



Globalization and E-Commerce: Environment and Policy in Denmark

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SUMMARY

- The diffusion of e-commerce in Denmark is mainly a result of what could be called a partnership between government and industry initiatives, rather than 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 adequately stimulate diffusion of e-commerce. Our analysis questions the effectiveness of the government-led approach due to its timing, the lack of coordinated actions, and the mixed motives of government actions, in particular at the European Community level.
- Our analysis also reveals serious structural barriers such as high marginal income taxation and a limited supply of qualified labor. Contributing to the limited supply of labor are strict immigration policies and late entry into the labor market (graduates from higher tertiary education enter the job market at the mean age of 29 years). 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.

PART I: INTRODUCTION, FRAMEWORK, AND STRUCTURE OF PAPER

Introduction

Denmark is often considered among the leading countries with regard to early adoption 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 is 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 a much higher level, at the top-end of the European B-to-B.

The Danish case is not interesting merely because of the advanced or widespread uptake of e-commerce. The Danish case is significant due to the relative absence of conventional market drivers and the relatively dominant role of government and business associations. Yet, the Danish case is not about a strong, dominant government intervention to push e-commerce. Rather, the case reveals a strong partnership between government and business associations for the small and medium sized enterprises (SMEs) as the key driver for e-commerce. Although the government holds major market influence due to its share of the economy, government has been reluctant to *mandate* that operations, companies, or citizens use e-commerce. Part of the reluctance to use 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 has attempted to fuel e-commerce diffusion by the carrot method.

Along a similar view, the business associations have a long tradition of helping to push e-commerce and being part of the knowledge networks. Yet, our analysis in various surveys suggests that SMEs are mostly immune to e-commerce awareness campaigns by the business associations and government. While government and business associations' joint action is the verifying paradigm, *the variety of policy instruments applied is limited and the course 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 captivating. Policies not only attempt to shape the features and directions of environmental drivers, but government is also a dominating part of the environmental drivers, which raises concerns of coordination costs, institutional disagreements, and lack of political commitment to fight structural barriers created in part by government.

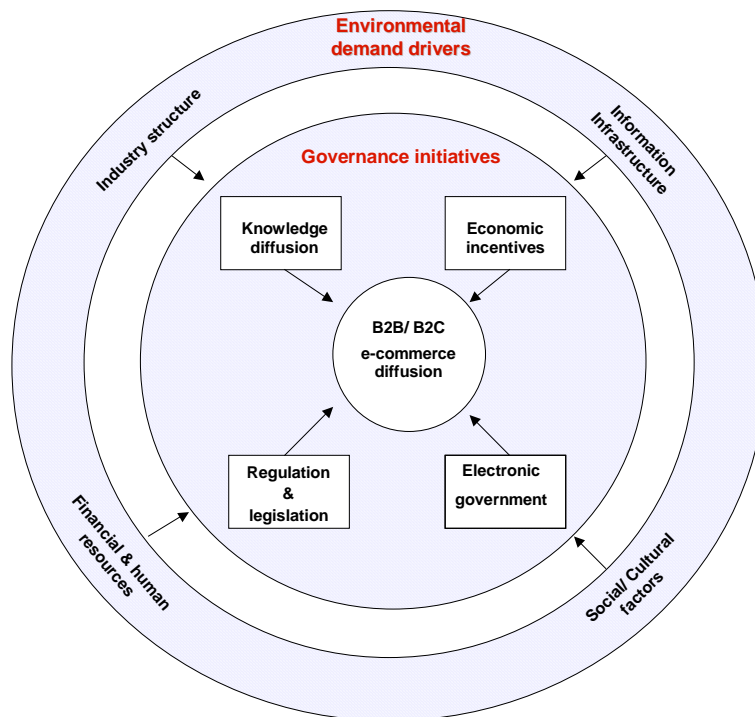
In this paper on *Globalization and E-Commerce: Environment and Policy in Denmark*, we will discuss the main environmental drivers and the role of policy in shaping the course and magnitude of e-commerce. Our paper explores why Denmark seems to lead the way in Europe in the B-to-B segment, but is lagging in the area of 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 will 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 to the evolution of e-commerce in Denmark.

Our Framework

E-commerce is defined in line with the U.S. Department of Commerce's definition 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. We will rather 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 seen in Figure 1.

FIGURE 1. Framework for analyzing environmental drivers and the role of governance initiatives in the diffusion of e-commerce



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

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 have recognized the significance of information communication technologies (ICT) for business and public administration. This has led to institutional initiatives, which have 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 Al Gore Information Highway, and the European Information Society are some of the major recent policies highlighting governmental interest in ICT. E-commerce has been an important part of these policy plans, and B-to-B e-commerce has had a high degree of policy saliency with various institutional initiatives to fuel the development and increase.

Within the economic-oriented literature, one of the most 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 due to the transformation 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 have 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 might also have 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 very domestic as opposed to globally competitive. With the emergence of e-commerce, the Danish companies appear very 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.

Despite these difficulties, the environmental factors in our framework are separated from the e-commerce policies. They are classified into *industry structure*, *information infrastructure*, *financial and human resources*, and *social/cultural* environmental demand factors: 1) Industry structure includes industry concentration, sector distribution, vertical integration, size of firms, and value networks; 2) Information infrastructure includes telecommunication, wireless and Internet infrastructure, technology access and use, and technology acceptance; 3) Financial and human resources include payment mechanisms, venture capital, population, wealth, income distribution, age, education, and IT skills; and 4) Social/cultural 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.

The second group of factors relates to governance initiatives on the part of government and private sector institutions to promote e-commerce. We have 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 have pointed 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 the 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 bills 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, forthcoming):

- 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, as well as 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 utilized in business transactions such as encryption and provision of certification measures.
- Electronic government focuses on the work processes within the public sector's own organizations, as well as services provided to the public.

Figure 1 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. Inside the environmental demand drivers, we have placed the four sets of governance initiatives in boxes. The boxes in Figure 1 illustrate that our framework has been 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 has been 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 get 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, this does 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 here done with reference to the anarchic model(s), since we depart from the (realistic) assumption that government can understand the e-commerce challenge, carefully analyze the options, 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 the 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 has undergone various rounds of changes in definitions. Thus, longitudinal data are few and the data that is available has overall low reliability. A critical dimension is that the data available has 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 have 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 have undertaken with our Danish colleagues. In Appendix A, we list a summary of the Danish sources and the focus of the analysis within each study. In addition to these sources, we have collected a substantial additional amount of quantitative and qualitative data for this paper. In particular, the policy aspects of e-commerce have been the targets for 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. However, we will first

focus on the national environmental drivers and thereafter to the explicit role of e-commerce policy.

PART II: NATIONAL ENVIRONMENTAL DRIVERS

Population and Demographics

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 economy 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 age group 20-59, and comparing this figure to the number of people in the rest of the population, Denmark has a value of 0.77 for year 2000. This means that 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 must be supported. The forecast from Statistics Denmark is that this figure will increase to 0.91 by the year 2010, and 1.0 by the year 2030 (Statistics Denmark, 2002a). Other European countries have even higher values on this variable.

Immigration is at a modest level 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 could potentially counteract the shrinking work force challenge, although most immigrants are not highly skilled. However, tighter anti-immigration policies were recently introduced, which may alter the growing immigration figures. Moreover, there is no green card policy in Denmark to attract high-skilled labor.

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

Geographically, Denmark is about 44,000 km², encompassing the Jutland peninsula and two main islands as well as 300 smaller inhabited islands. Ninety-five percent of the population is very well connected with physical infrastructure, such as roads, bridges, and ferries. The Danish government has pushed 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).

This has 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 has 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 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 have e-commerce implications. These initiatives have been motivated by environmental concerns but could also be contradictory to e-commerce, since the 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 there is a very high labor market participation rate and a small household size. This implies that no one would be at home to receive the goods during the daytime. Limited competition in the transportation and freight markets implies that no delivery at night has taken place (except for the 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.

Another important characteristic of the Danish demographics is the composition of the household. Table 1 indicates that the Danish household is rather small compared to the U.S. This small household size has emerged during the past five years. Other European countries such as Germany are facing a similar transition towards smaller households, but they have kept the average number above 2.0. In Denmark, the size has decreased from 2.2 in 1995, to 1.83 in 1998 (ITU Yearbook of Statistics, 2000).

