

# Globalization and Diffusion of E-Business: Two Sides of the same Medal

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## ABSTRACT

*Is globalization driving the diffusion of e-business or is the diffusion of e-business applications driving globalization? In this paper we analyze the empirical data from a cross-country survey with 903 firms from Denmark, France, Germany, and the US from a German perspective. In our survey, more than one third of all firms responded that the implementation of e-business contributed substantially to improve existing operational processes and to expand markets. Although e-business technologies may be available theoretically in all industries and firms, a sustainable impact on business processes depends on the extent and number of deployed e-business applications. A further prerequisite for efficient usage is the consistent and broad integration of applications to meet global competition. On a macroeconomic level, different economic environments and specific national drivers have a significant influence on the diffusion and resulting impact of e-business applications among the industries analyzed.*

**Key-words:** E-business, Adoption, Innovation, Diffusion, Global usage.

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## RÉSUMÉ

*Est-ce la globalisation qui entraîne la diffusion de l'e-business ou bien est-ce la diffusion des applications de l'e-business qui entraîne la globalisation ? Dans cet article, nous examinons de la perspective de l'Allemagne des données empiriques parvenues d'une enquête internationale auprès de 903 entreprises du Danemark, de France, d'Allemagne et des États-Unis.*

*Dans le cadre de notre sondage, plus d'un tiers des entreprises ont répondu que l'implémentation de l'e-business a substantiellement contribué à l'amélioration des processus opérationnels existants et à l'expansion des marchés. Bien que des technologies e-business soient théoriquement disponibles dans tous les secteurs et les compagnies, un effet durable sur les processus organisationnel dépend de l'étendue et du nombre des applications e-business déployées. Un préalable supplémentaire pour un usage efficace est la vaste et cohérente intégration des applications pour pouvoir répondre à la concurrence mondiale. Au niveau macro-économique, les différents environnements économiques et les facteurs nationaux spécifiques influencent considérablement la diffusion et l'impact des applications e-business dans les secteurs examinés.*

**Mots-clés :** E-business, Adoption, Innovation, Diffusion, Utilisation mondiale.

## 1. DIFFUSION AND USAGE OF INFORMATION SYSTEMS TECHNOLOGIES

During the last few years a rapid rate of diffusion and usage of e-business solutions was observable not only in the so-called “new economy” sector but also inside traditional industries (Dutta *et al.*, 1998; Hawkins *et al.*, 1999; Chang and Gurbaxani, 2004; Zhu *et al.*, 2004). Electronic business (e-business) involves the total digitization of value chains and business processes, and holds the promise of helping traditional organizations create new value and reach previously unattained heights of operational and financial excellence (Barua *et al.*, 2001).

In spite of the recent economic slowdown, e-business-driven changes and innovative improvements led to substantial efficiency increases (Cantwell, 2000) in globally acting as well as national oriented firms (Jalava and Pohjola, 2002; Kiiski and Pohjola, 2002; Beck *et al.*, 2004).

The impact of e-business diffusion is not only observable in firms focused on local or national markets but especially among internationally acting corporations. In fact, e-business solutions are an important prerequisite of globalization for world-wide acting enterprises to benefit from the advent of efficient communication and cooperation processes (Beck *et al.*, 2005). Thus, solely national acting enterprises often feel the competitive pressure from competitors across the border more urgent than from their well-known national counterparts. In this

paper, competitive pressure is therefore defined as the individual affection rate by competitors from outside their home market. This affection from abroad in turn asks for immediate counter-reaction in order to stay competitive and spurs the adoption and diffusion of new Internet technologies.

*Proposition 1: The competitive pressure on global level is positively related to the diffusion of e-business applications (and therefore Internet technologies).*

Gaining the full potential and benefits from e-business technologies depends—besides from the degree of globalization of a firm—even more on the consistent integration and implementation in business processes while these processes must be adjusted at the same time (Franke *et al.*, 2005).

