

Diffusion and Impacts of the Internet and e-Commerce: The Case of Denmark

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ABSTRACT

The Danish companies are ahead of the US in B2C e-commerce. With the exception of Germany, Denmark is leading the group of 10 countries included in the survey data forming the basis for this report. The average global sample and countries as Germany is performing substantially better than Denmark on B2B on-line sales.

Danish companies have high level of investments in IT, have the lowest barriers for e-commerce and the highest levels of e-commerce drivers. On most indicators for readiness e-commerce such as companies use of e-mail, intranet, EDI, extranet, and provision of mobile services, the Danish business sector has adopted the technologies that can foster e-commerce further on.

Yet, our analysis points to alarming and surprisingly findings. The companies have primarily managed to incorporate e-business in the processes controlled by the company themselves (marketing and customer service) but have failed to implement e-business in interorganizational system and business integration. Thus, the companies appears to have the inhouse means aligned for e-commerce exploitation, but have yet to transform their external business relations. The financial sector is the best performing sector with regards to sales, but not leading the pack in on-line services. Also, deficiencies of e-services are found especially within manufacturing companies, where few companies are providing product configuration information and order tracking. The Danish companies have failed to implement services such as gift certificates and product catalogs at their web site.

There are not a substantially higher number of Danish companies reporting on successes in terms of more efficient business processes, increased staff efficiency, cost reductions, increased sales areas etc. On several of these dimensions, there are even fewer Danish companies reporting on positive e-commerce impacts.

We group the policy implications of our analysis in four classes of actors (government, industry associations/service providers, companies and citizens/ individuals) suggesting that government will have to increase research, increase the production of engineers, intensify and broaden public e-procurement and e-government, further facilitate e-commerce (de-) regulation to boost on-line use in all business processes, further European harmonization of legislation regarding cross border on-line business processes, accelerate liberalization of labor market to make it easier to expand and contract, and increase public funding schemes for entrepreneurs.

Finally, we point to the need for critically accessing the role of industry associations/service providers in awareness campaigns, and stress the need for surveys and identification of weaknesses as well as best business practice and dissemination of this knowledge in spite of the reluctance of SME's to listen. For the companies, there seems to be a need for giving higher priority to integration with suppliers/customers, focusing on exploiting benefits of e-business investments and higher awareness and engagement in e-marketplaces. For the citizens/ individuals the report discusses the need for continued emphasis on further education and training in IT, languages and business processes and the increased willingness to change.

Introduction

Denmark is a small, relatively homogenous, urbanized, highly industrialized, open economy, with a population of 5.3 million and a long tradition of early adoption of new IT-based services. Electronic bank transfer of payments, salaries transferred from employer to banks, direct debit cards for shopping and check-less electronic clearing between banks were available and used for the majority of transactions from the mid 1970s.

From the late 1990s Danes and Danish companies have adopted the Internet to a high degree. Denmark is among the leading countries for use of home PC's, access to Internet, on-line sales, and mobile communications (ITU 2002). In the B2B area, Danish companies are typically further along the uptake route than e.g. their European counterparts.

The conditions for e-commerce have been fairly favorable. No significant stumbling blocks are reported, and in general, conditions especially for B2B are very good (high level of education, good service institutions for advice and consultation, general high innovativeness of Danish companies, general high level of IT competence, and high availability of vendors of different solutions). To the extent that companies could see their cost-benefit, e-commerce/e-business was adopted, especially in order to reduce costs, improve coordination with customers and/or suppliers and because customers demanded it.

The experiences with e-commerce have been mixed. Many new dot.com's were created in the late 1990s, but unfortunately, most of them disappeared rather quickly. But the enormous publicity, enthusiasm and hype around the dot.com's spurred traditional industry to start innovating through adoption of e-commerce. Often it turned out to be more difficult/expensive than expected, but the biggest disappointment has been that customers were not ready. This is probably the single most often quoted objection to e-commerce, 'end consumers do not come to our web-site, and in the B2B field, our larger trading partners, are not yet ready' (PLS Rambøll 2002).

The impacts are still rather marginal. But predictions are clearly beyond the stage of 'wishful thinking'. Consumers are now picking up e-commerce with annual growth-rates of up to 50%, and B2B has become a major growth area. A Danish survey showed that 10% of all companies have a significant standardized communication (EDI or XML), 21% have an e-strategy, the 'Internet-related turnover' is now around 10% of the GDP, and that this figure is expected to increase by 84% from 2002 to 2004 (PLS Rambøll 2002). This is likely to have a significant impact on markets, value chains, collaboration structures, and patterns of industry concentration.

Official government policy is very strongly in favor of supporting IT in general and Internet-based commerce in particular. In the speech to the nation on 31 December 2000, the Danish Prime Minister Poul Nyrup Rasmussen expressed:

"I envision a Danish society that is the world leading IT-nation in 2003. This is not an impossible dream. All Danish citizens need to have access to the Internet and the possibility of having an e-mail account. The public sector needs to be at the cutting edge with regards to exploiting IT".

This is more than an 'empty' vision statement. It is followed by a large number of initiatives from liberalizing the telecom market, pushing legislation (e.g. electronic

signature), increasing IT-education and supporting innovators/entrepreneurs to use the government supported procurement portal for the governmental part of the public sector. Every year the Minister of Research and Information Technology is required to report to parliament on state-of-the-art' regarding progress towards Denmark as an Information Society. Political initiatives often use the public sector as a locomotive to push Internet and IT adoption.

1 Background and a Priori Expectations

1.1 Country Background

Denmark is a small, homogeneous country, not by choice, but by default. The former glory of the Viking age and the Middle Ages is history. England, Normandy, Northern part of Germany, Estonia, Sweden, Iceland, Norway and other possessions have been lost in many wars, and with them the huge cultural diversity. Today the population is around 5.3 million amounting to roughly 2% of the EU and 1% of European population. Urban population is among the highest in Europe (85%), and household size among the lowest (1.8 persons).

GDP/capita is among the highest in Europe, \$30,470 in Denmark compared to the US figures of \$ 36,211 for 2000. However, comparisons with the US are difficult due the high volatility of the \$ against the Euro/DKK. The 20% weakening of the \$ against the Euro in the first month of 2003 has brought the GDP/capita on par with the US.

The import/export part of GDP is also among the highest (>30%). Income is distributed much more evenly than in any other country except the other Scandinavian countries, and the government plays a major role in economy through one of the highest taxation on income and sales tax rates anywhere.

But Danes get something for their taxes – a large number of welfare services (including 12 month paid maternity leave, free primary and secondary healthcare, generous unemployment benefits, and free higher education), six weeks annual paid vacation, a 37 hour work week, and early retirement plans from age 60.

Furthermore, among the OECD countries, Denmark has the second most efficient labor market after the US, meaning that the efficiency in acquiring and firing staff is very high. This flexibility is a strong stimulus for innovators and existing companies to innovate and try out new ventures. If things do not go according to plans, it is possible to lay off staff without financial obligations towards the employee.

1.2 Globalization

Having almost half of the total export/import with the four neighboring countries, the Danish economy is part of a regional economy rather than part of a global economy. The largest export in 2002 went to Germany (20.6%), Sweden (11.3%), England (8.6%) and Norway (6.0%), while the largest imports came from the same countries Germany (23.3%), Sweden (12.8%), England (8.6%), and Norway (4.4%) (Statistics Denmark 2003).

TABLE 1. Globalization Indicators, 2002

	Establishment		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Percent of companies with							

establishments abroad	39.8	73.5	49.6	46.1	30.7	40.6	23.9
Percent of companies with headquarters abroad	14.4	18.7	12.1	12.6	17.6	14.5	8.5
Mean percent of total sales from abroad	22.7	46.9	39.1	22.4	16.4	23.4	12.1
Mean percent of total procurement spending from abroad	28.9	36.4	30.3	49.6	10.0	29.1	20.3
Degree affected by competitors abroad ^e							
Low	67.8	29.7	49.9	72.5	69.6	66.9	68.3
Moderate	16.9	15.8	12.1	13.1	23.0	16.9	15.7
High	15.2	54.4	38.0	14.4	7.3	16.2	15.2

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact question wording: Using a 5-point scale where 5 is significantly affected and 1 is not at all affected, please tell me how much your establishment is affected by competitors from outside your country. Scores of 1 and 2 were classified as low, a score of 3 as moderate, and scores of 4 and 5 as high.

Source. CRITO Global E-Commerce Survey, 2002

On all dimensions, the Danish companies show a substantially higher level of globalization in the sense of having higher percent of companies with establishments abroad, having higher percent of companies with headquarters abroad, having higher percent of total sales from abroad, and having a higher percent of total procurement spending from abroad, than the total sample.

If we compare the three sectors, the manufacturing sector is clearly the most global. where most of the companies thrive as subcontractors to multinational companies, or play a leading role in very small niches like Novozymes in industrial enzymes, Coloplast in ostomy and continence care, Danisco in food ingredients, Oticon in hearing aids, etc.

Contrary to the manufacturing sector, the distribution sector in general is local catering almost exclusively for the Danish market and to a small extent the neighboring countries. One exception is the Maersk Sealand shipping line, which has the largest container fleet in the world.

Finally, the finance sector is traditionally local catering only for the Danish market due to different financial regulations in Denmark and most other countries in Europe. During the last 20 – 30 years, deregulation has made it economically attractive to enlarge the focus. Large-scale mergers in the Nordic countries have taken place across the borders, and the largest banks are expanding especially around the Baltic Sea.

1.3 Industry Structure

Turning to the industry structure, agriculture played the major role until the late 19th century, where manufacturing started. Being almost void of natural resources (except for crude oil/gas sufficient for covering around 50 years of consumption) as a basis for manufacturing, agriculture was the most important export until the middle of the 20th century.

Historically, the unique position of Danish agriculture started in the late 19th century, when the inexpensive grain especially from the US started being exported to the major markets in Europe. Being at that time a grain exporter, Danish farmers could not compete. There was no escape. Denmark could not impose import bans on the inexpensive grain. Instead a frantic race started to transform the agriculture to animal production, in the beginning bacon, ham and butter. Today Denmark is still the fourth largest producer of pigs in Europe, and the largest exporter of pork in the world, but the role of agriculture is continuously diminishing.

Today we see a much more diverse picture as revealed in Table 2, where we have shown the distribution of GDP according to industry sector for Denmark compared to three other countries (France, Germany and United States). Surprising to most observers, who know the agricultural background of Denmark, by far the largest sector today is manufacturing contributing a quarter of the GDP. This sector is followed by distribution (whole sales, retail, restaurants and hotels) and finance like in most developed countries.

TABLE 2. GDP distributed by industrial sector, Denmark, France, Germany and United States (%)

Sector	Denmark	France	Germany	United States
Agriculture, hunting, forestry & fishing	5.3%	3.0%	1.3%	1.9%
Mining and quarrying	1.1%	.5%	n.a.	1.7%
Manufacturing	25.1%	24.5%	28.6%	19.6%
Electricity, gas and water	2.5%	3.0%	n.a.	3.1%
Construction	6.9%	5.5%	7.4%	4.5%
Wholesale and retail trade, restaurants and hotels	16.8%	19.1%	n.a.	18.1%
Transport, storage and communication	11.4%	7.2%	6.1%	6.4%
Finance	23.9%	29.1%	16.7%	30.8%
Community, social and personal services	7.0%	8.0%	n.a.	12.4%
GDP total US\$ (Billions), 2001	161.5	1,309.8	1,846.1	10,065.3
GDP per capita (US\$), 2001	30,193.57	22,138.21	22,459.65	35,445.80

Sources. United Nations National Accounts 1999, World Bank World Development Indicators, 2003.

Comparing the relative importance of the different sectors to France, Germany and the US, it is interesting to note the relatively high importance of agriculture and transport for the Danish economy.

The reason for the relatively large agricultural sector is as mentioned above largely historical. The reason for transport sector is also historical. Since the Viking age, Danes have been a relatively large seafaring nation, and the relatively very important position of shipping for the Danish economy is to a very large degree thanks to Maersk Sealand, which is the largest container shipping line in the world.

The three sectors specifically focused on in this report, manufacturing, retail/wholesale and finance are discussed in more detail in the three sections below.

1.4 Sector Analysis

For the further comparative international analysis we have selected three sectors, manufacturing, retail/wholesale and finance. Employment and number of companies/establishments in the three sectors is shown in Table 3 and 4. These figures will be discussed in the following sections, where the three sectors are characterized.

TABLE 3. Number of establishments/companies within manufacturing, retail/wholesales, and finance

	Manufacturer.		Retail/Wholes.		Finance		All sectors	
	N	%	N	%	N	%	N	%
SME	21,808	98.6	50,463	99.9	49,746	99.8	285,694	96.4
Large	300	1.4	33	0.1	86	0.2	1,030	3.6
Total	22,108	100.0	50,463	100.0	49,832	100.0	286,724	100.0

Source. UCI, IDC 2002

TABLE 4. Number of employees within manufacturing, retail/ wholesales, and finance

	Manufacturer.		Retail/Wholes.		Finance		All sectors	
	N	%	N	%	N	%	N	%
SME	311,473	62.3	296,578	64.7	216,394	79.1	172,0921	74.4
Large	188,809	37.7	91,091	35.3	57,102	20.9	590,936	25.6
Total	500,282	100.0	387,669	100.0	273,496	100.0	2,311,857	100.0

Source. UCI, IDC 2002

Manufacturing Sector

The manufacturing sector includes machinery, tools, instruments, electronics, and a wide range of components produced as subcontractors to especially the larger industries in Germany and Sweden.

Key characteristics of the Danish industry structure likely to determine the direction and impacts of e-commerce are: 1) Dominance of SMEs; 2) Relative few MNCs, global brand leaders and/or upstream powerful companies; 3) Niche position of larger companies.

The industry is almost exclusively dominated by SMEs (small to medium size enterprises). Companies with less than 200 employees employ no less than 74% of the *private sector* labor force. To the extent that these companies are internationally oriented (with substantial part of their turnover generated through export) it is obviously critical to introduce e-business in order to further transactions and collaboration with trading partners. 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). Many SME's have a large challenge in keeping up.

For other part of the industry segment, (local oriented wholesales and producers) the issue of size has been found not to be critical. In a survey from 2001 on steel and manufacturing producer wholesales and in a survey in 2002 on the grocery sector, we

found that size did not hold any explanatory power for uptake of B2B e-commerce (Henriksen 2002).