Also, an increasing number of children are now raised by single parents. Single parent families now 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 there has been an increase in divorce, the biggest contributing factor to the increasing number of small households is that single parents often choose to be single. From 1999 to 2000, there were 6.3 percent more divorces (Statistics Denmark, 2001a). This 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 due to 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 products from Denmark have been more expensive, compared to when the consumer buys the products in a shop.

TABLE 2

Population, number of households, and average 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 within the areas of social security and care for the elderly, where local government has pushed electronic grocery shopping as a means to reduce labor costs related to 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, because of 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 chosen high-end grocery chain had a price level 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 any constructive synergy with the initiative from the government. We take this as an indicator of the incremental rationality outline discussed earlier in the paper. A more carefully prepared initiative could 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 -- are viewed as inhibitors.

Economy and Wealth

GDP figures for Denmark display a very high GDP per capita (\$30,470), 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. Actually, only Luxemburg, Monaco, and Switzerland had a higher GDP per capita in 2001. The figures displayed in Table 3 indicate that Denmark has quite a small economy, with an annual GDP at \$162 billion (U.S.). This is approximately two percent of the total European annual GDP.

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.

Yet, the GDP output increased less in Denmark than in other European countries during the late 1990s. Whereas GDP grew more than 4 percent in the U.S. and 3.2 percent in Europe, the Danish GDP growth was only 2.73 percent p.a. during 1995-99. Studies by the OECD have pointed 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. It has also been suggested by the OECD that the low geographical mobility of the workforce and high marginal income taxation have been the factors creating 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 the goods if they are delivered to the households? 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 concerning 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 is mainly due to general protection agreements negotiated by the rather strong unions in Denmark. It is therefore not only a question of getting the consumers to shop on-line, it is also an issue of organizing work in new ways that allow alternative working hours. This among other issues creates a real 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 its full capacity level 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).

TABLE 4
Unemployment rate and inflation

	Unemployment	Inflation,
	Rate (%)	Consumer Prices (annual %)
	1999 ^a	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.

Data on foreign trade shows that the Danish export market has been 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).

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 the fact that 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 have significant re-export and subcontracting activities in Denmark.

TABLE 5
IT hardware production and exports, US\$ M and relative to GDP, 2000

Country	IT Hardware Production		IT Hardware Exports	
	US\$ M	US\$/GDP	US\$ M	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	0.9	37,967.0 ^a	0.4 ^a
OECD ^a	221,159.2	0.9	169,573.8	0.7

Note: ^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 the IT development of Europe by using demand-side economics. However Denmark has been 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 has 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 have been increasing throughout the last half of the 1990s, but have, 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 very even, 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. This means that salaries, working conditions, etc., are highly unionized and standardized. The Danish labor market model has been successful in implementing new production technologies and major industrial restructuring without frequent and major strikes. Instead, labor unions have been 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 as well as increasing marginal labor output. Also, with the government employing about one third of the work force, that segment is very significant when calculating the equal income split.

TABLE 6
Income distribution

	Share of income or consumption, richest 20%	Share of income or consumption, poorest 20%
	1987-1998	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 the new liberal government taking office in November 2001 has "no further increase in taxes" as one of its key platforms. While Denmark has among the highest income tax (average and marginal) and sales taxes, corporate taxes are among the lowest in Europe. This 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, there should be a high potential for adoption of e-commerce, 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 orientation of the economy (rather than global), 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 Danish labor market has a high degree of participation from 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 even higher percentages of Danes in the workforce. 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 this 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. This is relevant in the case of diffusion of e-commerce as it highlights the increased domestic and particularly export-driven utilization of human resources.

TABLE 10

Unemployment rate and accumulated work hours, 1993-2035

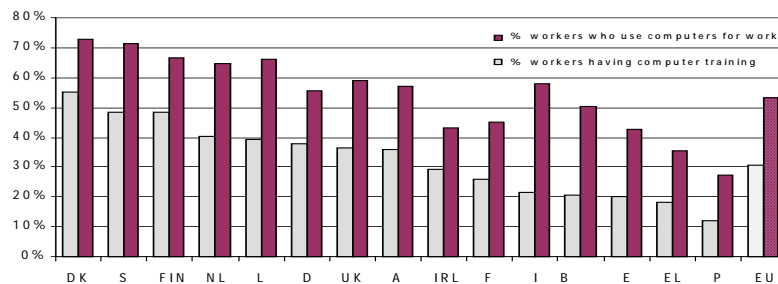
	1993	2000	2005	2010	2035
Unemployment (% of the labor force)	12.1	5.3	5	4.6	4.6
Accumulated work hours/ worker/ year	1,573	1,531	1,502	1,485	1,480

Source: Ministry of Finance, 2001a.

A unique feature of the Danish labor market is a very 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 has been 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 (see Figure 2).

FIGURE 2

Computer training and work



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.

Although the vocational training program has been an essential driver in terms of early training of the workforce in the usage of e-commerce technologies, this system has its shortcomings, since it involves only industrial and agricultural workers. The system overlooks more highly skilled people in the fields of education and service who are not covered by the vocational training centers. Also, the high orientation towards vocational

training raises serious doubts about Denmark's capacity to be part of the knowledge-intensive industries that are taking most of the share of future e-commerce growth.

The Danish economy benefits from a very 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 very low compared to the U.S. (45 percent in Denmark and 81 percent in the U.S.). In addition to the low tertiary enrollment there is an unusually long period of enrollment for the student, which many believe is due to state-subsidized tuition and living costs, available to all regardless of socio-economic status.

In the IT area, the Danish government has strongly promoted educational efforts 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).

TABLE 11

Secondary and tertiary enrollment, and science and engineering enrollment relative to tertiary students. Percent (%)

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

*Note:** The 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). In the e-commerce area, it is especially necessary to ensure a reduction of the time spent from enrollment of students to the output of graduates ready for the job market. This is due to the rapid technology shift of e-commerce technologies. 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's of science degree, as the information learned becomes obsolete so quickly.

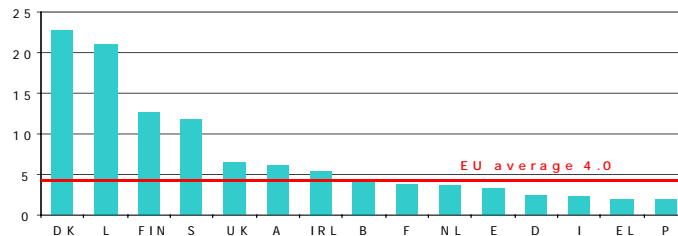
The political goal of the Danish system of subsidized tertiary education was to enable students to finish more quickly and in turn become part of a highly skilled labor force. However, the increase seems to have backfired and many believe that partly because of the absence of tuition fees and the monthly 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 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 in order to attract foreign IT skilled labor. However, such a policy has yet not been implemented.

The statistics on Internet usage in schools from the Eurobarometer (2001) place Denmark in the top, with 23 PCs with Internet access per 100 pupils, whereas the average European level is 4.0. See Figure 3. The use of information technology also impacts learning processes and physical architecture. For example, Hellerup Secondary School north of Copenhagen has

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 here interpreted as very high.

FIGURE 3

PCs in schools connected to the Internet per 100 pupils



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.

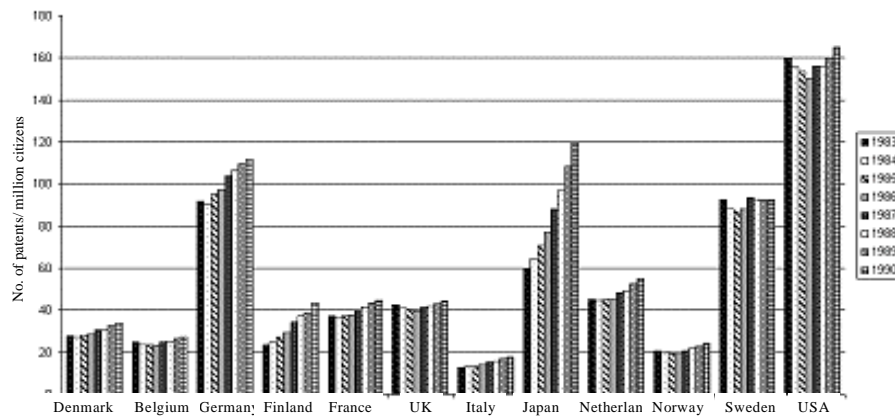
A heated debate took place during 2001 regarding publicly funded R&D in the IT sector. In the early 1990s, the public sector's financing of R&D activities was growing. However, in the policy initiatives since 1995, public R&D efforts have been reduced (The Danish Research Council, 2001).

