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THE EFFICIENT USAGE OF E-COMMERCE APPLICATIONS BY SMES IN THE RETAIL/WHOLESALE INDUSTRY: A FOUR-NATION COMPARISON

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Abstract

SMEs in the wholesale and retail industry are impacted by enormous changes in their business processes. E-commerce-related developments have reduced the importance of physical branches and changed the demands by customers for products and services. This paper analyzes the differences among SMEs in the distribution sector in four countries based on empirical data collected via a survey. Best practice cases such as Germany or Denmark in performing e-commerce in an efficient way are identified by using a data envelopment analysis (DEA). Leading SMEs in the sample have implemented consequently a wide range of e-commerce applications, resulting in a higher satisfaction rate, while less efficient ones are characterized by unfocused usage.

Keywords: Wholesale/retail industry, SME, e-commerce, DEA, efficiency, innovation, diffusion

Introduction

The impact of impending e-commerce on accepted business processes and methods has especially influenced the wholesale and retail industry. No other industry had to cope as much with the changes in customer preferences to shop online instead of making traditional brick-and-mortar sales. Changing customer preferences together with decreasing loyalty are a new challenge for small retailers. Internet customers are better informed and more price-sensitive than offline customers. The ability to compare prices directly on the Internet increased competition and provided greater transparency. Small- and medium-sized enterprises (SMEs) are predicted to be flexible and innovative in using the new form of conducting business more flexibly than large retailers. On the other hand, SMEs are often not able to compete with large competitors due to high setup costs of web-enabled materials management systems or web-based shopping systems. Moreover, SMEs have more difficulties to attract IT specialists for their business and can mostly not benefit from economies of scale nor do they have sophisticated distribution systems in comparison to large enterprises such as catalog sellers.

Nevertheless, SMEs in the wholesale and retail industry play important roles in most countries as the main distribution channels, responsible for 66% employment in the European Union and 46% of employment in the US (EC 2002).

Especially SMEs are looking more carefully at the return on investment in IT spending after the Internet bubble burst. The expensive integration of new technologies into an old environment has to be calculated very carefully. Therefore, it is important to identify successful integration approaches to learn more about the drivers and barriers of e-commerce usage at SMEs. Efficient combinations of IT implementations together with positive impacts on both the improvement of processes and the expanding of markets are necessary prerequisites to use e-commerce technologies in a profitable and satisfying way.

This paper provides empirical results based on a survey conducted during the summer of 2002 by International Data Corporation (IDC) on behalf of the underlying research project. It analyses the implementation and usage differences in three European countries (Denmark, France and Germany), as well as the US. While German SMEs in the distribution sector invested heavily in the development of their IT and e-commerce infrastructure, it seems that the targeted efficiency gains were not yet realized completely. Nevertheless, IT innovation or the fast adoption of innovative techniques and technologies in Denmark, Germany and the US is a critical factor in order to be successful today and in the future. It appears that French SMEs still have a substantial lack in the field of e-commerce implementation and usage. The investigated heterogeneities in the diffusion of e-commerce technologies and usage affirmed the authors' opinion that it is important to understand national differences in a better way to learn from best practice cases as benchmarks at the international level.

Following, this paper provides a short description of innovation diffusion theories and their limitations. Next important results of the empirical survey are presented together with a data envelopment analysis (DEA) to identify efficient SMEs in each country as an international benchmark. The paper concludes with a summary about SMEs' adoption behavior of innovative technologies and the related impact on operational process efficiency.

Diffusion of Innovations

The term diffusion is generally defined as “the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers 1983, p. 5). The traditional economic analysis of diffusion focuses on describing and forecasting the adoption of products in markets. In particular, the question of which factors—drivers and barriers—influence the speed and specific course of diffusion processes arises (Weiber 1993). Traditional diffusion models are based on similar assumptions: Generally, the number of new adopters in a certain period of time is modeled as the proportion of the group of market participants that have not yet adopted the innovation. Based on this fundamental structure, three different types of diffusion models are most common (Weiber 1993, Lilien & Kotler 1983, pp. 706-740, Mahajan & Peterson 1985, pp. 12-26): The exponential diffusion model (also external influence model or pure innovative model) assumes that the number of new adopters is determined by influences from outside the system, e.g., mass communication. The logistic diffusion model (also internal influence model or pure imitative model) assumes that the decision to become a new adopter is determined solely by the positive influence of existing adopters (e.g., word of mouth). The semi-logistic diffusion model (also mixed influence model) considers both internal and external influences.