*Proposition 2: The impact of e-business on business processes is positively related to the extent and number to which e-business applications are deployed.*

Strongly export-oriented nations (as percentage of Gross Domestic Product (GDP) such as Denmark or Germany) have to be more competitive not only in their own market segment but also in the employment of e-business solutions on an international level. Due to this, the need for cost-oriented and efficient production and distribution processes has a long tradition in those countries. Nevertheless, due to national differences such as available IT knowledge, ICT infrastructure or business laws but also mentality based variations such as concern about privacy or security, the importance of different e-business drivers varies among countries (Zhu *et al.*, 2003).

*Proposition 3: The existence of national e-business drivers has a positive impact on the diffusion of Internet technologies and e-business applications.*

Firms acting on an international level have a higher demand to adopt e-business applications to protect or expand markets or improve their business processes (Pohjola, 2002). Competitive pressure is an important reason for IT adoption, especially in the case of Electronic Data Interchange (EDI) (Vijayarathy and Tyler, 1997; Raymond and Blili, 1997; Angeles *et al.*, 2001). While EDI is based on costly, proprietary standards in closed networks and therefore primarily for the sake of large enterprises, e-business technologies and communication standards are in general open source, usable in open networks and have a global standardization potential. However, this comes with a higher competitive pressure which should drive the diffusion and adoption of e-business applications.

According to the three propositions, this paper identifies the determinants of competitive e-business using industries acting on national or global markets. More specifically, this paper examines the relative influence of e-business drivers (such as, e.g., system integration, customer and supplier orientate IT integration, and process adaptations (Barua *et al.*, 2001)) by analyzing the data of an empirical survey with altogether 903 firms (or 903 data sets) from industrialized nations such as Denmark, France, Germany and the US, which have quiet similar environmental and legal frameworks in common.

The structure of this paper is as follows: The authors provide a brief overview of theoretical approaches in the field of diffusion of innovation theory and the impact of globalization, followed by a section providing information about the underlying survey and the empirical data used to test the validity of the aforementioned propositions. In the next section the propositions are tested based on the empirical data and finally, a short summary and conclusion is provided.

## 2. THEORETICAL BACKGROUND AND RESEARCH FRAMEWORK

### 2.1. 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, 1995, p. 5). The traditional economic analysis of diffusion focuses on describing and forecasting the adoption of products in markets. In particular, identifying the factors that influence the speed and specific course of diffusion processes is of focal concern (Weiber, 1993). 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 (Lilien and Kotler, 1983, pp. 706-740 or Mahajan *et al.*, 1990, pp. 12-26).

The exponential diffusion model (also external influence model or pure innova-

tive 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.

Furthermore, network diffusion models can be subdivided into relational models and structural models. Relational models analyze, in which way direct contacts between participants in networks influence the decision to adopt or not to adopt an innovation. In contrast, structural models focus on the pattern of all relationships and show how the structural characteristics of a social system determine the diffusion process (Valente, 1995).

Besides the analytical economic research approaches described above, a set of empirical studies of diffusion processes can be found in various research areas (for an early overview of existing empirical studies refer to (Rogers and Shoemaker, 1971)). Most of the studies are based on critical mass approaches which analyze the diffusion rate of innovations, collective behavior, and public opinion (e.g., Granovetter, 1978; Marwell *et al.*, 1998).

A long research tradition exists in the area of network models of innovation diffusion. Subsequently, network analysis in this context is an instrument for analyzing the pattern of interpersonal

communication in a social network (for concepts of sociological network analysis, see e.g., Jansen, 1999; Wigand, 1988; Wigand and Frankwick, 1989).