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 biotech 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 the tertiary education, the tradition for spending many years at university (graduation on average at age 29), and the low patent intensity are all interpreted as serious inhibitors for e-commerce. As positive drivers, we found the PC penetration in the schools, computer training, and vocational training. These are all positive e-commerce drivers, although the strong orientation on general vocational training can equally well result in a competence trap in areas with low or no growth.

FIGURE 4

Patent intensity, OECD countries, 1983-1990



Source: Ministry of Trade and Industry, 2001c.

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, a constant economic need for efficient transportation of goods to the U.K., Germany, Scandinavia, and the Baltic states has promoted the sea freight, truck, and railroad transportation industries from early on. Companies such as Maersk-Sealand have provided a highly efficient sea-land transportation of agricultural and industrial products. During the 1990s, further steps were taken in order to make physical transport of labor and goods more efficient within Denmark and to the major export markets.

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 this to a major shift in infrastructure. Yet, the Danes still have substantially fewer cars as compared to the Swedes and the Germans. In 2000, the Danes had 346 cars per 1,000 citizens, whereas the Swedes had 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

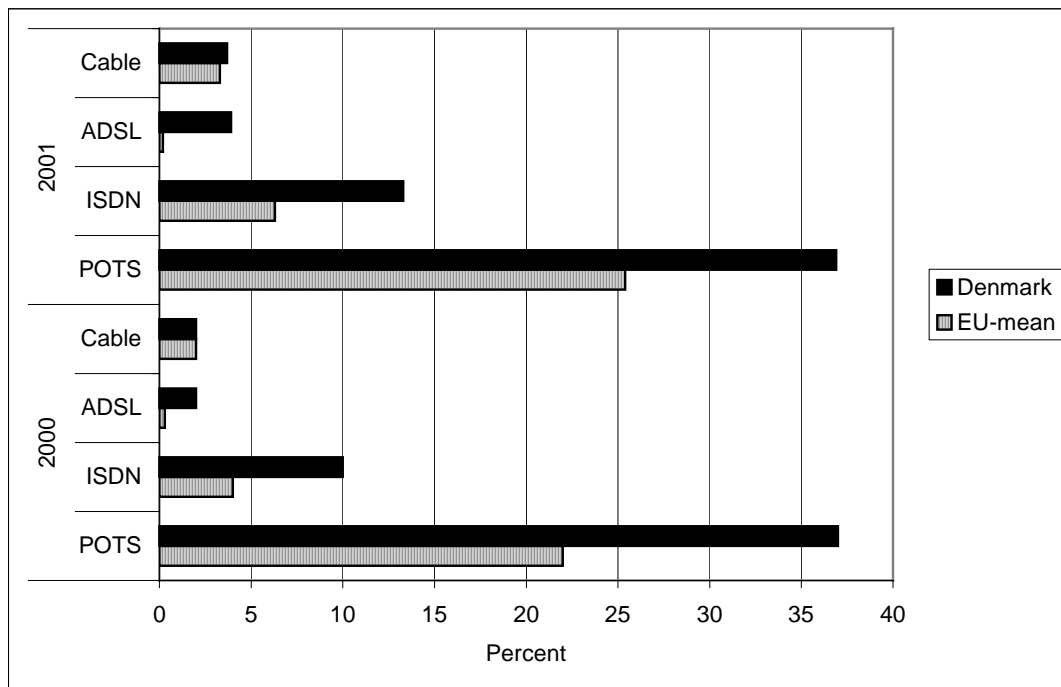
streamlining the physical transportation requirements even further. Access time to the major export markets has been reduced by two to three hours. For human transportation, a heavy investment in public transportation and a subway system in Copenhagen should help reduce commuting time.

With the physical infrastructure in place, Denmark and Sweden are hoping 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 have a mobile phone subscription package. In July 2000, only 2,800 households were using broadband, but at the end of 2001, the number of broadband subscribers had increased to 152,000 (National IT and Telecommunication Agency, 2002). Denmark had a higher number of ADSL and ISDN access points, as well as POTS, in both 2000 and 2001 than the EU average.

FIGURE 5

Internet access platform penetration in households, Denmark, and average EU figures for 2000 and 2001



Source: BDRC, 2001.

Looking at household Internet access, there has been a very rapid increase during the period from 1997 until 2000, regardless of age group. As shown in Table 12, there is only a marginal difference between the age group 16-29 years, and the age group 30-49 years. Yet, households with family members older than 60 had a significantly lower Internet penetration. Including access from household and/or job and education site, 74 percent of the population had access to 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). Percent (%)

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 have been 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., according to the OECD Technology Outlook. Also, it is 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 at a very modest level. Data from the Telecom Agency shows, however, that the number of secure servers increased rapidly in 1999 and 2000.

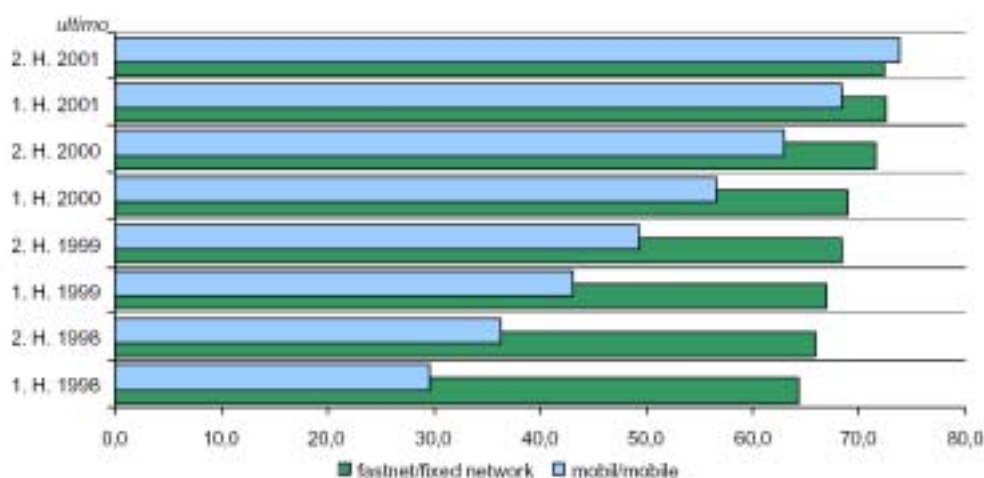
TABLE 13
Overall ICT penetration figures (1999)

	Denmark	Scandinavia	European Union 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

Source: ^a) ITU, 2001. ^b) OECD, 2000.

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

FIGURE 6
Fixed network and mobile subscribers per 100 inhabitants, 1998-2001. Percent (%)

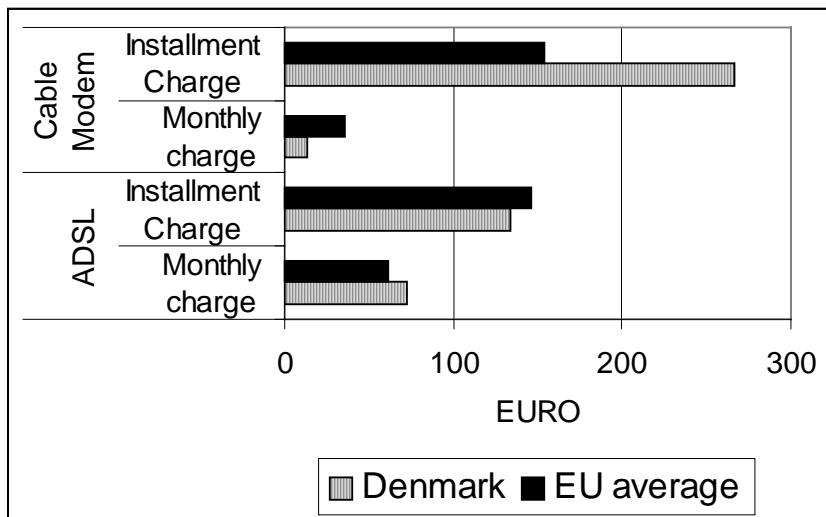


Source: National IT and Telecommunication Agency, 2002.