The Danish industry structure *lacks MNC* (multinational corporation) presence in the e-commerce diffusion. *Especially it lacks presence of strong upstream players* in the value chain and lacks *global brand leaders*. There are a few exceptions within the *biotech industry* with Novo Nordic Group, Lundbeck, ACADIA, Ferring Pharmaceuticals, Genmab, Nutri Pharma, and Structural Bioinformatics and in traditional *manufacturing*, where the globalization of Danfoss, Grundfos, Carlsberg Breweries and the Lego Group has also pushed for development and implementation of e-logistics.

The third characteristic of Danish industry is that the larger companies are almost all niche players. Danfoss is a world leader in compressors, Grundfos is one of the leading manufacturers of high quality pumps, Radiometer is one of the leaders in blodgas measurement instruments, and Denmark has three of the five largest producers of hearing aids (Oticon, GN Resound, and Widex).

For many of these companies, there has for more than a decade been *collaboration between small industry players* and large manufacturers using EDI (Andersen et al. 2000). The efficiency of EDI-systems, once established, is very high. Obviously, the Internet-based EDI is generally much easier and cheaper to install, but the security, ease of use and inter-organizational integration is usually easier to achieve in maintaining the EDI solutions using direct dial or third party vendors transportation mean.

Retail/Wholesale

The Danish retail sector has a very high concentration. Only 33 large companies employs more than on third of the labor force (35.3%). This is primarily due to the fact that only two retail supermarket chains control more than two thirds of all sales of supermarket products. The remaining close to 300,000 employees are employed in the 50,000 small shops/wholesale companies employing on average only six staff. These are almost all located in the urban areas. There is one shop for approximately 100 Danes.

The mail implication of this concentration has been that ‘everybody’ has waited to see what the two largest supermarket chains would do, especially when it came to inter-organizational business processes (ordering, order confirmation, dispatch document, invoices etc.). According, when the work on EDI was commenced, there was a high level of collaboration among the players in order to make sure that inter-organizational systems were following the same standard. Within the supermarket retail sector this was the HANCOM standard, and all industrial articles in the retail trade are provided with the EAN-article number. Already in the late 1980s, the supermarket acquired the main bulk of their supplies from the manufacturers using EDI through one large Value Added Network Service (VANS) provider. Four documents were used, order, order confirmation, invoice and payment. Later on, more documents have been added. On the one hand EDI provided a high IT-literacy, but on the other hand, a very effective EDI mitigated against shifting to Internet-based e-commerce.

Banking, Insurance and other Financial Services

Traditionally, the banking sectors and insurance sector has been very scattered. Within the banking sector alone, there were > 500 independent banks in Denmark in the late 1960s. This number has been drastically reduced, and today, in spite of the large

number of companies, the concentration in the finance sector is very high. Table 2 and 3 shows while the 86 largest companies employ 57,102 (20.9%) of the work force, the remaining 49,746 companies employ only 216,394, or on average approximately four employees. But the picture is even more pronounced. In the banking sector alone, the two largest banks employ > 50% of all bank employees, and in the insurance sector, the three largest companies employ > 50% of all insurance staff. This strong concentration is a result of many mergers, especially in the banking sector, a development strongly fueled by IT and other economics of scale areas.

Danish banks have been in the forefront as regards using IT from the mid 1960s. 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 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 'pay-as-you-earn-tax' in 1970, which almost made it necessary for every salary earner to have a bank account where salary after tax was deposited. The Dataløn (joint salary system offered by all banks) was introduced in 1969. Furthermore, the government enforced personal identification number made identification easy, and the government restrictions on maximum interest margin and a ceiling on loans (to avoid overheating of the economy) in the mid 1980s strongly reduced competition among banks to a question of service including the number of banking outlets. This strongly regulated banking market also made it a 'no-brainer' to establish a joint infrastructure and collaborate between the several hundred banks for any kind of transfers. Over and above the joint salary system from 1969, a joint electronic transfer payment system was introduced in 1974 and debit card (Dankort) was introduced in 1983. Already before the end of the 1980s, the number of Dankort transactions had surpassed the number of personal checks, and the use of checks today is extremely limited.

In the last decade, national and international mergers have been the overall trend for decades. 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 mean of reducing processing costs. From 1999 to 2000, the numbers of customers using Internet to complete banking transactions doubled (Ministry of Information Technology and Research 2000). With its more than ten million Internet users mid 2002, the Nordic Nordea bank, which covers all of Scandinavia, has approximately the same number of Internet users as Bank of America, but has more Internet transactions than any other bank in the world including Bank of America.

The mega banks are still supporting the joint debit-card (Dankort), making it extraordinarily inexpensive for new players like the totally Internet-based bank Basisbank, who for less than one million Euro got access to several thousand ATMs (Asynchronous Transfer Mode) spread over the whole country. The possibilities of the smaller banks of 'hanging in there' in spite of the large technological developments associated with e.g. e-commerce is that they joined forces and utilize a few large joint data centers, which also is doing their systems development. However, it is likely that in the future we shall see the mega banks go their own way in certain areas/functions.

The high level of regulation means that there is a high incentive to provide e-commerce services since this will give better service and will potentially save

substantial amounts for those customers servicing themselves on the web site. Furthermore, given the high concentration of IT-development/operations, costs of new e-commerce applications could be kept at a reasonable level.

1.5 Factors Influencing Diffusion

The Danish IT approach in general and in e-business in particular is focused on use rather than development/ production (Andersen, Bjørn-Andersen & Henriksen 2003). This reflects a business environment that lacks large high-tech (IT) manufacturing industry. But this has not been a barrier. On the contrary, the global IT-vendors have had an almost level playing field with very few governmental restrictions on the application and use of IT. This has been a positive impact on the diffusion of e-commerce, which for our further analysis will be separated into the two areas of B2B and B2C.

Within the B2B area, the Danish economy and business environment especially within manufacturing is characterized by a high number of SMEs and lacking MNC dominance. This in itself suggests that B2B e-commerce would not evolve. However, there are a large number of other factors suggesting a fairly high level of diffusion of e-commerce in the B2B area driven by factors like: 1) Extensive industry collaboration within several sectors. Within retail, the development of standards and EDI strongly encouraged all major players to coordinate their IT, and in the finance sector strong collaboration between all banks even to the extent of having joint systems for debit/credit cards, joint infrastructure for ATM's, and joint system for Electronic Funds Transfer (EFT) have raised the level of skills/systems countrywide. 2) Constant pressure for efficiency in form of cost and labor time reduction due to some of the highest salaries anywhere. 3) Good possibilities for harvesting IT-enabled labor savings due to the relative good possibilities of laying off staff. 4) Open economy with a high level of contacts to foreign companies. 5) Very extensive and successful vocational training programs, and 6) Strong governmental support to knowledge diffusion both through half a dozen technological service institutions, offering advice and rather inexpensive consultation for all companies, but especially SME's.

In the area B2C e-commerce, the high GDP/capita, the high per cent of women on the labor force, and the rather equal distribution of income, are likely to be the important driving forces leading to an early uptake of e-commerce. Furthermore, more households are connected to the Internet than anywhere else in the world. Households are to an increasing degree adopting broadband and mobile technologies. Even mobile technologies are diffusing rapidly. Other drivers for e-commerce in the B2C area includes the long tradition for using home banking, smart cards, debit cards and credit cards.

However, we have also identified serious inhibitors to B2C e-commerce (Andersen, Bjørn-Andersen & Henriksen 2003). These includes the regional / local orientation rather than global orientation of vendors, the consumers' desire to inspect products first, the non-EURO membership limiting transparency and ease of use when buying in EU, and the very effective retail-structure, reducing the relative advantaged of buying over the Internet. Furthermore, the collapse of the most high profile Danish e-tailors (e.g. Toycity and Gubi), the lack of high-end B2C brand leader products going digital, the lack of the largest companies functioning as locomotives, have all contributed to the e-commerce level being lower than what could have been expected.

2 Methods

Denmark is one of the ten countries participating in the CRITO/GEC Global e-commerce survey. This report presents the results regarding the Danish survey compared with the average of the ten countries. This is the primary data source for the analyses. The number of interviews is shown in Table 5. Three sectors are investigated, with half the respondents from large companies, and the other half from SME's, which in this sample are defined as companies with 25 – 249 employees. The number in each cell varies from 32 - 35, and the total number of interviews is 200.

TABLE 5. Survey sample

	Manufacturing	Retail/ Wholesale distribution	Banking, insurance and other finance	Total number of companies
Large (250 +)	34	34	32	100
SME's (25 – 249)	35	33	32	100
Total	69	67	64	200

Source. UCI, IDC, 2002

Furthermore, three more studies play a substantial role in the further analysis. First a telephone survey of the extent to which 23 largest, most highly respected and most innovative Danish companies within manufacturing, retail and telecommunication services are using e-commerce in their key business processes. This survey was carried out in August 2001, and includes status questions as well as forecasts for autumn of 2003.

A third survey is the PLS Rambøll 2002 e-business survey carried out in collaboration with largest newspaper, two ministries and the association of IT industries. This has three elements: 1) A survey 1,215 Danish companies constituting a representative sample of the 35,000 Danish companies, who have more than 5 employees. 2) A sub sample of the 300 largest companies is surveyed with 124 respondents. 3) A sample of 108 dot.com. companies who have been surveyed every year since 2000. The three surveys form a very comprehensive survey, specifically aimed at mapping the Danish e-business landscape.

A fourth study is a cross-national survey of the B2C web-sites of the 10 largest Australian and Danish companies within ten industry sectors, which have been carried out three times in Denmark and twice in Australia in the period between January 2000 and summer of 2002 (Elliott & Bjørn-Andersen 2002)

Finally, a number of other sources are used including case studies, literature surveys, and interviews with key informants.

3 E-commerce Readiness

3.1 Information Infrastructure

Use of E-commerce Technologies

The use of different types of e-commerce technologies/applications by establishment size and by industry sector are shown in Table 6, using data from the GEC survey. This allows a direct comparison with the global survey.

TABLE 6. Use of E-Commerce Technologies, 2002

Percent using ...	Establishment Size ^a		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
E-mail	100.0	100.0	100.0	100.0	100.0	100.0	98.5
Web-site	96.2	98.4	94.0	93.8	99.9	96.3	74.1
Intranet	83.8	79.7	71.4	74.0	99.5	83.7	63.6
Extranet	39.7	44.2	35.6	39.4	42.3	39.8	32.7
• accessible by suppliers/ business partners ^e	29.9	33.4	25.3	32.5	29.8	30.0	20.9
• accessible by customers ^e	23.0	25.8	34.5	26.8	13.8	23.1	17.8
EDI	68.9	77.7	54.4	78.9	66.5	69.1	44.3
• over private networks only ^e	16.1	32.6	13.0	21.1	13.6	16.5	19.4
• Internet-based only ^e	20.6	8.9	18.0	12.6	29.6	20.3	8.4
• both ^e	31.4	34.7	23.1	45.1	21.3	31.5	15.9
EFT	73.4	75.2	78.0	58.6	86.1	73.5	43.4
Call center	27.1	37.7	27.4	33.8	21.0	27.4	32.3

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Percent based on total sample.

Source. CRITO Global E-Commerce Survey, 2002

The general picture is that Danish companies are ahead of the average in the global sample. In some areas the difference is larger than in others. This will be dealt with below.

It is clear that **e-mail** by 2002 has reached full saturation in all three sectors of industry. This does not mean that everybody in the organization is using e-mail e.g. for contacts to customers. E.g. the largest Scandinavian bank, Nordea, has still not introduced e-mail between all customers and their staff. But staff obviously has access to e-mail among each other and for B2B contacts.

The same holds true for a company **website**, where the penetration level among Danish companies is from the mid to high nineties for the three industries, clearly higher than the average of the global sample.

Intranet is used by two-thirds of the companies within manufacturing and distribution, while there is a 99% uptake for the financial institutions. And while the general picture is one of larger establishments being more technological advanced than SME's, this is not the case for intranets. We believe that this is an indication of the technology not being vastly difficult to acquire/install, and that a slow uptake is more likely to one of

organizational adaptiveness / innovation, and here there are many indications that smaller establishments are more flexible.

Extranets on the other hand is only used by 30 – 40% of the companies, but it is noteworthy that this is a higher percent than in any of the other countries in the global sample. Especially we find the manufacturing companies having developed extranets both for their suppliers and/or other business partners and for their customers. This points in the direction of collaboration within logistics, procurement and joint R&D as the prime targets of extranets rather than marketing, sales and after sales service towards customers. This observation is consistent with the general pattern of the many Danish SME companies being relatively far down the road of integrating with their large business partners.

On the other hand it is worth noting the rather low figure of 13.8% extranet utilization for the finance industry for customers. This is surprising since ‘all banks’ have a rather elaborate Internet presence for their customers, as do insurance companies. The explanation must be that there are some other finance institutions who do not allow their customers access to their website.

As regards **EDI**, around two-thirds of all are using EDI. Distribution sector is clearly ahead (78.9% against an average for Denmark of 69.1% and 44.3% in the global sample), a result of an early adoption of EDI already in the early nineties. That early innovation is still bringing the distribution sector ahead. This is also reflected in the figures for use of private networks as against use of Internet. While the distribution sector is ahead on use of private (but also somewhat old-fashioned) networks, the manufacturing and finance sectors are both ahead using Internet for EDI. Again we see that Danish companies in all sectors have a significant lead over the global sample.

The purposes for using EDI are illustrated in a survey of the top 300 companies in Denmark (PLS Rambøll 2002). In this survey, the following e-business functions are used:

- Communication with customers/business partners (82%)
- Sharing of knowledge via intranet (69%)
- Recruitment (69%)
- Marketing (66%)
- Communication with suppliers (65%)
- Obtaining orders (45%)
- Electronic payments (41%)
- Integration with administrative systems and accounting systems (40%)

The same holds true for **EFT**. Three out of four Danish companies, large as frequently as small, use EFT for payment, predominantly in relation to buying and selling. This is well ahead of the global sample. But it is interesting to note that the manufacturing (78.0%) and finance (86.1%) sectors are way ahead of the distribution sector (58.6%).

Finally there is a question of **call centers**. Here Danish companies have a surprising lower penetration than the global sample. There are certainly call center companies available, but they have evidently not managed to obtain the same market share that we see elsewhere, especially in the Americas. One reason could be that Denmark has fairly

strict closing laws. This means that ‘every’ B2B company is open 8.00 – 16.00, and ‘every’ shop is open from 9.00/10.00 in the morning until 17.30. Nobody expects business partners to be open at other times, so why have a call center for calls outside these hours? And for calls during opening hours traditional call centers are used inside the company. At any rate, call centers have not taken off like in the global sample, although an excellent example of use of call center was the Lego Company, when they introduced the Lego World shop. At one point this website and other Lego business created so much telephone traffic from abroad that the call center outsourced to IBM in Denmark had 20 staff primarily handling calls for Lego.

