1993	2000	2005	2010	2035
Unemployment (% of the labor force)	12.1	5.3	5	4.6	4.6
Accumulated work hours/ worker/ year	1,573	1,531	1,502	1,485	1,480

Source: Ministry of Finance, 2001a.

Labor force participation is relevant for studying diffusion of e-commerce because it highlights the increased domestic, and particularly export-driven, utilization of human resources.

A unique feature of the Danish labor market is a well organized vocational training system, organized by the employers themselves using the 15 local vocational training centers, which offer more than 2,000 different courses. This unique vocational training institution was established in 1960 and is a cornerstone in diffusing e-commerce and IT in general to Danish manufacturing and service companies. The result is that Denmark has the highest percentage of workers with computer training and using computers for work of any country in the EU (Figure 2).

Although the vocational training program is an essential driver for early training of the workforce in the use of e-commerce technologies, it involves only industrial and agricultural workers. The system overlooks more highly skilled people in the education and service who are not covered by the vocational training centers. The high orientation towards vocational training raises serious doubts about Denmark's capacity to be part of the knowledge-intensive industries that predominate future e-commerce growth.

The Danish economy benefits from a high adult rate of literacy (99 percent) and a generally high level of secondary school enrollment. Yet the share of enrollment in tertiary education is low compared to the U.S. (45 percent in Denmark and 81 percent in the U.S.) (Table 11). In addition to low tertiary enrollment, students are enrolled for an unusually long time, which many believe is the result of state-subsidized tuition and living costs, available to all regardless of socio-economic status.

In the IT area, the Danish government strongly promoted educational efforts since 1995. In that year, the annual enrollment in IT-related higher education was 3600 students. In 2000, the enrollment was 7778 (Ministry of Information Technology and Research, 2000a).

Table 11. Secondary And Tertiary Enrollment, And Science and Engineering Enrollment Relative to Tertiary Students (%).

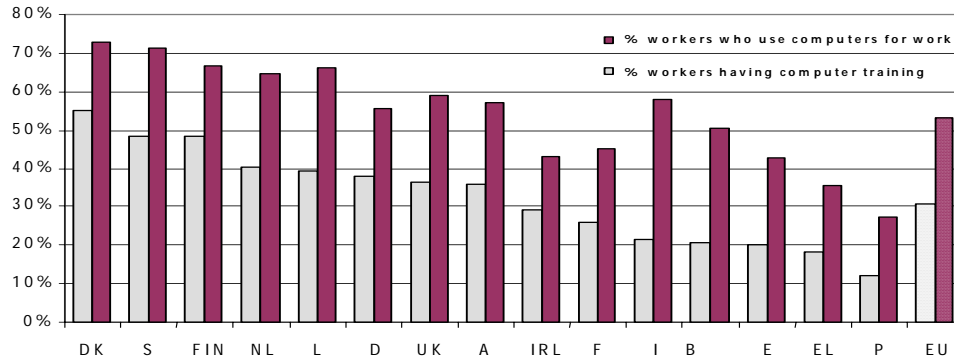
	% secondary enrollment*	% tertiary enrollment	Science and engineering as % of tertiary students
Denmark	121	45	25
United States	97	81	n.a

Note:* This figure can exceed 100% since the ratio is calculated as the total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education.

Source: World Bank Group, 2000.

However, the OECD is concerned about productivity in the Danish educational sector, where by OECD standards "...excessively long time spent in education still needs to be reduced" (OECD 2000a). For e-commerce, it is particularly necessary to reduce the time spent from enrollment to graduation and ready for the job market. Because of the rapid technology shifts of e-commerce technologies. Because the information learned becomes obsolete so quickly, it is critical that IT

students finish within the allotted timeframe of three years for a bachelor's degree and two years for a master of science degree.



Source: European Commission, 2001.

Note: DK-Denmark; S-Sweden; FIN-Finland; NL-Netherlands; L-Luxembourg; D-Deutschland (Germany); UK-United Kingdom; A-Austria; IRL-Ireland; F-France; I-Italy; B-Belgium; E-Spain; EL-Greece; P-Portugal; EU-European Communities.

Figure 2. Computer Training and Work

Table 11. Secondary And Tertiary Enrollment, And Science and Engineering Enrollment Relative to Tertiary Students (%).

	% secondary enrollment*	% tertiary enrollment	Science and engineering as % of tertiary students
Denmark	121	45	25
United States	97	81	n.a

Note:* This figure can exceed 100% since the ratio is calculated as the total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education.

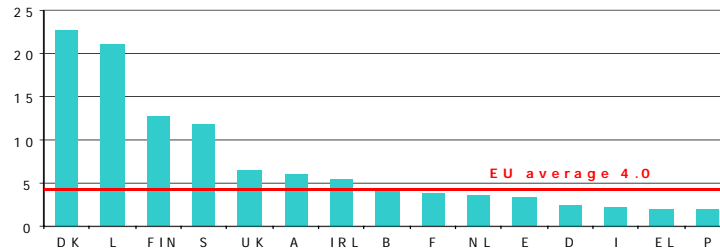
Source: World Bank Group, 2000.

The political goal of the Danish system of subsidized tertiary education was to enable students to finish more quickly so they become part of a highly skilled labor force. However, the increased subsidy seems to have backfired. Many believe that, partly because of the absence of tuition fees and the monthly stipends, Danish students spend more years as graduate students than in any other OECD country. Another explanation may be found in the culture among the Danish youth. A substantial part of any age group takes one or two years of sabbatical after high school. They go abroad or work as unskilled labor before they continue their studies. This pattern results in a late entry into the job market for the highly skilled labor.

In the 1990s, a topic of great debate was the development of special IT green cards to attract foreign IT skilled labor. However, such a policy is not yet implemented.

The statistics on Internet usage in schools (Figure 3) place Denmark in the top, with 23 PCs with Internet access per 100 pupils, whereas the average European level is 4.0 (Eurobarometer 2001).

The use of information technology also impacts learning processes and physical architecture. For example, Hellerup Secondary School north of Copenhagen equipped all students with smart cards and dismantled all formal classrooms, using ICT to foster individual-based, rather than class-based, teaching methods. Thus, the readiness of the younger generation to adopt e-commerce technologies is interpreted in this case as high.



Source: European Commission, 2001.

Note: DK-Denmark; S-Sweden; FIN-Finland; NL-Netherlands; L-Luxembourg; D-Deutschland (Germany); UK-United Kingdom; A-Austria; IRL-Ireland; F-France; I-Italy; B-Belgium; E-Spain; EL-Greece; P-Portugal; EU-European Communities.

Figure 3. PCs in Schools Connected to the Internet per 100 Pupils

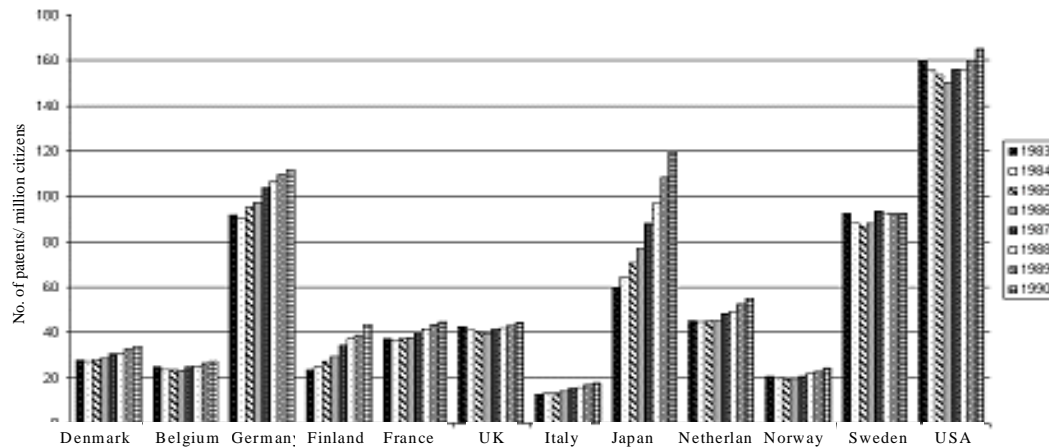
A heated debate took place during 2001 regarding publicly funded R&D in the IT sector. In the early 1990s, the public sector's financing of R&D activities was growing. However, in the policy initiatives since 1995, public R&D efforts were reduced (The Danish Research Council, 2001).

A similar negative indicator for the diffusion of e-commerce is the low innovation intensity, as measured by numbers of patents. Although patents are costly and time consuming to obtain, it is noticeable that during 1983-90 the only industry sector that showed increases in the number of patents was the biotechnology sector. The statistics shown in Figure 4 suggest the lack of a production-led IT strategy, and that the crucial cornerstones for the technology production that led to the push for e-commerce in the U.S. and Finland were actually founded in the mid- to late-1980s – long before the actual e-commerce increase.

In summary, the human resources in Denmark are more likely inhibitors than drivers of e-commerce. The absence of a policy commitment to an early boost of tertiary education, the tradition for spending many years at university (average graduation age 29), and the low patent intensity are all interpreted as serious inhibitors for e-commerce. We found PC penetration in the schools, computer training, and vocational training to be positive drivers. These positive e-commerce drivers, although the strong orientation of general vocational training, can equally well result in a competence trap in areas with low or no growth.

PHYSICAL AND TELECOMMUNICATION INFRASTRUCTURE

Denmark is located to the north of Germany, bordering the Baltic Sea and the North Sea. The primary export markets are all neighboring countries. Thus, the constant economic need for efficient transportation of goods to the U.K., Germany, Scandinavia, and the Baltic states promoted the sea freight, truck, and railroad transportation industries from early on. Companies such as Maersk-Sealand provide a highly efficient sea-land transportation of agricultural and industrial products. During the 1990s, further steps were taken to make physical transport of labor and goods more efficient within Denmark and to the major export markets.



Source: Ministry of Trade and Industry, 2001c.

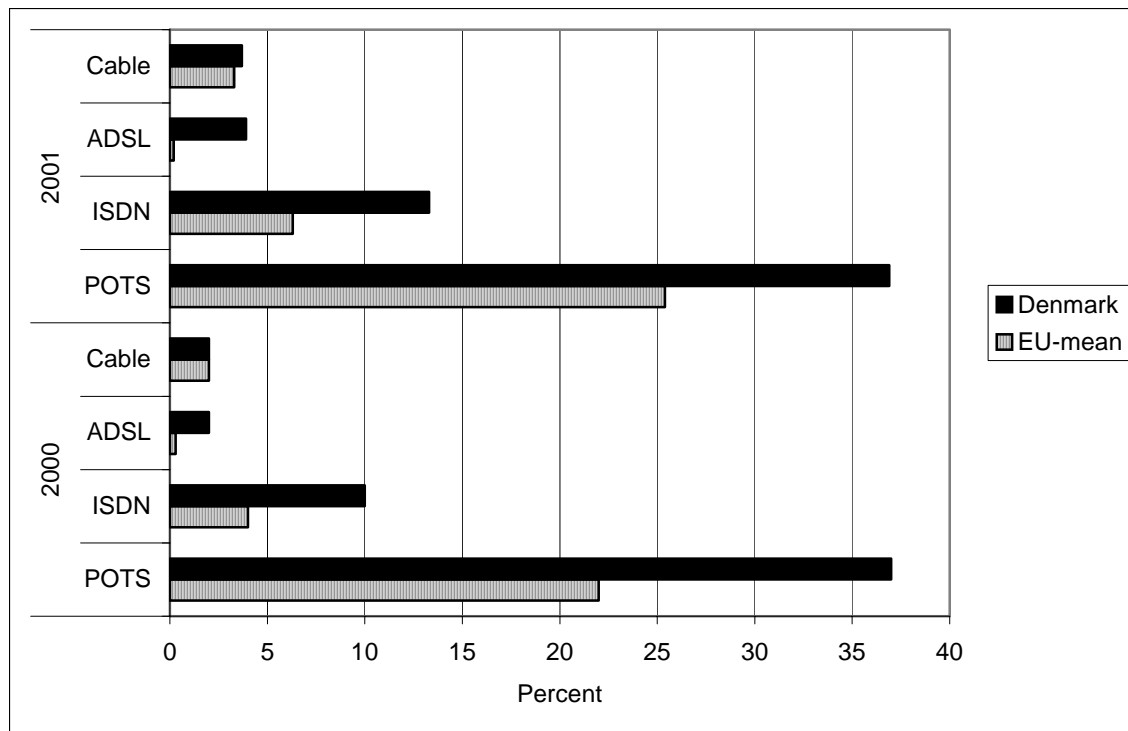
Figure 4. Patent Intensity, OECD Countries, 1983-1990

There is no or rather limited congestion on Danish freeways for business traffic. Yet from 1990 to 2000, the number of cars increased 21 percent, and the actual car traffic increased by 30 percent, whereas public transportation by train increased 17 percent, and bicycle traffic dropped by 26 percent (Statistics Denmark, 2000b). We attribute these changes to a major shift in infrastructure. Yet, the Danes still own substantially fewer cars than the Swedes and the Germans. In 2000, the Danes owned 346 cars per 1,000 citizens, whereas the Swedes owned 418 and the Germans 499 cars.

The bridges between Fyn and Sealand (the two major islands of Denmark) and between Sealand and Sweden, and a planned bridge from Sealand to Germany, contribute to streamlining the physical transportation requirements even further. These bridges reduced access time to the major export markets by two to three hours. For human transportation, a large investment in public transportation and a subway system in Copenhagen should help reduce commuting time.

With the physical infrastructure in place, Denmark and Sweden hope to create a cooperative high-growth area for IT and biometrics in the Øresund region, which consists of the eastern part of Denmark (the greater Copenhagen area) and southern Sweden (Lund, Malmö), with a total population of 3.5 million.

As for the region's ITC infrastructure, a key driver of e-commerce infrastructure is the digital readiness exhibited by both companies and households. About 61 percent of all Danish citizens subscribe to mobile phones. In July 2000, only 2,800 households were using broadband, but at the end of 2001, the number of broadband subscribers increased to 152,000 (National IT and Telecommunication Agency, 2002). The number of ADSL and ISDN access points, as well as POTS, in both 2000 and 2001 in Denmark was higher than the EU average (Figure 5).



Source: BDRC, 2001.

Figure 5. Internet Access Platform Penetration in Households, Denmark, and Average of EU for 2000 and 2001

Household Internet access increased rapidly from 1997 until 2000, regardless of age group. As shown in Table 12, the difference between the 16-29 age group, and the 30-49 age group is marginal. Yet, Internet penetration for households with family members over 60 was significantly lower. Including access from household and/or job and education site, 74 percent of the population could access the Internet by the end of 2001 (Statistics Denmark, 2001b). The total number of Internet subscribers jumped from 1.1 million by the end of 1999, to 2 million by the end of 2001 (Danish Telecom Agency, 2002).

Table 12. Internet Access in Danish Households, 1997-2002 (3rd quarter) (%).

Age	1997	1998	1999	2000	2001 ^a	2002 ^a
16-29 years	8	20	32	49	86*	89*
30-39 years	9	19	43	56	84**	87**
40-49 years	9	17	47	57	77***	82***
50-59 years	8	13	31	43		
60+ years	2	4	12	18	31	38
Total	7	15	33	45	72	76

Note: ^a) Access from the household and the company.

*16-19 years. **20-39 years. ***40-59 years.

Source: Statistics Denmark, 1997-2000, 2001b, 2002c, d.

The overall penetration of ITC is shown in Table 13. Comparing the cost of 40 hours of off-peak Internet access, the Danish costs are substantially higher than the corresponding costs in the U.S. Although flat rates were introduced, the bulk of Internet users pay by the minute. Thus, the rates for access could be interpreted as an inhibitor for e-commerce. Comparing Internet access costs for 20 hours per month peak rate, the Danish costs are lower than the corresponding costs in the U.S. (OERC 2000b). It is also worth noting that the number of CATV subscribers is at the

same level (25 percent) as in the U.S. Compared to subscribers in the other Scandinavian countries, the level of Danish CATV subscribers is about twice as high.

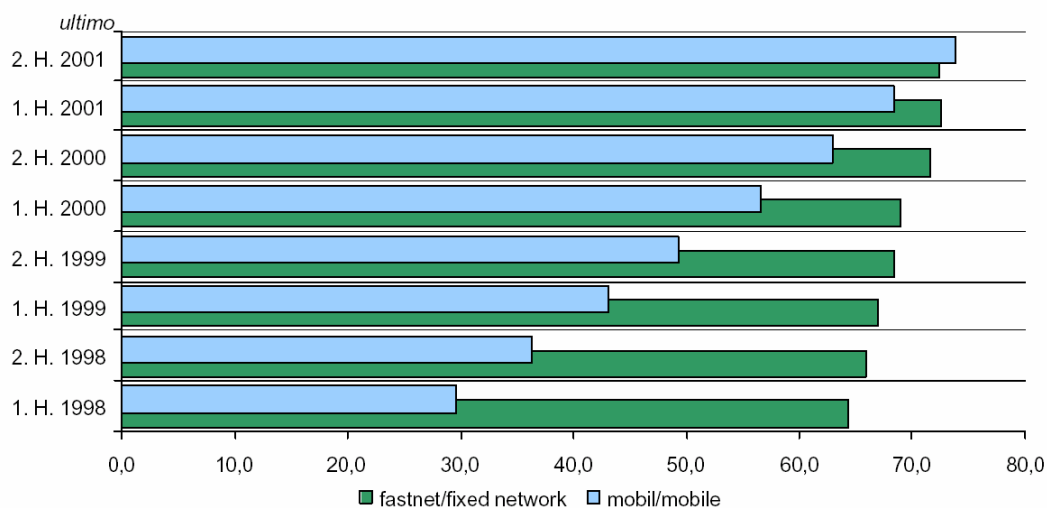
The number of Internet hosts per 1,000 inhabitants is still at a much lower level in Denmark than in the U.S. Comparing 1998 data on the number of secure servers, the Danish information infrastructure is modest. Data from the Telecom Agency shows, however, that the number of secure servers increased rapidly in 1999 and 2000 (National Telecom Agency, 2000).