A very interesting observation is that Denmark has one of the highest installation charges for cable modem service as compared to other European countries, but the lowest monthly charges (as shown in 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 that there is little if any competition for changing providers once a consumer has signed up with one. Regarding ADSL, Denmark's rate 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.

FIGURE 7

Price comparison, ADSL and cable modem



Source: BDRC, 2001.

Turning to the information infrastructure in the private sector, more than 90 percent of all Danish enterprises have access to 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. Percent (%)

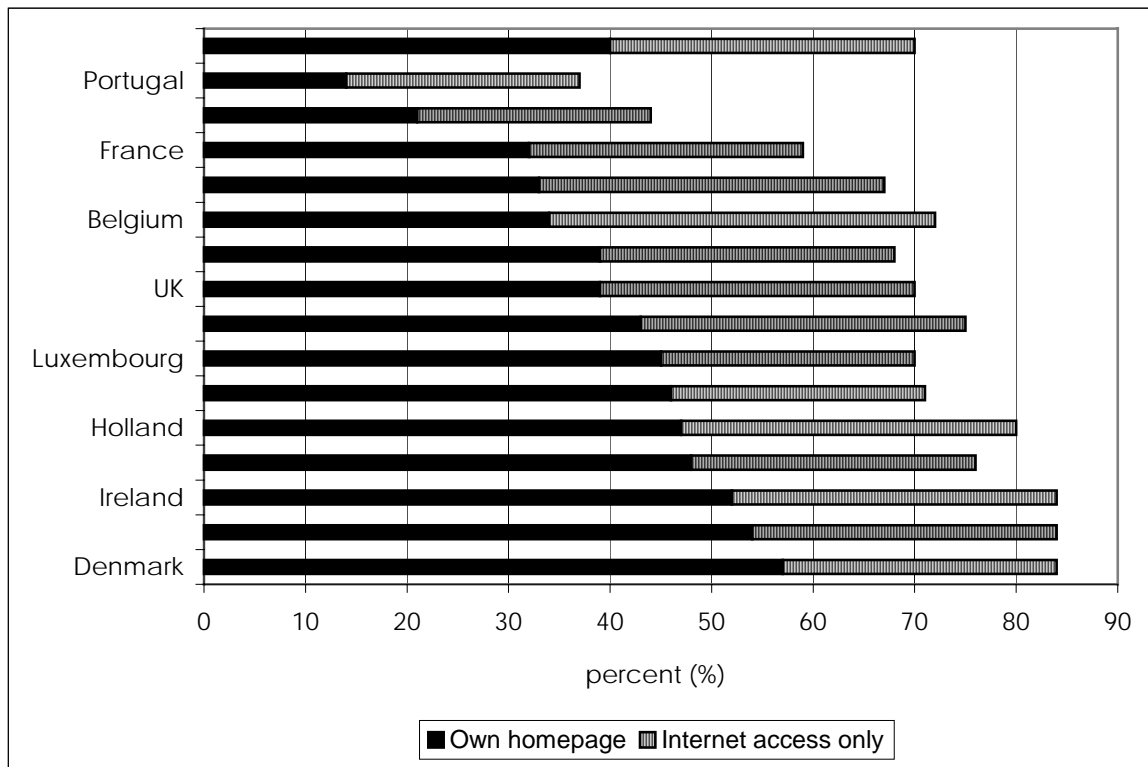
Number of employees	Internet access	Own homepage
10-19	87	84
20-49	93	84
50-99	95	91
100+	97	92
All	94	88

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 had either 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.

FIGURE 8

SMEs' Internet access and presence on the Internet by means of their own homepage, March 2000



Source: Eurobarometer, 2000.

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.

TABLE 15

Internet access distributed by sector and year. Percent (%)

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).

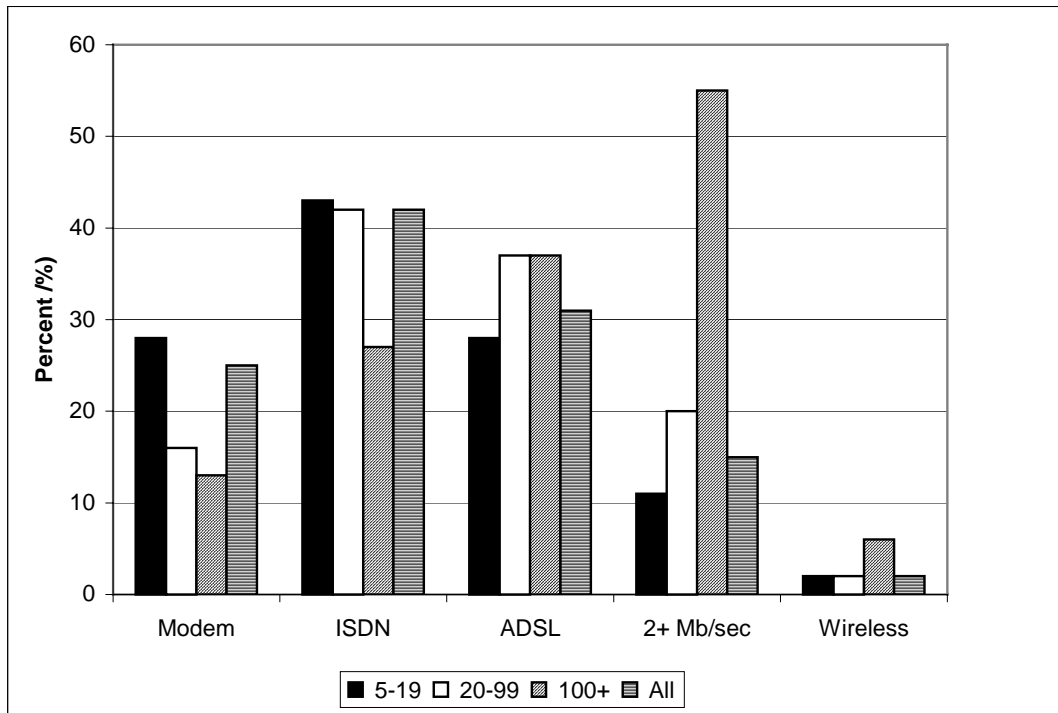
Extensive liberalization at the European level within the telecommunications sector has had a big influence at the national policy level. The liberalization of the telecommunications industry and a general growth in the market segment have increased the number of companies operating on the market and lowered prices. On average, prices have 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 have introduced more players and reduced rates, but they have also excluded the possibility of strong, coordinated actions in the innovation of the telecommunications area, as in the Japanese case.

FIGURE 9

Internet access for Danish companies distributed by size of company (number of employees), 2001

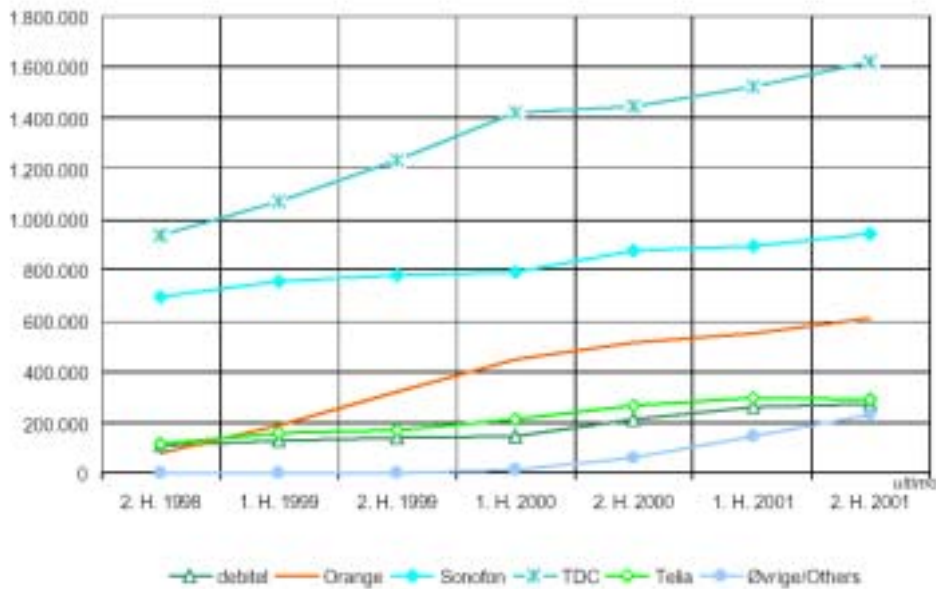


Source: Statistics Denmark, 2002a.