Although these theories are able to explain the process of diffusion, in general they fail in the field of explaining the impacts of innovation on existing organization structures or the measuring of hopefully resulting in efficiency improvements. Furthermore these models do not explain the real-world phenomena of different adoption decisions for SMEs and large enterprises at the same period nor give any information about the role of “gun-to-the-head”-adoption pressure of large business partners on small enterprises. Although the nature of e-commerce applications is more or less the same, each country is following its own diffusion path, based on national differences in competition, IT infrastructure, business concentration, governmental regulations or even mentality. Consequently, the paper provides an inside view of the different drivers and barriers resulting in the varying paths of diffusion in the four countries.

Identifying Efficient SMEs – A DEA Description

For a better understanding of the national differences among SMEs in the studied countries, the underlying empirical questionnaire was designed by the research project participants; the survey itself was conducted by IDC during the period of February 18, 2002 to April 5, 2002. It was conducted in four countries with altogether 151 SMEs of the wholesale/retail sector in Denmark (33 firms), Germany (34 firms), France (31 firms) and United States (53 firms). The survey included only firms which used the Internet to buy, sell or support products or services. SMEs are defined as enterprises with 25 to 249 employees. All studied 151 firms belong to this category.

For analyzing the relative efficiency of e-commerce-deploying SMEs in the distribution sector, a data envelopment analysis (DEA) is used (Charnes et al., 1978). Efficiency in this context is defined as the measured satisfaction on a five point Likert scale, ranking from e-commerce impact “not at all” (1) to “a great deal” (5) and based on the individual set of IT and e-commerce implementations. SMEs with a high satisfaction index based on the IT and e-commerce infrastructure in place may be defined as *efficient* in comparison to the rest of the four-country sample.

Since most SMEs cannot determine their benefits by implementing innovative technologies in monetary units, the survey asked for the set of adopted IT and e-commerce technologies on the one hand and the individually perceived efficiency or perceived satisfaction on the other hand.

The object of interest in a DEA model is the decision-making unit (DMU) which is similar to a firm. A DMU is a flexible unit responsible for the in- and output variables. DEA compares each DMU with only the “most efficient” DMUs of the sample. Efficient combinations of input and output relations or efficient DMUs of a sample build the so-called “efficient frontier line”. In a three-dimensional room the efficient frontier is equivalent to an imaginary umbrella over the sample, including the efficient DMUs and all theoretically possible combinations of efficient, virtual DMUs. The DEA model calculates for each DMU based on its set of inputs and set of outputs the relative position inside the data sample. Using a linear programming procedure for the frontier analysis of inputs and outputs, DEA evaluates here the “best-practice” users of e-commerce. The basic idea of DEA is the multi-input and multi-output-oriented efficiency evaluation without any further assumptions about the structure (e.g., normal distribution) or side conditions. In contrast to parametric methods DEA can use all kinds of input and output data to analyze the production behavior. The used DEA model was non input- or output-oriented because neither an input minimizing (input-oriented) nor an output-maximizing (output-oriented) analysis was necessary to evaluate the observed, actual input/output relation identified in the survey. Moreover, the model assumes returns of scale for each DMU depending on the size and a concave function of decreasing returns. The used software for the data analysis together with a detailed description is available with Scheel (2000). In comparison to traditional methods the DEA model needs no assumptions about the productivity function of a company with the exception of the given assumption that productivity is following a monotonely increasing and concave curve. A further difference between DEA and traditional analysis methods such as regression analysis is that DEA derives the efficient frontier line from the combination of in- and output relations, while the regression function uses a maximum-likelihood approach to identify the average input-output curve with a general tendency.

The DEA model was chosen over other potential analysis methods due to the alternative and novel way of analyzing a set of data in comparison to the best performing data sets. A regression analysis, e.g., only describes the deviation of best performing data sets from the average. This may be useful to compare the average e-commerce efficiency impact with other countries, but it can hardly be used to identify best practice cases and benchmark these within the national data set. Different kinds of DEA models found a manifold usage to measure the impacts of IT, e.g., in the banking industry (Barr et al., 1999).