Table 13. Overall ICT Penetration (1999)

	Denmark	Scandinavia	EU Member countries	United States
PCs per 1,000 population ^a	414.9	422.36	248.44	517.07
Internet users per 1,000 population ^a	282.3	390.83	158.65	271.74
Internet hosts per 1,000 population ^a	63	80	23	195
Secure servers per 1 million people (1998) ^a	8	16	13	54
Secure servers with strong encryption per 1 million people (1998) ^a	2	5	3	38
Cost of 40 hours off-peak Internet use, US\$ ^b	53	n.a.	n.a.	35
Cost of 20 hours peak Internet use (index OECD=100) ^b	65	n.a.	n.a.	83
CATV subscribers per 1,000 population	265	208	116	252
Cell phone users per 1,000 population ^a	610	691	625	457

Sources: ^{a)} ITU, 2001. ^{b)} OECD, 2000.

The penetration of cell phones is high and still rising. The data shown in Figure 6 indicates an increase in the mobile device, content, and infrastructure market that outpaces the increase in the fixed network market.

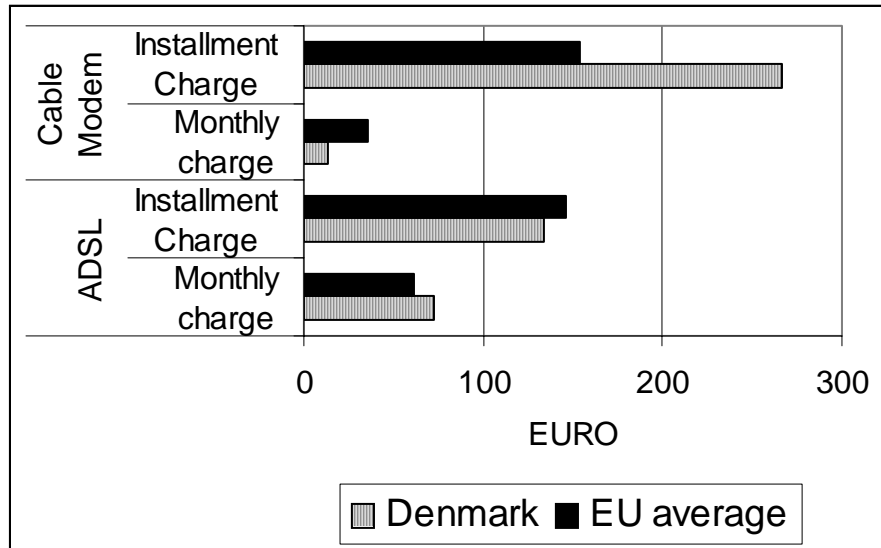


Source: National IT and Telecommunication Agency, 2002.

Figure 6. Fixed Network and Mobile Subscribers per 100 Inhabitants, 1998-2001 (%).

The installation charges for cable modem service is higher in Denmark than in other European countries, but the monthly charges are the lowest (Figure 7). High installation charges could be a barrier; but the low monthly charges could lead to higher use of the Internet for the households already signed up with a provider. The data also suggest little if any competition for changing providers once a consumer signed up with one. Denmark's rate for ASDL is similar to the other Scandinavian countries, Italy, and the U.K. at the very top. Furthermore, Denmark has a high

diffusion of cable TV, and many consumers now subscribe to WebTV. This factor is not reflected in Figure 7.



Source: BDRC, 2001.

Figure 7. Price Comparison, ADSL and Cable Modem

Private Sector Infrastructure. In the private sector, more than 90 percent of all Danish enterprises can access the Internet, and more than 80 percent of companies with more than 10 employees have their own homepage. Internet access and a digital front-end are positively correlated with the size of the company.

Table 14. Internet Access and Homepages in Danish Enterprises, Distributed by Size, 2000 (%).

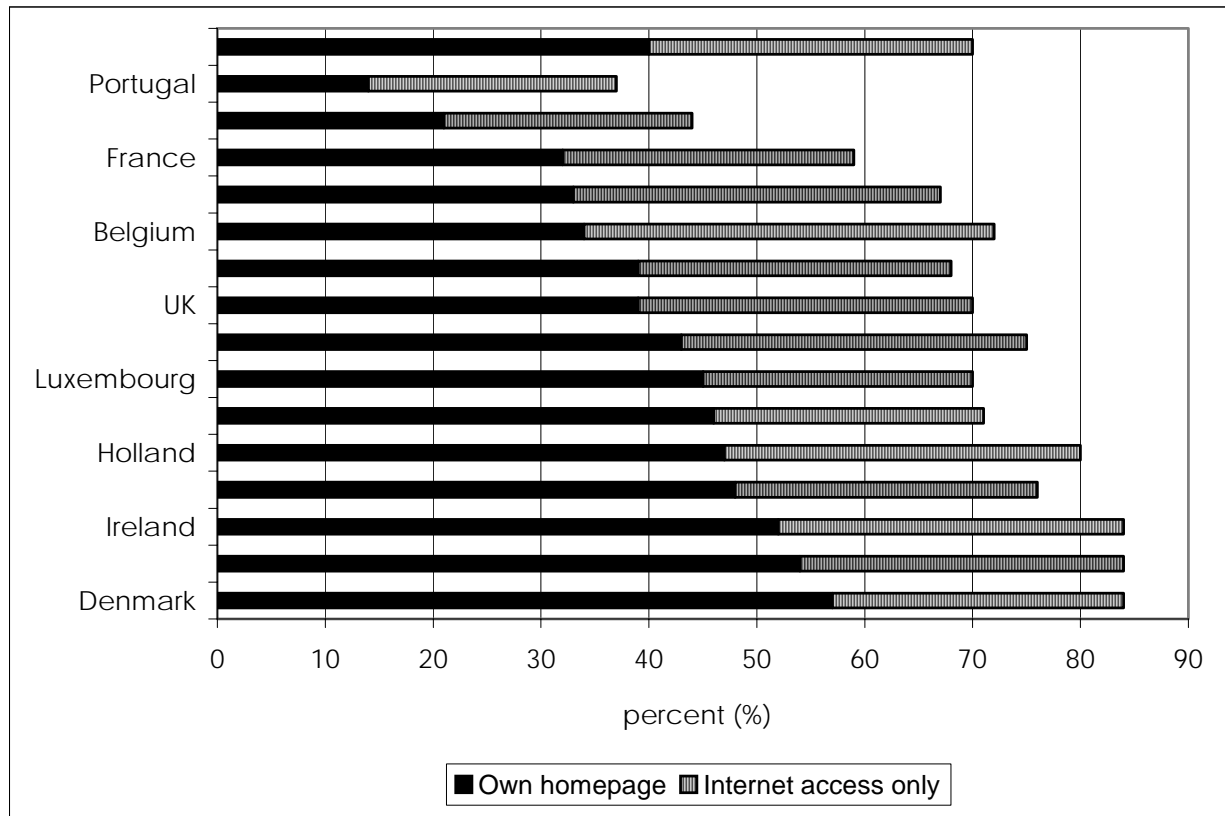
Number of employees	Internet access	Own homepage
10-19	87	84
20-49	93	84
50-99	95	91
100+	97	92
All	94	88

Source: Statistics Denmark, 2001a.

From a European perspective, Danish SMEs are rather competitive when it comes to creating virtual entry to their companies. Fifty-seven percent of the Danish SMEs (with fewer than 250 employees) had their own homepage, while the average European level was 40 percent. In total, 84 percent of all SMEs either had their own homepage and/or Internet access. The corresponding number at the EU level was 70 percent in March 2000. Note that the numbers displayed in Figure 8 differ from the ones displayed in Table 14, since the former includes all SMEs with fewer than 250 employees, and the latter only includes SMEs with between 10 and 250 employees.

Looking at the infrastructure across sectors, virtually all sectors are linked to the Internet, with the construction sector having the lowest penetration. It is especially worth noting the rapid increase

since 1998, as shown in Table 15. From a diffusion perspective, the first movers were finance and business services, followed by manufacturing.



Source: Eurobarometer, 2000

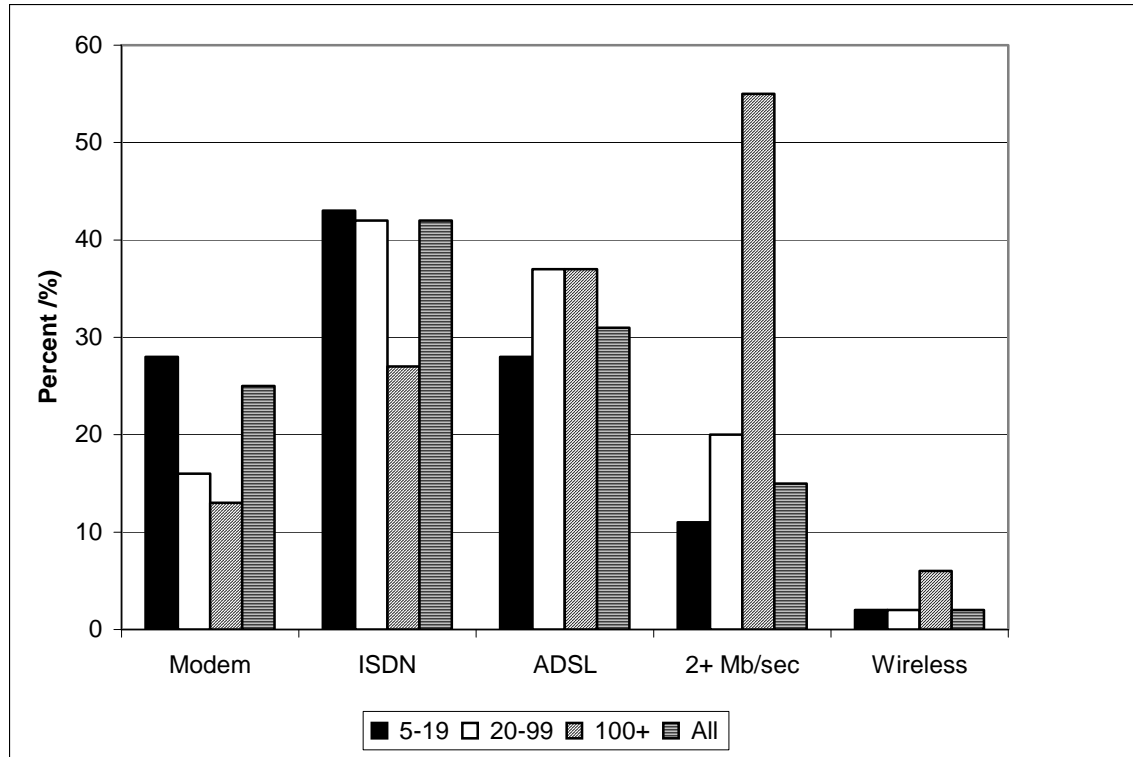
Figure 8. SMEs' Internet Access and Presence on the Internet by Means of their Own Homepage, March 2000

Table 15. Internet Access Distributed by Sector and Year (%)

Sector	1997	1998	1999	2000
Agriculture, hunting, forestry & fishing	n.a.	n.a.	n.a.	n.a.
Mining and quarrying	n.a.	n.a.	n.a.	n.a.
Manufacturing	42	81	89	95
Electricity, gas and water	n.a.	n.a.	n.a.	n.a.
Construction	17	58	78	86
Wholesale and retail trade, and restaurants and hotels	36	76	86	95
Transportation, storage and communication	32	68	88	94
Finance and business services	55	84	95	96
Community, social and personal services	n.a.	n.a.	n.a.	n.a.
Overall private sector	40	77	87	94

Source: Statistics Denmark, 1998, 1999, 2000, 2001a.

Further, Figure 9 shows that by 2001, about 25 percent of the companies were using modems (28 K or 56K), 40 percent were accessing the Internet using ISDN as the gateway, and 30 percent were using ADSL. Fifteen percent were using T1 connections, and fewer than 2 percent of the companies used wireless access (Statistics Denmark, 2002).



Source: Statistics Denmark, 2002a.

Figure 9. Internet Access for Danish Companies Distributed by Size of Company (Number of Employees), 2001

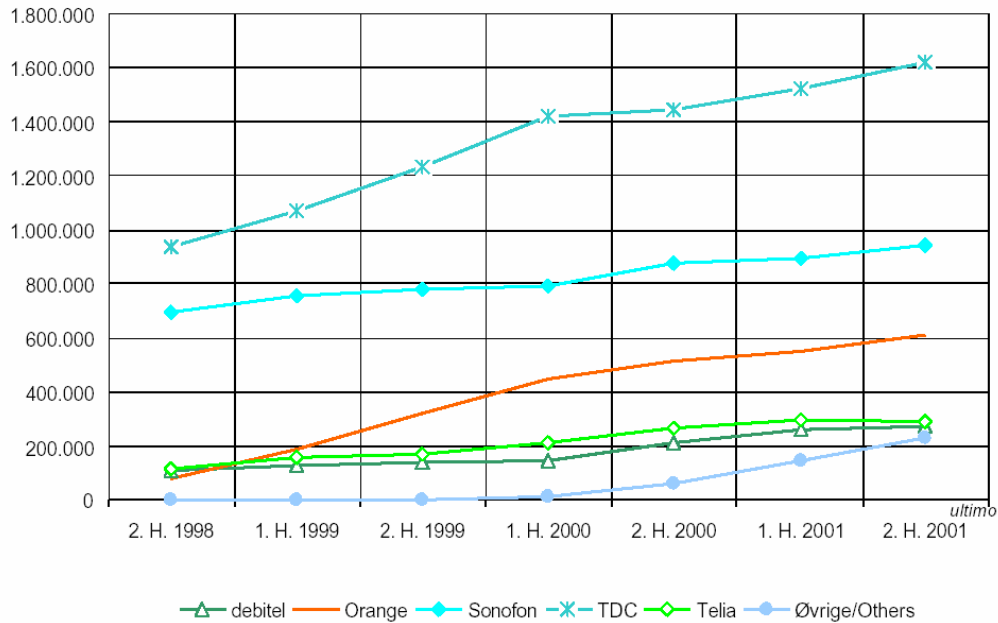
Extensive liberalization at the European level within the telecommunications sector had a major influence at the national policy level. The liberalization of the telecommunications industry and a general growth in the market segment increased the number of companies operating on the market and lowered prices.

On average, prices decreased annually by 2.5 percent since 1984. The rates in Denmark are at the average level of the other OECD countries (OECD, 2000b).

In 2000, more than 50 companies offered Internet access to 1.5 million households. Yet, the three dominant players shared more than 70 percent of the market (Tele Danmark, 37%; Tele2, 23%; and World Online, 12%).

The policy reforms in the telecommunications sector indeed introduced more players and reduced rates, but they also excluded the possibility of strong, coordinated actions in the innovation of the telecommunications area, as in the Japanese case.

Also, it is worth noting that only 13 companies offered Internet services at a national level in 2000, and only four companies in 1998. The GSM (standard mobile protocol) market was also impacted by this liberalization. Figure 10 illustrates the overall market and the entry of new firms. However, the former telecom monopoly (TDC), which had consistently dominated the market in terms of subscribers before liberalization, is still in a leading position. This result might be due to a remarkable customer loyalty to the previous monopoly company, which built a large customer base during the monopoly and successfully nursed the customer base after deregulation. Another less positive interpretation is convenience. The market for mobile services is characterized by a high lack of transparency. For consumers, it is a jungle to enter when trying to compare offers. Given that users are familiar with TDC from the time of the monopoly, most may just continue regardless of other offers in the market.



Source: National IT and Telecommunication Agency, 2002.

Figure 10. Mobile Subscriptions by Company in Denmark, 1998-2001

The annual investments in telecommunications increased substantially since 1992, although 2000 showed a minor drop in investments. In 1992, DKK 512 million was invested in telecommunications. In 1996, the investments increased to DKK 4,734 million, and in 1999, to DKK 6,526 million. The deployment of FWA (fixed wireless access) and 3G (third generation) Net, including broadband connections, is expected to increase these investments rapidly (National Telecom Agency, 2000). Investments in development broadband and other telecommunications funding will primarily come from the private sector.

All in all, telecom investments in Denmark are much greater than in the U.S. per capita, but less than investments in the other Scandinavian countries and in the EU. If we look at the general spending on systems, software, and/or services, Denmark is spending less than the U.S., but more than the Scandinavian and European countries on average. ITU (International Telecommunications Union) also calculated the total expenditures for obtaining property and plant (including transmitters, land, and buildings) used for telecommunication services (Table 16). The data shows that Danish expenditures are at an average OCED level, but higher than in the U.S. Thus, one could expect lower international (outside European Union) competitiveness of companies located in Denmark.