Globalization may be defined as the growing interconnections through cross-border flows of information, capital and people (Held *et al.*, 1999). It represents a challenging issue for firms operating internationally while being competitive on both national, as well as global markets. The adoption of e-business applications may lower transaction and coordination costs and may enable firms to enter new markets or to penetrate existing markets more efficient (Steinfeld and Klein, 1999). Therefore, creating and sustaining competitive advantage is mandatory for successful enterprises and is typically achieved by reducing transaction costs and the deployment of innovative and efficient e-business applications at the same time (Gordon, 2000). From a macroeconomic view, there is evidence that highly export oriented countries and/or industry sectors which are open for foreign trade and investment exhibit a higher level of e-business implementation (Caselli and Coleman, 2001; Shih *et al.*, 2002). At the same time, due to higher competitive pressure, global enterprises use e-business applications more holistic than national or local oriented ones. For a deeper discussion of the impact of globalization on e-business adoption and enterprise performance see Kraemer *et al.*, 2002 and Kraemer *et al.*, 2006.

Accordingly, this paper investigates the relationship between globalization and the efficient usage of a set of e-business applications at industry and country levels. Germany's role in the global e-busi-

ness context is analyzed in more detail. Focusing on the economic impact, globalization in this paper is measured in terms of the competitive pressure at international level. Furthermore, the impact of several e-business drivers on the deployment of e-business applications is analyzed and national variations among drivers are identified.

## 2.2. Empirical Data

The underlying questionnaire was designed by the participants in an international joint research project. The questionnaire enfolded 50 questions on different topics such as globalization of enterprises, implementation of e-business technologies, as well as the usage of these technologies, drivers and inhibitors of e-business implementation and usage, impacts on business processes and efficiency and e-business implementation strategies. The survey itself was conducted by International Data Corporation (IDC) in spring 2002 on behalf of the research project in four countries and resulted in a data set incorporating 903 firms (Denmark, France, Germany, and the United States). The responding firms were classified by size (large firms: 250 or more employees, and small firms: between 25 and 249 employees) and by industry (manufacturing, wholesale/retail distribution and banking/insurance). In the German sub-sample, *e.g.*, 202 firms were investigated, subdivided in 68 from the manufacturing industry, 66 from the wholesale/retail industry and 68 from the banking and insurance industry. 102 firms belong to the class of small and medium-sized enterprises, 100 firms can be classified as large firms. The survey

only took firms into account which used the Internet to buy, sell or support products or services.

## 3. GLOBALIZATION AND THE USAGE OF E-BUSINESS

The following paragraph addresses Proposition 1 and analyzes the relationship between the usage of e-business applications and the competitive pressure from abroad as an indicator for the degree of globalization of a firm. The rationale behind this proposition is that global markets are more competitive than local or national markets. With the diffusion and the availability of e-business applications cross-border business is more likely than before. Therefore, globalization provokes more competitive pressure from abroad, as ebay, amazon or google as examples for globally active and competitive players illustrate. Consequently, the question arises if e-business using, global acting companies really have a competitive advantage, as the proposition suggest and can this proposition also be validated for the data sample at hand?

Doubtlessly, an important driver of the diffusion and usage of e-business applications is the strong international competition or globalization of markets, especially in export-oriented countries such as Germany. The manifold international trade connections increase the speed of diffusion of standardized electronic transactions. But the surveyed German industry sectors are not only focused on foreign trade, in fact, they are closely interconnected with own foreign branches or headquarters (*cf.* table 1). Compared to the global average, Germany is above average, with exception

of the total sales from abroad. The international diversification enables and increases the number of foreign business contacts, which is also measurable when focusing on the percentage of procurement from abroad which in Germany is equal to or above the global average with the exception of the banking/insurance sector. In spite of strong international competition, the surveyed German industry sectors seem to be well positioned in the global sample, especially in the manufacturing and banking/insurance industry, where the intensity or impact of international competition is reported to be below average.

The impact of global competition on the diffusion of e-business applications is analyzed by using the data of table 1 and 2. The perceived competitive pressure from abroad is shown in table 1. The degree of deployed e-business applications is calculated as the total number of deployed solutions shown in table 2 for every firm.