Here the DEA was used as follows: As input variables for the DEA model the results of seven questions about the set of used e-commerce applications are used (cf., table 2), measuring the number of e-commerce technologies in place as a binary variable. Variables are coded as 0 when an establishment uses the asked for e-commerce technology and 1 if it does not use it. The coding is equivalent to more costs of input when e-commerce is not available or the other way round, i.e. firms using e-commerce gain benefits by reducing their processing costs. The ten output variables of the model are measured on a five-point scale (cf., table 4) with 1 (no impact at all) to 5 (a great deal). The DEA model uses a linear program to analyze for each establishment the ratio between low costs of input (using e-commerce) and the resulting satisfaction output. As a result the DEA identifies the best practice cases or the most efficient establishments within the sample. Firms on this so-called “efficient frontier line” are relatively more efficient users than other firms below the frontier line. For a better explanation of the results the average of “efficient” and “inefficient” establishments were calculated. The seven input variables are aggregated to an Internet usage indicator, while the ten output variables resemble an average e-commerce satisfaction index. The input variables are used unweighted so that each e-commerce technology has the same explanatory weight or loading for the efficiency of DMUs.

Results of the Four-Country SMEs Survey in the Retail/Wholesale Distribution Sector

The overall diffusion and adoption of e-commerce applications has reached a high level in all countries studied. As table 1 indicates, the usage of e-mail has become a common tool in everyday work. Denmark is the leading user of public websites or homepages (97.0%), as well as in the deployment of Extranet technologies (39.4%). But German SMEs are not far behind, i.e. they less often provide their own websites (91.2%), they are at the forefront in Intranet usage (82.4%), the usage of electronic data interchange (EDI) (76.5%), of electronic funds transfer (85.3) and even in offering call centers (41.2%). Aside from German and Danish SMEs in the distribution sector, French and American SMEs use one of these technologies less often.

Especially in the field of business process automation German SMEs use more often EDI or EFT than any other country's industry. The usage of EDIFACT and its subset EANCOM has a long tradition in Germany's distribution industry which offers

also message types for electronic funds transfer. Aside from EDI-based funds transfer online banking has gained considerable importance in Germany.

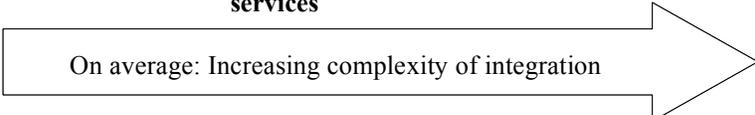
Table 1. SMEs E-Commerce Readiness in the Distribution Sector by Country

	Denmark	France	Germany	USA
Use of E-mail	100.0%	96.8%	100.0%	100.0%
Public Web site	97.0%	51.6%	91.2%	73.6%
Use of Intranet	78.8%	71.0%	82.4%	58.5%
Use of Extranet	39.4%	9.7%	26.5%	28.3%
Use of EDI	66.7%	41.9%	76.5%	37.7%
Use of electronic funds transfer	57.6%	29.0%	85.3%	56.6%
Use of call center	33.3%	25.8%	41.2%	35.8%

Source: IDC, 2003

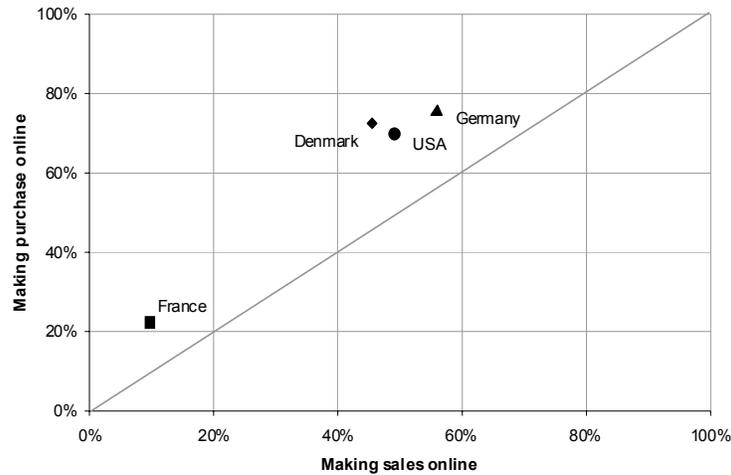
Based on the large installed base of established e-commerce technologies in the distribution sectors of the four countries, e-commerce is used to improve all kinds of internal and external business processes (cf., table 2). While the Danish SMEs use with 93.9% online advertising more often than any other distribution sector, the lowest usage was in France with 25.8%. Internet-based after-sale customer services are more often provided in the US than anywhere else (52.8%). Aside from these two areas German SMEs in the distribution sector dominate in all the other ones. SMEs in Germany use more often the possibilities by deploying online sales (55.9%), online procurement (73.5%), EDI with suppliers (67.6%) and customers (52.9%), as well as Internet-based supply chain management (44.1%). While France reported in all these fields a low usage, the high usage in Germany is especially in comparison to the US or Danish SMEs remarkable. The usage of electronic commerce which is not based on the Internet has reached a high level in Germany, especially with EDI. The integration of such advanced and standardized technologies is more complex than the usage of, e.g., online sales or procurement which is often used without any automatic ordering system. EDI or supply chain management is in general a machine-to-machine connection without any manual manipulation or media-flow interruption. Those efficient technologies together with the underlying electronic internal and external business processes are the basis for efficiency and economy-of-scale benefits.