Although the Scandinavian countries penetration of mobile Internet technologies and mobile phones in particular is high, the traffic on the fixed phone lines is still substantially larger. An important reason why mobile phone use caught up rapidly in Denmark is that only the caller pays for the call. The receiver does not pay for receiving calls or SMS messages.

Table 16. IT and Telecommunication Investments. Percent of GDP (%)

	Hardware, software and/or IT services as % of GDP ^a	Expenditures on acquiring ownership of property and plant (including transmitters, land, and buildings) used for telecommunication services, as % of GDP ^b
Denmark	3.41	0.54
Scandinavia	3.33	0.71
European Union	2.67	0.61
United States	4.14	0.28
OECD	3.09	0.54

Source: ^{a)} IDC, 1999, ^{b)} ITU, 2001.

Table 17. Fixed Phone Line and Mobile Traffic Subscribers, Traffic, and SMS Messages, 1998-2001

		Number of subscribers (1,000s) (percent of population)	Outbound calls (millions)	SMS (N; millions)
Fixed phone lines	2001	3,882 (72.3)	23,520	n.a.
	2000	3,826 (71.6)	23,138	n.a.
	1999	3,638 (68.3)	n.a.	n.a.
	1998	3,496 (65.8)	n.a.	n.a.
Cell phone	2001	3,954 (737)	3,112	1,362
	2000	3,543 (66.2)	2,695	753
	1999	2,629 (49.3)	2,117	n.a.
	1998	1,931 (36.3)	1,621	n.a.

Source: National IT and Telecommunication Agency, 2002.

The industry exploited the highly mobile and accessible population using Short Message Services (SMS). The use of the third generation of the General Packet Radio Services (GPRS) standard is expected to increase rapidly in the Scandinavian countries in areas such as marketing, logistics, ticketing, news, and entertainment. The Danish auctioning of the 3G-net, held in fall 2001, generated a higher than expected revenue, approximately two billion DKK.

Thus, intelligent tags in the baggage and freight industry, information and infotainment distribution and services over Bluetooth technology, and payment using mobile phones in trains and ferries, for example, are currently being implemented. The following services are already implemented and used extensively:

- Notification via SMS in case of flight and train delays and cancellations;
- News (financial, weather updates, general news, narrow-casting);
- E-mail and web surfing;
- Banking services via WAP; and
- Peer-to-peer services (e.g., chat).

A major part of the current SMS applications is almost exclusively used in a peer-to-peer mode, leaving no or very limited room for content developers to capitalize from market adoption. Instead, the telecom operators are cashing in on the current user pattern.

Summary

In summary, the physical and telecommunications infrastructure is generally high and clearly an overall positive driver rather than an inhibitor. The highly developed physical and digital infrastructure and availability of technologies across geographical boundaries in companies and households clearly enable e-commerce. Yet, there appears to be a wide gap between the rapid speed with which the households and companies acquire new technologies, and their actual use of the devices in a significant way. Thus, the massive spread of mobile handsets is not met by a corresponding use. Despite the fact that the number of households with a mobile phone is equal to the number of households with a fixed-line phone, the use of the mobile devices amounts to only 12 percent of the total number of calls made.

FINANCIAL RESOURCES

Venture Capital

In general, venture capital has never been very plentiful in Denmark. A survey by the European Venture Capital Association (EVCA, 2002), of the amount of venture capital as a percentage of GNP for 2001 shows Denmark at the bottom of the list, with only 1.0 percent, while the average for the EU is 2.0 percent. However, the accuracy of these figures is questioned by official Danish institutions who argue that in reality the Danish venture market is substantially larger (Fond, 2001). Indeed, it is argued that ECVA only captures about fifty percent of the Danish market. This error may also apply to other EU countries, but Danish sources claim that the discrepancies in the Danish statistics are much larger than in the other EU countries. In general, however, the Danish market for venture capital is less than in comparable countries, and this lack of venture capital is a strong barrier to entrepreneurial development. Indeed, this lack is often cited as one of the main weaknesses for the long-range competitiveness of the Danish economy.

Reasons for the low availability of venture capital include:

1. Because a relatively larger part of the GNP in Denmark is channeled through the public sector, relatively less is available for creating new businesses in the private sector.
2. The absence of large industries, which could be instrumental in providing venture capital, as is seen, for example, in Sweden.
3. The resources of the small Danish stock market are limited, which hinders the possibility of providing financial support for start-up ventures.

Venture capital is often divided into seed capital, start-up capital, and expansion capital. Seed capital is especially limited, although interest grew over the past several years. The number of participants in the venture capital market with interest in seed financing grew from 17 in 1998 to 30 in 2001, and their available capital grew from 570 million DKK to 2.6 billion in the same period. However, the actual investments only increased from 137 million in 1998 to 172 million in 2001.

To overcome the need for seed funding for start-ups, the government is funding eight "Innovation Centers" across the country. These centers can provide seed funding of up to approximately €100,000 under favorable conditions. With these ventures, the government funds approximately 66 percent of the direct seed investments (Venture, 2001). These "Innovation Centers" are very successful at handing out funds for start-ups. Unfortunately, this program reaped few long-term results, because very little venture capital is available for bridging the funding gap after the first initial investment of the €100,000, especially after the summer of 2000. Expansion capital from mutual funds established by banks and pension funds was especially affected. The total amount cannot be estimated, but in general, start-ups found it difficult to obtain funding.

Of the total seed funding in 2000, public investments were 66.9 percent, corporate venture companies invested 25.6 percent, and venture companies a meager 7.6 percent. It is generally believed that this relationship between public and private seed financing hampers the development and expansion of the market. During the perceived 'gold-rush' in the e-commerce/e-business sector from 1997 to 2000, a large number of business angels were attracted to this

area. Mutual funds were created by banks to invest in e-commerce, and a handful of venture companies obtained their equity from the stock market for bridge funding. However, since the summer of 2000, these sources dried up. Two of the largest venture funds listed on the Danish stock exchange went bankrupt in the spring of 2002.

All in all, the Danish venture capital market is lower than the EU average, it is relatively non-competitive, and it is a far cry from the efficiency of the U.S. market, which is generally regarded as the most effective. And what little venture capital is available depends heavily on public sourcing, which most observers see as an obstacle to creating an efficient market. No doubt this struggling venture capital market did not aid the development of e-commerce in Denmark. On the contrary, the lack of funds is a significant barrier.

Payment Mechanism

For consumers, Denmark is a world leader in the use of new technologies in banking. The first on-line terminal banking system was introduced in 1969, followed by check-less clearing, and electronic payment transfer systems introduced in the early 1970s. It is especially noteworthy that Denmark was the first country to reduce the number of (private) checks significantly and substitute direct debit card transactions (using a system known as Dankort). 3 million, 200 thousand debit cards were issued. In 2001 and 715 million electronic transactions were performed. These values are 9 percent more than those for 2000.

A unique feature of the financial resources and payment mechanism is a high penetration of home banking systems. About 30 percent of the households can access home banking, and about 80 percent use electronic transfer of payments for electricity, rent, taxes, car repairs, and similar functions via their banks. Although the electronic payment systems are now over the Internet, the home banking and office banking systems operate on proprietary software packages. Thus, the inter-operation ability and the ability of consumers and businesses to shift between these two forms are limited because they require installing dedicated software. However, payments between banks are fully electronic and point to a high readiness for financial e-transactions. This observation is particularly true for the B-to-B segment. As a result, the use of checks and cash is decreasing to a marginal level.

The substantial banking success is no doubt related to the fact that debit card use is free for consumers and retailers. Practically all shops either use a Dankort terminal (where the customer swipes the card and enters a pin code) or accept the cards manually. The direct debit card, offered jointly by all banks in Denmark, is extremely successful as a payment method, even when compared with international credit cards.

The Dankort uses only a magnetic stripe that offers limited security. The fact that it is jointly run by all banks through a joint company, PBS, makes it difficult to innovate and migrate to a chip-card, since the large banks, for competitive reasons, want to change to bank-specific cards.

Since the SSL standard only offers limited security, PBS decided to adopt a higher security standard, SET, in conjunction with the credit companies. Before SET was made available, PBS spoke out strongly against B-to-C e-commerce on the Internet, by pointing out the lack of security. It is widely believed that this position by PBS was a significant barrier to the diffusion of e-commerce in Denmark. Unfortunately, when the more secure SET standard was released with a lot of backing from PBS and the international credit card companies, it turned out that the consumers were not prepared to go through the rather cumbersome procedure of acquiring the SET software for installation on their PCs. Reluctantly, PBS is now also supporting the SSL standard.

The number of debit card transactions on the Internet doubled from 2001 to 2002 (Table 18). The payment is well organized, with a long tradition of digital trust mediated through the banks and their shared inter-bank clearing IT center (PBS). All debit cards are issued by PBS, and they can be used in any ATM in the country for electronic payment in a shop, or for payment via any of the websites that offer online payment options.

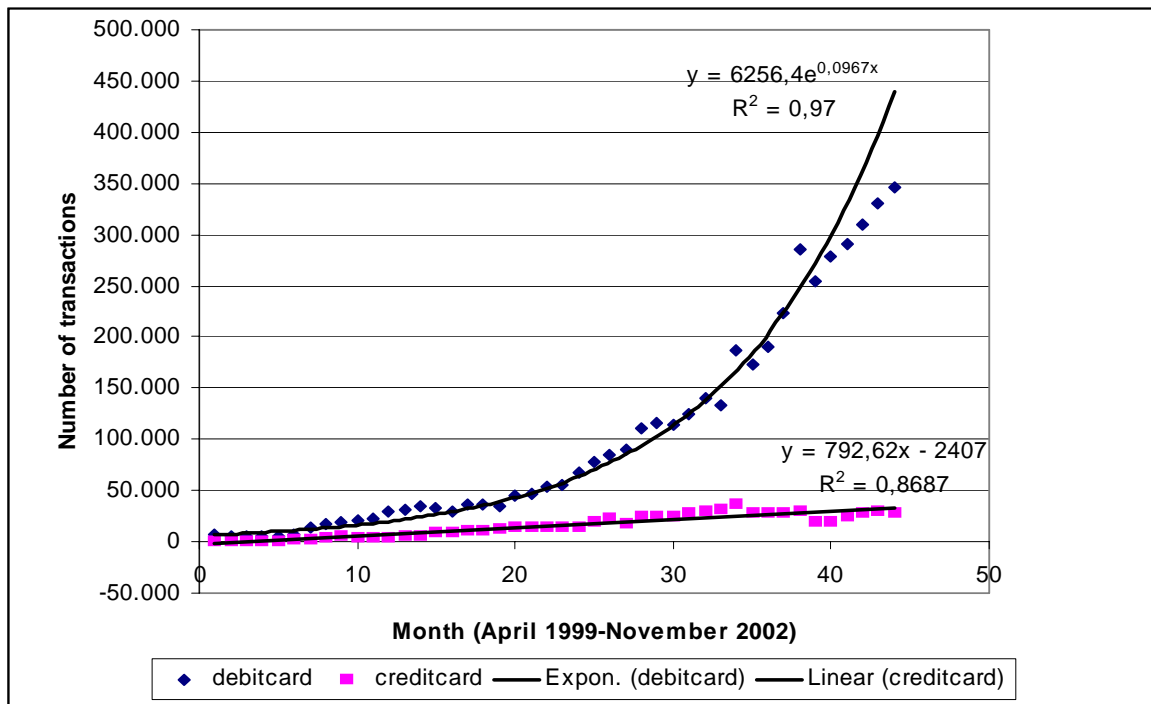
Table 18. Internet Payment Transactions, April 1999-November 2002 (N)

	Debit card*	Credit card (Visa, Euro & Master Card)	Total
1999	21,029	3,741	24,770
2000	53,808	14,485	68,293
2001	187,799	36,326	224,125
2002, first eleven months	2,873,008	297,677	3,170,685

Note: * Debit card with a very limited credit and include debit-Visa card holders.

Source: PBS, 2001, 2002.

As shown in Figure 11, the substantial increase in B-to-C e-commerce transactions did not take off until after the dot.com breakdown. Figure 11 analyzes the number of monthly payment transactions using debit or credit cards. Data on the newer micro payment system (CoinClick, offered by telecom companies and banks, or Valus, offered by a group of content providers), which facilitates micro payments on mobile and Internet devices by allowing pre-paid and post-paid payments to be made from bank accounts, is not included in Figure 11.



Source: PBS, 2002.

Figure 11. Internet Payment Transactions, April 1999-November 2002, Monthly Transactions by Debit Card and Credit Card

The EURO

The final important financial issue we highlight here is the EURO. Along with the U.K. and Sweden, Denmark is not a member of the common European Currency (the EURO). It maintains its local currency, the kroner (DKK). We interpret this national decision as having a possible negative impact on the B-to-C market because it increases transaction costs for imports and exports. Although the Danish kroner is fully convertible and an internationally traded currency, the market access and orientation at the B-to-C e-commerce level seems to be impacted by not being a EURO member.

Summary

In summary, venture capital in Denmark is weak in both magnitude and timing. In particular, venture capital has been and continues to be in short supply in the seed market. Overall, we do not assess the lack of venture capital as the single most important inhibitor for e-commerce, but the lack of capital is part of the explanation for the lag in B-to-C e-commerce – although it does not impact B-to-B e-commerce. The few companies that actually handle online payments and the even fewer that accept high-end encryption payments, as well as not being a member of EURO membership, also seriously inhibit B-to-C e-commerce.

A positive financial resource driver for B-to-C e-commerce is the widespread adoption of digital payment systems, which at the consumer level are more mature than those in place in the U.S. For B-to-B e-commerce, we consider financial readiness as key to the ongoing diffusion. Readiness comes from the existing streamlined payment systems (salaries and invoices are all transferred to accounts directly), electronic transfer payments, and the decreasing cash-ratio.

CONSUMER PREFERENCES

In this section, we address consumer preferences as an environmental driver for e-commerce. We focus on

- household expenditure composition,
- characteristics of the consumers who do shop online (e.g., gender, age), and
- consumers' perceived motivators and barriers for e-commerce.

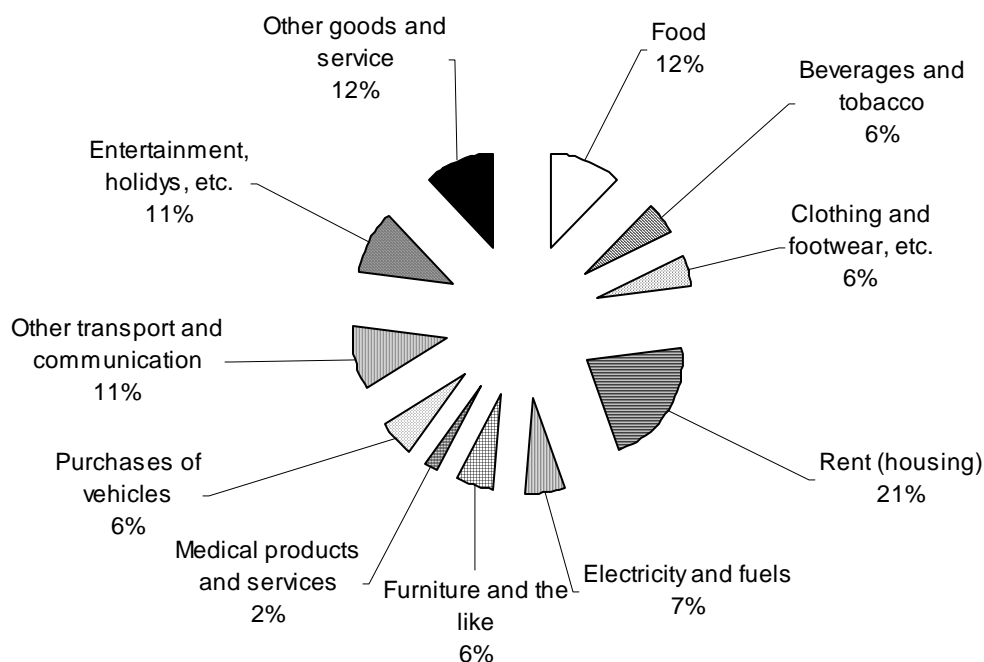
Household Expenditures

By European standards, Danish households are quite domestic, with a large part of their income spent on the household, rather than traveling or public interaction. Figure 12 shows the distribution of household expenditures. People invite others to their homes to dine, rather than to a restaurant. People spend money and time on maintaining their homes (61 percent of the Danes own their houses) rather than on expensive food. Danes are among the Europeans who spend the least amount on food (about 12 percent of yearly income), almost the same amount they spend on entertainment and vacations. Thus, e-commerce sites related to the household, such as those reporting gas, electricity, and water consumption, and various sites with legal and maintenance information are popular. Yet, these sites will not show up in most figures on B-to-C e-commerce, although a business transaction is performed.

When comparing Danish Internet-based B-to-C revenues with other countries, (Table 19), Denmark is at about the average level for EU countries, but is low compared to Scandinavia, the U.S., and OECD countries. A survey by Taylor Nelson Sofres (2000) found that only 16 percent of Internet users purchased online in the past month, whereas the corresponding figure in the U.S. was about 27 percent. By 2002, this number grew to 22 percent in Denmark and 32 percent in the U.S.