Proposition 1 suggests a positive relation between the perceived competitive pressure on global level and the number of implemented e-business applications

and underlying Internet technologies (table 2). Spearman's correlation coefficient between the competitive pressures from abroad (see table 1 for reported affection rates) and the number of e-business applications in place (table 2) reveals a positive correlation (significant at the 0.01 level) of 0.142 for the global sample and the French sub-Sample (0.256). There is no significant correlation in the German, Danish and US sub-sample between competitive pressure and the number of deployed e-business applications. Therefore, Proposition 1, which suggests that global acting companies are extensive users of e-business technologies, is only supported for the French sub-sample. Only French enterprises that feel highly affected by competitors from abroad tend to be extensive users of e-business applications.

#### 4. THE IMPACT OF E-BUSINESS APPLICATIONS

The following paragraph addresses Proposition 2 and analyzes the impact of e-business applications on different internal as well as external business processes.

	Manufacturing		Wholesale/Retail Distribution		Banking/ Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
% with establishments abroad	57.4%	53.1%	45.5%	42.2%	32.4%	30.2%	45.0%	41.9%
% with headquarters abroad	23.5%	17.4%	18.2%	11.1%	14.7%	10.4%	18.8%	13.0%
% of total sales from abroad	23.0%	28.7%	13.35%	13.3%	6.15%	8.88%	14.1%	17.2%
% of total procurement from abroad	26.1%	22.8%	26.21%	23.1%	1.36%	4.6%	16.4%	16.4%
Affected by competitors from abroad:								
Low	42.2%	38.9%	57.4%	67.5%	82.3%	81.8%	60.5%	62.3%
Moderate	21.9%	21.2%	14.8%	13.7%	11.3%	9.7%	16.0%	15.0%
High	36.0%	39.9%	27.9%	18.7%	6.4%	8.6%	25.5%	22.7%

Table 1: Indicators of Globalization (Global: 4 countries: Denmark, France, Germany, and the US).



	Manufacturing		Wholesale/Retail Distribution		Banking & Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
Advertising and marketing purposes	73.5%	64.5%	81.8%	69.7%	92.6%	79.3%	82.7%	71.1%
Making sales on-line	26.5%	23.1%	48.5%	47.0%	48.5%	43.3%	41.1%	37.7%
After sales customer service and support	44.8%	43.9%	43.9%	49.0%	68.2%	58.1%	52.3%	50.3%
Making purchases on-line	55.4%	62.5%	59.4%	58.9%	41.2%	58.6%	51.8%	60.0%
Exchanging operational data with suppliers	51.5%	52.2%	66.2%	51.9%	31.3%	45.2%	49.5%	49.8%
Exchanging operational data with customers	54.5%	58.0%	51.5%	45.3%	44.8%	53.2%	50.3%	52.2%
Formally integrating the same business processes with suppliers/ partners	28.1%	32.6%	46.2%	38.2%	29.7%	37.6%	34.7%	36.1%

Table 2: Implementation of e-business applications (Global: 4 countries: Denmark, France, Germany, and the US).

First, the extent of electronic integration and implementation of e-business applications in Germany and the global sample is compared (see table 3). The rationale behind this approach is that the full advent of e-business can only be achieved if a tight integration of all business partners, customers and suppliers, is given; only if the external business processes are standardized and automated an enterprise will benefit from the full potential in form of cost savings and faster in-house processes. Then, the correlation between the number of deployed e-business applications and the perceived impact on business processes is investigated.

The extent of integration of Internet applications with internal databases or ERP-systems is as low in Germany (44.8% responded with “little to no integration”) as in the global survey (42.5%) (see table 3). The same low extent of integration can be observed in the area of electronic integration of customers and suppliers, where the German industry responded with a non-integration rate of 72.9%, even higher

than the global sample rate of 69.1%. Regarding the percentage of firms responding that integration is “a great deal”, only 11.6% of German firms are able to benefit from it. According to the survey, most German firms seem to wait until they can benefit from Internet application integration. The electronic integration of customers and suppliers on industry level seems to follow similar rules, especially in the banking and insurance industry, where 78.3% reported a “little to none” integration.