Table 2. SMEs E-Commerce Usage in the Distribution Sector by Country

	Online advertising	Online Sales	After sales customer services	Online procurement	EDI with suppliers	EDI with customers	Internet based supply chain management
							
Denmark	93.9%	45.5%	48.5%	72.7%	45.5%	27.3%	39.4%
France	25.8%	9.7%	12.9%	22.6%	29.0%	29.0%	16.1%
Germany	82.4%	55.9%	41.2%	73.5%	67.6%	52.9%	44.1%
USA	54.7%	49.1%	52.8%	69.8%	41.5%	43.4%	35.8%

Source: IDC, 2003

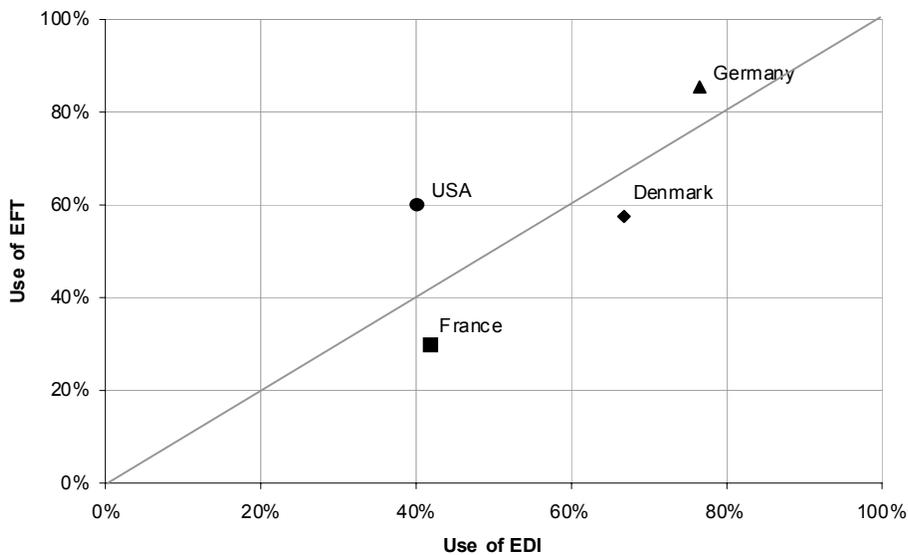
Although e-commerce technologies made their way into all European and US wholesale and retail firms, still remarkable differences remain. German retailers (see figure 1) as part of the very innovative German SMEs, the so-called *Mittelstand*, are leading in the field of online sales and procurement. 55.9% of German SMEs reported the active usage of online sales and 75.8% the usage of e-procurement. At the same time, SMEs in other economies such as in the US or Denmark use less often these possibilities. Only 45.8% of Danish retailers use online sales while online procurement is only used by 72.7%. American retailers are nearly equal to Danish ones with 49.1% usage of online sales and 69.8% usage of online procurement. While German firms were able to catch-up with former leading nations, French SMEs still lack behind. E-commerce to support sales is only used by 9.7% and online procurement by 22.2% of all analyzed SMEs in France.