Consumer Characteristics

The top five list of what consumers buy online in Denmark (Taylor Nelson Sofres, 2002) is electronics/electrical devices (15%), books (14%), holidays/leisure (11%), clothes (11%), and PC hardware (10%). This list of products bought on the net is consistent with the findings by the Danish Ministry of Science, Technology and Innovation (April, 2002).



Source: Statistics Denmark, 2000.

Figure 12. Household Consumption Expenditures, (2000), (%)

Table 19. B-to-C E-Commerce Trade and Online Transactions

	B-to-C trade in US\$M 2000 ^a	B-to-C as % of GDP 2000	% Internet users who purchased online in the past month, 2000-2002 ^b		
			2000	2001	2002
Denmark	\$177.22	0.1	16	18	22
Scandinavia	\$1,042.23	0.2	19 ⁱ	19 ⁱ	25 ⁱ
EU	\$8,083.13	0.1	13 ⁱⁱ	16 ⁱⁱ	17 ⁱⁱ
United States	\$38,755.00	0.4	27	33	32
OECD	\$52,184.17	0.2	10 ⁱⁱⁱ	10 ⁱⁱⁱ	15 ⁱⁱⁱ

Note: Internet users are defined as someone who personally used the Internet in the past month; an online shopper is an Internet user who bought or ordered goods or services on the Internet during the past month.

ⁱ Data for Norway only.

ⁱⁱ Data for Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, and the U.K. only.

ⁱⁱⁱ Data includes the EU (see ⁱⁱ), the U.S., and Argentina, Australia, Bulgaria, Canada, the Czech Rep., Estonia, Hong Kong, Hungary, India, Indonesia, Israel, Korea, Latvia, Lithuania, Malaysia, Mexico, Norway, Poland, Romania, Serbia, Singapore, Slovak, Spain, Taiwan, Thailand, Turkey, and the Ukraine.

Source: ^{a)} Forrester Research Inc., 2000; ^{b)} Taylor Nelson Sofres, 2000, 2002.

Surveys by Statistics Denmark show that an increasing part of the population shops more frequently on the Internet, but there is also a large segment that does not shop there at all. For example, in the third quarter of 2001, 45 percent of the population had not purchased anything at all during the past year. In the third quarter of 2002, 50 percent of the consumers had not purchased on the Internet at all during the past year. This apparent marginalization could be

caused by the number of people with Internet access increasing faster than the number buying. At the other end of the purchasing spectra, only 4 percent purchased online on a monthly basis in the third quarter of 200, whereas 11 percent shopped on the Internet regularly in the third quarter of 2002.

The marginalization of consumer readiness is more prevalent among females than males. As shown in Tables below,

- the age group over 40 to an increasing degree choose not to shop online.
- the percentage that chooses not to shop is higher among population groups with limited education.
- Employment status influences the tendency toward marginalization, mostly for blue-collar workers and the self-employed.

The marginalization is of even greater significance considering the decrease in the population that does not have access at all. Within just one year, the ratio of people with no Internet access was reduced from about one-third to one-fifth.

Table 20. Purchasing Pattern Distributed by Gender, for Q3 2001 and Q3 2002

		At least once a month	Less than once a month	Nothing within the last year	No access
Total %		4	19	45	32
		11	18	50	22
Sex	Male	6	21	44	29
		12	21	46	21
	Female	3	16	47	35
		9	14	54	23

Note: Data for third quarter 2002 in bold.

Source: Statistics Denmark, 2002d.

Table 21. Purchasing pattern distributed by age, Q3 2001 and Q3 2002

Age	At least once a month	Less than once a month	Nothing within the last year	No access
16-19	3	27	59	11
	16	17	58	9
20-39	8	27	48	17
	15	25	49	10
40-59	2	16	50	32
	9	16	58	17
60+	1	4	23	73
	2	5	33	60

Note: Data for third quarter 2002 in bold.

Source: Statistics Denmark, 2002d.

Table 22. Purchasing Pattern Distributed by Education,Q3 2001 and Q3 2002

Education	At least once a month	Less than once a month	Nothing within the last year	No access
Primary	3	12	40	46
	8	12	44	37
Secondary	5	18	46	31
	10	17	55	18
Higher	5	29	54	13
	17	27	49	7

Note: Data for third quarter 2002 in bold.

Source: Statistics Denmark, 2002d.

Table 23. Purchasing pattern distributed by employment status,Q3 2001 and Q3 2002

Employment	At least once a month	Less than once a month	Nothing within the last year	No access
Student	8	31	53	8
	19	20	56	5
Blue-collar	3	11	43	42
	7	14	53	26
Office worker	5	26	54	14
	15	25	56	5
Self-employed	5	18	46	31
	9	17	60	14
Unemployed	1	6	26	67
	3	8	34	55

Note: Data for third quarter 2002 in bold.

Source: Statistics Denmark, 2002d.

Motivators and Barriers to Use

In a national survey conducted by the Danish statistical office, consumers who shopped online were asked to specify what motivates them to use the Internet for purchasing goods and services. The most important motivators for consumers to shop online were

- time savings,
- cost savings, and that it was
- easier to find the goods online than in physical stores.

These issues were consistently the most prominent motivators over seven quarters shown in Table 24. Less frequent motives are the larger supply, the ability to shop at any time, and that Internet shopping is less stressful.

The statistical office also addressed the inhibitors of B-to-C e-commerce (Table 25). Although security is a key concern (24%), the importance of this issue is much less than in other countries (Taylor Nelson Sofres, 2002) and ranked only third in Denmark. As of the third quarter of 2002, the single most prominent negative indicator was that 32 percent want to see/inspect the goods. Twenty-seven percent of the consumers reported no need to shop online.

Table 24. Consumers' Single Highest Motive for Shopping Online
2001 to Second quarter 2002 (%)

Drivers	2001 Quarter				2002 Quarter		
	1	2	3	4	1	2	3
Time savings	19	24	22	31	29	26	27
Cost savings	26	25	23	24	26	27	30
Easier to find the goods online than in the physical stores	26	21	27	18	20	22	21
Less stressful	3	3	2	2	3	3	3
Can shop any time	4	4	5	8	6	6	6
Larger supply	10	9	10	11	10	10	8
Other reasons	11	14	12	6	6	7	6

Source: Statistics Denmark, 2001b, c, d; 2002c, d.

Table 25. Consumers' Barriers for Shopping Online,
2001 to Third Quarter 2002, (%)

Drivers	2001				2002		
	1 st Q	2 nd Q	3 rd Q	4 th Q	1 st Q	2 nd Q	3 rd Q
Want to see/inspect the good	26		29	34	31	27	32
Security issues	33		36	35	n.a.	n.a.	n.a.
Payment security	n.a.		n.a.	n.a.	29	28	24
No need for shopping online	n.a.		n.a.	n.a.	26	29	27
Other inhibitors	34		27	25	7	9	11

Note: No data available for the second quarter of 2001.

Source: Statistics Denmark, 2001b, c, d, 2002c, d.

Summary

Within the B-to-C area, there is now clear growth in online purchases, even though the total revenue is far lower than the predictions of the late 1990s. The number of online purchases doubled from 2001 to 2002. However, it is still a fairly small group. The large majority of people with Internet access have not yet even tried e-commerce. Since the increase in the number of people with access was larger than the increase in the number of shoppers in 2002, the percentage of Internet users who actually shop actually decreased. In the segmentation of shoppers, we see the usual pattern for B2C e-commerce of more men than women, and fewer shoppers in the older age groups.

BUSINESS READINESS

Danish companies are adapting and reconfiguring their business organizational strategies to encompass e-commerce (Ministry of Foreign Affairs, 1999). However, studies suggest that the innovation faces fundamental challenges (Lundvall, 1999). The most common barriers to e-commerce are the lack of capabilities to innovate using ICT and companies' perception that some goods being unsuitable for e-commerce. This finding suggests that the business environment may not be ready to adopt a pro-active approach to investing in e-commerce (Statistics Norway, 2001; Ministry of Information Technology and Research, 2000b).

As shown in Table 26, total B-to-B e-commerce turnover amounted to less than 2 percent of the GDP in 2000 (Forrester 2000). This level is the same as the other Scandinavian countries, and well above the EU average. However, compared to 4.5 percent in the U.S. and 2.3 percent for the average OECD level, Denmark is by no means a global leader. The data presented in Table 26 from the Forrester Research Group include only sales executed over the Internet, and not EDI transactions or electronic transactions on other media. In terms of turnover, Internet-based B-to-B revenues are estimated to account for only about 20 percent of the total B-to-B e-commerce

(DanNet, 2001). Thus, B-to-B e-commerce could account for as much as 5 percent of the GDP in 2001.

Table 26. B-to-B E-Commerce Trade

	B-to-B trade in US\$M 2000	B-to-B trade relative to GDP 2000
Denmark	\$3,124.62	1.9%
Scandinavia	\$12,500.31	1.8%
EU	\$71,880.16	0.9%
United States	\$449,900.00	4.5%
OECD	\$588,900.80	2.3%

Source: Forrester Research Inc., 2000.

The data for 2001 from Statistics Denmark shows a slight increase but not a substantial one. Furthermore, around 80 percent of the B-to-B and B-to-C sales are domestic, and only about twenty percent are for export (Statistics Denmark, 2002a). One exception is Maersk-Sealand, which generates extensive revenues from their web portal for shipping orders (<http://www.maersksealand.com/>), combined with a marketplace that they established with their competitors (<http://www.intra.com/>) as a counterstrike against the third party marketplaces that emerged during the late 1990s.

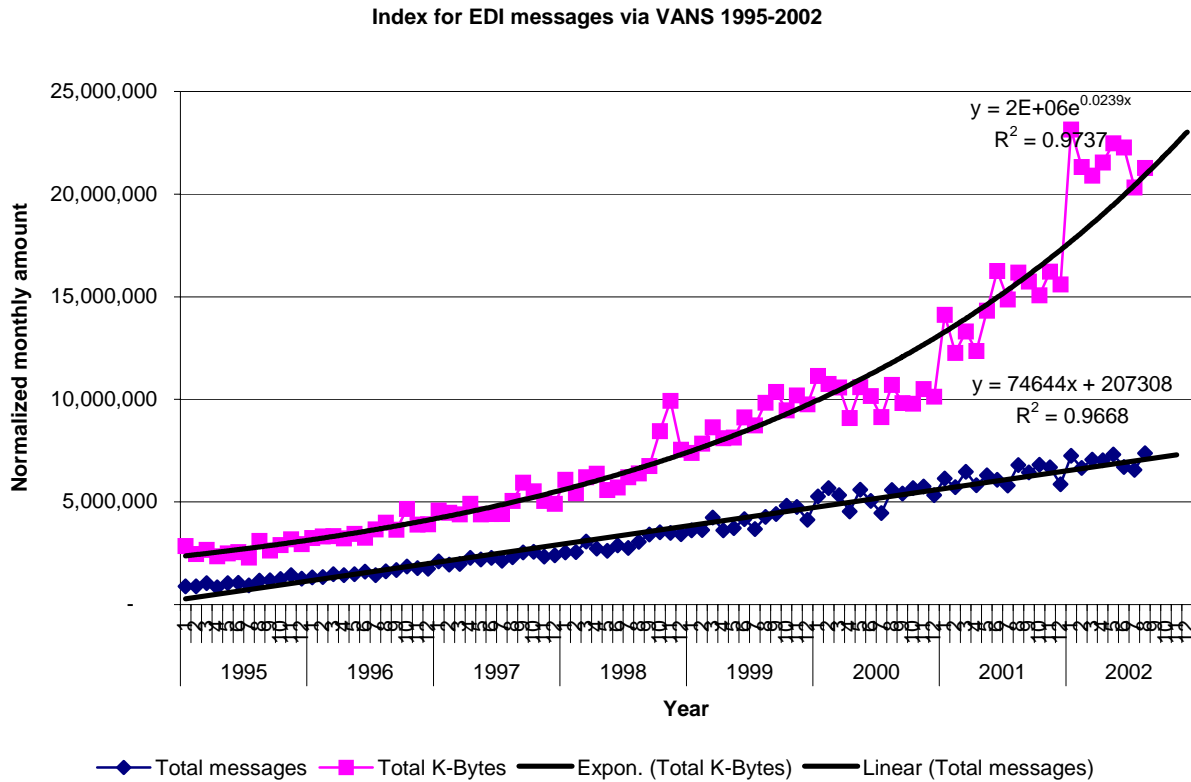
During the late 1990s, we studied the EDI increase and pointed to outstanding growth rates of VANS-based EDI during the assumed dot.com boom of 1998 to 2000, and a generally high level of EDI application use (Andersen et al., 2000). Based on an update of our analysis, we can now show that this third party, against all odds, is doing well and continues to outperform the Internet-based exchange of EDI messages. The growth in the Danish EDI traffic is remarkable in light of the business structure where there are few MNCs and no major upstream powerful companies. Our analysis includes all major VANS operators in Denmark, where we collected all outbound traffic month by month for the time span from 1995 until the fall of 2002. In Figure 13, we display data for kilobytes and messages. The increase in bytes is more exponential than the growth in messages.

Analysis of B-to-B EDI traffic also shows that the companies that use EDI exchange even more messages with still more partners, but do not exchange more different types of messages. Also, there is no indicator that the integration of the EDI messages is at a substantial higher level, since the most prevalent message types are orders and invoices. One exception is the health care sector, which has been the major reason for the growth in EDI traffic and the expansion to new users and message types.

Various initiatives for boosting e-procurement were launched, such as IBX (SEB, Ericsson, NovoNordisk), Gatetrade, WebIndkøb (KMD), intergovernmental procurement collaboration at the municipality level, government tendering sties (<http://www.udbudsportalen.dk>), and supplier-initiated portals (Lyreco). Yet, few suppliers support the online sales, and the volume channeled through the digital e-procurement solutions is small.

In 1999 and 2002, we surveyed e-procurement in the Danish municipalities (Andersen & Juul, 2002). One of the outcomes was that while 40 percent in 1999 had never used e-procurement, the figure was reduced to 15 percent in 2002. Also, we found that while only 6 percent shopped daily using the Internet in 1999, this figure grew to 14 percent in 2002.

In general, the Internet is used more as a communication channel than a sales transaction channel. In terms of the elements in the value chain, support rather than primary activities dominate the use of e-commerce. The Internet is used by 90 percent of companies for general information retrieval, by 65 percent for payment transactions, by 60 percent to streamline communication with the public sector, by 50 percent to obtain information about competitors, and



Source: Andersen and Juul (2003).

Figure 13. EDI Messages through Third Party Vendors, 1995-2002

Table 27. Ordering of Goods and Services via the Internet Within Government, 1999 and 2002, (%)

	1999	2002
Daily	5.7	14.29
Weekly	20.89	27.78
Monthly	23.42	30.95
Annual	8.86	11.11
Never	41.14	15.87
Sum (N)	100% (N=158)	100% (N=126)

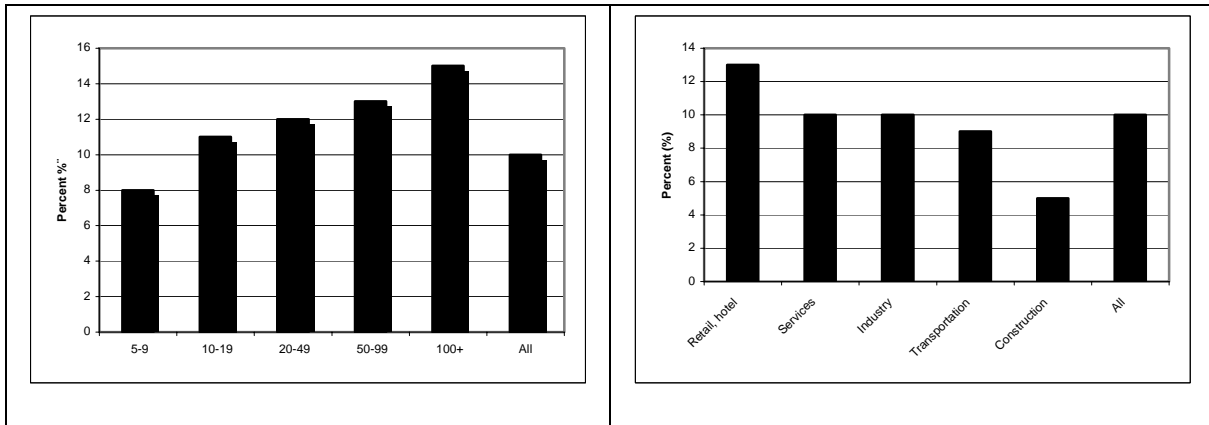
Source: Andersen and Juul (23002)

by 33 percent to recruit personnel (Statistics Denmark, 2000). Only 5 percent of the enterprises generated 2 percent or more of their revenue from Internet orders.

During 2002, the number of shops that could receive payments online increased. By March of that year, 2,628 companies were capable of receiving payments over the Internet using a credit or debit card. Ninety percent of these payments are done using SSL. By November 2002, the number of companies that were capable of receiving payments over the Internet jumped to 3,058 (PBS, 2001, 2002).

The primary business opportunities are in the retail, hotel, and restaurant sectors, whereas construction activities were below the average for B-to-C sales. As shown in Figure 14, the larger

the company, the more successful they are on the Internet. This result indicates major problems for Danish e-commerce diffusion, since the majority of the businesses are SMEs.



Source: Statistics Denmark, 2002.