For the information infrastructure applications mentioned above, it is clear that these technologies are no longer strategic advantages. They are operational necessities. And it only a question of a few years before an almost 100% penetration will have taken place. Compared to the global sample, Denmark seems to be around 6 – 18 month further along the adoption/diffusion curve than the global sample or indeed the average OECD country. This conclusion is supported in the Australian/Danish comparative study of the use of Internet for marketing, sales and after sales services in the B2C area (Elliott & Bjørn-Andersen 2002).

Enterprise Integration Strategy

A key requirement for any Internet application to contribute to the overall efficiency is the extent to which it is possible to integrate the web-applications with the existing largescale transaction oriented systems. This was measured in the GEC survey and shown in Table 7 illustrating the extent to which Internet applications are electronically integrated with internal databases and information systems on the one hand and with those of the suppliers and business customers on the other hand.

TABLE 7. Enterprise Integration Strategy, 2002

	Establishment		Sector ^b			Total	
	Size ^a		Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Extent to which internet applications are electronically integrated with ...	SME	Large					
Internal databases and information systems ^e							
% little to none	22.0	49.7	42.5	21.4	14.3	22.7	52.5
% some	24.2	27.3	24.3	29.0	19.6	24.3	23.6
% a great deal	53.8	23.0	33.2	49.6	66.1	53.0	23.9
Those of suppliers and business customers ^f							
% little to none	58.3	66.3	63.6	47.5	67.5	58.5	72.1
% some	27.0	18.3	17.2	27.4	30.7	26.8	18.3
% a great deal	14.7	15.3	19.1	25.1	1.7	14.8	9.6

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the extent to which your internet applications are electronically integrated with your internal database and information systems. Scores of 1 or 2 are categorized as "little to none", a score of 3 as "some" and scores of 4 or 5 as "a great deal".

^f Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the extent to which your company's databases and information systems are electronically integrated with those of your suppliers and business customers. Scores of 1 or 2 are categorized as "little to none", a score of 3 as "some" and scores of 4 or 5 as "a great deal".

Source. CRITO Global E-Commerce Survey, 2002

For both of these measures, Danish companies have integrated further than the average of the global sample. Furthermore, a more specific comparison with German and French companies show that 53% of Danish companies 'to a great deal have integrated their internet applications with internal databases and information systems' compared to 31.8% of the French 31.8% and 27% of the German companies. On the second dimension 'integration with internet applications of those of suppliers and customers', the comparable figures (adding to 'some extent' and to 'a great deal') 31,6% of Danish, 19.2% of the French and 27.8% of the German companies.

For manufacturing this picture is reflected in the fact that the predominantly SME size companies are functioning as subcontractors to larger typically multinational companies. When that is the case they need to integrate their own systems internally, and they need to integrate with the systems of especially their customers in order to be flexible, agile, innovative, and competitive.

But it is interesting to note that finance enterprises have integrated much more internally, while the integration with suppliers and customers are spearheaded by distribution. The high level of standardization of products in finance (money!) makes it necessary and advantageous to integrate internally, but the very high security requirements makes it difficult to integrate externally with anybody not dedicated to the same high level of security.

The situation for distributors is almost the opposite. Products are standardized, but there are many thousands, and there is very strong incentive to modify and integrate systems across enterprises in order to enhance effectiveness and reduce the number of errors. On the other hand, the figures also show that this is an area where there is much room for improvement. Clearly, most enterprises have only just started scratching the surface, and we should expect large improvements in development of inter-organizational systems.

Content/Services to Mobile Customers

When it comes to providing mobile content and services, this is fairly new phenomenon. The typical 9.6 kbits telephone connection does not provide many opportunities, but the advancements towards 2.5 G, GPRS, and Wi-Fi are providing new possibilities for mobile communications. The Scandinavian countries strongly spurred by Ericsson and to an even higher degree Nokia, are latching on to these new possibilities.

Many companies tried developing applications using the WAP protocol in 2000. The initial launch of the WAP phone sold many phone sets, but most customers soon got disappointed with lack of usability and the narrow bandwidth. However, early 2003

several WAP applications are now in existence. E.g. the Danish financial daily Børsen is providing tailor-made financial news for customers using the Nokia Communicator. Each of such applications has a small but rather dedicated number of users. The percent of the companies in the GEC Survey providing or planning to provide mobile services is shown in Table 8.

TABLE 8. Content/Services To Mobile Customers, 2002

	Establishment Size ^a		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Percent providing or planning to provide mobile content or services ^e							
Already available	29.6	14.6	.2	20.4	52.2	29.2	13.7
Plan to add within the next year	12.1	15.9	21.6	13.2	6.5	12.2	18.2

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Today it is possible to access content or services from various mobile devices such as mobile phones and handhelds such as Palms or Pocket PC devices. Does your organization provide or plan to provide content or services that mobile customers can access?

Source. CRITO Global E-Commerce Survey, 2002

The difference between the three sectors may at first sight be surprising. Finance is very high but when one thinks of a service like offering balance on an account, it becomes clear why most of the banks already are offering that to consumers. On the other hand, almost no manufacturing companies are offering mobile services. Their customers are not moving around, and it is still more advantageous to use Internet application over physical lines than wireless.

It is noticeable that twice as many enterprises in the Danish compared to the global sample are already providing mobile services. Also, it is interesting to note that the number of enterprises in Danish sample planning to use mobile services is significantly smaller than in the global sample. This could be analyzed as the mobile market in Denmark has reached a saturation point. Yet, it could also be interpreted from the angle that the Danish companies have adopted the mobile services and now are exploiting the technology in the communication with its customers, business partners, and own employees.

Denmark seems well positioned to be (b-) leading edge in the development/application and uptake of such mobile services. In a survey published in September 2002, Denmark was number 2 after Hong Kong as the 'Top Mobile/Internet Index rankings worldwide' (ITU 2002). However, it should be noted that the difference in index are very small, from Hong Kong (65.88) to number five United States (65.04).

Our analysis in this section shows that larger companies have a higher utilization of almost all of the different technologies, but the difference is surprisingly little. And between the different industry sectors, Finance is clearly ahead using Intranet and EFT, while the distribution sector is ahead in using EDI, especially over private networks. And if one compares with the two large developed countries in Europe, France and Germany, Danish companies are substantially ahead on almost all dimensions.

3.2 IT Investments

The level of IT investments in Denmark is higher than the average in the global survey. In general, the IT-infrastructure is in place, and the most basic Internet services have been implemented almost universally. There is a large difference between the three sectors of our survey. Finance sector got off to an early start already in the 1960s and have kept the lead. Distribution also got a significant boost in the early 1990s due to the EDI initiatives and the joint efforts to standardize and automate. Manufacturing got off to a later start, but is likely to catch up as the possibilities for inter-organizational systems are likely to bring substantial savings regarding in logistics, inventory, and procurement, but also enhancements in R&D and all customer business processes from marketing to sales and after sales service.

4 Key barriers and Incentives

4.1 General Conditions for Development of E-commerce

Over and above the infrastructure and IT investment, there are other necessary conditions for the development of e-commerce. We have earlier grouped these into 1) industry structure, 2) financial resources, 3) human resources and 4) social/cultural factors (Andersen et al. 2002).

An industry structure dominated of SME's in Denmark is often mentioned as a drawback since the investment is relatively larger for the SME. However, this is to a large extent mitigated by a strong tradition for collaboration and there are more than one hundred associations and interest organizations competing to support enterprises with e-commerce as with everything else. Especially the partly government supported 'technology support centers' employing several thousand employees, are playing a major role in updating and assisting enterprises in developing and transforming themselves to compete on the new conditions.

Financial resources have been very short in supply for new ventures or start-ups, but relatively seldom for already established enterprises. There are exceptions where the financial situation was limiting innovation, but the crucial factor is the cost-benefit of the business plan.

Human resources have been identified as a bottleneck, especially when it comes to very highly skilled specialists (Andersen et al. 2002). On the other hand, the worlds highest penetration of PC's in schools (25% in 2002) (European Commission 2002), the vocational training system and the policies on furthering the acquisition of PC's in the home has paid off. Human resources are in general well equipped and well positioned for coping and utilizing the new possibilities.

Social/cultural conditions could be a key to understanding a slower B2C diffusion than we have seen elsewhere. Danes have not had the big incentive to change to buying on-line. Easy access to off-line shopping, easy payment via debit-card, and low risk when

shopping in traditional stores, have reduced the incentive to shop on-line. These characteristics may also apply to countries like Japan, Singapore, and France.

4.2 Drivers for E-commerce

There are a number of drivers to the e-commerce development in a particular sector or a particular country. The GEC survey has illustrated this in Table 9 below showing the Danish data, and in Table 10 showing a comparison with the two other countries in Europe.

TABLE 9. Drivers For Internet Use, Establishment Size. Denmark, Germany, and France. 2002

% indicating driver is a significant factor ... ^b	Denmark		Germany		France	
	SME ^a	Large	SME ^a	Large	SME ^a	Large
Customers demanded it	52.2	43.4	24.6	36.8	14.3	25.3
Major competitors were online	37.7	37.0	42.9	41.9	22.0	23.3
Suppliers required it	13.9	27.2	8.2	13.7	9.5	13.0
To reduce costs	56.9	40.7	20.4	17.6	18.2	22.3
To expand market for existing product or services	45.7	38.8	58.4	31.6	21.3	30.0
To enter new businesses or markets	37.2	27.4	45.9	39.1	20.2	21.9
To improve coordination with customers and suppliers	50.7	62.3	42.0	49.2	41.6	36.2
Required for government procurement	14.9	4.3	1.9	10.8	14.6	19.8
Government provided incentives	3.3	5.5	2.0	1.1	9.3	1.7

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees. Survey sample sizes for are 100 establishments classified as SME and 100 as large.

^b Exact wording of question: Using a 5-point scale where 5 is "a very significant factor" and 1 is "not a factor at all," please rate how significant each of the following was to your organization's decision to begin using the Internet for business. A score of 4 or 5 was classified as "a significant factor".

Source. CRITO Global E-Commerce Survey, 2002

TABLE 10. Drivers For Internet Use. Denmark, France, Germany, Global, 2002

Percent indicating driver is a significant factor ^c	Europe			Global ^b
	Denmark ^a	France ^a	Germany ^a	
Customers demanded it	52.0	14.6	24.8	36.9
Major competitors were online	37.7	22.0	42.9	31.3
Suppliers required it	14.3	9.6	8.3	22.3
To reduce costs	56.5	18.3	20.3	35.7
To expand market for existing product or services	45.5	21.5	57.9	47.9

To enter new businesses or markets	37.0	20.2	45.7	42.0
To improve coordination with customers and suppliers	51.0	41.4	42.1	43.7
Required for government procurement	14.6	14.8	2.1	15.2
Government provided incentives	3.3	9.1	2.0	8.3

Notes: ^a Responses were weighted based on the total number of establishments by employee size within the sector for each country.

^b Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^c Exact wording of question: Using a 5-point scale where 5 is "a very significant factor" and 1 is "not a factor at all," please rate how significant each of the following was to your organization's decision to begin using the Internet for business. A score of 4 or 5 was classified as "a significant factor".

Source: CRITO Global E-Commerce Survey, 2002

TABLE 11. Drivers for Internet Distributed on Sector.^a Denmark, Germany, and France, 2002

% indicating driver is a significant factor ^b	Denmark			Germany			France		
	Mfg.	Distrib.	Finance	Mfg.	Distrib.	Finance	Mfg.	Distrib.	Finance
Customers demanded it	59.1	52.3	48.2	32.6	22.3	27.7	15.1	14.5	13.8
Major competitors were online	36.0	26.8	50.0	29.8	45.5	53.7	23.9	19.9	31.8
Suppliers required it	17.8	18.9	7.1	32.3	2.3	.1	5.4	10.9	10.0
To reduce costs	57.7	59.8	53.0	32.5	16.3	24.8	16.0	18.7	21.1
To expand market for existing product or services	42.8	45.5	46.8	51.0	61.3	45.1	23.5	18.9	34.3
To enter new businesses or markets	36.6	33.0	41.1	39.3	49.6	27.6	21.6	19.3	23.2
To improve coordination with customers and suppliers	52.9	58.6	42.5	58.9	38.0	35.2	37.2	44.0	33.0
Required for government procurement	21.4	19.6	6.0	7.6	0.1	5.8	10.2	14.6	26.8
Government provided incentives	3.9	0.6	5.7	8.6	0.0	2.3	1.7	11.7	7.2

Note. ^a Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65). Survey sample sizes for

Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance.

^b Exact wording of question: Using a 5-point scale where 5 is “a very significant factor” and 1 is “not a factor at all,” please rate how significant each of the following was to your organization’s decision to begin using the Internet for business. A score of 4 or 5 was classified as “a significant factor”.

Source. CRITO Global E-Commerce Survey, 2002

In a small, open, competitive, international oriented, high cost economy like the Danish, it is not surprising that the three most important drivers are cost reductions (56.7%), that customers demand it (52.0%), and to improve coordination with customers/suppliers (51.0%). Not only are these three identified as the most significant drivers, they are also the ones where the Danish sample is significantly higher than the global sample taken as one, but it is also larger than the two other most developed countries in Europe (table 9a). We believe that this is an indication of a high level of preparedness in the Danish society.

This is also consistent with the PLS Rambøll 2002 report about Internet use in Denmark, where it is concluded that the key efficiency drivers for 2003 will be

- Integrating the Internet part to administrative and accounting systems
- Logistics and efficiency in flow of goods

If we look at the three sectors, there are fairly small differences expect for three factors that we would like to discuss here. First of all it is important to note that no less than 59.1% of manufacturing organizations claim that ‘customers demand’ their use of Internet. This is consistent with the story that Danish manufacturers live and die by their ability of integrating with their often large B2B customers.

Secondly, it is worth noting ‘that major competitors were on-line’ was perceived to be a strong driver in the financial sector (50.0%). This is easily explained by the very advanced IT-applications that the largest players could show, and a very real threat that unless a bank could offer Internet-banking, it would definitely look dated.

The third driving factor, which is not equally relevant for the three sectors is ‘required for government procurement’. This is for obvious reasons not as relevant for finance sector (only 6.0% of the companies state this driver), while it was 19.6 and 21.4 for distribution and manufacturing sectors. Actually at first sight it could be surprising that this factor is only mentioned by one in five given the huge effort by government to force the public sector to procure on-line, partly because the government issued a circular requesting all Danish governmental institutions to procure on-line, and partly because the Danish governmental sector has commissioned the first European Governmental procurement portal DOIP from the middle of 2002. However, DOIP has got on to a slow start, and one also has to take into account that many organizations do not sell to governmental institutions, even though it is covering more than 50% of the GDP.