Source: IDC, 2003

Figure 1. SMEs Use of Online Sales and Procurement in the Distribution Sector

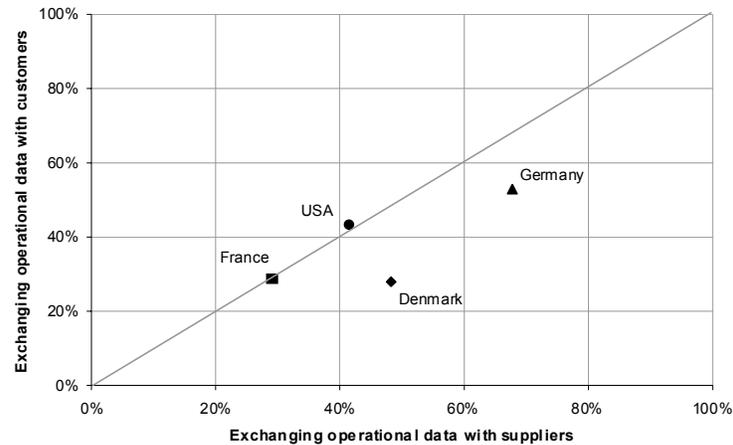
Interestingly, all countries and firms use more often online purchasing in contrast to online sales. While online sales is not as complex to integrate into existing ERP systems, firms in this study use more often online procurement. This may be explained in that most establishments have not integrated automatic replenishment systems or interlinked their ERP-systems with the Internet, but are ordering manually at web front-ends. This is of course the easiest way to use e-commerce in the first step, but holds no additional positive network effects for, e.g., the storage and processing of data in in-house systems. The usage of these technologies is therefore not applicable to make assumptions about e-commerce readiness of an industry. To analyze the degree of automation-avoiding media-flow interruptions which occur often by using web front-ends manually, national differences in the availability and usage of electronic marketplaces and standardized electronic formats such as the XML-based catalog standard BMEcat in Germany have to be taken into account in further research.



Source: IDC, 2003

Figure 2. SMEs Use of Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT)

While the usage of online sales and procurement may be described as more or less equally distributed in Germany, Denmark and the US, larger differences among the studied four countries may be observed in the application of EDI and electronic funds transfer (cf., figure 2). 76.5% of German SMEs are using EDI and 85.3% use EFT to conduct their payment traffic online or via EDI networks. While the usage of these technologies became a common every-day application among most German SMEs in the retail business, Danish SMEs with their also long tradition in EDI usage only deploy it in 66.7% of all cases and EFT only with 57.6% of all respondents. In fact, 60% of US merchants are using EFT, but only 40% are using EDI in addition. Again French SMEs are far behind the best-performing countries in this sample. Only 41.9% of French mid-sized firms in the distribution sector have EDI systems in place and only 30.0% are using EFT for financial transactions.



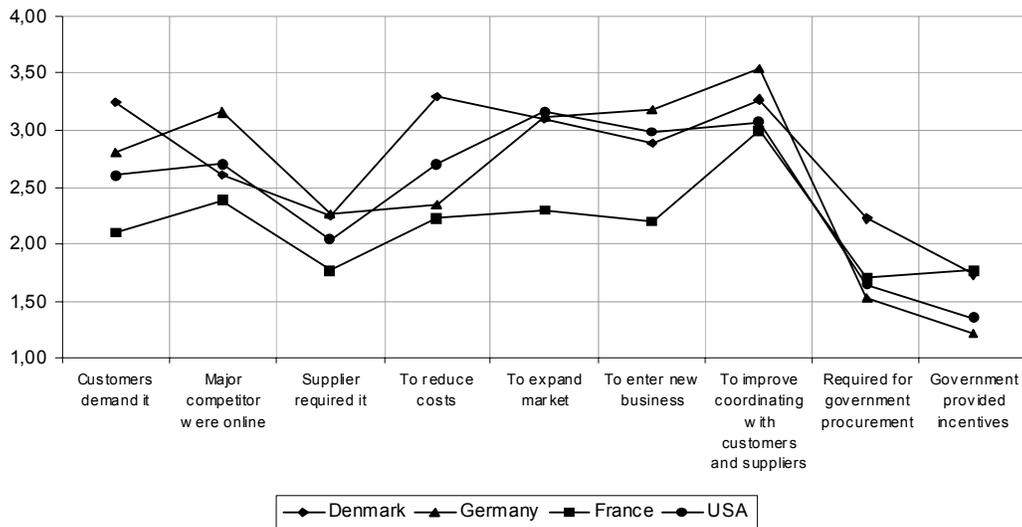
Source: IDC, 2003

Figure 3. SMEs Use of Internet to Exchange Operational Data with Customers or Suppliers

In the area of more advanced and sophisticated e-commerce solutions the overall penetration is lower in all countries in comparison to the latter ones (cf., figure 3). Approximately 67% of German SMEs use operational data exchange with their suppliers and also approximately 53% of them conduct operational data exchange with their customers. In comparison to Germany, US SMEs using these two e-commerce categories up to 41.5% (EDI with suppliers) and 43.5% (EDI with customers). In France and in Denmark, the usage of supplier-oriented supply chain management is nearly equally distributed with 29.0% in France and 28.1% in Denmark. At the same time Danish firms use with 48.4% EDI for operational data exchange with suppliers while only 29.0% of French firms do so. As expected, the downstream usage of EDI to correspond with suppliers is higher than in the upstream with customers in all countries studied.