Figure 14. Companies with at Least 1% of Turnover Sold via the Internet, 2001 (Distributed by Number of Employees in the Company and Business Segment)

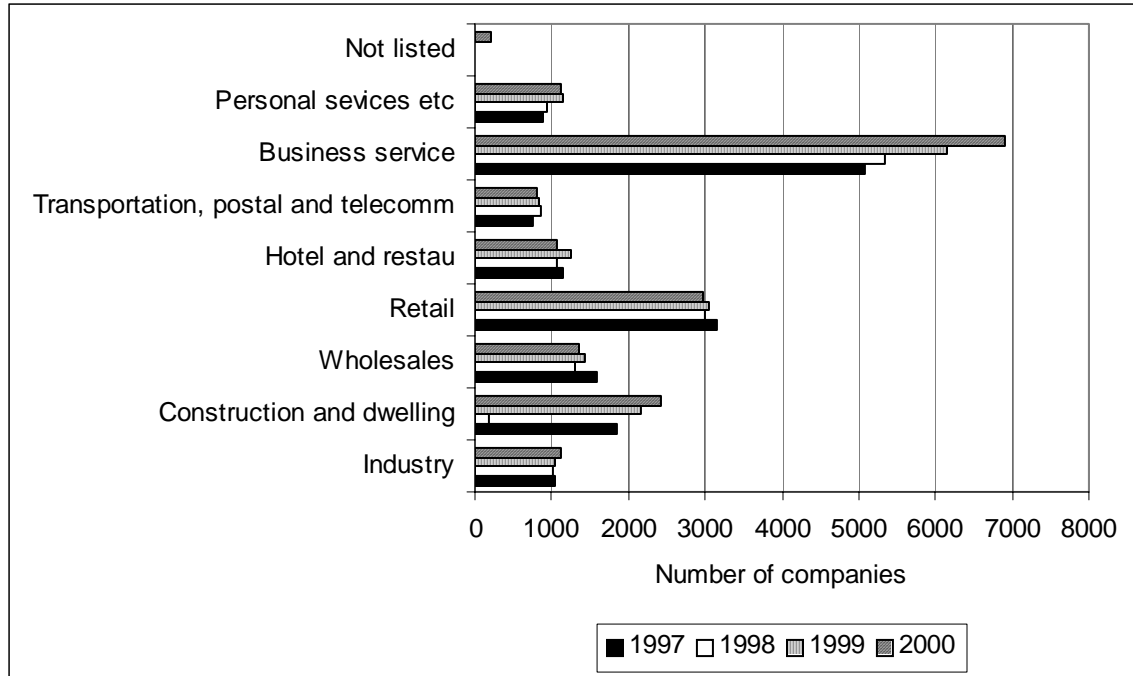
Many companies entered the B-to-C e-commerce arena, primarily in the financial sector, transportation, and logistics. The strong participants, shown in Table 28, are all from the pre-dot.com period, and they all had a digital history in the sense that data alignment, integration, EDI, and digital supply chain networks were progressing before the concept of e-commerce. The successful B-to-C companies are all examples of companies for whom back-office and internal data integration are critical indicators of e-commerce readiness.

Table 28. The Dominant Danish B-to-C E-Commerce Companies

Company	Product/ service
DanskeBank (www.danskebank.dk)	Banking
Nordea (www.nordea.dk)	Banking
Lego (www.lego.com)	Toys
KRAK Maps (www.krak.dk)	Maps and business information
Interflora (www.interflora.com)	Flowers
TDC (www.tdc.dk)	Telecom services
SAS (Scandinavian Airline Systems) (www.sas.com)	Airline tickets
Boersen (www.boersen.dk)	Financial News

Note: Assessment by authors.

In summary, Danish business readiness for B-to-C e-commerce is overall quite weak, given its highly national orientation. Eighty percent of the turnover is directed toward the national market. Also, many Danish companies regard their products as unsuitable for selling on the Internet. For B-to-B e-commerce, the use of the Internet is limited to searching for general information rather than e-procurement or sales and services. Instead, companies rely on EDI to perform digital exchanges of orders and invoices. The high and growing EDI penetration does point to high readiness in terms of streamlining business processes and digital exchanges of documents between companies. Although we have seen an increase in e-procurement in government, the figures are still low and do point to a business readiness at neither the supply side or the demand side, but we can realistically expect a “catch-up effect” in 2003 or 2004.



Source: Statistics Denmark, 1999-2002.

Figure 15 Start of New Companies, 1997-2000, by Business Sector

SOCIAL AND CULTURAL FACTORS

Denmark is a culturally and politically homogenous society, with a relatively high level of political participation. After World War II, the government mostly consisted of parties across the center in Parliament. For extended periods, the government was controlled by minority administrations that relied on other parties for support. As in the other Scandinavian countries, the social democratic party was the dominating political force. In such a political climate, the so-called Scandinavian welfare model has developed, with (1) economic prosperity and (2) high social welfare for everybody as the two main objectives.

In the pioneering work by Hofstede (1994) on cultural differences, Denmark showed a relatively extreme position on three out of four dimensions: low power distance, low uncertainty avoidance, high emphasis on feminine rather than masculine values, and high individualism rather than collectivism. With a low centralization of power, the main emphasis in Denmark is to minimize inequality, strive towards equal rights, and improve opportunities and living conditions for all; superiors and subordinates are treated as almost equals.

Surprisingly, in a cultural sense Denmark is regarded as low uncertainty avoidance, indicating that Danes perceive risk-taking positively. This finding is not reflected in the number of start-up ventures in Denmark. Labeled as a feminine society in the cultural sense, the Danes are considered to work in order to live, rather than live for their work. Also, they are more likely to sympathize with the less privileged. The feminine values of the Danish culture are in part contrasted by its being a highly individualistic society, where one tends to take responsibility for oneself and one's immediate family, rather than for society as a whole.

In summary, cultural and social factors are not key drivers for B-to-C e-commerce in Denmark, although there is a high degree of readiness for adoption of the U.S.-dominated globalization of e-commerce within areas such as software, books, music, entertainment, and sports. At the same time, the cultural and social factors can have possible negative implications on the supply side. The cultural drive for business start-ups in the e-commerce area is limited. Instead, less risky careers within the public sector are culturally accepted and hold social prestige.

SUMMARY OF ENVIRONMENTAL E-COMMERCE DRIVERS AND INHIBITORS

Dominated by small and medium size enterprises (SMEs), a large public sector presence, and a lack of international high-tech production plants, Denmark is not a major force in the global ICT industry. Furthermore, Denmark is not an important player in the global or regional production networks of multinational ICT companies, as are Ireland and the U.K. As a result, the Danish economy did not benefit from the acceleration in IT demand in the 1990s as much as these countries.

Yet, there are strong driving forces that can be attributed to a highly developed infrastructure and a high penetration of new technologies. The highest Internet penetration in the world, either from home or from work, is found in Denmark. Sixty percent of the households and 94% of all Danish enterprises can access the Internet. More than 80% of companies with more than ten employees offer their own homepages. Paradoxically, the very high degree of urbanization -- higher than in the other Scandinavian countries, the EU countries, and the U.S. -- is likely to impact negatively on B-to-C e-commerce because of the high availability of physical shops within normal commuting distance. On the other hand, urbanization could also make it easier to support e-commerce with a strong communications and delivery infrastructure. However, this pattern is not yet prevalent.

Consistent with most other developed countries, the aging population trend poses challenges to e-commerce adoption in two ways:

- the general disposable income level might be shrinking while the aging population requires more welfare services. This combination could potentially drive income taxes up, leaving less disposable income to spend online or offline.
- innovation, entrepreneurship, and the abilities needed to fuel e-commerce might be less likely to flourish in an aging population.

The Danish economy benefits from a high adult literacy rate (99%) and a generally high level of secondary enrollment, but the share of enrollment in tertiary education is relatively low compared to the U.S. This disparity could result in a shortage of advanced skills needed to support e-commerce deployment.

In terms of market potential, Denmark is a small, wealthy, slow-growing economy. Denmark's average GDP growth rate from 1995 to 2000 was lower than that of Scandinavia, Europe or the U.S. Yet, the average income per capita is well above the average Scandinavian and European level.

Generous welfare services, six weeks paid annual vacation for all employees, a 37-hour working week, early retirement plans, and twelve months maternity leave could reduce efficiency and productivity in the economy. To sustain development, work processes need to be streamlined. Development is an important force driving both the government and the private sector toward the adoption of e-commerce. Extremely high income and sales taxes are the primary sources for financing public sector spending, possibly reducing the incentives for marginal labor input. Taxes can be considered a significant barrier for start-ups and a disincentive for increasing the labor supply.

Adding to the possible structural inhibitors, Denmark lacks a large, wealthy population segment to drive B-to-C e-commerce sales. Yet, the equal income distribution at relatively high levels could also be viewed as fueling e-commerce in that the discretionary income of middle-income groups is sufficient to purchase goods and services online, and these groups seek labor-saving solutions.

Table 29 summarizes the environmental drivers and inhibitors for e-commerce.

Table 29. Environmental E-Commerce Drivers and Inhibitors

	Drivers	Barriers
Population/demographics	Internationally unique high degree of urbanization	Small, aging and declining population (decreasing household size); low immigration; small market size limits development of local B-to-C content
Economy and wealth	High GDP per capita Exports primarily to neighboring countries (Germany, Sweden, and the U.K.); rapid growth in gross foreign investment (1995-2000); equal income distribution at the high-end (large group with high middle income, few low income)	80% of Internet sales to domestic market; 80% of shopping online import; relatively slow GDP growth; economy at full capacity due to low geographical mobility; high marginal income tax (68%); high labor market insurances /social security, and high inflation; equal income distribution (lack of high-end incomes to drive B-to-C); semi-manufacturing industry and agricultural industry the important exports
Industry structure	Large government sector (33% of labor force) has the potential to propel use of e-commerce; growth in IT sector (relatively low hardware production but high IT hardware exports); industry drivers: agricultural, shipping logistics, health care, and banking/finance	Dominance of SMEs and industry clusters; lack of MNC dominance; no high-tech industry growth during second half of the 1990s; niche production; high availability of local shops in urban areas (rather than mega-shopping centers);
Human resources	Vocational training centers diffuse e-commerce and IT to population	large and decentralized public sector Lack of highly skilled IT workers: long tertiary enrollment; late entry in workforce; shrinking workforce due to low pop. growth and aging pop.; low immigration and no IT Green Card policy; high average and marginal income tax reduces private initiatives and discourages foreigners from workforce
Physical and telecommunication infrastructure	Strong ICT infrastructure (telecom, wireless and Internet); rapid increase in Internet and cell phone penetration, cable TV; high digital literacy among businesses and consumers; high Internet use and org. websites in private sector – including SMEs; cell phone cost structure: charges for outgoing (not incoming) calls only	Two-thirds of users have access through <56 K modem; infrastructure dominated by domestic players; high access costs – although flat rate has been introduced (lower 20-hour peak rates); lack of secure servers
Financial resources	High income (GDP per capita) and equal distribution; developed payment methods: credit/debit cards, wireless; venture capital; capital from equity funds	Lack of funding for ventures (no vibrant venture capital industry); low-growth and insignificant equity market
Consumer preferences	Price-sensitive shopping; high debit card use; relatively high credit card use; history of digital trust; growing number of Internet users; rapid increase in growing 50+ age group	Limited tradition for mail order purchases; primary buying of products not sold by Danish websites (PCs, hardware, electronics/electrical goods, and books)
Business readiness	Rapid increase of new technologies	Low degree of innovation; general perception that goods are not suitable for sale on the Internet
Social/cultural factors	Individualistic values; Americanization of culture; shared values; international language orientation	Consensual decision-making and shared values; domestic rather than international orientation

III: THE ROLE OF GOVERNANCE IN THE DIFFUSION OF E-COMMERCE

EU AND NATIONAL POLICY OBJECTIVES

In the previous sections, we addressed the environmental demand drivers for e-commerce. We now turn to the policies that fuel and/or inhibit e-commerce diffusion. Because Denmark is part of the European Community, this section includes policies at the European level. EU policies are important for understanding the role of governance in e-commerce development and practices in Denmark, both due to

- *direct intervention*, such as the data protection act and the e-commerce directive, and
- *indirect intervention*, such as action plans and green papers.

The European Community put e-commerce on the agenda and made it an important issue in overall policy: "The European Union is confronted with a quantum shift resulting from globalization and the challenges of a new knowledge-driven economy. These changes are affecting every aspect of people's lives and require a radical transformation of the European economy. The Union must shape these changes in a manner consistent with its values and concepts of society and also with a view to the forthcoming" (European Council, 2000).

Whether or not minor departmental fights occur at the national level, conflicts in the European Community due to functional and institutional aspects often arise. These conflicts played a key role in the way e-commerce regulation emerged. A crucial part of regulation is the European Communities' Governing Bodies division in *Directoire Generale* (DGs), the Parliament, and the Council of Ministers.

Within the DGs, Commissioner Erkki Liikanen, heading DG XIII, is in charge of Enterprise & Information Society issues. In DG X, Frits Bolkestein is in charge of taxation and internal markets. Although the DG information society placed the e-commerce issue high on the list of priorities, it is important to understand that only a small share of the total EU budget and policy actions are devoted to this area.

When issues such as the Safe Harbor principle are discussed, the *Commission for Taxation and Internal Markets* is a central player. The link between taxation and fiscal policy is not discussed, but rather the free movement of persons, goods, services, and capital within (the expanding) European Community. The main focus of the commissioner's work is to point out that, "Tax regimes whose advantages are granted only to non-residents or that are intended to attract only capital and not real economic activity - known as "letter-box" companies - cannot be considered fair." However, he also stated that, "Taxpayers should be able to take advantage of the increasing opportunities presented by globalization and technological developments."

Also, the *European Parliament* -- and the committee part of the Parliament work -- is a key policy driver that shapes the e-commerce initiatives. Within the Citizens Rights and Freedom Committee, the 2001 package of liberalization of the telecommunication market gave way to the current 2002 reading of the Cappato report on data protection. In trying to find a way to regulate the use of cookies, a serious clash occurred between consumer protection interest groups that advocate more direct legal regulation and industry participation that argue for more indirect co-regulation (as opposed to self-regulation).

Thus, the European Community policy arena is filled with institutional conflicts that indeed shape and often hinder radical initiatives. Three important general EU policy documents are:

1. the European Initiative on Electronic Commerce (1997);
2. the eEurope Initiative: An Information Society for All (1999); and
3. the more recent initiative from the European Commission on "The European e-action plan" (2001).

The latter deals extensively with e-commerce initiatives promoting:

1. cheaper, faster, and more secure networks for the Internet;

2. investment programs in people and skills; and
3. e-acceleration programs and transportation media to stimulate the use of the Internet (European Commission, 2001).

Adoption of EU legislation on copyrights, e-marketing, e-money, and jurisdiction are the key priorities for the Commission. Significant emphasis is given to co- and self-regulation within the e-commerce area, in close cooperation with the Commission and various business groups such as the Global Business Dialogue (GBD).

The milestones proposed for 2002 were:

- Adoption of two directives regarding Public Procurement, which will incorporate provisions to remove legal obstacles to electronic procurement.
- Establishment of electronic marketplaces for public procurement.
- Adoption of a directive on the Value Added Tax (VAT) on certain services supplied by electronic means to ensure compatibility between the EU VAT system and e-commerce, in particular to provide a level playing field for European content providers.
- Encouragement of SMEs to 'Go Digital' through coordinated networking activities for the exchange of knowledge, best practices, e-commerce readiness, and benchmarking.

The European focus on SMEs and on public procurement are well in line with the Danish national policies on e-commerce, and they are areas where Denmark is likely to benefit because Danish industry is dominated by SMEs and the public sector is a major part of the economic activity.

As illustrated in Table 30, the policy focus of the European Community is primarily at the consumer and the public sector level, rather than businesses. Acquisition of services from the public sector to citizens are provided through building of fast and secure infrastructures, providing optimal working conditions, and learning. According to the eEurope objectives for 2000 and 2002, the focus is on bridging the gap between the "haves" and the "have-nots" - the digital divide (European Commission, 2000, 2002). On the content side, the emphasis is on providing information and services from the public sector – e-government.

On the national level, public and private sector policies and objectives were formulated to:

- position Denmark as a world leader in IT, and
- to be among the top five countries with regards to e-commerce revenue, minimizing the digital divide, and using e-commerce to ensure sustainable economic growth.

Thus, Danish e-commerce governance initiatives focus more on bridging the digital divide. Compared to most other societies Even though Denmark enjoys one of the highest penetrations of computers and Internet connections in the world, it still has a high policy priority to give full access to all citizens. In other words, to minimize the tendency to put the tools only in the hands of the 'haves,' while bypassing the 'have-nots.' Virtually all of the policies and governance initiatives discussed below should be seen from this perspective.

This perspective is also in accordance with the Scandinavian IT approach, in place since the early 1970's, that is characterized by a great concern for democratization and human factor issues (Bjørn-Andersen et al., 1982; Dybkjær and Christensen, 1994). It is seen as more important to get everybody on the digital path than merely to have a small group of super users.