4.3 Barriers to E-commerce

The account of the perceived barriers to the e-commerce adoption and diffusion are shown in Table 12 –16 providing the figures for three sectors as well as the comparative figures with the global survey.

Only one factor is standing out as being of substantial significance, which is that of having a ‘need for face-to-face customer interaction’. A more careful look at the

importance of firm size reveals the surprising fact that larger companies find face-to-face more important than SMEs. A possible explanation is that smaller companies are likely to be more specialized and have fewer customers enabling them to get to know customers better and thereby reducing the necessity for face-to-face contact.

TABLE 12. Barriers/Difficulties for e-commerce. Denmark, France, Germany, Global. 2002

Percent indicating statement is a significant obstacle ... ^c	Denmark ^a	France ^a	Germany ^a	Global ^b
	Need for face-to-face customer interaction	33.6	46.5	11.9
Concern about privacy of data or security issues	22.7	20.0	24.9	44.2
Customers do not use the technology	26.8	30.5	24.2	31.4
Finding staff with e-commerce expertise	14.6	20.3	41.2	26.5
Prevalence of credit card use in the country	4.7	13.6	21.6	20.3
Costs of implementing an e-commerce site	12.8	21.8	32.3	33.6
Making needed organizational changes	14.4	22.2	30.8	23.9
Level of ability to use the Internet as part of business strategy	19.1	16.2	14.3	24.8
Cost of Internet access	5.8	5.7	1.6	15.1
Business laws do not support e-commerce	15.1	24.1	5.1	24.2
Taxation of internet sales	8.7	19.9	1.5	16.5
Inadequate legal protection for Internet purchases	11.8	38.7	20.8	34.1

Notes: ^a Responses were weighted based on the total number of establishments by employee size within the sector for each country.

^b Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^c Exact wording of question: Using a 5-point scale where 5 is "a very significant obstacle" and 1 is "not an obstacle," please rate how significant the following obstacles are to your establishment's ability to do business on-line. A score of 4 or 5 was classified as "a significant obstacle".

Source: CRITO Global E-Commerce Survey, 2002

TABLE 13. Barriers/Difficulties for e-commerce among SME and LE. Denmark, 2002

Percent indicating statement is a significant obstacle ... ^c	Establishment Size ^a	
	SME	Large
Need for face-to-face customer interaction	33.2	48.2
Concern about privacy of data or security issues	22.5	30.8
Customers do not use the technology		

	27.1	15.0
Finding staff with e-commerce expertise		
	15.0	0.7
Prevalence of credit card use in the country		
	4.8	2.7
Costs of implementing an e-commerce site		
	12.3	34.0
Making needed organizational changes		
	14.2	24.6
Level of ability to use the Internet as part of business strategy		
	19.1	17.5
Cost of internet access	5.7	8.1
Business laws do not support e-commerce		
	15.3	7.0
Taxation of internet sales	8.9	.8
Inadequate legal protection for Internet purchases		
	11.7	16.8

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Using a 5-point scale where 5 is "a very significant obstacle" and 1 is "not an obstacle," please rate how significant the following obstacles are to your establishment's ability to do business on-line. A score of 4 or 5 was classified as "a significant obstacle".

Source. CRITO Global E-Commerce Survey, 2002

TABLE 14. Barriers/Difficulties, Manufacturing sector. Denmark, Germany and France. 2002

% indicating statement is a significant obstacle ^e	Denmark	Germany	France	Global
Need for face-to-face customer interaction	33.1	23	36.1	31.5
Concern about privacy of data or security issues	18.8	20.9	23.5	47.1
Customers do not use the technology	22.4	26.4	27.2	30.3
Finding staff with e-commerce expertise	8.1	28.2	5.5	23.8
Prevalence of credit card use in the country	0.3	17.3	19.2	22.4

Costs of implementing an e-commerce site	20.4	22.5	20.1	32.6
Making needed organizational changes	13.1	26.9	19.3	23.8
Level of ability to use the Internet as part of business strategy	17.2	14.6	18.1	28.0
Cost of internet access	4.4	4.6	11.1	13.5
Business laws do not support e-commerce	12.8	17.0	20.5	27.6
Taxation of internet sales	6.1	7	13.0	14.0
Inadequate legal protection for Internet purchases	19.0	13.3	15.9	37.3

TABLE 15. Barriers/Difficulties, Wholesale/ Retail Distribution. Denmark, Germany and France. 2002

% indicating statement is a significant obstacle ^e	Denmark.	Germany	France	Global
Need for face-to-face customer interaction	27.5	8.8	51.1	34.2
Concern about privacy of data or security issues	12.7	21.5	15.2	40.4
Customers do not use the technology	31.9	24.3	33.7	33.1
Finding staff with e-commerce expertise	13.9	47.7	23.9	28.8
Prevalence of credit card use in the country	0.0	23.0	11.8	19.9
Costs of implementing an e-commerce site	8.0	37.2	23.6	34.9
Making needed organizational changes	12.5	34.2	23.6	24.8
Level of ability to use the Internet as part of business strategy	14.7	14.1	16.2	23.7
Cost of internet access	6.3	0	3.8	16.3
Business laws do not support e-commerce	10.8	0	23.6	22.6
Taxation of internet sales	13.4	0	23.5	18.8
Inadequate legal protection for Internet purchases	12.5	2.2	47.1	33.6

TABLE 16. Barriers/Difficulties, Financial sector. Denmark, Germany and France. 2002

% indicating statement is a significant obstacle ^e	Denmark	Germany	France	Global
Need for face-to-face customer interaction	39.8	11.6	37.5	40.1
Concern about privacy of data or security issues	34.7	65.1	45.2	62.0
Customers do not use the technology	23.9	18	16.6	23.2
Finding staff with e-commerce expertise	18.7	13.5	26.7	19.9
Prevalence of credit card use in the country	11.4	19.7	14.1	15.4

Costs of implementing an e-commerce site	13.8	14	11.9	27.6
Making needed organizational changes	17.0	9.3	19.1	17.5
Level of ability to use the Internet as part of business strategy	24.4	14.7	11.2	20.8
Cost of internet access	6.0	8.8	6.4	12.7
Business laws do not support e-commerce	19.9	21.6	35.0	23.3
Taxation of internet sales	5.5	1.2	15.5	8.2
Inadequate legal protection for Internet purchases	7.2	26.2	35.1	26.0

Also, the data shows that the need for face-to-face contact is especially high in the financial sector, where there are a lot of private customers occasionally needing face-to-face contact at important personal crossroads (new house, new member of family member, investment decisions). At such crossroads customers need somebody to talk to e.g. about different insurance needs, where many contacts have an element of persuasion/negotiation. This is not easily carried out using Internet, where there is an obvious lack of many context cues, and where it is difficult/impossible to use intonations, irony and feelings.

For all the other barriers to e-commerce it is characteristic that the Danish respondents express a uniformly lower level of barriers/difficulties than in the global sample. On most of the dimensions, less than half the respondents are identifying the individual factors as significant. We suggest three possible explanations.

Firstly, we believe that objectively it is probably correct that there are less barriers/difficulties for enterprises in transforming themselves to Internet-based applications in Denmark. The different environmental factors are rather positive, and any significant barrier has been addressed, but of course not eliminated, by government, industrial associations and/or general service institutions.

Secondly, a reason for the rather low perceived barriers could be that Danish enterprises by and large are further ahead than the average enterprises in the global sample. We have argued before that this is the case, and it is quite conceivable that once an enterprise has 'got its feet wet', and started implementing different types of Internet-based applications, 'übung magt den meister' (German: the more you try, the easier it becomes). The fact that the second most mentioned barrier/difficulty is that 'customers do not use the new technology' support this view. This barrier has also been mentioned quite frequently by Danish Internet-frontrunners like Danisco and Novozymes, both producing goods to be used large brand manufacturers, who find that the mega-companies (Nestlé, Unilever, Procter & Gamble etc) of this world are not prepared to procure electronically, and that this is holding them back (Interviews with Jan Sindesen, Danisco and Mette Vestergaard, Novozymes 2002)

In general we can conclude that the by and large there are many positive drivers in the Danish society, and the barriers are most likely less severe than in most other countries.

5 Diffusion of E-commerce

5.1 Diffusion of e-commerce use at country and industry level

Extent and Rate of Diffusion over Time

E-commerce has traditionally been associated with B2C sales, and the Christmas sales in the US 1998 as the first major step forward. The year 1999 showed a doubling of sales in most countries and for most products. Accordingly, most forecasters forecasted triumphantly (and naively) in 1999 and 2000 that on-line retail sales would double every year (e.g., Boston Consulting Group 2000). And they were not the only ones. Gartner Group, Forrester, AMR, and many others were competing on bringing the highest forecasts for future on-line sales. Today we all know the story of the dot.com burst.

Unfortunately, Christmas of 1998 was also the peak of class action lawsuits because so many families had their Christmas ruined because the goods bought on-line did not appear until after Christmas. This fact bears evidence to one of the key reasons why so many dot.com's did not survive. They did not have proper fulfillment systems. Actually, as it turned out, most of them did not have proven, efficient business processes in any area, except perhaps marketing.

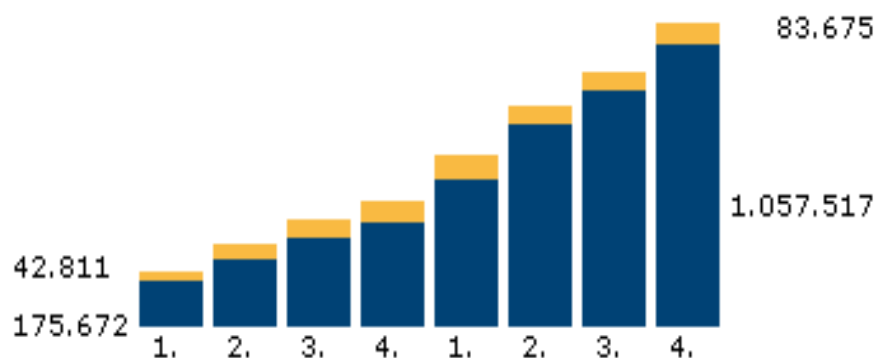
However, the dot.com hype had a significant impact on traditional industries. It absolutely scared the 'hell of them'. A good example was the 'Industry day' in September 2001. This is the most important day for Danish industries, where CEO's of the 600 largest companies and the top level representatives from government meet to discuss key issues. On that particular occasion there was just one issue: How to cope with the Digital Economy, Internet etc. Also interesting event on this day was a carefully choreographed dialog/play between a father who had a 300 person company and his son who had started a successful dot.com company. Almost nobody left the room without a feeling that this was a challenge that he/she had to address. And at the time when the dot.com's had peaked and were facing severe difficulties, traditional industries woke up to the challenge and took significant steps to engulf the Internet.

Accordingly, from 1999 – 2001 practically all Danish companies with more than 25 employees started taking the Internet seriously in the sense of establishing a web-site for marketing, and most of them embarked upon developing Internet-based applications for different types of business processes.

Current E-commerce Revenues

A very reliable, but not necessarily totally valid estimate of e-commerce revenue is found on the website of PBS, the central clearing house for payment transactions owned by all the banks. Looking at their figures we see that the total number has gone up from 218,483 in Q1 of 2001 to 1141.192 in Q4 of 2002. In fact there has been more than a doubling in one year from 487.354 in Q4 of 2001 the 1141,192 in Q4 of 2002. However, a significant part of this doubling is the downloading of ring-tones for the mobile phones, which is hardly a good predictor of typical Internet behavior.

FIGURE 1. The number of Internet transactions per quarter using credit-/debitcards



Legend: The figure shows the four quarters of 2001 and 2002. Dark column is Dankort (debitcard)/VisaDankort. Grey is international creditcards.

Source: PBS (2002).

A number of results from the PLS Rambøll 2002 survey summarize the current status of e-business in Denmark:

- Internet related sales (B2B and B2C) grew from 81 billion DKK (11.6 billion \$) in 1999, 91 billion DKK (13.0 billion \$) in 2000, 123 billion DKK (17.6 billion \$) in 2001 and is expected to grow till 162 billion DKK (23 billion \$) in 2002 and 226 billion DKK (32.3 billion \$) in 2003
- The relations between B2B and B2C sales are roughly 80 – 20.
- The growth pattern is roughly similar for B2B and B2C. Both are expected to grow 30-40%/year

Nature of Use of the Internet

An overview of the extent to which Internet is used in key business processes is shown in Table 17.

TABLE 17. Uses of the Internet, 2002

Percent using the Internet for ... ^c	Establishment Size ^a		Sector ^b			Total Denmark ^c	Global ^d
	SME	Large	Mfg.	Distrib.	Finance		
Advertising and marketing purposes	89.0	79.9	69.2	98.9	88.3	88.8	57.6
Making sales online	47.5	32.0	28.0	40.4	63.3	47.2	29.9
After sales customer service and support	57.0	52.1	47.6	59.1	59.2	56.9	43.7
Making purchases online	67.3	78.0	71.5	67.1	66.0	67.5	46.8
Exchanging operational data with suppliers	56.1	43.4	60.6	45.6	63.6	55.8	48.1
Exchanging operational data with business customers	40.5	41.3	54.1	32.8	41.6	40.5	50.7
Formally integrating the same business processes with suppliers or other business partners	44.5	41.6	29.7	52.5	43.3	44.4	33.9

- Note.* ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.
- ^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).
- ^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.
- ^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.
- ^e Exact wording of question: Does your establishment use the Internet for ...

Source. CRITO Global E-Commerce Survey, 2002

The data clearly shows that by far the most popular business process supported is advertising and marketing which of course is the business process most easily supported. The figure for Danish companies is no less than 88.8% is also higher than any of the other countries in the global sample. The same figure for 26.4% for French, 77.7% for German and 64.3% for US companies.

The second most popular Internet-supported business process is purchasing, where the proportion of Danish companies (67.5%) again is much higher than the global sample (46.8). Here the comparable figures for French, German and US companies are 24.1%, 60.8 and 73.2.

Accordingly, up to three quarters of all companies in the developed world have started procuring on-line. However, our figures do not provide any information of the proportion of goods/services procured on-line. It could be fairly ordinary buying of software, books, plane tickets or booking of hotel rooms, i.e. maintenance, repair, and operation (MRO) targeted products/services, or it could be direct products utilized in own production. Actually it is surprising that around a quarter of all enterprises in the developed countries do not use Internet for procuring indirect goods/services. In other words, at clear confirmation that not all enterprises have embarked upon the 'risky business!' of buying supported by the Internet, but also a clear indication that it is an area, where there is a great potential.