The reasons for implementing e-commerce technologies also vary among the surveyed countries, depending on the time-lag in innovation diffusion behavior in each country, as well as on the different drivers and inhibitors which are also closely related to national tradition and mentality. Figure 4 depicts the yielded drivers of e-commerce, using a five point scale, where 1 corresponds to “not a factor at all” and 5 to “a very significant factor”. Important drivers for SMEs to adopt e-commerce technologies are in all countries the possibility to improve the coordination with customers and suppliers. The expansion of markets or the entering of new markets is of high importance for advanced users of e-commerce in Denmark, Germany and the US. French SMEs in the wholesale/retail industry regard all asked about drivers continuously with lower importance than SMEs in other countries. While especially in Germany the adoption of e-commerce applications is strongly driven by competition issues, in the US, Denmark and again in France this factor seems to be less important.

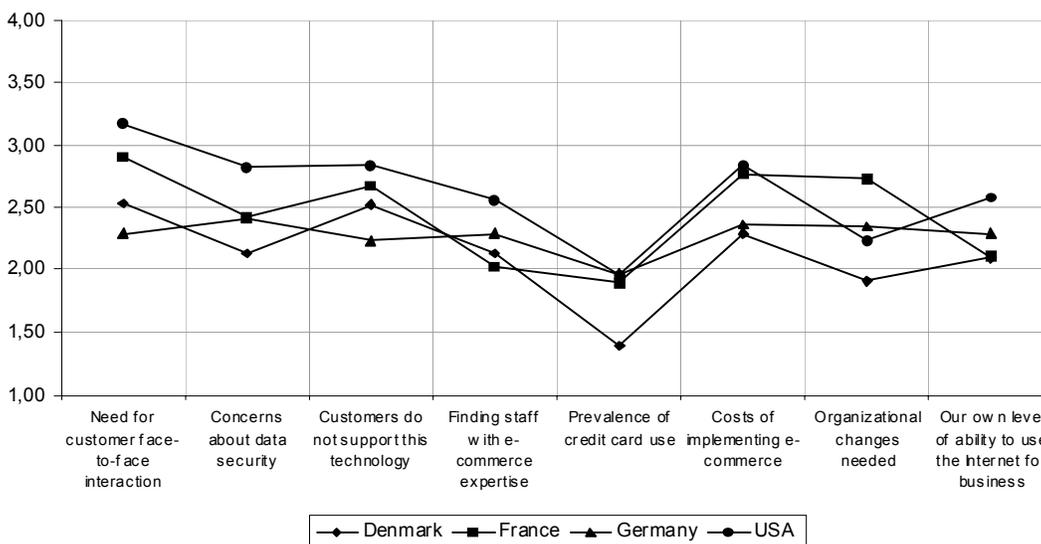
One of the most unimportant drivers of e-commerce—for economic reasons—is the necessity to integrate e-commerce based on pressure of suppliers requiring e-commerce-ready business partners. Government’s contribution to the diffusion of e-commerce seems to be rather unimportant in all surveyed countries. With the exception of France and Denmark, where online business with the government seems to require e-commerce standards, SMEs in the distribution sector assess the impact of the government not as a driving factor.