While the motivation for bridging the digital divide can be analyzed as a reflection of the cultural norms and neo-corporatism embedded in the society, the objectives of being among the leading e-commerce nations and the leading IT nation can be analyzed as a reflection of the hard challenges facing the Danish economy. The economy was experiencing low growth rates, missed the IT manufacturing wave, a decreasing enrollment and supply of higher science education students and low R&D funding. Thus, the objective of becoming the world's leading IT nation can

Table30. Objectives in eEurope 2000 and eEurope 2002

eEurope 2000		eEurope 2002	
A cheaper, faster and secure Internet	Cheaper and faster Internet access Faster Internet for researchers and students Secure networks and smart cards	Promote attractive content for all Europeans	Content in mother tongue Content in all terminals: the computer, mobile phone, PDA. and television Primarily market-driven content development
Investing in people and skills	European youth in the digital age Working in the knowledge-based economy Participation for all in the knowledge-based economy	Provide public services online	Change in front office goes hand in hand with back office Reorganization and investments in human capital Particular attention to health sector
Stimulate the use of the Internet	Accelerating e-commerce Government on-line: electronic access to public services Health online European digital content for global networks Intelligent transport systems	Pursue digital inclusiveness for all Europeans	Develop new generation of digitally skilled citizens through schools E-learning important tool for people in the job market Promote free public Internet access points All parts of EU part of the knowledge economy
		Promote faster Internet, broadband	Promote favorable legal conditions Stimulate competition between platforms Accelerate investments in broadband Sharing of ducts, antennas Support local initiatives, promote multilingual contents, tax incentives
		Ensure trust and confidence in cyberspace	Proper and timely implementation of EU legislation related to information and network security Reinforce international dialogue and cooperation Develop and support means of action at EU level

Source: European Commission, 2000, 2002.

be interpreted more as a desperate effort and an attempt to focus attention on serious structural problems, rather than a goal per se. The only area where the goal appears to be realistic is in the area of inter- and intra-government organizations, and in part of the business segments (banking, shipping and logistics, and agriculture). Thus, the objectives were more a matter of discourse than an end. As a result, strategy and means shifted substantially.

We next analyze the means and outcomes of the policy initiatives. We structured the analysis in four sections: knowledge diffusion, economic incentives, regulation and legislation, and electronic government.

KNOWLEDGE DIFFUSION

The Danish government launched various policy initiatives to cope with the digital divide and promote IT use for citizens, businesses, and the public sector throughout the 1980s and 1990s. Two policy statements prepared for the Danish Parliament are of particular relevance for e-

commerce field, with respect to bridging the digital divide and preparing the Danish society for the information age.

- The first statement, "From Vision to Action – Info-Society 2000" (Ministry of Research and Information Technology, 1995), published in 1995 by the government, was used as a lever to create awareness about the significance of the information revolution.
- The second statement, "The Info-Society for All - the Danish Model" [Ministry of Information Technology and Research, 1996], proclaimed that: "... this new technology presents a number of opportunities and problems, which demand political consideration and action. A cohesive, aggressive strategy for how we wish developments in Denmark to take place is necessary." A direct goal was that all Danish households and companies should be able to access the Internet.

Three major knowledge diffusion initiatives were launched specifically to diffuse e-commerce:

- the EDI-strategy in 1996,
- the e-commerce initiative in 1999, and
- the e-commerce action plan in 2002.

In the following three subsections, the content of each initiative is described briefly. The major shift in policy focus is from standardization of the messages and the technologies (1996), to diffusion of the technologies (1999), and finally to innovation of the business practices (2002).

The 1996 EDI Strategy

In 1996, the Danish Ministry of Research and Information Technology, the Ministry of Business and Industry, major industry and trade associations, and a range of public institutions proposed an action plan for electronic commerce [Ministry of Research and Information Technology, 1996]. It was maintained that technological advances in general and EDI in particular could give Denmark an international lead by improving the efficiency of working procedures and the development of new products and production processes. The goal of the action plan was thus to provide the necessary conditions for companies, the public sector, and consumers to reap the benefits enabled by EDI. The plan acknowledged that because of the growing globalization of commerce, it was essential for Denmark to be able to do business electronically across borders. It was also recognized that most Danish companies possessed a sufficient level of experience and knowledge of IT to implement EDI (Hørlück, 1996). This policy of supporting EDI diffusion was maintained until 1998-1999, when a new direction towards a more general e-commerce standard was undertaken.

The 1999 E-Commerce Initiative

In 1999, the Ministry of Information Technology and Research, together with the Ministry of Trade and Industry, launched the "Focus on e-commerce" initiative (Ministry of Information Technology and Research, 1999). This initiative was, like the 1996 action plan, a joint initiative launched by the Danish government and a number of major industry and commerce associations. The e-focus agenda was comprised of an advisory group consisting of the most important participants and a project committee operating under the two ministries. The specific stages of the project were carried out by a number of working groups convened by the so-called e-group. The first of these working groups started its activities in March 1999.

The aim of the e-commerce initiative was to achieve a rapid, flexible, and efficient increase in new technologies and practices. In recognition of the fast-changing technological environment of e-commerce, the main players in the action plan implemented new methodologies for the plan's adoption. Seven points for action were adopted as part of the 1999 e-commerce initiative: 1) Awareness and sharing of experiences; 2) Reliable and secure basic functions on the Internet; 3) Establishing an effective infrastructure for electronic commerce; 4) Standard contractual and

regulatory frameworks; 5) Research and training; 6) Electronic commerce in the public sector; and 7) Social aspects of e-commerce.

The 1999 initiative recognized that e-commerce was broader and more multifaceted than the exchange of EDI messages. Contrary to the 1996 action plan, the 1999 e-commerce agenda introduced a dynamic definition of e-commerce, where all possible actors, business processes, and technologies were included.

The 2002 Action Plan for E-Commerce

The 2002 action plan for e-commerce (Ministry of Science, Technology and Innovation, 2002) is based on the assumption that Denmark, measured by IT and telecommunications indicators, is considered to be at the forefront compared to other nations. However, the government acknowledges that there is still room for improvement. It is argued in the plan that:

“Denmark needs a more helpful, varied and realistic IT policy. Instead of merely focusing on the technology, future IT policy must be concerned with how new technology can help create value for individuals, for businesses and for society.”

The aim of the Danish Government's IT policy is therefore to secure further economic growth in Denmark, promote the reform of the public sector, and contribute to equipping the nation for the knowledge society in the future. Compared to the 1996 action plan for e-commerce and the 1999 e-commerce initiative, the 2002 action plan focuses on more qualitative success criteria. Many of these criteria are, among others, related to how well the collaboration between research, education, and business and industry is strengthened. It focuses on how knowledge is generated, which benefits business and industrial enterprises, and how to attract investments for enhancing the competitiveness of Danish business and industry. Seven policy areas are identified as the means for reaching these goals. These seven policy areas are:

1. More IT in Danish business and industry
2. A competitive telecommunications sector
3. Strong IT competencies
4. An IT-based public sector
5. IT security
6. Useful Internet content
7. Danish impact on IT in the EU

The 2002 action plan emphasizes economic potential of e-commerce is still underutilized, but can be reached through recommendations in the action plan. It is clear uncertainty remains about e-commerce and that increased complexity demand information both in relation to businesses and to consumers. This plan, combined with improved technical and legal frameworks, raises the need for initiatives that are targeted at both the national and international levels.

IT EDUCATIONAL INITIATIVES

The fourth area related to knowledge diffusion is IT education. Whereas the first three initiatives relied upon soft-law frameworks and broad policy statements, the IT education area is characterized by direct regulatory directives issued by the Parliament or ministerial bodies. The regulation is targeted at a specific group in the Danish society, namely, students at different levels in the educational system.

The Danish government aggressively promoted educational efforts in the area of IT and e-commerce since 1995. In that year, the annual enrollment in IT-related higher education was 3,600 students. In 2000, the enrollment was 7,778 (Ministry of Information Technology and Research, 2000a). In addition, a well organized system of vocational training for employees, was

developed by the employers themselves in collaboration with 15 local vocational training centers. Through institutions of vocational training, the government offers virtual e-learning courses about office packages, such as the Microsoft Office suite, free of charge.

In a recent study of Denmark, the OECD expressed concern about productivity in the educational sector, where, by OECD standards, an "...excessively long time spent in education still needs to be reduced" (OECD 2000a). In the area of e-commerce education, it is particularly critical to ensure a reduction of the time spent from enrollment to output of tertiary students. In spite of (or perhaps because of) massive financial support to all students and the absence of tuition fees, Danish students spend more years studying than in any other OECD country. As a result, the average age for entry into the job market for highly skilled labor at the master's level is 29.

Business schools promote education in e-commerce in both regular and executive programs. Also, the Danish government established an entire university devoted to IT research and education. The IT University of Copenhagen is a graduate school with the goal of providing postgraduate education for students with bachelor's degrees in disciplines that are less favored by the current labor market. IT skills in both technology and strategy have become a requirement. The IT University of Copenhagen opened in 1999, and by 2002 it reached an enrollment of 1,300 students. E-commerce is one of the four key priorities of the IT University's curriculum.

In summary, the impact of the different knowledge diffusion initiatives is positive. In B-to-B e-commerce, major investments were made prior to 2000. Many firms continued developing their EDI applications, while others implemented e-commerce applications using Internet platforms (Andersen et al., 2000). The government, major industry associations such as the Confederation of Danish Industries, and the Association for Danish Trade and Commerce (Henriksen, 2002), as well as larger companies like Novozymes and Lego (Elliot, 2001), collaborated effectively.

The educational efforts led to a general IT upgrade of the Danish citizens and SMEs. At the master's level, it is too early to measure the impact of the initiatives. One reason is that only a few Master's candidates have yet graduated from the IT University of Copenhagen.

We assess the results of the knowledge diffusion initiatives as impacting positively on the diffusion of e-commerce by increasing enrollment in IT –education, although the timeframe for this strategy to have any impact is long. We also assess the knowledge diffusion initiatives as increasing the awareness and discourse on e-commerce and helping to stimulate the adoption of EDI and Internet-based e-commerce, especially in the B-to-B segment.

ECONOMIC INCENTIVES

In this section, we discuss the direct and indirect economic initiatives for enhancing e-commerce in Denmark. The "Lighthouse Project," R&D expenditures on telecommunications, and the home PC tax relief program are all important positive policy drivers. Yet, bad timing and lack of consistency and momentum make the economic policy initiatives weak and inadequate to cope with the serious structural problems in the economy, as discussed in Section II.

Lighthouse Project. An important initiative is the so-called Lighthouse Project, with an estimated cost of approximately € 70 million over four years. The Lighthouse Project was launched in 2000, and is structured in four parts:

- digital administration (local government, discussed below),
- qualification and education (private companies and government),
- industrial development (private companies exclusively), and
- IT infrastructure.

This program is financed by a grant from the Ministry of Science, Technology and Innovation, although all projects require matching investments from industry and/or local government partners. It is worth noting that this money is not primarily earmarked for development of new IT–software and hardware. Money was mainly given to modernize different areas of the public sector using ICT.

After 1992, public sector-financed R&D activities were increased for a while, but in recent policy programs, public R&D efforts were again reduced (Research Council, 2001). This reduction came even though part of the revenue from the 3G wireless auctions in November of 2001 was scheduled to be transferred back into IT research. In assessing the total R&D funds available, it is also worth mentioning that the EU grants from the different R&D framework programs are more or less the same level as the national research grants.

Telecommunications R&D Spending. Within the telecommunications sector, annual investments increased substantially since 1992, although a minor drop occurred in 2000. In 1992, € 69 million was invested in telecommunications. In 1996, the investment increased to € 635 million, and in 1999 to € 876 million. The deployment of the Fixed Wireless Access (FWA) technologies and 3G Net, including broadband technology, is expected to increase investment rapidly (National Telecom Agency, 2000). Investment in the development of broadband width and other telecommunication investments will primarily come from the private sector.

Telecommunications investments are proportionally well above the investments in the U.S., but smaller than investments in the other Scandinavian countries and in the EU. Looking at the general spending on systems, software, and/or services, Denmark is spending proportionally less than the U.S. but more than the Scandinavian and European countries, on average.

Home PC Tax Relief Program. The government launched a bill in 1997 that allowed companies to provide their employees with a tax-free PC at home, with the provision that the employee takes a number of PC courses. This program is often referred to as the PC–driver’s license, for which it is even possible to take a test and obtain a certificate from the Danish IT Society. This initiative clearly overlaps with the knowledge diffusion initiative described above, which served as a general upgrading of IT skills in the population. However, to fuel the general knowledge diffusion process, economic incentives were added.

The consolidated effects of these economic initiatives are difficult to isolate from the effects of the other initiatives and market forces. However, there is no doubt that the investments made in the telecommunication infrastructure were necessary to further the diffusion of Internet use. The initiatives have been a significant stimulator of industrial growth in the B-to-B and B-to-C e-commerce sector.

Finally, the direct subsidies, such as the Lighthouse Project and the tax breaks on PCs, also created a substantial demand for better IT solutions and more e-commerce in the B-to-C area (an increase in potential customers and the number of activities on the Internet), as well as in the B-to-B area (better and cheaper inter-organizational systems, higher awareness, and better training of employees).

REGULATION AND LEGISLATION

General liberalization of the telecommunications market, together with the directives on electronic signatures (1999), e-commerce (2000), copyright (2001), e-money (1999), data protection and data processing, government e-procurement, and the planned adoption of the EU top level domain suffix, are viewed by the authors as the important policy regulatory initiatives with direct relevance for e-commerce. Whereas the telecommunications liberalization efforts had a positive impact, we believe the other initiatives are either inadequate or have been too delayed to create much of an impact.

Liberalization and a general growth in the telecommunications market segment increased the number of companies operating in the market and reduced prices. On average, telecommunications prices decreased annually by 2.5 percent since 1984.

The rate per minute for domestic outbound calls in 2000 was at the average level of the EU countries [OECD, 2000b]. By the end of 2002, this rate dropped to the lowest in the EU. However, it is important to note that increasing the number of participants in the market does not necessarily result in lower prices for all services and/or better services. In the broadband market for ADSL, the new entrants are all buying cable access from one telecommunications provider – namely, the former state monopoly company. As a result, the price level and price structure for

broadband from an end-consumer point of view did not change radically from the increase in the number of providers.

In 2000, more than 50 companies offered Internet access to 1.5 million households. Three dominant companies shared more than 70 percent of the market. Thirteen companies offered Internet services at a national level in 2000, compared to only four companies in 1998. Comparing the cost of Internet access, Danish costs are at a substantially higher level than the corresponding costs in the U.S., although about average compared to Scandinavia, the EU, or OECD countries. Although flat rates were introduced for ADSL, the bulk of Internet users still pay by the minute.

Despite the increase in the number of firms on the supply side, the digital divide may remain a problem, as service providers do not want to be required to meet universal access goals. Skogerbø and Storsul suggested that the Danish "... business actors are well networked and press for a minimal definition of universal services, whereas those actors promoting an extended definition seem to be less coordinated and therefore less successful. Hence it is unlikely that universal services will be defined more extensively in the future" [Skogerbø and Storsul, 2000].

An interesting twist and an indicator of the influence of the European Commission on national policy occurs within the regulation of the telecommunications market. On January 29, 2002, the European Commission contacts the Danish Telecommunication Agency regarding the Danish SMP operator at the fixed network market, TDC. The European Commission requested documentation that Denmark is meeting the European Law requirement with respect to monopoly.

It is also worth emphasizing the European Data Protection Act, which mandates that companies use a specific standard for collecting and using private data. Similar directives were issued on digital signatures and consumer protection. The extensive Internet regulation in Europe is in contrast to the market-driven approach in the U.S., and has been criticized for stalling e-commerce diffusion [Lewell, 1999].

Adoption of EU legislation on copyright, e-marketing, e-money, and legal jurisdiction are key priorities for the Commission. They emphasize on co- and self-regulation within the e-commerce area in close corporation with the Commission and various business groups such as Global Business Dialog (GBD).

The directives on electronic signatures (1999), e-commerce (2000), copyright (2001), e-money (1999), and data protection and processing, and the planned adoption of the EU top level domain suffix, are all specific directives that could impact e-commerce at the European Community level, since, according to the Rome Treaty, all directives must be implemented nationally.

The *electronic signature directive* from 1999 targets legal recognition and free movement of e-signatures and certificates. The directive states that digital signatures have the same legal status as hand-written signatures within Europe. The electronic signature directive was adopted in Denmark in 2001. The absence of electronic signatures was seen for a long time as a threshold for the further diffusion of e-commerce. Yet, it is questionable whether electronic signatures will impact direct B-to-C sales, although it could more likely impact B-to-B sales transactions and the flow of documents associated with business collaboration and, in particular, with government.

The *e-commerce directive* (2000) outlines the country of origin principle. The country of origin principle was subject to intense debate in the preparation phase of the directive. The consequence of the principle is that the national rules of the sellers' country are to be followed when a purchase agreement is settled. The principle has no practical implications for marketing or registration of personal data, since marketing and registration of data are already regulated in EU directives.

The complications of the country of origin principle are related to the settlement of the agreement, payment, and especially return policy, which varies in the different EU member states.

The *data protection directives* (European Parliament and European Council, 1995, 2002) and the *data processing* directive and regulation (European Parliament and European Council, 1997,

2001) ensure a high level of privacy protection for individuals, as well as the free movement of personal data within the EU. They grant the subjects the right to information from data users, to access personal data, and to rectify personal data. Also, data subjects have a right to opt out, meaning that personal data may not be used in certain circumstances, such as direct marketing. Explicit consent of the data subject must be obtained if the data concerns medical, financial, race, or religious issues.