Although the low levels of integration of external business partners in Germany but also in the global samples is an important hindering reason for gaining the full potential of e-business-based automation, the positive impact is nevertheless measurable. As the correlation analysis for Proposition 2 suggests, there is a strong interconnection between the number of deployed e-business applications and the impact on these perceived business processes. For the test of Proposition 2, the impact of business applications on business processes (see table 4) is correlated



Extent to which Internet applications are electronically integrated with...	Manufacturing		Wholesale/Retail Distribution		Banking/ Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
internal databases and information systems:								
% little to none	53.1%	55.1%	44.4%	39.8%	37.3%	32.4%	44.8%	42.5%
% some	26.6%	22.4%	22.2%	24.0%	34.3%	24.8%	27.8%	23.7%
% a great deal	20.3%	22.5%	33.4%	36.2%	28.3%	42.7%	27.3%	33.7%
those of suppliers and business customers:								
% little to none	76.7%	73.9%	63.9%	66.5%	78.3%	66.5%	72.9%	69.1%
% some	20.0%	16.0%	14.8%	19.7%	11.7%	16.9%	15.5%	17.5%
% a great deal	3.4%	10.1%	21.3%	10.7%	10.0%	16.5%	11.6%	13.5%

Table 3: Enterprise Application Strategy (Global: 4 countries: Denmark, France, Germany, and the US).

	Manufacturing		Wholesale/Retail Distribution		Banking & Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
Internal processes more efficient	29.2%	33.7%	25.3%	31.6%	26.9%	32.8%	27.2%	32.7%
Staff productivity increased	15.6%	21.5%	18.2%	24.7%	15.4%	22.1%	16.4%	22.8%
Sales increased	8.1%	15.6%	18.1%	20.3%	19.4%	18.1%	15.3%	17.9%
Sales area widened	13.9%	24.0%	23.0%	26.3%	16.6%	23.8%	17.7%	24.6%
Customer service improved	27.7%	35.4%	30.1%	34.6%	51.6%	44.6%	36.6%	38.3%
International sales increased	12.5%	12.6%	11.9%	9.4%	3.2%	4.8%	9.2%	9.1%
Procurement costs decreased	9.4%	15.1%	17.7%	16.0%	6.4%	11.8%	11.2%	14.4%
Inventory costs decreased	6.5%	8.1%	6.5%	10.2%	11.7%	10.7%	8.2%	9.6%
Coordination with suppliers improved	33.3%	31.8%	21.5%	30.5%	21.0%	26.4%	25.2%	29.6%
Competitive position	25.0%	26.5%	21.9%	27.6%	37.5%	33.4%	28.1%	29.2%

Table 4: Impacts of Doing Business Online (percent indicating impact is above average) (Global: 4 countries. Denmark, France, Germany, and the US).

with the diffusion of deployed e-business applications (provided in table 2). Business process improvements were aggregated to a single index by adding up all potential improvements. Spearman's correlation coefficient between deployed e-business applications and the overall business process improvements index reveals a positive correlation of 0.207 (significant at the 0.01 level) in the global sample and 0.212 (significant at the 0.01 level) in the German sub-sample. Both data sets exhibit similar correlations between the number of deployed e-business applications and their impact on business pro-

cesses. Therefore, a higher number of e-business applications in place have indeed a strong positive impact on the perceived improvements on all kinds of business processes, resulting in higher productivity, lower costs or even efficiency increases. A broad deployment of e-business applications significantly improves all kinds of business processes.