Source: IDC, 2003

Figure 4. E-Commerce Drivers for SMEs in the Distribution Sector

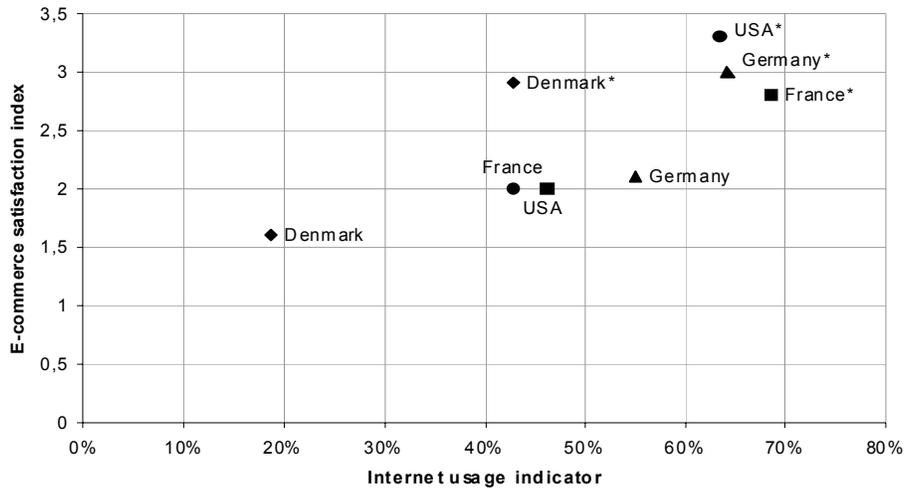
Conversely, and aside from the e-commerce drivers, the questionnaire investigated also the most important impeding reasons for doing business online (cf., figure 5). For to figure 4, a five-point scale was used; where 1 correspond to “not an obstacle” and 5 to “a very significant obstacle”. Interestingly, SMEs in the US rated the highest obstacles on average. While the need for customer face-to-face action is not as important in Germany or Denmark, American or French SMEs rate this obstacle as an important hindering reason. American SMEs, followed by French and German ones, regard security reasons as important obstacles. While the obstacles in the field of technology support on the customer side or the bottleneck of e-commerce skilled staff is more of a problem in the US, the prevalence of credit cards for online shopping is not seen as an important impeding reason in all countries, especially not in Denmark. An often mentioned barrier for SMEs is the costly integration of e-commerce solutions into existing in-house IT infrastructure. US SMEs regard this together with French ones as an important barrier; followed by German and Danish retailers. In the field of mandatory organization changes Danish SMEs, followed by US ones, responded with the lowest hindering reasons. French and German firms regard this point as critical for successful implementation of e-commerce applications. The level of ability to use the Internet for their own business is seen as critical in the US, followed by German SMEs. In general, US SMEs believe to be confronted with more impeding reasons than European ones.



Source: IDC, 2003

Figure 5. E-Commerce Impeding Reasons for SMEs in the Distribution Sector

The e-commerce output and, therefore, the impact of e-commerce on business processes depend directly on the intensity and variety of implemented applications. The DEA avails the 151 data sets as decision-making units (DMU). Afterwards, the results may be used to select the efficient (marked by *) from the inefficient ones. In figure 6 the results of the DEA are provided. On average, efficient SMEs in the US use 63.5%, in Denmark 42.9% and in Germany 64.3% of the seven asked for e-commerce technologies (i.e. usage of: online advertising, online sales, after-sale customer service, online procurement, EDI with suppliers, EDI with customers, Internet-based supply chain management). The impact on business improvement is measured as the satisfaction index among 2.8 (France), 2.9 (Denmark), 3.0 (Germany) and 3.3 (US).



Source: IDC, 2003

Figure 6. Results of the DEA Analyses

The largest differences in the availability of e-commerce technologies, as well as the derived satisfaction are observable in Denmark and France between efficient and inefficient SMEs. While inefficient German SMEs deploy only 9.2% fewer e-commerce applications, the differences in Denmark are with 24.1% or France with 22.3% quite large. Together with the lowest efficiency ratio (cf., table 3) one may argue that in these countries a few outperforming SMEs exist, while the majority of firms are somewhat behind. In Germany, the percentage of efficient firms is higher and the gap between efficient and inefficient SMEs is not as large. This might be an indicator for a broader diffusion of advanced e-commerce solutions among the majority of German wholesale/retail industry.

Interestingly, efficient Danish SMEs derive nearly the same satisfaction out of e-commerce as German ones with only 42.9% of all available e-commerce technologies. One possible explanation might be the higher enthusiasm in Denmark accompanied by e-commerce than in the other three countries. Another explanation might be the larger potentials even of fewer e-commerce technologies in Denmark than in Germany or the US.