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 has also been impacted by this liberalization. Figure 10 illustrates the overall market and the entry of new market players. It is significant that the former telecom monopoly (TDC), which had consistently dominated the market in terms of subscribers before the liberalization, is still in a leading position. This 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.

FIGURE 10

Mobile subscriptions by company in Denmark, 1998-2001



Source: National IT and Telecommunication Agency, 2002.

The annual investments in telecommunications have 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 had 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 rapidly increase these investments (National Telecom Agency, 2000). Investments in development of the broadband width 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) has also calculated the total expenditures for obtaining property and plant (including transmitters, land, and buildings) used for telecommunication services. The data shows that Danish expenditures are at an average OCED level, but higher than in the U.S. Thus, one could expect this could lower the international (outside European Union) competitiveness of companies located in Denmark.

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.

Although the Scandinavian countries have a high penetration of mobile Internet technologies and mobile phones in particular, there is still substantially larger traffic on the fixed phone lines. An important reason why mobile phone use has 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 17

Fixed phone line and mobile traffic subscribers, traffic, and SMS messages, 1998-2001

		Number of subscribers (1,000) (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 has 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 rapidly increase in the Scandinavian countries in areas such as marketing, logistics, ticketing, news, and entertainment. The Danish auctioning of the 3G-net, held in the fall of 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 (chat, etc.).

It is worth noting that 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 the market adoption. Instead, the telecom operators are cashing in on the current user pattern.

In summary, the physical and telecommunications infrastructure is generally very 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

In general, *venture capital* has never been very plentiful in Denmark. In a survey published by the European Venture Capital Association (EVCA, 2002), 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 has been questioned by official Danish institutions, and it is argued that in reality the Danish venture market is substantially larger (Fond, 2001). Indeed, it is argued that ECVA is only capturing about fifty percent of the Danish market. This 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 has often been pointed out as one of the main weaknesses for the long-range competitiveness of the Danish economy.

One reason for the low availability of venture capital is that since 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. Another reason is the absence of large industries, which could be instrumental in providing venture capital, as has been seen, for example, in Sweden. A third reason is that the small Danish stock market has limited resources, and this 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 has been especially limited, although interest has been growing over the past few years. The number of participants in the venture capital market with interest in seed financing has grown from 17 in 1998 to 30 in 2001, and their available capital has grown from 570 million DKK to 2.6 billion in the same period. However, the actual investments have only increased from 137 million in 1998 to 172 million in 2001. In order to overcome the need for seed funding for start-ups, the government is funding eight "Innovation Centers" across the country. These 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" have been very successful at handing out funds for start-ups. Unfortunately, this program has reaped little in terms of long-term results, as very little venture capital has been 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 has especially been affected. The total amount cannot be estimated, but in general, start-ups have found it very 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 is hampering 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 in order to do the bridge funding. However, since the summer of 2000, these sources have 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 is heavily dependent on public sourcing, which most observers see as an obstacle to creating an efficient market. Accordingly, there is no doubt that this struggling venture capital market has not aided the development of e-commerce in Denmark. On the contrary, the lack of funds has been a significant barrier.

With regard to *payment mechanisms* for consumers, Denmark has been a world leader in the use of new technologies in banking since the introduction of the first on-line terminal banking system 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 dramatically reduce the number of (private) checks and substitute these with direct debit card transactions (Dankort). As of December 2001, 3.2 million debit cards were issued. In 2001, 715 million electronic transactions were performed. That is 9 percent more than in 2000.

A unique feature of the financial resources and payment mechanism is a very high penetration of home banking systems. About 30 percent of the households have access to home banking, and about 80 percent use electronic transfer of payments for electricity, rent, taxes, car repairs, etc., via their banks. Although the electronic payment systems have now been transferred to the Internet, the home banking and office banking systems are operating on proprietary software packages. Thus, the inter-operation ability and the ability of consumers and businesses to shift between these are limited, and require installation of dedicated software. However, payments between banks are all progressing electronically and point to a high readiness regarding financial resources. This is particularly true for the B-to-B segment. As a result, the use of checks and cash has been decreasing to a marginal level.

The substantial success is no doubt related to the fact that it is free for consumers as well as retailers to use the debit card, and practically all shops have either a Dankort terminal (where the customer swipes the card and enters a pin code) or manually accept the cards. The direct debit card, offered jointly by all banks in Denmark, has been 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 develop 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 has been 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. And reluctantly, PBS is now also supporting the SSL standard.

The number of debit card transactions on the Internet doubled from 2001 to 2002. The payment is very 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

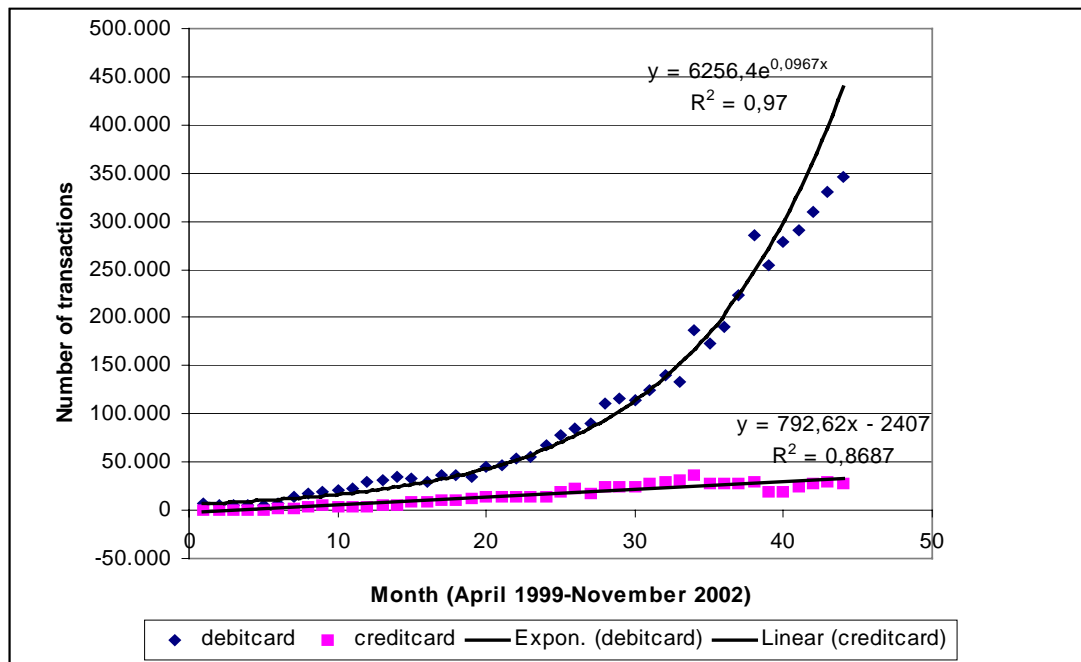
Note: * Debit card with a very limited credit and combined debit-Visa card holders.

Source: PBS, 2001, 2002.

The increase in B-to-C e-commerce transactions has been very substantial, but interestingly enough, it did not take off until after the dot.com breakdown. In Figure 11, we have analyzed the number of monthly payment transactions using debit or credit cards. 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 the data analyzed in Figure 11.

FIGURE 11

Internet Payment transactions, April 1999-November 2002, monthly transactions by debit card and credit card



Source: PBS, 2002.

The final important financial issue we highlight here is the non-EURO membership. Along with the U.K. and Sweden, Denmark is not a member of the common European Currency (the EURO), but has maintained the local currency, the kroner (DKK). We interpret this as having a possible negative impact on the B-to-C market, due to higher 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 the non-EURO membership.