While the regulation by the European Communities protects the consumer, the tight regulation might also impact European companies' ability to compete globally on the Internet. Furthermore, the European Communities require companies selling to European consumers to be registered in Europe, although there is a safe harbor agreement with the U.S. – in which the U.S. Department of Commerce holds a roster of companies that meet the principles outlined by the European Commission, hence allowing them to operate in Europe.

Table31. EU Regulation on Taxation of Digital and Physical Goods

	Sale side and buy side within EU	Sale side outside EU, buy side within EU
Digital goods	VAT in seller's country	VAT in country of buyer; seller is required to have registration in country of buyer
Physical goods	VAT in country of buyer (if total sale for seller in one year exceeds EURO 40,000)	VAT in country of buyer (if total value of good exceeds EURO 10)

Note: Assessment by authors.

Although important policy initiatives, such as the Law on Digital Signatures (L229 from 2000) and various EU initiatives, are likely to shape future e-commerce diffusion, we find that the key regulation and legislation initiatives that promote e-commerce are found within the extensive liberalization of the telecommunications sector at the European and national levels.

ELECTRONIC GOVERNMENT

The final governance driver in our framework is e-government. We highlight three initiatives of particular relevance for e-commerce diffusion:

- the mandatory public sector e-procurement act,
- the national health data network, and
- the digitalization of the government-citizen-business communication.

E-Procurement. With e-procurement, the Danish government launched a blueprint in its EDI action plan (1996) for expanding public e-commerce in general, and the procurement function in particular. The government planned to provide technical capabilities by 1998, and to issue guidelines for e-commerce at all levels of government by 2000. In 1999, a special task force made ten recommendations for national e-commerce policy [Ministry of Information Technology and Research, 1999]. Among these were the establishment of explicit and ambitious objectives for public e-commerce, and the creation of a public auction platform on the Internet. The task force became even more important in 2001 by an institutional transfer to the powerful Ministry of Finance. At the local government level, various e-government initiatives were launched. One of the most promising examples is the Digital Lighthouse Project (part of the Lighthouse Project), where digital procurement in two areas in Denmark (Northern Jutland and the Ørestad region) is promoted full scale. The goal is to encourage local and county authorities, together with local enterprises, to align their procurement/sales systems to improve efficiency and effectiveness by going digital. The objective is supported by various pilot projects such as digital marketplaces, digital construction processes, and WAP interfaces for e-procurement.

By the end of 2002, all public procurement, which amounts to 13 to 19 billion Euro (about 10 percent of the GDP), was expected to be done digitally. Although few e-procurement projects are successful, the aggregated impact is an early

uptake of e-procurement, digital streamlining of work processes within government, and improved government-business-citizen communication. However, the implementation of the strategies were rather incremental and lacks strategic vision and overall coordination.

The National Health Data Network. Started in 1991, this network involves prescription letters, letters of discharge, test results, invoices to the health insurance, and other administrative documents. More than 85 percent of physicians, pharmacies, health insurance companies, and hospitals use the system, covering more than 70 percent of the total number of messages. Part of the health sector is public, but is predominantly contracted to private companies. The initiative in the health data network came from the public sector, but spread most successfully to the private sector part of the health sector.

Digitalization of the government-citizen-business communication. This initiative was given priority in both local and national governments, in the areas of tax administration and social welfare services.

SUMMARY OF IMPACTS OF GOVERNANCE ON E-COMMERCE ADOPTION

In this section, we outlined the governance initiatives and assessed their possible impacts on e-commerce diffusion. Table 32 summarizes the findings in the four areas of governance initiatives analyzed. For each area, we summarized the point-of-departure, the governance initiative, and the outcome. We rated the outcome in five categories: very successful (++), successful (+), neutral/unclear (0), unsuccessful (-), and very unsuccessful (--). Although we categorized most of the initiatives as successful, participants other than government were responsible for much of the success as well. Also, throughout our analysis we pointed to various non-decisions or inaction that could be interpreted as counterbalancing the positive impacts of actual initiatives taken.

IV: CONCLUSIONS AND PERSPECTIVES FOR E-COMMERCE DIFFUSION IN DENMARK

The Danish e-commerce approach is focused on use rather than development and production. This reflects a business environment that lacks a large high-tech (IT) manufacturing industry. The Danish IT sector during the 1990s grew exclusively due to an increase in consultancy services, compensating for a drop in manufacturing.

B-to-B Commerce. For B-to-B e-commerce diffusion, we highlight five key drivers:

1. extensive collaboration within the agriculture, health care, and finance industries;
2. constant pressure for efficiency in the form of cost and labor reductions;
3. an open economy and European integration;
4. the extensive and successful vocational training programs; and
5. governmental support for knowledge diffusion.

The Danish economy and business environment is characterized by a high number of SMEs and lacks MNC dominance. This distribution of firms in itself suggests that B-to-B e-commerce could not evolve. Yet, our conclusion is that Denmark is in a strong position within the business segment – in particular, agriculture, health care, and finance –because of the streamlining of business practices and the rapid increase of technology. EDI increases in the mid-1990s were an indicator of these changes (although the downside to the sound EDI diffusion is the danger of lock-in, both with regards to technology, standardized technology solutions, and business partners).

Table 32. National and EU Governance Goals, Point-Of-Departure, Initiatives, and Outcome

Governance aspects	Point-of-departure	Governance initiatives	Outcome
Regulation & legislation	Monopoly	Liberalization	* More competitive market dynamics in the telecommunications market (new players, lower prices, and new services) (+)
	U.S. dominance	Digital signatures	* High access but low use of Internet and low diffusion of high-speed connections (+/-)
	Restrictive data protection	E-commerce directive	* Low diffusion of digital signatures and encryption certificates beyond the banking sector (--)
		Data protection directive	* Reduced sales barriers within the EU (0/+)
Economic incentives	Need for IT replacement and more socially-balanced diffusion of IT in households Low R&D expenses	EU top level domain	
		Home PC tax relief Increased R&D in telecommunication Subsidy of e-commerce projects	* High diffusion of PCs in households (++) * 100% digitalization of phone lines and access points (++) * High CATV and web TV use (++) * Low impact of investments and few start-ups (--)
Knowledge diffusion	Low enrollment in/ supply of higher science education Digital divide EDI-centered Discourse	New IT education institutions EDI and annual ITaction plan IT Ministry Project E-government Focus on e-commerce	* Increased enrollment in IT-education (++) but long time to impact (0) * Increased awareness and discourse change towards e-commerce (++) * Continuous increase in EDI use (+/0) and simultaneous increase in Internet-based B-to-B e-commerce
E-government	Lacking strategies for e-commerce Primarily inter-governmental IT use Widespread red tape	Mandatory e-procurement Health data network (MedCom) Digitalization of the tax administration (processes and access points)	* Early adoption of e-procurement (+), although limited to few items and lacking focus on CB and strategic impacts (-) * Digital streamlining of internal public sector processes (+) * Digital access and services for business and citizens (+)

Note: (++)very successful, (+)successful, (0) neutral/unclear, (-) unsuccessful, (--) very unsuccessful.

The Danish e-commerce approach is predominantly regional (with neighboring countries) and domestic, rather than global. This approach reflects barriers such as low immigration, export orientation almost exclusively in neighboring markets, and not being a member of EURO.

B-C Commerce. In B-to-C e-commerce, we highlight lifestyle changes (working at home and the smart home), a long tradition of digital trust, electronic banking, European integration (the entry of more companies, leading to price competition), and high GDP per capita as the primary driving forces. More Danish households are connected to the Internet than anywhere else in the world, and an increasing degree of households are using broadband technologies. Even mobile technologies are diffusing rapidly. Other drivers for e-commerce include the long tradition of using home banking, smart cards, debit cards, and credit cards. Furthermore, European integration and an EU policy focus on SMEs will increase the role of government and SMEs in e-commerce diffusion. The fact that Denmark has access to the European markets, and that competitors are

putting pressure on Danish companies to streamline processes and expand into other markets, could be considered to be a driver. On a global scale, however, companies in the European Community are not world leaders in e-commerce diffusion, reducing the likelihood that EU membership and the corresponding markets will be overall drivers for e-commerce.

We also identified serious inhibitors to B-to-C e-commerce. These inhibitors include a dominance of primary industries and government services, rather than high-tech industry; the lack of content providers and high-end B-to-C brand leader products; the short work hours; the equal income distribution; the regional and local orientation rather than global orientation; the consumers' desire to inspect products first; non-EU membership; and the conflicting goals and means in European Community regulation.

Table 33. Primary B-to-B and B-to-C Environmental and Governance Drivers and Inhibitors

	B-to-C	B-to-B
Drivers	Lifestyle changes (working at home and the smart home, office, and street), wireless, mobile Long tradition of digital trust (banking) European integration (entry of more companies leading to lower prices) High GDP per capital	Collaboration within agriculture, health care, and finance Ongoing need for cost and labor time reductions Open economy and European integration Vocational training Government support for knowledge diffusion
Inhibitors	Lack of supply of goods and services Dominance of low-tech manufacturing sector and services (primarily government) Lack of content or high-end B-to-C products Short work hours Equal income distribution Regional/local orientation rather than global orientation Security concerns; desire to inspect product first Non-EU membership Conflicting goals and means in the European Community regulations	National and regional e-commerce rather than global e-commerce due to low immigration Export orientation toward neighboring markets Lack of commitment to fight structural inhibitors (educational aspects, taxation)

In this paper, we presented several national policy initiatives on EDI and Internet-based commerce and procurement. In policy terms, the Danish government is committed and has allocated resources to fuel both B-to-B and B-to-C e-commerce. The 1996 plan, the e-commerce agenda from 1999, and the e.gov.dk initiative from 2001, along with various legislative milestones, show a strong policy commitment. However, the actual implementation of both EDI-enabled and Internet-based e-procurement in government is progressing slowly, with the exception of the public health system.

Throughout the 1980s and 1990s, budgets were decentralized, various functions were outsourced, and the central and shared IT applications were questioned and in many cases abandoned. The Danish government can make plans, but they cannot make their own organizations actually implement the ideas by force. This result is a major shift from the success of the Scandinavian countries during the 1970s, when the Scandinavian governments followed a line-of-command style. Government was a strong force in IT diffusion. We are skeptical as to whether the government still is able to play this active role and to motivate a shift in direction, given the overall dedication to a more market-driven diffusion. If this interpretation holds, B-to-B and B-to-C diffusion is not likely to reach the official government goal -- to be a world leader in IT in general and e-commerce in particular.

ACKNOWLEDGEMENTS

This research is part of the Globalization and E-Commerce (GEC) project at the Center for Research on Information Technology and Organizations (CRITO) at the University of California at Irvine. This research was supported by the National Science Foundation under Grant No. 0085852. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

The following persons provided comments on earlier drafts of this report: Ruth Nielsen, Copenhagen Business School; Morten Falch and Anders Henten, Danish Technical University; Niels Christian Juul, Roskilde University; Sara Korzen-Bohr, Copenhagen Business School; and Hanne Westh Nicolajsen, Danish Technical University.

The authors are solely responsible for the content of this document.

Editor's Note: This article was received on February 25, 2003 and was published on September 4, 2003. This article is part of the series Globalization and E-Commerce under the editorship of Kenneth L. Kraemer and Jason Dedrick of the University of California at Irvine.

REFERENCES

EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
2. the contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. the authors of the Web pages, not CAIS, are responsible for the accuracy of their content.
4. the authors of this article, not CAIS, are responsible for the accuracy of the URL and version information.

EDITOR'S NOTE: The date of last access given in this list of references are in the European format for dates. Thus, 10/12/02 refers to December 10, 2002 rather than October 12, 2002 which would be the interpretation in the United States.

Andersen, K. V. Ed. (1997). *EDI and Data Networking in the Public Sector: Governmental Action, Diffusion, and Impacts*. Amsterdam: Kluwer.

Andersen, K. V., and Nicolajsen, H. W. (2000). *Strategies for Digitalizing Government: E-Commerce Adoption in the Public Sector*. Copenhagen: Copenhagen Business School, Department of Informatics. Working paper. <http://www.cbs.dk/cips/research/survey.pdf> (last access 10/12/02)

Andersen, K. V., Bjørn-Andersen, N., and Dedrick, J. (2003). Governance Initiatives Creating a Demand-Driven E-Commerce Approach: The Case of Denmark. *The Information Society*, 19(1), pp. 95-105.

Andersen, K. V., Bjørn-Andersen, N., and Wareham, J. (1998). Using the Public Sector as a Locomotive for Electronic Commerce: The Case OF Denmark.: *Proceedings of the Bled International Conference on Electronic Commerce*. Bled, Slovenia

Andersen, K. V., and Henriksen, H. Z. (2000). E-commerce in the Public Sector: Managerial Challenges In Homecare Service. *Proceedings of the Second Electronic Grocery Shopping (EGS) Conference*, Charlotte, NC: pp. 10-22.

Andersen, K. V., and Juul, N. C. (2002). *E-handel i kommunerne (E-Commerce in Local Government)*. Copenhagen: Copenhagen Business School, Department of Informatics working paper. <http://www.cbs.dk/cips/kommuner2002/ehandel.pdf> (last access 10/12/02)

Andersen, K. V., Juul, N. C., Henriksen, H. Z., Bjørn-Andersen, N., and Bunker, D. (2000). *Business-to-Business E-Commerce*. Copenhagen: DJOEF Publishers.

Andersen, K. V., Juul, N. C., Korzen-Bohr, S., and Henriksen, H. Z. (2003). *The End of Power and Persuasion? Up-stream Adoption of B2B E-Commerce in the Danish Grocery Value Chain*. Copenhagen: Copenhagen Business School, Department of Informatics Working paper. <http://www.inf.cbs.dk/departments/inf/working-papers/> (last access 05/01/03)

BDRC. (2001). *The Development of Broadband Access Platforms In Europe: Technologies, Services, Markets*. Brussels: European Communities. http://europa.eu.int/information_society/eeurope/news_library/new_documents/broadband/broadband_report.pdf (last access 02/01/03)

Bjørn-Andersen, N., Earl, M., Holst, O., and Mumford, E. Eds. (1982). *Information Society for Richer for Poorer*. Amsterdam: North-Holland.

Center for Transportation Studies. (2000). *Pendling og befordringsfradrag (Commuting and Tax Subsidies)*. Copenhagen: Center for Transportation Studies. <http://www.transportraadet.dk>. (last access 15/03/02)

Chatfield, A., and Bjørn-Andersen, N. (1996). Reengineering with EDI: A Trojan Horse in Circumventing Non-Tariff Barriers to Trade. *Proceedings of the 4th European Conference on Information Systems* (pp. 1197-121). Lisbon, Portugal.

Cohen, M. D., March, J. G., and Olsen, J. P. (1972). A Garbage Can Model Of Organizational Choice. *Administrative Science Quarterly*, 17(1), pp. 1 - 25.

Damsgaard, J., and Lyytinen, K. (2001). The Role of Intermediating Institutions in Diffusion of Electronic Data Interchange (EDI): How Industry Associations in the Grocery Sector Intervened in Denmark, Finland, and Hong Kong. *The Information Society*, (17)3.

Danish Economic Council. (2001). *Danish Economy, Spring 2001*. Copenhagen: The Danish Economic Council. <http://www.dors.dk/> (last access 20/10/02)

Danish Health Care Data Network. (2001). *EDI-toppen*. Odense. Danish Health Care Data Network. <http://www.medcom2.com> (last access 20/12/02)

DanNet. (2001). *E-handler danske firmaer for 12 mia kr. eller 115 mia kr.?* <http://www.dannet.dk>. (last access 02/09/02)

Dybkjær, L., and Christensen, S. (1994). *Information Society 2000*. Copenhagen: Ministry of Research and Information Technology. <http://www.fsk.dk> (last access 20/12/02)

Eckhoff, T. (1987). *Statens Styringsmuligheter*. Oslo: Tanum-Norli.

Einhorn, E. S., and Logue, J. (1989). *Modern Welfare States*. Westport, CT: Praeger Publications.

Elliot S. Ed. (2002). *E-Commerce: B2C Strategies and Models*. Wiley Series in Information Systems. Chichester, UK: John Wiley and Sons.

Eurobarometer. (2000). *European SMEs Internet Access*. Brussels: Eurobarometer.