## 5. DRIVERS INFLUENCING THE DIFFUSION OF E-BUSINESS

As already discussed in the preceding paragraphs, there exist some differences

between the German sub-sample and the global sample. The purpose of the following paragraph is to identify the significant deviations, as well as to discuss Proposition 3 identifying possible relations between national drivers of e-business and the diffusion of Internet technologies and e-business applications. In contrast to other countries, German firms use and understand the Internet and related e-business applications not as a substitute to traditional markets or distribution channels. German firms use the Internet as a complementary instrument to complete and support the already sophisticated market penetration (cf. table 5). Consequently, the goal to address only new markets is not perceived as that important

because national and international markets have been objects of market penetration strategies even before the Internet emerges (only 5.3% affirm). Due to this, 81.1% of the German industry responded the use of Internet capabilities only to serve and support existing distribution channels while only 2.1% responded the reduction or replacement of traditional distribution channels. Consequently, following a multi-channel strategy, the Internet does not compete directly with other distribution channels (only 11.6% of German firms think it does) in comparison to other countries.

As table 6 indicates, competition is a significant factor for online activities.

	Manufacturing		Wholesale/Retail Distribution		Banking/ Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
Addresses new markets only	0.0%	10.1%	12.1%	12.0%	2.5%	10.5%	5.3%	11.0%
Addresses traditional distribution channels only	90.9%	56.2%	78.8%	51.9%	77.5%	45.2%	81.1%	50.6%
Competes directly with traditional distribution channels	9.1%	24.7%	9.1%	26.3%	15.0%	36.3%	11.6%	29.5%
Replaces traditional distribution channels	0.0%	9.0%	0.0%	9.8%	5.0%	8.1%	2.1%	9.0%

Table 5: How Establishments Use the Internet to Sell Products and Services (Global: 4 countries: Denmark, France, Germany, and the US).

Percent indicating a significant factor ...	Manufacturing		Wholesale/Retail Distribution		Banking/ Insurance		Total	
	GER	Global	GER	Global	GER	Global	GER	Global
Customer demanded it	33.8%	34.1%	25.8%	32.4%	25.8%	42.8%	35.0%	36.5%
Major competitors were online	33.3%	29.0%	36.0%	34.7%	36.0%	53.8%	45.4%	39.2%
Suppliers required it	22.0%	21.6%	15.4%	14.1%	15.4%	10.0%	13.7%	15.4%
To reduce costs	23.5%	32.7%	22.7%	34.4%	22.7%	35.7%	24.2%	24.3%
To expand market for existing product/services	38.2%	39.5%	37.9%	41.7%	37.9%	47.3%	37.8%	42.8%
To enter new businesses or markets	36.7%	34.9%	44.0%	37.0%	44.0%	35.9%	38.2%	35.9%
To improve coordination with customers and suppliers	60.0%	50.3%	57.6%	59.5%	57.6%	45.1%	48.2%	48.3%
Required for government procurement	9.1%	11.7%	7.7%	10.7%	7.7%	8.1%	7.6%	10.2%
Government provided incentives	4.5%	3.4%	1.6%	4.8%	1.6%	4.8%	4.1%	4.4%

Table 6: Drivers of e-business (Global: 4 countries: Denmark, France, Germany, and the US).

39.2% of establishments in the three sectors consider major competitors going online as a significant incentive for e-commerce use. While only 29.0% of the manufacturing industry viewed this factor as significant, high competition is a significant pressure for distributors (34.7%) and even more for financial firms (53.8%). Pressure by customers (36.5%) or suppliers (15.4%) to use the Internet is rather low in the global sample. Administrative issues (required for government procurement, government provided incentives) only play minor roles (10.2%, 4.4%), neglecting the impact of B2A.

Proposition 3 suggests, that the existence of national e-business drivers has a positive impact on the diffusion of Internet technologies and e-business applications. For testing this thesis, Spearman's correlation coefficient between drivers of e-business diffusion and the number of deployed e-business applications is calculated (table 7 shows the results) for all countries. In the global sample, all

drivers except business to administration-related ones are correlated with the number of deployed e-business applications. Reducing costs and the opportunity to enter new businesses or markets appear to be the most important drivers for the deployment of e-business application. National variation of important e-business drivers can be stated when comparing the correlation weights. As for German firms, cost reduction, the opportunity to enter new markets and the fact that major competitors are also online are main drivers. In France, the only significant driver is the expansion of markets for existing products and services. The main drivers of Danish firms are competitors are online as well as supplier coordination-related issues. Cost reduction and new business opportunities are most important drivers for firms in the US. As this suggests, there are indeed strong national differences. Anyhow, business to administration-related drivers play an important role in none of the investigated countries.