On the two other business processes, 'making sales on-line', and 'after sales customer service and support' we also find that a higher percentage of Danish companies have used the Internet to support those than in any other country (except in purchases where the percentage is slightly higher in the US). Clearly, Danish companies are homogenously behind these initiatives which we might add do not require a lot of collaboration from business partners.

However, if we look to the three last business processes in Table 17, we find a rather different picture as shown in Table 18, where we especially have focused on a comparison with the other European countries, the US and the global sample.

TABLE 18. Use of the Internet for collaboration business in Denmark, France, Germany, US and Global, 2002

Percent using the Internet for ^a	Denmark ^b	France ^b	Germany ^b	US ^b	Global ^c
Exchanging operational data with suppliers	55.8	35.7	59.7	42.8	48.1
Exchanging operational data with business customers	40.5	39.7	51.9	53.8	50.7

Formally integrating the same business processes with suppliers and other business partners	44.4	24.0	47.6	35.5	33.9
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Note. ^a Exact wording of question: Does your establishment use the Internet for ...

^b Responses were weighted based on the total number of establishments by employee size within the sector for each country.

^c Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

Source. CRITO Global E-Commerce Survey, 2002

For these three business processes it is clear that we see a penetration in roughly half of the Danish companies, but this does not constitute a global lead. Although Danish companies are further on the up-take curve for all three business processes than French companies, a higher percentage of German companies have established these electronic links with suppliers and customers. We believe that to a large extent the explanation should be found in the small size of Danish companies compared to their mostly much larger business partners. It is the larger business partner that calls the shots. It is not often that the tail is allowed to wag the dog.

If one compares the company size, it is a common belief that SME's are behind large enterprises when it comes to utilizing Internet. Only when it comes to purchasing do we see a larger part of the large enterprises use the Internet. For all the other business processes, a higher percent of the SME's than of larger enterprises are using the Internet for making their business processes more efficient and effective.

If one compares the three sectors, manufacturing has the largest penetration in 'making purchases on-line' (presumably direct goods), and in exchanging operational data with business customers. A good example is the Bang & Olufsen HiFi manufacturer, who has a total integration, forwards into the distribution companies and all the way to the retail shops on the sell side, and backwards to the suppliers of components on the procurement side. All sales and procurement is done Internet-supported.

In the distribution sector it is impressive that no less than 98.9% are using the Internet for advertising. It is also worth pointing out that more than half (52.5%) are integrating the same business processes with those of their business partners. This confirms a picture of a sector where the margins are low, and where the advantages of the Internet for reducing costs have been utilized to a very large extent.

In the third sector (finance) the most common applications of the Internet for improving business processes have been advertising and marketing on-line. But it is also characteristic that finance in general has reached rather far in the direction of selling on-line, providing service (typically self-service) on-line, and even exchanging operational data with suppliers.

In summary, when it comes to utilizing the Internet for business processes, which can be carried out almost unilaterally (e.g. marketing, selling on-line and providing after sales service) a larger percent of Danish companies have implemented different Internet solutions than in the other nine countries in the sample. However, when it comes to integration of business processes through collaborative schemes; Danish companies are not at par with the leaders (developed economies like Germany and the US but also developing countries like Mexico and Brazil).

Use of Marketplaces

One of the most exciting features of the New Economy is the advent of e-marketplaces, e-hubs, e-exchanges etc. The excitement is captured in the quote from Louis Gerstner, IBM from 2000

‘The next chapter in the e-business revolution involved the transformation of entire markets and the redefinition of industries. We will see the rise of a new class of entities: e-marketplaces, that will help on-line buyers and sellers find each other, attack the inefficiencies of traditional markets, and carve out for themselves important roles in the e-business economy’

The predictions for e-marketplace were as ambitious as the predictions for Internet vendors. Gartner Group predicted that they would capture 35% or 2.7 trillion \$ of worldwide B2B sales. But the e-marketplace bubble burst like the dot.com bubble. The results of our survey regarding e-marketplaces participation are shown in Table 19.

TABLE 19. Participation in an Internet-Based Trading Community, 2002

	Establishment Size ^a		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Percent who have heard of the concept of an Internet marketplace ^e	95.5	92.9	91.8	92.6	99.9	95.4	80.0
Percent participating as a buyer only ^f	2.7	7.2	0.4	6.8	0.2	2.8	6.7
Percent participating as a seller only ^f	7.9	7.6	11.9	8.0	6.0	7.9	12.2
Percent participating as both a buyer and a seller ^f	5.4	12.2	12.9	6.8	1.0	5.6	16.9

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. “Global” sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Have you ever heard of the concept of an Internet marketplace, exchange or trading community, through which multiple businesses buy and sell goods and services?

^f Percents based only on those establishments which have heard of the concept of an Internet marketplace.

Source. CRITO Global E-Commerce Survey, 2002

In spite of the fact that almost all Danish enterprises have heard of the phenomenon of e-marketplaces (95.4%), and that this figure is substantially higher than the average of 80.0% for the global sample, a significantly smaller percent of Danish enterprises seems to be participating as buyers, vendors or both.

One explanation could be an early adoption of EDI with main trading partners and a subsequent reluctance to change to e-marketplaces. However, we do not believe that this could be the full explanation. The data on e-marketplaces shows a similar tendency as the figures regarding ‘exchanging operational data with business customers’ in

Table 17, where Danish companies are also lower than the global sample. This suggests that Danish companies might have been very early in getting their feet wet (establishing web-sites especially for marketing/advertising), but that they seem reluctant to put the whole foot in, and seriously modify their business processes through integration with business partners. This hypothesis is confirmed in a survey of procurement behavior of the 23 largest and most innovative Danish companies in Table 20.

TABLE 20. Procurement behavior on e-marketplaces for leading Danish companies^a

		2001 ^b	2003 ^c
		Actual	Forecast
		number of	number of
		enterprises	enterprises
Transaction	Identification of potential suppliers	32 %	68 %
	Investigate or determine prices	27 %	77 %
	Buy on-line	23 %	77 %
Collaboration	Give wishes for future deliveries	9 %	59 %
	Improve production plans with supplier	5 %	36 %
	Inform suppliers about future production needs	9 %	55 %
	Inform suppliers about future engineering needs	5 %	55 %

Note. ^a Sample of the 23 largest and most innovative Danish companies expected to set the pace

^b Question: Does your company use e-marketplaces for any of the following transactions or collaboration activities

^c Question: Do you expect your company to be using e-marketplaces for any of the following transactions or collaboration activities in 2003

Source. Heiberg 2001

This survey in Table 20 shows a clear distinction between the number of enterprises doing (simple) transactions with their suppliers, and the ones who have entered into a more collaborative mode, focusing on an improvement of the inter-organizational systems. Almost none of them were doing collaboration in 2001, but two thirds expect to do it in 2003. Indeed we seem to be in the middle of a 'ketchup-bottle effect'.

If we look at the three sectors, it is clear that knowledge about e-marketplaces is uniformly high, between 90 % and 100 %. But when it comes to actually participating in e-marketplaces, the highest participation is found in manufacturing. This confirms the story we have seen several times that (relatively small) Danish manufacturing companies have to enter into collaboration electronically in order to integrate as seamlessly as possible with the large customers in the B2B markets.

For distribution companies the pattern is that rather few organizations use e-marketplaces for buying, selling and/or both. In both cases the figure is 6 – 8 %. Given the fact that very large e-market places are developing both from the brand vendors and from the large buyers (supermarket chains), there seems to be a large risk associated with not trading on the marketplaces.

For finance, everybody knew about e-marketplaces, but there were only supporting selling activities. We suspect that most of them had been thinking about their own marketplaces. The two largest Danish banks, Danske Bank and Nordea have a large market place of their own offering electronic retail outlets for their business customers to sell to their private customers. This is a big success, especially for the banks, if both seller and buyer are customers. In this case, all transactions become internal in the bank

with a dramatic reduction in costs for the bank e.g. due to absence of any trust problems.

All in all, e-marketplaces are surprising little used by Danish companies. In all the countries in the international sample, the percentage of companies using e-marketplaces is much larger except for France and Japan, which are on the same level as Danish companies. But it is worth to note that Danish companies are far behind companies even in developing countries like Mexico, Brazil, China and Taiwan (See Appendix 7).

Channel Conflict

The e-business literature has many discussions of potential channel conflict especially when it comes to disintermediating the distributor or other intermediaries. One might get an impression of the extent to which companies are facing channel conflicts in Table 21 showing how establishments are using the Internet to sell products/services

TABLE 21. How Establishments Use The Internet To Sell Products and Services, 2002

	Establishment		Sector ^b			Total	
	Size ^a		Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Percent indicating Internet used to ... ^e	SME	Large					
Address new markets only	3.5	9.0	16.7	0.1	0.0	3.7	15.3
Address traditional distribution channels only	57.8	21.0	44.2	77.6	48.7	57.1	44.1
Compete directly with traditional distribution channels	35.3	55.0	30.7	18.8	50.0	35.7	27.4
Replace traditional distribution channels	3.3	15.0	8.4	3.5	1.3	3.5	13.2

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Which of the following statements best characterizes how you are using the Internet to sell products and services.

Source. CRITO Global E-Commerce Survey, 2002

For interpreting the data displayed in Table 14, it is important to note that respondents were just given one choice and had to select which of the four that had the best match. By far the most dominant use was to address the traditional distribution channels only. This is a strategy chosen e.g. by several of the PC vendors in Denmark selling through distributors (Fujitsu/Siemens, IBM, HP) while Dell is selling directly and bypassing the distributors. The Internet strategy for the traditional PC vendors has been to strengthen and further empower the distributors to compete in the market through better access to knowledge and provision of sales/configuration tools.

Compared to the global sample, very few Danish companies are using the Internet for replacing traditional distribution channels, at least in the short run! This might also be a very risky strategy when sales through the on-line channel still contribute a marginal proportion of total sales (4.8 %).

On-line Sales

Somewhat surprisingly, the data in Table 22 shows that the on-line B2C sales of Danish enterprises are around twice as large as in the global sample (7.6% for Danish and 3.8% for the global sample). It is also especially worth noting that it seems to be almost exclusively the SME's who have been successful in adopting this new sales channel. Only 0.5% of the total consumer sales are obtained by the large enterprises using the Internet. Compared to France Denmark is leading substantial, but lacking to Germany within the wholesale/ retail distribution. Denmark is beyond the figures for Germany within manufacturing and finance.

As regards B2B sales, Danish enterprises are ahead of the global sample. Germany is leading within the manufacturing and wholesale/ retail distribution. Only in finance, Denmark is leading as compared to Germany. 3.1 % of large enterprises state that they are 'conducting sales on-line', whereas 4.0 % in the global sample are conducting on-line sale.

Thus, the data presented here suggest that the e-commerce has diffused along the SMEs and the financial sector primarily within the B2C segment. Wholesale/ retail distribution is, in particular within the B2B segment, clearly lacking behind in the on-line sales.

TABLE 22. On-Line Sales, 2002

	Establishment Size ^a		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Type of On-Line Sales ^e							
% B2B only	15.3	25.6	23.7	20.5	6.6	15.5	12.9
% B2C only	15.2	4.6	3.7	6.8	28.5	15.0	7.1
% both B2B and B2C	22.9	8.5	17.1	13.1	34.6	22.6	15.0
Mean percent of total consumer sales conducted on-line (all establishments) ^f	7.8	0.5	3.4	4.0	14.1	7.6	3.8
Mean percent of total business sales conducted on-line (all establishments) ^g	4.9	3.1	5.9	0.6	8.7	4.8	4.0
Mean percent of total consumer sales conducted on-line (only those doing B2C sales on-line) ^f	22.6	6.6	16.4	20.6	24.4	22.5	18.6
Mean percent of total business sales conducted on-line (only those doing B2B sales on-line) ^g	15.0	10.5	15.6	2.2	26.0	14.9	15.1
Percent of web-sites that support on-line payment (only those doing on-line sales)	49.2	8.2	23.6	37.2	69.1	48.3	33.6

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Percents are based on the full sample (all establishments). Exact wording of question: Are these online sales to other businesses or to consumers or to both?

^f Exact wording of question: What percent of your establishment's total consumer sales are conducted online?

^g Exact wording of question: What percent of your establishment's total business to business sales are conducted online?

Source. CRITO Global E-Commerce Survey, 2002

There is an almost equal split between whether the enterprise sells to businesses (15.5%), consumers (15.0%) or both (22.0%). As suspected, enterprises within manufacturing and distribution sectors are more strongly relying on B2B, while enterprises in the finance sector cater for both types of customers.

The actual amounts traded shows that Denmark are still in the lower part of the diffusion/adoption 'S-curve'. Enterprises report that only 7.6% of their total B2C turnover comes from on-line sales, while it is 4.8% of B2B sales, which is conducted on-line.

The final question in Table 22 shows the percent of web sites that support on-line payment of those doing on-line sales. The finance sector is showing the highest penetration as suspected. On-line payment is much easier in this sector, and one would expect an almost 100% penetration within a rather short period. Again it is worth noting that the SME's are the ones who are spearheading this innovation with 49.2% as compared to the large establishments who only reach a level of 8.2%.

On-line Services

A more in depth investigation of the kind of services offered on-line are shown in Table 23. The most general issues concern the mean percent of total consumer/business services conducted on-line. In general the percent of services conducted on-line for Danish companies is substantially higher than the global sample, roughly twice as high for B2C and three times as high for B2B. However, there are some important shortcomings.

TABLE 23. On-Line Services, 2002

	Establishment		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Type of On-Line Service ^e							
B2B only	22.8	43.9	42.1	32.0	7.4	23.3	23.1
B2C only	19.1	12.7	9.3	8.6	33.0	19.0	12.9
Both B2B and B2C	53.5	41.2	39.8	52.1	59.5	53.2	33.3
Mean percent of total consumer services conducted on-line ^f	16.2	3.4	18.8	0.4	22.4	15.9	7.6

Mean percent of total business services conducted on-line ^g	32.7	17.5	28.2	12.2	35.6	32.2	11.0
% of manufacturing web sites which support ... ^h							
Product configuration	9.8	29.3	10.9			10.9	54.7
Order tracking	8.7	9.8	8.8			8.8	21.5
Service and technical support	61.8	90.2	63.2			63.2	54.4
Product specification	62.7	100.0	64.6			64.6	79.9
Account information	31.3	19.5	30.7			30.7	17.0
% of wholesale/retail distribution web sites which support ... ^h							
Gift certificates and/or registry	0.2	58.3		0.6		0.6	20.6
Product catalogue	79.7	69.2		79.6		79.6	69.8
Product reviews	50.0	53.8		50.0		50.0	48.6
Ind. customization	59.3	53.8		59.2		59.2	21.3
Account information	40.8	46.2		40.8		40.8	21.7
% of banking and insurance web sites supporting ... ^h							
On-line services such as filing applications, filing claims, paying bills, transferring funds	55.9	50.0			55.7	55.7	53.9
Access to account information	58.2	47.4			57.9	57.9	57.3
On-line tools such as research tools, planning tools, etc.	43.3	60.5			43.6	43.6	52.0

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Percents are based on the full sample (all establishments). Exact wording of question: Are these online services to other businesses or to consumers or to both?