European Commission. (1996). *Commission Recommendation of 3 April 1996 Concerning The Definition Of Small And Medium-Sized Enterprises*. Brussels: European Commission. <http://europa.eu.int/ISPO/ecommerce/sme/definition.html> (last access 19/12/02)

European Commission. (2000). *An Information Society For All*. Communication on a Commission Initiative for the Special European Council of Lisbon. Brussels: European Commission. [http://europa.eu.int/ISPO/docs/policy/docs/e_europe/COM\(99\)_en.pdf](http://europa.eu.int/ISPO/docs/policy/docs/e_europe/COM(99)_en.pdf) (last access 19/12/02)

European Commission. (2002). *eEurope 2002 - Accelerating E-Commerce*. Brussels: European Commission. http://europa.eu.int/information_society/eeurope/action_plan/ecommerce/index_en.htm (last access 19/12/02)

European Parliament and European Council. (1995). *Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data*. Brussels: European Communities. http://europa.eu.int/comm/internal_market/en/dataprot/law/ (last access 19/12/02)

European Parliament and European Council. (1997). *Directive 97/66/EC of the European Parliament and of the Council of 15 December 1997 Concerning the Processing of Personal Data and the Protection of Privacy in the Telecommunications Sector*. Brussels: European Communities. <http://europa.eu.int/ISPO/legal/en/dataprot/protection.html> (last access 19/12/02)

European Parliament and European Council. (2001). *Regulation (EC) 45/2001 of the European Parliament and of the Council of 18. December 2000 on the Protection of Individuals with Regard to the Processing of Personal Data by the Community Institutions and Bodies and on the Free Movement of such data*. Brussels: European Communities. http://europa.eu.int/comm/internal_market/en/dataprot/news/286en.pdf (last access 19/12/02)

European Parliament and European Council. (2002). *Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 Concerning The Processing Of Personal Data And The Protection Of Privacy In The Electronic Communications Sector* (Directive on Privacy and Electronic Communications). Brussels: European Communities. http://europa.eu.int/comm/internal_market/en/dataprot/law/ last access 19/12/02)

Forrester Research Inc. (2000). Global E-Commerce Model. <http://www.forrester.com.last> access 15/12/2002

Frøkjær, E., Korsbæk, H., and Færch, H. (1999). Computer Based Tools For Cooperative Work Among Politicians And Officials In Danish Local Government. In W. van de Donk et al. (Eds.) *Orwell in Athens: A Perspective on Informatization and Democracy*. Amsterdam: IOS Press. pp. 109-126

Greenbaum, J., and Kyng, M. (1991). *Design at Work*. Hillsdale, NJ: Erlbaum.

Henriksen, H. Z. 2002. *Performance, Pressures, and Politics: Motivators for Adoption of Interorganizational Information Systems*. Ph.D.-thesis. Copenhagen: Copenhagen Business School, Department of Informatics. http://www.cbs.dk/staff/hzh/hzh_phd.pdf (last access 10/12/02)

Henriksen, H. Z., Andersen, K. V., and Pedersen, T. (2002). IS Innovation: Adoption of B2B E-Commerce.. *Proceedings of the IFIP I3E 2002 Conference*. Lisbon, Portugal.

Hofstede, G. (1994). *Cultures and Organisations: Intercultural Co-operation and its Importance for Survival*. London: Harper Collins Publishers.

Hjarup, S. (2001). *Distributed Multimedia Technologies and Value Chain Structuring: An Economic Theory of Communications*. Ph.D. thesis. Lyngby: Center for Teleinformation, Technical University of Denmark. URL <http://www.cti.dtu.dk/publications/phdtheses/hjarup.pdf> (last access 10/12/02)

Hørlück, J. (1996). *EDI and Danish Companies*. Copenhagen: Dansk Industri. URL <http://www.di.dk> (last access 09/11/02)

IDC. (1999). *The 1999 IDC Worldwide Black Book*. Framingham, MA: International Data Corporation,

International Labour Organization. (2001). *LABORSTA*. <http://www.laborsta.ilo.org> (last access 15/11/02)

International Telecommunication Union. (2001), March. *World Telecommunication Indicators*. Geneva: International Telecommunication Union. <http://www.itu.org> (last access 15/11/02)

International Telecommunication Union. (2000). *ITU Yearbook of Statistics 2000*. Geneva: International Telecommunication Union. <http://www.itu.org> (last access 15/11/02)

Keen, P. G. W., and Mackintosh, R. (2001). *The Freedom Economy*. Berkeley, CA: Osborne-McGrawHill.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London: MacMillan.

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 Systems Research*, 5(2), pp. 129-140.

Lewell, J. (1999). Forrester Slams Internet Regulations in Europe. *Internet News* Feb.19. http://www.internetnews.com/intlnews/article/0,,6_70291,00.html (last access 05/01/03)

Lindblom, C. E. (1959). The Science' of Muddling Through. *Public Administration Review*, 19(2), pp. 79-88.

Lindblom, C. E. (1979). Still Muddling, Not Yet Through. *Public Administration Review*, 39 (Nov/Dec), pp. 517-526.

Lundvall, B.-Å., Olesen, N. M., and Aaen, I. (1984). *Det landbrugsindustrielle kompleks – Teknologivurdering, konkurrenceevne og beskæftigelse (The Agricultural-Industrial Complex: Technology Assessment, Competitiveness and Employment)*. Aalborg: Aalborg University. <http://www.business.auc.dk> (last access 08/11/03)

McFarlan, F. W. (1984). Information Technology Changes the Way You Compete. *Harvard Business Review*, 62(3), pp. 77-88.

Ministry of Finance. (2001a). *Finansredegørelse 2001*. Copenhagen: Danish Ministry of Finance.

Ministry of Finance. (2001b). *Investeringer i Danmarks fremtid*. Copenhagen: Danish Ministry of Finance.

Ministry of Information Technology and Research. (1999). *Digital Denmark - Conversion to the Network Society*. Copenhagen: Danish Ministry of Information Technology and Research.

Ministry of Information Technology and Research. (2000a). *Satsninger og tal - bilag til netværksredegørelse 2000*. Copenhagen: Danish Ministry of Information Technology and Research.

Ministry of Information Technology and Research. (2000b). *Danske virksomheders brug af informationsteknologi 1999*. Copenhagen: Danish Ministry of Information Technology and Research.

Ministry of Science, Technology and Innovation. (2002). *IT for All - Denmark's Future. IT and Telecommunications Policy Statement and Action Plan 2002*. Copenhagen: Ministry of Science, Technology and Innovation June
<http://www.videnskabsministeriet.dk/fsk/publ/2002/itforall/itforall.pdf> (last access 05/01/03)

Ministry of Science, Technology and Innovation. (2002), Denmark's IT-status 2002. *Bilag til IT for alle - Danmarks fremtid - IT- og telepolitisk redegørelse og handlingsplan 2002*. Copenhagen: Ministry of Science,

Technology and Innovation

http://www.videnskabsministeriet.dk/fsk/publ/2002/denmarks_it_status_02/pdf/Denmarks_IT-status_2002.pdf (last access 05/01/03) April.

National Telecom Agency. (2000). *Telesektoren i Danmark - faktisk redegørelse*. Copenhagen: Danish National Telecom Agency.

Ministry of Trade and Industry. (2001a). *Kompetenceklynger i dansk erhvervsliv – en ny brik i erhvervspolitikken (Clusters in the Danish Business Structure: A New Dimension in the Business Policy)*. Copenhagen: Ministry of Trade and Industry. <http://www.efs.dk/publikationer/rapporter/kompetenceklynger> (last access 05/01/03)

Ministry of Trade and Industry. (2001b). *IT kommunikation - en erhvervsanalyse (IT Communication: A Business Cluster Analysis)*. Copenhagen:

Ministry of Trade and Industry. <http://www.efs.dk/publikationer/ressourceomraader/itk/> (last access 05/01/03)

Ministry of Trade and Industry. (2001c). *Den vidensbaserede økonomi - en analyse af Vidensintensitet og vidensstrømme i det danske innovationssystem. DISKO-projektet: Rapport nr. 4*. Copenhagen: Ministry of Trade and Industry.

National IT- and Telecommunication Agency. (2002). *Tele Statistics*. Copenhagen: Ministry of Science, Technology, and Innovation.

Neo, B.-S., King, J. L., and Applegate, L. (1995). Singapore TradeNet: The Tale Continues. *Harvard Business School Case # 9-193-136*.

OECD. (2000a). *OECD Economic Surveys Denmark*. Paris: OECD.

OECD. (2000b). *OECD Information Technology Outlook - ICTs, e-Commerce and the Information Economy*. Paris: OECD.

PBS. (2001, 2002). *Betalinger på nettet [Internet Transactions]*. <http://www.pbs.dk> (last access 06/01/03)

Pedersen, T., Petersen, B. and Jespersen, A. H. (2002). *E-Business i Industrien - En Undersøgelse af Virksomhedernes Internationale Afsætningsprofil*. Copenhagen: The Confederation of the Danish Industries.

Porter, M. E. (1990). *The Competitive Advantages Of Nations*. New York: The Free Press.

Porter, M. E. (1998). *On Competition*. Boston, MA: Harvard Business School Press.

Porter, M. E. (2001). Strategy and the Internet. *Harvard Business Review*, 79(3), pp. 61-79.

Raman, K.S., and Yap, C. S. (1996). From a Resource Rich country to an Information Rich Society: An evaluation of Information Technology Policies in Malaysia. *Information Technology for Development*, 7(3), pp. 109-131.

Reed Electronics Research. (2000). *The Yearbook of World Electronics Data, 2000*. Surrey, UK: Reed Electronics Research.

Research Council. (2001). *Grundlaget for vidensamfundet smuldrer - udsigt til stort fald i de offentlige forskningsbevillinger*. Copenhagen: Ministry of Information Technology and Research.

Rosen, K. T., and Howard, A. L. (2000). E-retail: Gold Rush or Fool's Gold? *California Management Review*, 42(3), 72-100.

Schmitter, P. C. (1974). Still the Century of Corporatism? *Review of Politics*, 36(Jan.), pp. 85-131.

Skogerbø, E., and Storsul, T. (2000). Prospects for Expanded Universal Service in Europe: The Cases of Denmark, the Netherlands, and Norway. *The Information Society*, 16(2), pp. 135-146.

Smith, A. (1776). *The Wealth of Nations*. Reprinted 1937 by Random House, Inc., New York.

Statistics Denmark. (1999-2002). Nye virksomheder 1997, 1998, 1999, 2000. *Nyt fra Danmarks Statistik*, 324, 337, 278, 273. Copenhagen: Statistics Denmark.

Statistics Denmark. (1997-2000). *Familiernes brug af internet*. Copenhagen: Statistics Denmark.

- Statistics Denmark. (1998). *Danske virksomheders brug af IT 1997*. Copenhagen: Statistics Denmark.
- Statistics Denmark. (1999). *Danske virksomheders brug af IT 1998*. Copenhagen: Statistics Denmark.
- Statistics Denmark. (2000). *Danske virksomheders brug af IT 1999*. Copenhagen: Statistics Denmark.
- Statistics Denmark. (2001a). *Danske virksomheders brug af IT 2000*. Copenhagen: Statistics Denmark.
- Statistics Denmark. (2001b). *Familiernes brug af internet 1. kv. Copenhagen: Statistics Denmark.*
- Statistics Denmark. (2001c). *Familiernes brug af internet 3. kv. Copenhagen: Statistics Denmark.*
- Statistics Denmark. (2001d). *Familiernes brug af internet 4. kv. Copenhagen: Statistics Denmark.*
- Statistics Denmark. (2002a). *Danske virksomheders brug af IT 2001*. (Danish Companies' Use of IT 2001, Nr. 71, 18. february 2002). Copenhagen: Statistics Denmark.
- Statistics Denmark. (2002b). *Service Erhverv, May 7, 2001, November 7 2001, January 25 2002, April 25 2002*. Copenhagen: Statistics Denmark.
- Statistics Denmark. (2002c). *Familiernes brug af internet 2. kv.. Copenhagen: Statistics Denmark.*
- Statistics Denmark. (2002d). *Familiernes brug af internet 3. kv.. Copenhagen: Statistics Denmark.*
- Statistics Norway. (2001). *Use of ICT in Nordic enterprises 1999/2000*. Oslo: Statistics Norway.
- Taylor Nelson Sofres. (2000). Global eCommerce Report. *Taylor Nelson Sofres*. <http://www.tnsofres.com>. (last access 07/02/01)
- Taylor Nelson Sofres. (2002). Global eCommerce Report. *Taylor Nelson Sofres*. <http://www.tnsofres.com>. (last access 19/12/02)
- UNDP, United Nations Development Programme. (2000). *Human Development Report 2000*. New York and Oxford: Oxford University Press.
- United Nations. (1999). *National Accounts Data Description*. United Nations, Statistics Division.
- Venture. (2001). *Venture no. 1*, November 2001.
- Williamson, O. E. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: The Free Press.
- Wong, P.K. (1996). *Implementing the NII Vision: Singapore's Experience and Future Challenges*. Irvine, CA: CRITO <http://www.crito.uci.edu/git/publications/pdf/pac-097.pdf> (last access 06/11/02)
- World Bank. (2001). *World Development Indicators CD-Rom 2001*. Washington, DC: World Bank Group.
- World Bank Group. (2000). *WDI Data Query and World Development Indicators CD-Rom 2000*. Washington, DC: World Bank Group. URL <http://www.devdata.worldbank.org/data-query>

ABOUT THE AUTHORS

Kim Viborg Andersen researches organizational and policy aspects of IT at the Copenhagen Business School. He conducts Danish and international empirical studies within his research fields. His books include EDI and data networking in the public sector (Kluwer, 1998), Information systems in the public service (IOS Press, 1995) and various journal contributions including

Information Society, European Journal of Information Systems, Social Science Computer Review, and Information Communication and Society.

Dr. Andersen is vice-chair of the IFIP WG 8.4 on interdisciplinary e-business and in various editorial boards. He is head of the recently established Center for Research on Information Technology in Policy Settings (CIPS) at the Copenhagen Business School. He served as study director for the M.Sc. e-commerce program (www.ebuss.dk) at the IT University in Denmark.

Niels Bjørn-Andersen received his Ph.D. in decision support systems in 1973 and was appointed full professor at the Copenhagen Business School in 1987. He is Director of the Center for Electronic Commerce (www.cbs.dk/cec) at Copenhagen Business School since August 1998. He was visiting researcher/professor at six well-known institutions abroad.

Niels Bjørn-Andersen was President of Association for Information Systems in 1996. He served on several academic review boards. His publication list includes 15 books, more than 30 refereed articles, and about 100 other publications. He received several academic awards including the Tietgen Gold medal in 1972, IFIP's award for Outstanding Services in 1988, ICIS Appreciation Award in 1990, AIS appreciation award 1997, Best paper award at International Conference on Information Systems in Helsinki 1998, and the Association for Information Systems Fellow award in 1999. In 2003, he was knighted by the Queen of Denmark for his contribution to the IS-field.

Helle Zinner Henriksen, Ph.D. is assistant professor at the Copenhagen Business School. Her research focuses on adoption and diffusion of information systems, including e-commerce systems. Helle is an active member of the Scandinavian IS community (IRIS) and IFIP-group 8.6. Her current major research task is membership of EU-funded e-factors 'Network of Excellence'. Fifteen partners, including industry and university institutions, are collaborating in developing and implementing business models for the digital economy.

Copyright © 2003 by the Association for Information Systems. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and full citation on the first page. Copyright for components of this work owned by others than the Association for Information Systems must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or fee. Request permission to publish from: AIS Administrative Office, P.O. Box 2712 Atlanta, GA, 30301-2712 Attn: Reprints or via e-mail from ais@gsu.edu



Communications of the Association for Information Systems

ISSN: 1529-3181

Paul Gray
Editor-in-Chief
Claremont Graduate University

AIS SENIOR EDITORIAL BOARD

Detmar Straub Vice President Publications Georgia State University	Paul Gray Editor, CAIS Claremont Graduate University	Sirkka Jarvenpaa Editor, JAIS University of Texas at Austin
Edward A. Stohr Editor-at-Large Stevens Inst. of Technology	Blake Ives Editor, Electronic Publications University of Houston	Reagan Ramsower Editor, ISWorld Net Baylor University

CAIS ADVISORY BOARD

Gordon Davis University of Minnesota	Ken Kraemer Univ. of California at Irvine	Richard Mason Southern Methodist University
Jay Nunamaker University of Arizona	Henk Sol Delft University	Ralph Sprague University of Hawaii

CAIS SENIOR EDITORS

Steve Alter U. of San Francisco	Chris Holland Manchester Business School, UK	Jaak Jurison Fordham University	Jerry Luftman Stevens Institute of Technology
------------------------------------	--	------------------------------------	---

CAIS EDITORIAL BOARD

Tung Bui University of Hawaii	H. Michael Chung California State Univ.	Candace Deans University of Richmond	Donna Dufner U.of Nebraska -Omaha
Omar El Sawy University of Southern California	Ali Farhoomand The University of Hong Kong, China	Jane Fedorowicz Bentley College	Brent Gallupe Queens University, Canada
Robert L. Glass Computing Trends	Sy Goodman Georgia Institute of Technology	Joze Gricar University of Maribor Slovenia	Ake Gronlund University of Umea, Sweden
Ruth Guthrie California State Univ.	Juhani Iivari Univ. of Oulu, Finland	Munir Mandviwalla Temple University	M.Lynne Markus Bentley College
Don McCubbrey University of Denver	John Mooney Pepperdine University	Michael Myers University of Auckland, New Zealand	Seev Neumann Tel Aviv University, Israel
Hung Kook Park Sangmyung University, Korea	Dan Power University of Northern Iowa	Ram Ramesh SUNY-Buffalo	Nicolau Reinhardt University of Sao Paulo, Brazil
Maung Sein Agder University College, Norway	Carol Saunders University of Central Florida	Peter Seddon University of Melbourne Australia	Upkar Varshney Georgia State University
Doug Vogel City University of Hong Kong, China	Hugh Watson University of Georgia	Rolf Wigand University of Arkansas	Peter Wolcott University of Nebraska- Omaha

ADMINISTRATIVE PERSONNEL

Eph McLean AIS, Executive Director Georgia State University	Samantha Spears Subscriptions Manager Georgia State University	Reagan Ramsower Publisher, CAIS Baylor University
---	--	---