Drivers	Deployed e-business applications				
	GER	France	Denmark	US	Global
Customer demanded it	0.108	0.137	0.015	0.250**	0.174**
Major competitors were online	0.181*	0.130	0.160*	0.204**	0.186**
Suppliers required it	0.088	0.101	0.092	0.104	0.098**
To reduce costs	0.178*	0.148	0.048	0.309**	0.226**
To expand market for existing product/services	0.096	0.216**	0.014	0.160*	0.129**
To enter new businesses or markets	0.223**	0.144	0.118	0.216**	0.211**
To improve coordination with customers and suppliers	0.096	0.063	0.143*	0.278**	0.183**
Required for government procurement	0.083	0.033	0.056	0.007	0.005
Government provided incentives	0.054	0.012	0.069	0.013	0.015

Table 7: Correlation of e-business diffusion drivers and deployed e-business applications (\*\*significant to 0.01; \*significant to 0.05).

## 6. CONCLUSIONS

In general, the diffusion of the asked for e-business applications and solutions has reached a high level in nearly all investigated industries. Competitive pressure from abroad is often cited to be a strong driver of e-business diffusion to strengthen and defend competitive advantage by extensive usage of information systems. In literature, diffusion of innovative e-business solutions is based on the number of adopting "imitators" (individuals or enterprises) and characterized by uncertainty about the success, the compatibility with existing solutions, and the ability to be more innovative on their part (Rosenberg, 1982). Diffusion is regarded as an adjustment process towards a global equilibrium depending on the learning curve of potential imitators.

This empirical survey, however, does not reveal a significant relationship between competitive pressure from abroad and the number of deployed e-business applications as an imitation reaction as expected. However, our research results indicate that e-business diffusion and globalization are strongly correlated, but not in the originally imagined way: enterprises' such as in Germany, are not "forced" by competitors to go on-line, but are actively utilizing the potentials to establish themselves as competitive global players. In general, it seems that Danish, German, and US firms regard themselves as strong players exercising competitive pressure to others. In our sample, only the data from France reveal a strong positive correlation between perceived competitive pressure and deployed applications.

A positive correlation between the impact on business processes and the number and extent of deployed e-business applications is supported for the global sample and the German sub-sample. Both correlation indices suggest a strong correlation between the number of deployed applications and their positive impact on distinct business processes. Technological progress or innovations are often context-related and highly specific, as the literature on diffusion of innovations states (Cantwell, 2000). Therefore additional improvements or the adoption of further e-business applications are often necessary to build a general innovation in order to make it useable for other processes, products, or adopters. If an innovator or even adopter is able to identify and transfer further implementation options onto similar or complementary processes or products, the probability of making such a generalized or standardized innovation successful increases (Cantwell, 2000).

The impact of several national drivers on the deployment of e-business applications was also analyzed. As a correlation analysis has revealed, distinct national drivers exist pushing the diffusion of e-business applications. The two foremost important drivers in the global sample and the German sub-sample are cost reduction and the opportunity to expand markets or businesses by applying information technology. Business to administration-related drivers have shown to be irrelevant in all samples.

In contrast to the global survey, German firms regard e-business less often as an enabler to increase markets on the international level. Given the existing

global market orientation, German firms were competitive on international markets even in the pre-e-business era.

Recapitulating, many of those firms implementing e-business in a consistent way benefit from process improvements and increasing efficiencies. The e-business diffusion race has reached a high level of maturity which seems to be an excellent base to remain competitive in a globalized economy.

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