In summary, venture capital in Denmark is weak in magnitude and timing. Venture capital has been in short supply at the seed market, in particular. 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 has not impacted B-to-B e-commerce. The low numbers of companies that actually handle online payments and the even fewer that accept high-end encryption payments, as well as the non-EURO membership, are also seriously inhibiting 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. This is in particular due to the already existing streamlined payment systems (salaries and invoices are all transferred to accounts directly), as well as electronic transfer payments, and the cash-ratio is still decreasing.

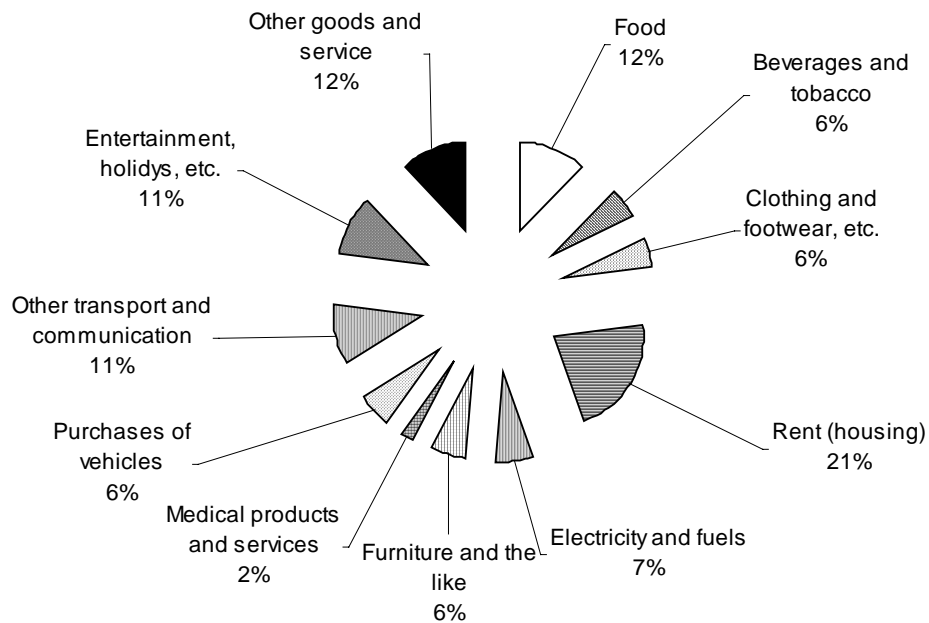
Consumer Preferences

In this section, we address consumer preferences as an environmental driver for e-commerce. We focus on the household expenditure composition, characteristics of the consumers who do shop online (e.g., gender, age), and the consumers' perceived barriers for e-commerce.

By European standards, Danish households are in general very domestic, with a large part of their income spent on the household, rather than traveling, etc. 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 that are related to the household, such as those reporting gas, electricity, and water consumption, and various sites with legal and maintenance information are very popular. Yet, these sites will not show up in most figures on B-to-C e-commerce, although a business transaction is performed.

FIGURE 12

Household consumption expenditures, percent (2000)



Source: Statistics Denmark, 2000.

When comparing Danish Internet-based B-to-C revenues with the overall rates in Scandinavia, the EU, the U.S., and the OECD, 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) demonstrated 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 had grown to 22 percent in Denmark and 32 percent in the U.S.

TABLE 19

B-to-C e-commerce trade and online transactions

	B-to-C trade in US\$M	B-to-C as % of GDP	% Internet users who purchased online in the past month		
	2000 ^a	2000	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 has personally used the Internet in the past month; an online shopper is an Internet user who has 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.

The top five list of what consumers buy online in Denmark, according to 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). Also, the surveys by Statistics Denmark have shown 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. This apparent marginalization could be due to the fact that the number of people with Internet access is increasing faster than the number buying. 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. At the other end of the purchasing spectra, 11 percent shopped on the Internet regularly in the third quarter of 2002, whereas in the third quarter of 2001, only 4 percent purchased online on a monthly basis. The marginalization of consumer readiness is more prevalent among females than males. As shown in the tables below, the age group 40+ years to an increasingly degree choose not to shop online. Also, the percentage that chooses

not to shop is higher among the population groups with limited education. Employment status also influences this 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 this one year, the ratio of people with no Internet access has been 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.

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 have consistently been the most prominent motivators during the past seven quarters. Less frequent motives are the larger supply, the ability to shop at any time, and that Internet shopping is less stressful.

TABLE 24

Consumers' single highest motive for shopping online, 2001 to second quarter 2002, percent

Drivers	2001				2002		
	1 st Q	2 nd Q	3 rd Q	4 th Q	1 st Q	2 nd Q	3 rd Q
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.

The statistical office also addressed the inhibitors of B-to-C e-commerce. 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, whereas 27 percent of the consumers report that they have no need to shop online.

TABLE 25

Consumers' barriers for shopping online, 2001 to third quarter 2002, percent

Drivers	2001			2002		
	1 st 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: There was no data available for the second quarter of 2001.*Source:* Statistics Denmark, 2001b, c, d, 2002c, d.

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 is decreasing at this particular moment in

time. As far as the segmentation of shoppers, we see the usual pattern 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 is facing fundamental challenges (Lundvall, 1999). The most common barrier to e-commerce is the lack of capabilities to innovate using ICT, combined with the fact that some goods are unsuitable for e-commerce. This 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).

According to Forrester (2000), as shown in Table 26, total B-to-B e-commerce turnover amounted to less than 2 percent of the GDP in 2000. That is the same level 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 at the average OECD level, Denmark is by no means a global leader. The figures 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, it has been estimated that the Internet based B-to-B revenues only account for 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.

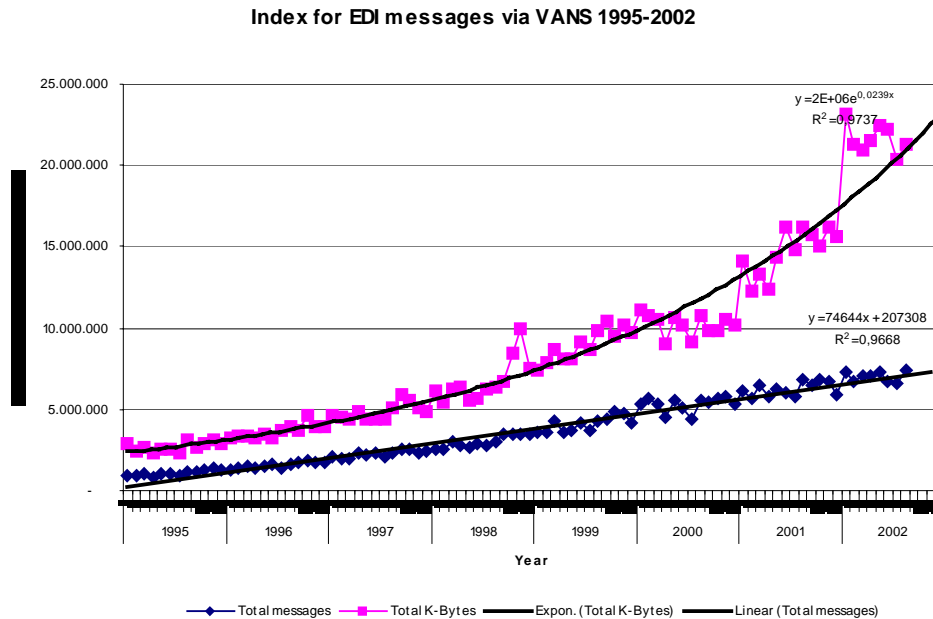
The data for 2001 from Statistics Denmark reveals a slight increase but not a substantial one. Furthermore, it is worth noting that around 80 percent of the B-to-B and B-to-C sales are domestic, and only about twenty percent are for export (Statistics Denmark, 2002a). One exception is Maersk-Sealand, 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 towards 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 have displayed data for K-bytes and messages. The increase in bytes is at a more exponential level than the growth in messages.

FIGURE 13

EDI messages through third party vendor, 1995-2002



Source: K.V. Andersen and N.C. Juul, 2003.