^f Percents are based on the full sample (all establishments). Exact wording of question: What percent of your establishment's total services to consumers are conducted online?

^g Percents are based on the full sample (all establishments). Exact wording of question: What percent of your establishment's total services to businesses are conducted online?

^h Percents are based on only those establishments which have a web-site and conduct business within the specified sector.

Source. CRITO Global E-Commerce Survey, 2002

Firstly, it is surprising that large companies are only conducting 3.4% of their total consumer services on-line as compared to the figure of 16.2% of the SME's. We

believe this is a structural phenomenon in the way that most large Danish companies are only reaching consumers indirectly through distributors.

Secondly, it is noteworthy that the distribution sector including retail is only conducting 0.4% of its consumer services on-line. Clearly, this is not a coincidence. The established retailers, and here we are especially thinking of the largest supermarket chains and department stores are only reluctantly utilizing Internet. As one of them said: 'We have the best locations in the physical world, and we have more than 100 years experience in optimizing the business processes in that world. We have very little incentive to go through the effort of teaching the consumers to rely more on shopping in the virtual world' (Interview with CEO of Dansk Supermarked 2000). The figures documents that this is the strategy followed. But this strategy is also opening up for dot.com retailers, global players like Amazon but also very small agile, cost-conscious, primarily Danish e-tailors, who in this way are carving a niche for themselves which is likely to cut substantial chunks out of the total traditional retail sector report on high both of these.

Thirdly it is worth noting the large differences between the three sectors in supporting the different more detailed business processes. On the on-line services, wholesale/retail distribution and financial services are beyond the global sample, whereas manufacturing is clearly lacking behind. Danish manufacturing companies support product configuration and order tracking to a very small extent, almost to the lowest degree in the total sample. The low score on product configuration could be due to nature of the products. Order tracking is only done by 8.8% of the manufacturing companies (same level as Brazil and Mexico) while typically 40 – 70% of companies in the developed countries are offering this service to their customers. The only areas where the manufacturing are within service and technical support and account information.

The distribution sector shows a much more advanced but also different level on the five different detailed services (Appendix 10). Compared to Germany and France, gift certificates, and product catalogue are not used by Danish distribution companies, while individual 'customization' and 'account information' is more widespread than in France and Germany.

Finally for finance, Danish companies are roughly on par with France and Germany and the average in the global sample, but Danish companies are clearly not as advanced in this field as companies in China, Taiwan and the US, where a substantial larger proportion of the businesses have on-line services.

Ale in all, the figures for the three sectors illustrate that Danish companies are far from world class for providing on-line services via the Internet.

On-line Procurement

No less than 67.5% of all Danish companies are purchasing on-line as shown in Table 24, a figure which is on the same level as other developed countries like Germany and the US but also developing countries like Brazil and Mexico but way ahead of companies in France and Japan (see Appendix 11). 67.5% it is not an insignificant amount. No less than 16.7% of the value of direct goods is procured on-line (highest figure in global sample except for Japan), 14.4% of all goods ordered for resale is ordered on-line (highest figure in global sample except for Mexico), and 13.1% of the value of all supplies and equipment (MRO products) is ordered on-line (highest figure

in the global sample except for the US). In general, the figures for Danish companies are around twice of those of the global sample. (See also appendix 11).

There is no doubt that a fair part of this purchasing is just done using the web-site of the vendor (e.g. Dell to buy lap-tops), but if one compares with the figures for ‘integration of systems with those of suppliers and business customers’: a great deal (14.8%), some (26.8%), and little to none (58.5%) in Table 24, it is clear that some modification and integration of the procurement process has taken place.

TABLE 24. On-Line Procurement, 2002

	Establishment		Sector ^b			Total	
	Size ^a		Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
	SME	Large					
Percent of establishments doing on-line purchasing	67.3	78.0	71.5	67.1	66.0	67.5	50.8
Mean percent of money spent for direct goods for production is ordered online (all establishments) ^e	17.0	12.3	16.7			16.7	8.3
Mean percent money spent on goods for resale is ordered online (all establishments) ^f	14.4	19.3		14.4		14.4	6.8
Mean percent of the money spent on supplies and equipment for doing business is ordered online (all establishments) ^g	13.2	12.0	15.9	13.6	11.3	13.1	8.3

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. “Global” sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Question asked only to those in the manufacturing sector; percent based on all manufacturing establishments. Exact wording of question: What percent of the money your establishment spends on direct goods for production, such as parts and components, is ordered online?

^f Question asked only to those in the wholesale/retail distribution sector; percent based on all wholesale/retail establishments. Exact wording of question: What percent of the money your establishment spends on goods for resale is ordered online?

^g Percent based on all establishments. Exact wording of question: What percent of the money your establishment spends on supplies and equipment for doing business is ordered online?

The government is also strongly encouraging the use of on-line procurement, especially through the DOIP as discussed earlier in the section on marketplaces. Technically it was operational summer 2002, but less than 1% of all companies used this portal in that year. But, some forecasters believe that it will rise to 48% by end of 2004. (PLS Rambøll 2002, p 40). Helge Sander, minister of ‘Science, technology and development’ announced early 2003 that it was the policy of the government that 50% of all Danish public sector procurement should be on-line at end of 2005 (Speech given at Teknofo, Copenhagen 13th February 2003).

In our opinion, however, it will take substantially longer. The main reason is that each public institution is free to use its budget and buy where it wants. In general it is believed that this is the most effective way of managing, since the management of an institution is expected to choose rationally on the total costs of procurement, where the price may not be the most important factor. However, large institutions like Copenhagen Municipality claim that they can reduce the procurement time from 45 minutes to 10 minutes using the DOIP portal (Helge Sander *ibid*), so maybe such figures will spur adoption.

5.2 Diffusion of E-commerce Industry

The introduction and diffusion of the e-commerce and e-business industry has been as dramatic and as volatile as at no time in history before. The concept of 'Internet-speed' became more than just a buzzword. Successful business models one year turned out to be financial disasters the next. We shall discuss the development over the last five years by looking first at the trading companies and later at the support industry.

E-commerce companies/dot.coms

E-commerce in general, and dot.com's in particular was certainly not invented in Denmark. Inspiration came as most business innovations from the US and some extent from UK and Sweden. The shining examples of Amazon, Yahoo and E-Bay filled the front pages of first the IT-trade press, then the business press and soon after also the bigger daily newspapers. Innovators of all types with skills, expertise, or money hastened to latch on to this new goldmine. E-commerce companies sprang up typically one year after the US and 6 months after the Swedish innovations. No idea seemed too bad to get funding, and in 1999 and early 2000, a typical reply to a business plan from VC's was that it was not ambitious enough. 'Why settle for only the Danish market or the Scandinavian market, why not adopt a European strategy'. Or expressed in the words of Thomas Siebel (Siebel & House 1999):

- *The web loves a risk taker....*
- *The name of the game, right now, is not revenue but exposure....*
- *The battle for name recognition will be won and lost over the next three years (1999 - 2002)....*
- *By being too cautious here, you may count yourself out ...*
- *If you don't solidify your name recognition in this wide open space, there is no guarantee that playing catch-up later will enable you to displace the smart online leader*

And indeed, many followed that above strategy. Boo.com, Toycity.com, Gubi.com and Boxman.com to mention a few. But all these spectacular attempts failed, when funds started to dry out during 2000, and with the failures a lot of venture capital got lost. Another failing dot.com was 'On-wine', an on-line e-tailer with tasting, wine-bar and recommendations for what wine to buy, had a very ambitious web-site developed for 600,000\$. However, they could not generate enough revenue to recube this investment in competition with the half a dozed other wine e-tailors, who had just established a very basic on-line wine-shop based on virtually free software. Indeed one might say putting it a little too sharply, that the only ones to survive in Denmark were the ones who had chosen a strategy opposite to the one suggested in the citation by Thomas Siebel above. In other words, only those who had opted for limited budgets with a

rapid change towards a positive cash flow, and had viable and robust business models, could survive.

One example of this is Aarstiderne.com, who started selling ecological vegetables directly to consumers on a subscription basis, where Aarstiderne decides what to put in the weekly deliveries and supply the parcel with interesting recipes. There is now a wide selection of parcels to be bought, and it is possible to change ones deliveries on-line. This subscription business model has been a great success. The number of different types of vegetable boxes has been enlarged, and they have also enlarged the assortment with fish, bread, fruits etc

Haburi.com is another example of a Danish dot.com company with an interesting business model. This is a virtual factory outlet selling branded fashion clothing and accessories. The largest markets are UK, Germany, Denmark and Sweden. Unfortunately, the company went bust early 2003 with an accumulated deficit of approximately 36 million Euro, but has been taken over by a German company, who is continuing the business. The main reason for the large deficit should be found in the large investments made when venture funds were plentiful, and a growth rate in sales being less than the projected doubling every year.

Next to the dot.com companies, the e-commerce era has seen the advent of a number of portals, Jubii (Danish equivalent of Yahoo but having a larger market share than Yahoo in Denmark), OFIR, Opasia (owned by largest Telecom provider), AOK plus the marketplaces of the two largest banks, Danske Bank and Nordea. Especially, the marketplace of Nordea Bank, Solotorvet.com is one of the largest with 115 Danish e-shops early 2003. Here all the shops are directly accessible from the web-page of the bank, and buying is very much facilitated in the way that payment obviously takes place directly from the chosen bank account in a totally trusted environment.

Finally it is worth mentioning the two large horizontal third-party e-marketplaces for B2B, Gatetrade and IBX. Both of these have been established primarily in order to provide procurement solutions for large companies for MRO products.

Gatetrade was originally proposed by Oracle to a large group of potential investors, and was eventually established with four large shareholders, Danske Bank, Danish Post, Maersk IT, and TDC (earlier Danish Telecom). Each had a particular interest in the marketplace over and above own procurement, i.e. banking, logistics, IT and telecommunication.

The technical problems for Gatetrade in establishing the web-site turned out to be larger than expected. Although Gatetrade was the 52nd marketplace established on the OBX platform using Oracle, Gatetrade found on several occasions that they were the first ones to encounter specific problems. Furthermore, it turned out that security was not acceptable to governmental standards required in Denmark. Accordingly, the original solution with a hosting of the database in California had to be abandoned, and the hosting transferred to Denmark.

The uptake of using Gatetrade for procurement has been much slower than expected even from the four original investors, although by the end of 2002 two of them are now handling a substantial (but not disclosed) part of their procurement via Gatetrade. However, it was a great breakthrough for Gatetrade, when they succeeded in securing the public sector procurement platform (DOIP). It is the official government policy that 40% of the public procurement by 2005 should take place using this Gatetrade. And early 2003 vendors are struggling preparing to be able to deliver catalogs in the

UNSPEC standard with the different prices for the different customers or customer groups. Vendors on the other hand are struggling to organize procurement procedures and business processes in order to make use of Gatetrade. Gatetrade expects to break-even by end of 2003 with a turnover of around 1 billion \$/year.

E-commerce and support activities

Many claim that is a well-known fact, that those who made money out of the gold rush in California were not primarily the gold miners but everybody providing supplies or services, from clothing and tools to hookers and transporters. In the e-commerce area we see much the same picture. Few of the dot.com's made it really big, and most of the growth took place in companies providing infrastructure, software, hosting, services, consulting, etc even though some of those have had very bad times on the stock-exchange too. The most important of these support companies are grouped below.

E-shop providers

The e-commerce area saw the advent of a large number of companies capable of helping e-shops along. Some got assistance programming 'everything' from scratch using HTML, PHP or ASP. Others utilized the possibilities provided by portals and ISP's (e.g. TDC's Opasia or MSN-network). These provided basically three types of solutions, from quick and dirty self configuring web-sites requiring no programming as the one extreme, to more advanced web-sites offering integration with existing sales systems as the other extreme. These solutions were typically acquired by the smaller e-shop vendors.

Large e-shops or those aspiring to 'make it big', had very elaborate systems developed often relying on a high degree of integration with production, ordering, and logistics systems. A good example is Lego Worldshop, where Lego acquired a fully developed system from IBM Denmark, who later on turned the system into a 'standard package' market under the name of 'Global Merchant'.

Irrespective of the path chosen, this created a large software industry to facilitate the development of e-commerce solutions for e-shops. Some of these software providers were paid in cash, but many took equity in the e-shop, and did not survive longer than the e-shop.

Finally, the largest Danish companies had their e-shop developed as an add-on or extension to their ERP-system (SAP, Oracle Financials/Applications but also to the Danish Navision, where the latter had almost 50% of the SME market for ERP-systems in Denmark in 2002). Navision was also one of the two ERP-system providers for SME's which was acquired by Microsoft in 2002 to form the basis for the strategy of Microsoft of integrating into the applications market.

Payment providers

Any e-shop needs a payment system. In the beginning many shops would just have the web-site as a storefront directing customers to their physical store. However, this is unpractical, and many observers believed that a secure payment system was a necessary prerequisite for especially consumers buying on the Internet.

Danish PBS, center for all debit card, credit card and EFT transactions in Denmark, has a natural monopoly on clearing on-line payment transactions at some stage in the process. However, to facilitate the process, a large group of independent software service providers has emerged providing a link between the e-shop and PBS. An example of one of those is Dansk Internet Betalings System, who early 2003 had

around 800 customers, each paying a monthly fee of 300 or 800 DKK (45\$ or 115\$) for the service of a provision of an encrypted secure payment service. When one is going to buy, a new window is opened, and the payment is done using the DIBS software.

PBS also started developing a better security standard together with MasterCard, which would be more secure than the widely used SSL-encryption standard. The SET standard, relying on public/private key technology, however, have not yet taken off, even though it was clearly much more secure. It was just too cumbersome for consumers first to have to install the software on ones own machine, and a large number of vendors did not offer the solution either.