While figure 6 only indicates the percentage of e-commerce applications and resulting satisfaction of efficient and inefficient firms, it provides no information about the percentage of inefficient and efficient SMEs in each country. The percentage of efficient SMEs per country, identified by the DEA method, is provided in table 3. Only 30.4% of Danish and 33.3% of French SMEs are efficient users of e-commerce at the international level, gaining nearly as much process improvement and satisfaction from these technologies as German or US SMEs. The percentage of efficient SMEs in this sample is for Germany and the US with approx. 36% nearly equal.

Table 3. Percentage of Efficient SMEs in the Sample per Country

	Denmark	France	Germany	USA
Efficient	30.4%	33.3%	36.4%	35.3%

Source: IDC, 2003

Drivers and barriers, as well as the efficient usage of e-commerce have impacts on the internal and external business processes. Detailed information about the resulting process improvements are provided in table 4. The highest impact in comparison to other countries in Denmark was reported in the area of coordination improvement with suppliers (30.2%). SMEs in other countries were not able to improve this external process in the same way. The highest impact in France in international comparison was reported in the area of internal process improvement (38.7%), while all other countries reported improvements below 30%. German SMEs best perform at the international level in the area of increasing international sales (14.7%) and decreasing inventory costs (20.6%). Astonishingly, only German SMEs were able to widen their international sales by double digits.

The highest positive impacts are reported in the US. Here SMEs reported e-commerce as “a great deal” to increase staff productivity (30.2%), to increase sales (24.5%), to widen the sales area (35.8%) or to improve customer services (35.8%). Moreover, SMEs in the US believe that their competitive position was improved by the deployment of e-commerce (32.1%). Also US SMEs listed more often e-commerce as a great deal with high impacts on business processes, SMEs in Denmark or Germany are as often at the forefront of e-commerce usage. Further research needs to investigate why e-commerce-leading SMEs with efficient usage stated a lower impact rate than the US.

Table 4. Impact of Doing Business Online, i.e. Percent Indicating Impact is “a great deal”

	Denmark	France	Germany	USA
Internal processes more efficient	27.3%	38.7%	29.4%	24.5%
Staff productivity increased	9.1%	29.0%	11.8%	30.2%
Sales increased	9.1%	9.7%	20.6%	24.5%
Sales area widened	12.1%	16.1%	26.5%	35.8%
Customer service improved	27.3%	19.4%	23.5%	35.8%
International sales increased	6.1%	9.7%	14.7%	9.4%
Procurement costs decreased	18.2%	3.2%	20.6%	11.3%
Inventory costs decreased	15.2%	0.0%	5.9%	11.3%
Coordination with suppliers improved	30.2%	16.1%	17.6%	28.3%
Competitive position improved	21.2%	12.9%	23.5%	32.1%

Source: IDC, 2003

Conclusion

SMEs in the wholesale and retail industry have been impacted by enormous changes in their business processes. E-commerce-related developments have reduced the importance of physical branches and changed customer demands for products and services. We analyzed the differences among SMEs in the wholesale and retail distribution sector in four countries based on empirical data collected via a survey in 2002. Best practice cases such as Germany or Denmark in performing e-commerce in an efficient way are identified by using a data envelopment analysis (DEA). Leading SMEs in the sample have implemented consequently a wide range of e-commerce applications, resulting in a higher satisfaction rate, while less efficient ones are characterized by unfocused usage.

The rush to pursue e-commerce just to keep up with competitors in the retail/wholesale distribution sectors of Germany, Denmark or the US is over. SMEs are using e-commerce tactically to improve their everyday business processes and to widen their sales on the national market in the same way as large enterprises. E-commerce has changed substantially the B2C relation to customers and created more competitive markets. The often heralded lack of e-commerce applications and business strategies among SMEs seems no longer valid for the studied markets, maybe with the exception of France. In that sense we could posit that the diffusion of e-commerce technologies and applications seems to have peaked or, using diffusion-phraseology, has plateaued.

The implementation of e-commerce has shown operational improvements and efficiency gains and thereby helped to decrease procurement or inventory costs. Collaboration along the entire extended supply chain, as well as customer relationship chain has improved trading not only for large enterprises. In comparison to early adopters of e-commerce in the US, European SMEs seem to have sped up their path towards the Internet economy and have reached a leading position in many areas.

Although the nature of e-commerce applications is more or less the same, each country is following its own diffusion path, based on national differences in competition, IT infrastructure, business concentration, governmental regulations or even mentality. Consequently, we provide a practical inside view of the different drivers and barriers resulting in the various paths of diffusion among SMEs in the four countries.

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