The analysis of B-to-B EDI traffic has also shown 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 have been 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). The turnover on these initiatives shows an increasing readiness for online procurement. Yet, there is still a lack of suppliers that support the online sales, and there is a lack of volume channeled through the digital e-procurement solutions.

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 had grown to 14 percent in 2002.

TABLE 27

Ordering of goods and services via the Internet within government, 1999 and 2002, percent

	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: K.V. Andersen and N.C. Juul, 2002.

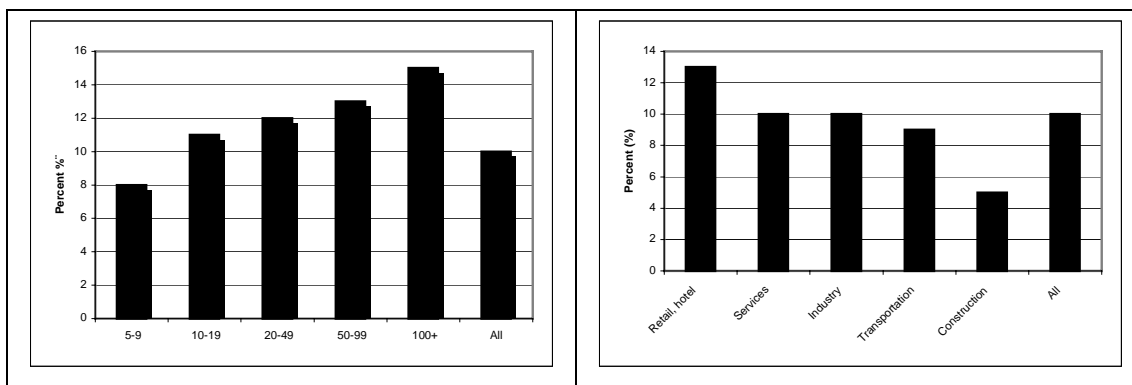
In general, the Internet is used more as a communication channel than a sales transaction channel. In terms of the elements in the value chain, support rather than primary activities dominate the use of e-commerce. The Internet is used by 90 percent of companies for general information retrieval, by 65 percent for payment transactions, by 60 percent to streamline communication with the public sector, by 50 percent to obtain information about competitors, and by 33 percent to recruit personnel (Statistics Denmark, 2000). Only 5 percent of the enterprises have 2 percent or more of their revenue generated from Internet orders.

During 2002, there was an increase in the number of shops that could receive payments online. 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 had jumped to 3,058 (PBS, 2001, 2002).

The primary business opportunities are within the retail, hotel, and restaurant sectors, whereas construction activities had less than the average B-to-C sales. As shown in Figure 14, the larger the company, the more successful they are on the Internet. This indicates major problems for Danish e-commerce diffusion, since the majority of the businesses are SMEs.

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)



Source: Statistics Denmark, 2002.

There have been many companies entering the B-to-C e-commerce arena, primarily in the financial sector, transportation, and logistics. The strong players, shown in Figure 15, 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.

FIGURE 15

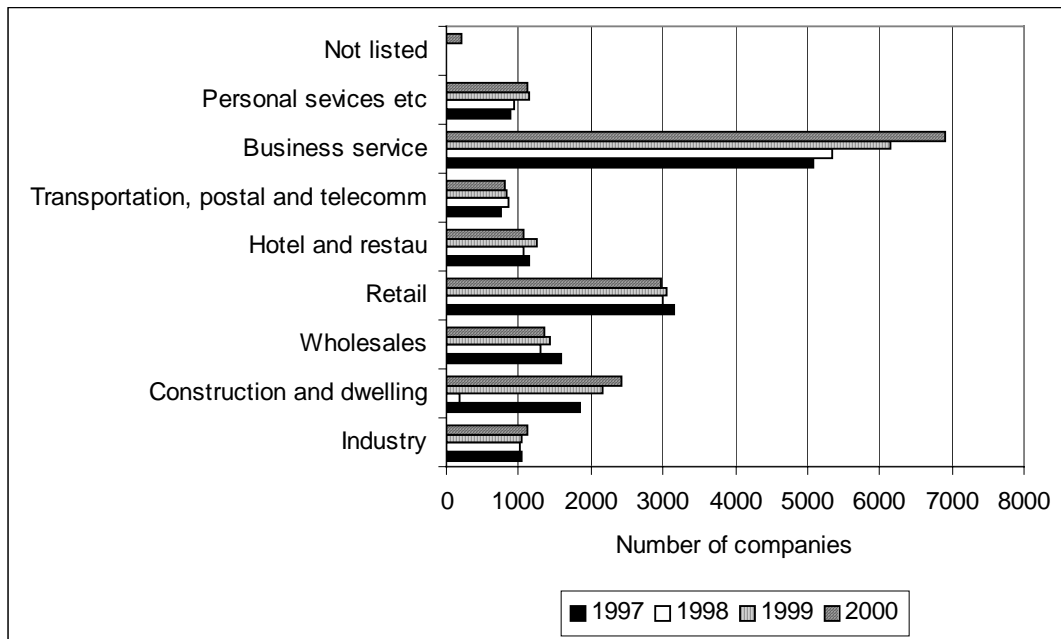
The dominant B-to-C e-commerce companies

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.

FIGURE 16

Start of new companies, 1997-2000, by business sector



Source: Statistics Denmark, 1999-2002.

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.

Social and Cultural Factors

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

In the pioneering work by Hofstede (1994) on cultural differences, Denmark was shown to have 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 in a positive way. This figure 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 the fact that it is a highly individualistic society, where one tends to take responsibility for oneself and 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 have access to the Internet. Ninety four percent of all Danish enterprises have access to the Internet, and more than 80 percent of companies with more than ten employees have 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 have a negative impact on B-to-C e-commerce because of the high availability of physical shops within reachable 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 has not been prevalent so far.

Consistent with most other developed countries, the aging population trend poses challenges to e-commerce adoption in two ways. First, the general disposable income level might be shrinking while the aging population requires more welfare services. This could potentially drive income taxes up, leaving less disposable income to spend online as well as offline. Secondly, 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 very 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 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 this development, there is a need to streamline work processes. This 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. This can be considered as 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 middle-income groups

have enough discretionary income to purchase goods and services online, and they have a strong need for labor-saving solutions.

TABLE 28

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); large and decentralized public sector
Human resources	Vocational training centers diffuse e-commerce and IT to population	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

PART 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 very 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, green papers, etc.

The European Communities have 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 there are minor departmental fights at the national level, conflicts in the European Communities due to functional and institutional aspects often arise, and have played a key role in the way e-commerce regulation has emerged. A crucial part of this 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 the DG XIII, is in charge of Enterprise & Information Society issues. In the DG X, Frits Bolkestein is in charge of taxation and internal markets. Although the DG information society has placed this issue high on the list of priorities, it is important to understand that there is only a small share of the total EU budget and policy actions 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 has been 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 has 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 heavy clash occurred between consumer protection interest groups that advocate for more direct legal regulation, and industry participation 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 the European Initiative on Electronic Commerce (1997); the eEurope Initiative: An Information Society for All (1999); and 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. There is a significant emphasis on 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 are:

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

Objectives in eEurope 2000 and eEurope 2002

Source: European Commission, 2000, 2002.

As illustrated in Figure 17, the policy focus of the European Community is primarily at the consumer and the public sector level, rather than businesses. Through the building of fast and secure infrastructures, the provision of optimal working conditions, learning, and acquisition of services from the public sector to citizens are provided. According to the eEuropa objectives for 2000 and 2002, the focus is on bridging the gap between the "haves" and the "have-nots" - the digital divide. On the content side, the emphasis is on provisions for information and services from the public sector – e-government.

On the national level, public and private sector policies and objectives have been formulated so as 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. This means that relative to most other societies, Danish e-commerce governance initiatives have a greater focus on bridging the so-called digital divide. Despite the fact that Denmark has 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 that has been in place since the early 1970s, and is characterized by a great concern for democratization and human factor issues (Bjørn-Andersen et al., 1982; Dybkjær and Christensen, 1994). It has been seen as more important to get everybody on the digital path than to merely have a smaller 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, had missed the IT manufacturing wave, and had a decreasing enrollment and supply of higher science education students, as well as low R&D funding. Thus, the objective of becoming the world's leading IT nation can be interpreted more as a desperate effort and an attempt to focus attention on the 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, as well as 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 have shifted substantially. Below, we 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 the 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.