Web-hosting

Web-hosting is another new business area where there are a number of lager players (the 'usual suspects' of IBM, Cap Gemini, TDC etc.), but also new larger players like Mondo, Tiscali or UNI-2. Indeed most of the ISP's are also providing web-hosting. In fact here are probably more than one hundred smaller companies providing hosting services.

Domain registration

Domain registration is another interesting new business area, where there are probably 500 – 600 companies capable of registrate / maintain new domains on DK-hostmaster. The tendency seems to be that this service as many of the other services, are being taken care of by companies specializing in this particular service. One such Danish company is Speednames, who have been very innovative in developing a business in this area, and have offices abroad.

Web-development

Development of web-sites has been mentioned above, and in relation to the further development of e-commerce solutions, software houses offered Internet solutions for any need. Initially most of these were tailor-made, but over time, more and more plug-in standard packages became available. Often systems could be developed for a fraction of the price one year later, when standards had become available. The typical make/buy choice became more and more tilted in the direction of buying standard than having ones own developed as we see in other areas.

One of the most amazing developments was the original Framfab company, which started in 1996 and grew to 3,500 staff within five years. By any standard, this was the optimization of the Internet area. A young, aggressive, flamboyant, and creative company which was a true child of the so-called 'New Economy'.

This was reflected in the share value. The market cap of Famfab on the Stockholm stock exchange in March 2000 was valued at 35.8 billion SKR (4.4 billion \$ in March 2000) which was equal to the consolidated value of three of the largest companies in Sweden: Saab, Swedish Match and SKF. However, one year later in March of 2001, the share price for Framfab had dropped to 0,7 billion SKR (0.09 billion \$), while the market cap of the other three had grown to 43.0 Billion, a healthy growth of 11%. Indeed, an amazing collapse.

But there were a number of other independent software houses popping up in Denmark like Areneum, Mouse House and Cell Networks. All of which made creative solutions, but could not survive the extremely sharp downfall of the dot.com crash in 2000/2001.

And with them fell also the two most highly profiled Venture funds solely dedicated to 'the New Economy', 2M Invest and Brandt.com

Consulting

The development of the e-commerce field was strongly fuelled by the consulting companies. Everybody from the large international companies (Andersen Consulting, Deloitte & Touche, etc), over some new innovative companies (Ashton Group, Catenas) all the way to the vast number of small one person companies. Some of these even took an equity share in the many dot.com and e-market places (e.g. Andersen Consulting), often as payment for their services. Originally there was work for everybody, but when the prospects of the initial 'Icaruss-line'¹ directly vertically towards the stars turned downward, the consulting companies were the first ones to identify the problems and many of the large international consulting companies, who had more stings to their bow than just e-commerce, managed to turn their attention to a more diversified set of business problems, while the many more specialized consulting companies were less blustered both financially and intellectually to survive the dot.com collapse.

Conclusion

Al taken together, the readiness in Denmark to engulf the e-commerce revolution has been rather high compared internationally, although of course there are large differences between the main groups, the providers, the merchants and consumers.

The **providers** (software, hardware, infrastructure, consultants etc) have been in the absolute forefront pushing the development in an obvious self interest. We have not data to support a statement whether they pushed more or better other than the fact that it has been more effective than in most other places.

E-commerce 'merchants' (sellers), both B2B or B2C, have been willing to get influenced, and have to a very large extent got off to an early start although not as fast as the most early adopters in the US, UK and Sweden (Amazon, e-Bay, Boo.com, Boxman, Dell to name a few of the most cited examples from the Danish medias in the late 1990s. The most 'low-hanging' fruits (getting a web-site, buying a few obvious advantageous goods etc) were picked first, and Danish companies have clearly been in the forefront globally. Furthermore, Danish companies in general have also been substantially faster (further ahead than every on in the global sample) on the diffusion/adoption curve when it comes to modifying business processes like advertising/marketing, sales on-line, after sales/customers support, and make purchases on-line.

However, when it comes to substantially integrating or modifying business processes, Danish companies are not further ahead than the global sample. Danish companies are not at all ahead on dimensions like

- Exchanging operational data with business customers
- Exchanging operational data with suppliers
- Integrating the same business processes with business partners
- Trading on e-marketplaces

¹ Icarus in the Greek mythology was a youth who tried to fly all the way to the sun with wings of wax and feathers, at the time upwards, and finally the sun melted his wings and he fell into the water.

This ought to be of great concern, since these are the dimensions, which are likely to be the determining long-term profitability and markets presence. The future will belong to inter-organizational systems, and unless companies are capable of doing that they are likely to be excluded from trading relationships.

Finally when it comes to **consumers**, these is obviously a very heterogeneous, diverse group, from the early trendsetters ('techsetters') to the 40-50% of the population, who have not yet tried to buy anything on the Internet. Danish consumers seems on average to be among the leading nations as regards up-take of e-commerce, but it is important to stress that we are still in the very early stages of the diffusion/adoption curve.

This development has been spurred by a 'holly coalition' of leading users, the media, the government, and the providers (HW, SW, infrastructure providers, consultants, etc). These groups have been successful in raising the expectations and creating an atmosphere of guilt/fear that if one was not part of it, and did not act now (got a website, got an e-business strategy, bought something, etc.) one would be eternally lost. This had the desired effect of furthering innovation and early adoption, as documented in the global survey above. However, after the initial steps, when it comes to modifying business processes or modifying consumer behavior, old habits change very slowly. And it is by no means certain to us that the Danish position among the leaders is sustainable.

6 Impacts of the Internet and E-commerce

6.1 Impact on efficiency of Doing Business On-line

As discussed above, Danish companies are in the forefront regarding adoption and utilization of the Internet compared to the global sample. Accordingly, one would expect that Danish companies also to a larger extent than the global sample had been able to harvest the benefits in the form of efficiency gains. This has been investigated in the GEC survey shown in Table 25, where ten different efficiency measures are reported.

The overall result is surprising and disappointing due to the relatively high investments in IT-infrastructure, the low barriers, the strong drivers, and the high use of Internet. Danish companies have not been able to harvest benefits to any larger extent than companies in the global sample. Denmark is on above the global average on five dimensions, but is not a single leading country on any dimension on impacts (see also Appendix 12). Let us explore in detail the most interesting of the ten dimensions.

TABLE 25. Impacts of Doing Business On-Line, 2002

	Establishment Size ^a		Sector ^b			Total	
	SME	Large	Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
Percent indicating high impact ^e							
Internal processes more efficient	39.4	39.8	25.3	38.2	47.7	39.4	33.9
Staff productivity increased	16.4	17.3	26.0	8.6	18.8	16.5	27.2
Sales increased	25.0	12.2	24.0	16.0	32.9	24.6	20.5
Sales area widened	19.7	17.3	17.5	15.0	25.1	19.6	31.4
Customer service improved	44.8	37.9	43.8	30.0	59.4	44.6	34.8
International sales increased	3.8	6.2	16.5	0.6	0.5	3.8	19.5
Procurement costs decreased	17.7	15.7	18.8	16.4	18.2	17.7	17.7

Inventory costs decreased	11.9	10.2	12.2	22.1	0.7	11.8	14.0
Coordination with suppliers improved	27.0	29.8	23.7	33.8	22.4	27.0	29.8
Competitive position improved	29.8	25.2	23.9	18.2	42.6	29.7	29.8

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Using a 5-point scale where 5 is "a great deal" and 1 is "not at all", please rate the degree to which your establishment has experienced the following impacts since it began using the Internet for business. A score of 4 or 5 was classified as "high impact".

Source. CRITO Global E-Commerce Survey, 2002

One of the most positive effects is found on the first dimension '**Internal processes made more efficient**', where no less than 39.4% claim that there has been high impact. This is slightly higher than the global sample (33.9%). Not surprising, the largest percent of high impact is found in the finance sector, where the possibilities for integration are the highest (47.7 %). In comparison, only 23.3 % of the French and 22.8 % of the German financial sector report high impacts on this variable. Some might find it surprising that the Internet, which in its very nature is predominantly facilitating external communication/processes, should have impact on internal processes. However, there are at least two good reasons for that. Firstly, Internet in general and Intranet in particular, are furthering internal communication and coordination through increasing transparency in all those processes where applied. Secondly, extranet and enhanced integration with business processes of customers/suppliers also contribute to higher efficiency in internal processes.

It is more surprising that only 16.5% of the Danish companies claim that there have been '**increased staff productivity**', especially since 27.2% of companies in the global sample have experienced this. One explanation could be that the productivity was already at a very high level in most Danish companies, whereas there were some 'low hanging fruits' to be harvested in some other countries, where Internet (and related technologies) provided an excuse to reengineer processes which hitherto had been too difficult to change.

Three dimensions are concerned with sales. 24.6% of the Danish companies had experienced '**sales increases**' (against the global sample of 20.5%), but only 19.6% had experienced that their '**sales area widened**' (against 31.4% in the global sample), and only 3.8% had experienced '**increased international sales**' (against the global sample of 19.5%). Since 88.8% of the Danish companies are using the Internet for advertising and marketing, and 47.2% of them are making sales on-line, it is surprising that so few of them report on high increase in sales. And it is even more surprising that so few report that their sales area has widened domestically and internationally. It is clearly not enough just to have a web-site and hope that customers latch on to it. More needs to be done, especially as regards the international situation. Integration with customer systems and a higher involvement in e-marketplaces to increase traffic are potential drivers of more positive developments.

As regards **‘Improved customer service’**, no less than 44.6% of the Danish companies identify a high impact here. This is the highest number but one in the global sample, second only to Mexican companies. In actual fact of course, one ought to ask the customers about this and not the service provider. And since we only have the word of the sender, we just need to treat these results that with some caution. Not surprisingly, it is especially in the finance sector where largest number is reported. No less than 59.4% of the finance institutions identify that their customer service has improved. But in this sector one might even say it is surprising that the number of companies is not even larger.

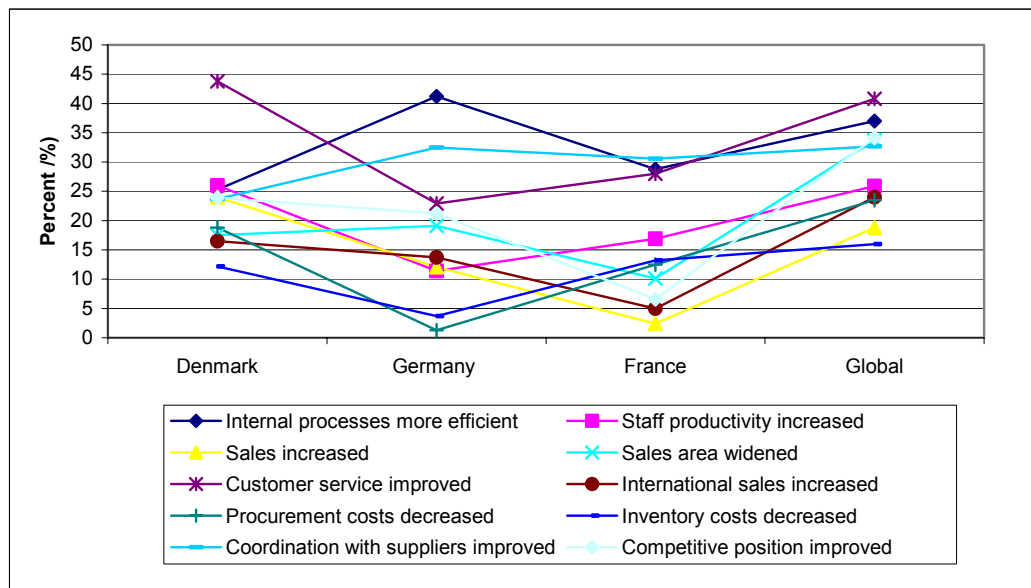
A **‘decrease in procurement costs’** was experienced by 17.7% in the Danish sample, and a meager 11.8% could report that their **‘inventory costs and decreased’**. These figures are fairly close to the global sample, mind there is little variation due to company size and industry except the obvious exception that finance companies do not report on reduction in inventory. We believe that for both of these dimensions, companies have not yet achieved such a level of sophistication in their e-commerce/e-business solutions, where it has been possible to harvest such efficiency gains.

‘Coordination with suppliers’ had been experienced by 27.0% of the Danish companies – a figure almost on par with the global sample (29.8%) with no significant difference according to size or industry.

Finally, we asked the more general and somewhat overarching question whether the **‘competitive position had been improved’**. 29.7% of the Danish companies had experienced that (global sample 29.8%), and the only significant industry difference were that more finance companies had seen this improvement (no less than 42.6%), while only 18.2% of the distribution companies had experienced this improvement.

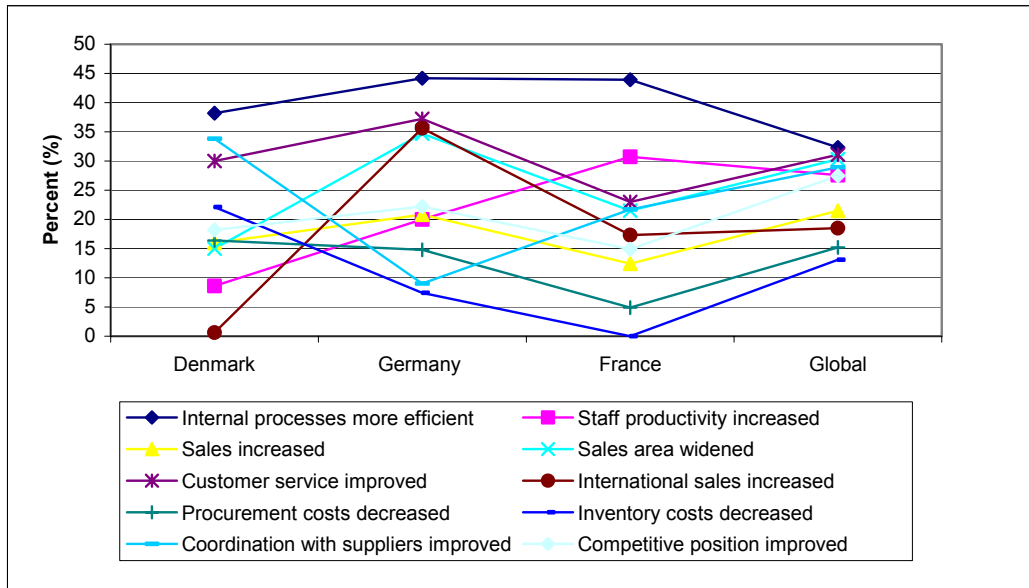
The sector reporting the most positive impacts as compared to Germany and France is the financial sector, whereas the manufacturing is reporting the least positive impacts. In Figure 2-4 we have compared the impacts sector wise in Denmark, Germany, France and Global sample.

FIGURE 2. Impacts of Doing Business On-Line within the Manufacturing Sector. Denmark, Germany, France, and Global Sample, 2002



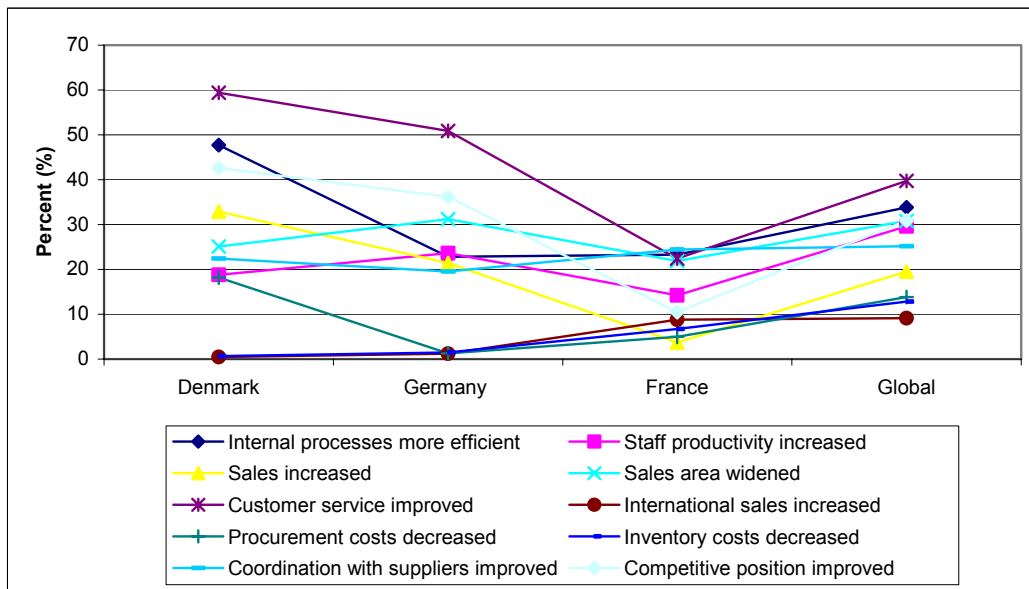
Note. Please consult Table 25 for definitions and sample sizes
 Source. CRITO Global E-Commerce Survey, 2002

FIGURE 3. Impacts of Doing Business On-Line within the Wholesale/ Retail Distribution Sector. Denmark, Germany, France, and Global Sample, 2002



Note. Please consult Table 25 for definitions and sample sizes
 Source. CRITO Global E-Commerce Survey, 2002

FIGURE 4. Impacts of Doing Business On-Line within the Financial Sector. Denmark, Germany, France, and Global Sample, 2002



Note. Please consult Table 25 for definitions and sample sizes
 Source. CRITO Global E-Commerce Survey, 2002

In summary, the efficiency gains reported by the Danish companies are not reflecting the high level of e-commerce readiness, the high investments in Internet applications, the presence of many positive drivers, and the relative absence of barriers for this development. Internal efficiency gains have been harvested, and customer service has been improved. But especially the figures for sales increase are disappointing, and there seems to be a case for a deeper analysis why almost no Danish companies report on increases in sales area, when close to one third in the global sample have had this positive effect. This is the more surprising since Denmark has one of the highest figures for export in percent of GDP.

Danish companies have gone further along the road of providing on-line sales and services, but the lack of integration (including the use of e-marketplaces) suggests to us that they have not been able to exploit the leading position to obtain efficiency/effectiveness gains which are beyond the average in the global sample.

6.2 Impact on Industry Structure of Doing Business On-line

The final set of questions from the GEC-survey were related to the way in which the Internet has changed industry structure, value chains, markets and the competitive climate. The hypotheses are of course that markets become more transparent, more efficient, and more competitive.

More than 40% of the companies in the Danish as well as the global sample report that the '**number of distribution channels**' has increased. The Internet has added at least one new distribution channel for information, on-line services, customer support, on-line sales etc. This is especially the case for companies within the finance industry, since the product of these companies might be digitalized.

But also traditional manufacturing companies can benefit. Novozymes, (global leader in enzymes for industrial purposes e.g. for detergents, baking powder and more than fifty other processes) developed a private trading exchange for their > 20,000 SME customers. For the 16 – 17 key customers, Novozymes enter into 'any' type of collaborative agreement regarding integration of their sales processes into the procurement processes of their customers (e.g. vendor managed inventory). But for all other customers, they will either have to order from the web-site, or pay a penalty of 150\$ to order by fax. More than 40% of all orders in 2002 are received via their web-site. Over and above the 'buying room', the web-site includes a 'product room' containing 'all you ever wanted to know about industrial enzymes' drawing on a large number of sources for updating, and a 'customer service-room' This much acclaimed web-site was selected as the best B2B site in Denmark in 2002, and hailed by Accenture as one of the leading European B2B sites in their report: The surprising success of European eCommerce, (Accenture, 2001). Furthermore, the '**number of suppliers**' and the '**number of competitors**' have increased for 16.7% and 18.0% of the Danish companies, but these numbers are only about two-thirds of those in the global sample. But we do not have any good explanation why Danish companies had this lower estimation.

Finally, no less than 48.3% of the Danish sample (against 41.5% in the global sample) report that there is an '**increased intensity of competition**'. This is what we would expect. The Internet makes it much easier to identify new potential suppliers, identify their products/prices, inspect the quality of their goods/services, negotiate conditions, handle logistics etc, especially from hitherto rather inaccessible markets like e.g. China.

TABLE 26. Impacts of Doing Business On-Line, 2002

	Establishment		Sector ^b			Total	
	Size ^a		Mfg.	Distrib.	Finance	Denmark ^c	Global ^d
% indicating ^e	SME	Large					
Number of distribution channels increased	42.8	31.9	27.5	31.8	60.9	42.5	40.2
Number of suppliers increased	16.9	10.5	24.7	20.6	7.8	16.7	29.9
Number of competitors increased	18.2	9.8	12.8	14.3	23.9	18.0	27.9
Intensity of competition increased	48.6	35.9	35.2	29.2	73.5	48.3	41.5

Note. ^a SME (small and medium sized establishments) are those with 25-250 employees; large are those with more than 250 employees.

^b Manufacturing includes all establishments classified as SIC 20-39; distribution includes wholesale and retail (SIC 50-54, 56-57, 59); finance includes banking and insurance (SIC 60-65).

^c Responses were weighted based on the total number of establishments by employee size within the sector for each country. Survey sample sizes for Denmark by sector are 69 establishments in manufacturing, 67 in wholesale & retail distribution, and 64 in banking & insurance; by size are 100 establishments classified as SME and 100 as large.

^d Consists of weighted survey responses in 10 countries combined: United States, Mexico, Brazil, Germany, France, Denmark, Singapore, Taiwan, China and Japan. "Global" sample sizes by sector are 743 in manufacturing, 701 in wholesale/retail distribution, and 695 in banking & insurance; by size are 1,088 establishments classified as SME and 1,053 as large.

^e Exact wording of question: Please indicate whether the following have increased, decreased or stayed the same in your establishment since it began using the Internet for business.

Over time we would expect to see increased coordination and control within the four areas of

- Collaborative demand forecasting, replenishment, promotion planning towards customers in the downstream supply chain
- Collaborative supply planning, procurement, production scheduling upstream in the value chain
- Collaborative logistics planning, transportation management, distribution services, typically with third party companies
- Collaborative product engineering and design of new products

One of the Danish companies who have gone furthest down this route is the HiFi manufacturer Bang & Olufsen. They have totally integrated their downstream supply chain to distributors and retailers, and their upstream supply chain towards components suppliers.

An interesting change in industry structure has taken place during the 1990s with the Danish Textile industry. In the early 1990s there were 20,000 seamstresses in an area in the middle of Jutland around Herning. Today there may be 200 left. (Danish Textile Union, interview 2001). The reason is that Danish seamstress salaries of 12 – 13 \$/hour cannot compete with salaries in Poland, Lithuania and Asia. Earlier the transaction costs of sending the cloth to these places was too high. Today, with the advances in Internet and to some extent lower transportation costs, it is possible to outsource production to these places. Accordingly, the nature of the industry has changed. Design, management, logistics, sales, marketing etc is still carried out in Denmark, but the labor intensive part is placed in areas/countries where the labor costs are substantially lower.

A third example relates to the area of B2C kitchen durables. An increasing number of consumers now utilize www.hvidevarepriser.dk. Here consumers can search information on all types of durables and their prices. Typically one would find that the lowest offer here will be a meager 5% higher than the price from the manufacturer/importer.

This type of web-sites are now changing the nature of the market for white goods. Unofficial sources in the industry now claim that 10% of all sales of white goods are now distributed through these types of discount stores where the business model is to obtain orders from the web-site, and not procure from manufacturers until order is obtained. Delivery takes place directly from the warehouse of manufacturer to the consumer with a margin of 5%.

In other markets like job-advertising or advertising of real estate, there is a clear reduction in the number of traditional newspaper ads. No official statistics exists, but the unofficial estimates is that in 2002 the number of advertisements have been reduced by 20% in 2002. Some of this is explained by the downturn in the economy, but that does not explain the full story. The Internet has sparked off an irreversible trend.

One of the expectations has been that the Internet is creating a devastating price competition where the lowest cost will be determined by the most efficient supplier, and where a small price difference will cause all buyers to shift their supplier. Clearly this has not been the case. There are many more aspects to buying than the price. Quality, trust, service etc. But especially regarding price we have seen a tendency to the advent of 'virtual cartels'. If a vendor in a market with standard products (e.g. airline tickets or CD's) is lowering the price, there is no question that competitors as a general rule will find out long before customers. Accordingly, almost all competitors will be able to follow suit and eliminate price differentials. Accordingly, we find that prices published on the net are either standard prices (no negotiation possible) or maximum prices as a starting point for negotiations. This is another type of change in market conditions.

In summary, competition has changed. But we believe that we are still in the early stages of the total restructuring of whole industries, markets and value chains, which have been predicted. We have given a number of examples of how this is taking place already now. However, but we are still in the early days of the transitions towards the New Economy.

7 Conclusion

The Danish society in general, and Danish industries in particular, has a relative high IT-awareness and the technological prerequisites for a fast, widely dispersed diffusion/adoption of e-commerce. Danish companies are clearly ahead of the global sample in using e-mails, establish web sites, use intra/extranet, EDI and EFT. Danish companies are also ahead when it comes to internal integration of the Internet applications with other internal systems (databases and other information systems often called ERP-systems). Also when we are looking at integration with systems of suppliers and customers, Danish companies are ahead of the global sample, although not by a large margin.

Furthermore, the prerequisites for being ahead are there. The drivers for e-commerce (e.g., that customers demand it) are perceived stronger, and the barriers (privacy objections, lack of credit-cards, costs of e-commerce etc.) are clearly perceived less

obstructing than in the global sample and in developed countries like Germany, France and the US.

As one would expect, Danish companies got off to an early start not just getting a website and using e-mail, but more actively embarking upon re-engineering their business processes. According to the global survey, more Danish companies than in the global sample were using the Internet for advertising/marketing, selling on-line, after sales service, making purchases on-line, integrating business processes with suppliers/customers, and exchanging operational data with suppliers. Only 'exchanging operational data with business customers' and 'participation in 'Internet-based Trading communities' (e-marketplaces) was less widespread among Danish companies than in the global sample.

According to the GEC survey, the mean percent of total consumer sales conducted on-line of Danish companies is double of the global sample, and the mean percent of total business sales is also ahead of the global sample (4.8% against 4.0%). Furthermore, readiness to accept payment on-line is 48.3% compared to the global sample of 33.6%.

On the general level, we see the same picture for on-line services. Substantially more Danish companies conduct some service on-line (53.2 percent against 33.3 percent in global sample), twice as large a percent of total consumer service is conducted on-line (15.9% against 33.3%), and the mean percent of total business services is 33.2% in Danish companies as against 11.0% in the global sample.

However, in the more detailed analysis of kind of services within the three industries, we find large deficiencies and surprises. Deficiencies are found especially within manufacturing companies, where much fewer Danish companies are providing product configuration information and order tracking. The surprise is especially with finance, where contrary to what most observers in Denmark would expect, it is the same percent of Danish banks/insurance/other institutions conducting on-line services as we find in the global sample. But it is also surprising that expect for 'gift certificates' the percent of Danish companies in retail/wholesale offering product catalogs, product reviews, customizations, and account information on-line is clearly ahead of the global sample.

In general, when comparing the performance of SME's and larger companies, there is not a big difference. Often SME's have been faster and more flexible to get onboard e-commerce than the larger companies. Only the smallest SME's, those often called micro-companies (5 – 9 employees), and SME's with 10 – 24 employees, are in general diagnosed by e.g. by The Association of Danish Industries, to be lacking behind.

The picture above of relatively high IT-readiness, high adoption, strong drivers, low barriers, high level or adoption of on-line in all business processes etc. has, however, not had a significant impact on business. There are not a substantially higher number of Danish companies reporting on successes like more efficient business processes, increased staff efficiency, cost reductions, increased sales etc. On several of these dimensions, there are even fewer Danish companies reporting on positive developments.

One possible solution to the puzzle of this paradox could be related to this very few companies have increased the number of suppliers (have they strongly enough exploited the procurement possibilities?) or maybe the answer should be found in the fact that more Danish companies (48.3% as compared to the global sample of 41.5%)

report that the intensity of competition had gone up. Either of these offers appear to offer the full explanation. We see a clear need for more proactive Internet-based business strategies and policy implications.

The World Economic Forum ranks Denmark number eight (after Finland, US, Singapore, Sweden, Iceland, Canada and UK) on their 'Networked Readiness Index' (WEF 2003), especially drawing points for having limited production of IT-hardware and be relatively low when it comes supply of engineers and scientists.

The ITU ranks Denmark second after Hong Kong on their 'Top Mobile/Internet Rankings Worldwide' when it comes to readiness for the uptake of mobile services.

Clearly, our study points in the direction of increased focus and accelerated efforts if Danish companies are to take advantages of the early uptake of Internet.

All in all, Denmark has been among the leaders in the e-commerce field until 2002, although by no means in the pole position. The very high costs of labor, the very open economy, the increased competition and the relative ease at which it is possible to catch up in the e-commerce race, makes it a key challenge to further boost the restructuring of Danish industries to meet the challenges of the networked economy.

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