In the second IT policy statement, “The Info-Society for All - the Danish Model” (Ministry of Information Technology and Research 1996), it was 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.” It was formulated as a direct goal that all Danish households and companies should be able to access the Internet. Three major knowledge diffusion initiatives have been launched specifically intended to diffuse e-commerce: the EDI-strategy in 1996, the e-commerce initiative in 1999, and the e-commerce action plan from 2002. In the following three sections, the content of these initiatives is briefly described. 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 through improvement of 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 due to 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 Research and Information Technology, together with the Ministry of Trade and Industry, launched the "Focus on e-commerce" initiative. This 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 players 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 e-commerce agenda from 1999 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 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 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 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 (Ministry of Science, Technology and Innovation, 2002) emphasizes that there is still underutilized economic potential related to e-commerce, which can be reached through recommendations by the present action plan. It is clear that there is still uncertainty related to e-commerce, as well as increased complexity, which demand information both in relation to businesses and to consumers. This, 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 has 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). There is also a very well organized system of vocational training for employees, 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 in 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 maybe 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. This results in entry into the job market for highly skilled labor at the master's level at the average age of 29.

Business schools have promoted education in e-commerce in both regular and executive programs. Also, the Danish government has 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, where IT skills in both technology and strategy have become a requirement. The IT University of Copenhagen was 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 curriculum.

In summary, the impact of the different knowledge diffusion initiatives has been very 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). There was effective collaboration among 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).

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

We assess the results of the knowledge diffusion initiatives as having positive impacts on the diffusion of e-commerce by increasing enrollment in IT –education, although there is a long timeframe for this strategy to have any impact. We also assess the knowledge diffusion initiatives as having increased the awareness and discourse on e-commerce, 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 will discuss the direct and indirect economic initiatives for enhancing e-commerce. 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 of this paper.

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 has mainly been given in order 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 have again been reduced (Research Council, 2001). This is in spite of the fact that part of the revenue from the 3G wireless auctions in November of 2001 is 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 have been at more or less the same level as the national research grants.

Within the telecommunications sector, annual investments have increased substantially since 1992, although there was a minor drop in 2000. In 1992, € 69 million was invested in telecommunications. In 1996, the investment had 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 rapidly increase investment (National Telecom Agency, 2000). Investment in the development of broadband width and other telecommunication investments will primarily come from the private sector.

Telecom 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.

The third issue we highlight here is the 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 get 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 have been necessary in order 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 so-called Lighthouse Project and the tax breaks on PCs, have 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, as well as 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 as the important policy regulatory initiatives with direct relevance for e-commerce. Whereas the liberalization efforts are viewed as having a positive impact, the other initiatives are either inadequate or have been too delayed to have much of an impact.

Liberalization and a general growth in this market segment have increased the number of companies operating in the market and reduced prices. On average, telecommunications prices have 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 players 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 have not been radically changed by the increase in the number of market players.

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. 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 have been introduced on ADSL, the bulk of Internet users still pay by the minute.

Despite the increase in the number of market players 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 requests 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 have been 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. There is an emphasis 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 Communities 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 has for a long time been seen as a threshold for the further diffusion of e-commerce. Yet, it is questionable whether this 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. As for marketing or registration of personal data, the principle has no practical implications, 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.

TABLE 29

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 that are 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.

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, with plans 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 was fortified even further by an institutional transfer to the powerful Ministry of Finance in 2001. At the local government level, various e-government initiatives have been 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, along with local enterprises, to align their procurement/sales systems in order 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 have been successful, the aggregated impact has been an early uptake of e-procurement, digital streamlining of work processes within government, and improvement in government-business-citizen communication. However, the implementation of the strategies has been rather incremental and lacks strategic vision and overall coordination.

Another policy initiative has been the national health data network, started in 1991. This network involves letters of discharge, test results, bills, etc. More than 85 percent of the physicians, the pharmacies, the health insurance companies, and the hospitals use the system, with coverage of more than 70 percent of the total amount of messages. Part of the health sector is public, but is predominantly contracted to private companies. The initiative in the health data network is from the public sector, but has spread most successfully in the private sector part of the health sector. Finally, the digitalization of the government-citizen-business communication has been 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

We have outlined the governance initiatives and assessed their possible impacts on e-commerce diffusion. Table 30 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 have rated the outcome in five categories: very successful (++), successful (+), neutral/unclear (0), unsuccessful (-), and very unsuccessful (--). Although we have categorized most of the initiatives as successful, players other than government have been responsible for much of the success as well. Also, throughout our analysis we have pointed to various non-decisions or inaction that could be interpreted as counterbalancing the positive impacts of actual initiatives taken.

TABLE 30

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/+)
		EU top level domain	
Economic incentives	Need for IT replacement and more socially-balanced diffusion of IT in households	Home PC tax relief	* High diffusion of PCs in households (++)
		Increased R&D in telecommunication	* 100% digitalization of phone lines and access points (++)
		Subsidy of e-commerce projects	* High CATV and web TV use (++)
	Low R&D expenses		* Low impact of investments and few start-ups (--)
Knowledge diffusion	Low enrollment in/supply of higher science education	New IT education institutions	* Increased enrollment in IT-education (++) but long time to impact (0)
		EDI and annual ITaction plan	* Increased awareness and discourse change towards e-commerce (++)
	Digital divide	IT Ministry	* Continuous increase in EDI use (+/0) and simultaneous increase in Internet-based B-to-B e-commerce
	EDI-centered Discourse	Project E-government Focus on e-commerce	
E-government	Lacking strategies for e-commerce	Mandatory e-procurement	* Early adoption of e-procurement (+), although limited to few items and lacking focus on CB and strategic impacts (-)
	Primarily inter-governmental IT use	Health data network (MedCom)	* Digital streamlining of internal public sector processes (+)
		Digitalization of the tax administration (processes and access points)	* Digital access and services for business and citizens (+)
	Widespread red tape		

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

PART 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 exclusively grew due to an increase in consultancy services, compensating for a drop in manufacturing.

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 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 – due to the streamlining of business practices and the rapid increase of technology. EDI increases in the mid-1990s were an indicator of this (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).

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 non EURO membership.

In the area of 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 rapidly diffusing. Other drivers for e-commerce include the long tradition of using home banking, smart cards, debit cards, and credit cards. Furthermore, European integration and a 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 have also identified serious inhibitors to B-to-C e-commerce. These 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; the non-EU membership; and the conflicting goals and means in European Community regulation.

TABLE 31

Primary B-to-B and B-to-C environmental and governance drivers and inhibitors

	B-to-C	B-to-B
Drivers	<ol style="list-style-type: none"> 1. Lifestyle changes (working at home and the smart home, office, and street), wireless, mobile 2. Long tradition of digital trust (banking) 3. European integration (entry of more companies leading to lower prices) 4. High GDP per capita 	<ol style="list-style-type: none"> 1. Collaboration within agriculture, health care, and finance 2. Ongoing need for cost and labor time reductions 3. Open economy and European integration 4. Vocational training 5. Government support for knowledge diffusion
Inhibitors	<ol style="list-style-type: none"> 1. Lack of supply of goods and services 2. Dominance of low-tech manufacturing sector and services (primarily government) 3. Lack of content or high-end B-to-C products 4. Short work hours 5. Equal income distribution 6. Regional/local orientation rather than global orientation 7. Security concerns; desire to inspect product first 8. Non-EU membership 9. Conflicting goals and means in the European Community regulations 	<ol style="list-style-type: none"> 1. National and regional e-commerce rather than global e-commerce due to low immigration 2. Export orientation toward neighboring markets 3. Lack of commitment to fight structural inhibitors (educational aspects, taxation)

In this paper, we have 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 has been progressing slowly, with the exception of the public health system.

Throughout the 1980s and 1990s, budgets have been decentralized, various functions have been outsourced, and the central and shared IT applications have been 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 is a major shift from the success of the Scandinavian countries during the 1970s, when the Scandinavian government

followed a line-of-command style. Government was a strong force in IT diffusion. We are skeptical as to whether the government still has the means 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 goal of the government -- to be a world leader in IT in general and e-commerce in particular.

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