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Impacts of e-commerce on international structures of competition and potential policy responses from a German point of view

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1. Introduction: The importance of a fast development of e-commerce

The report on the Digital Economy 2000[1] shows the important role of IT industry for the US economy: In 1998 5.2 m[2] employees were working in IT-producing industries and another 5.3 m[3] were employed in IT occupations. Between 1996 and 1998 both segments together accounted for the creation of 1.3 m new jobs. Additionally, these jobs are clearly higher paid than industry average. Per worker wages in IT producing industries, for example, were 87 per cent higher than the private industry average[4]. The IT producing industries alone accounted for nearly one third of real GDP growth between 1995 and 1999 in the US[5].

A recent study by the CREC[6] shows that the internet economy – a subgroup of the upper – has grown much faster than the industrial revolution and that its potential scope, size and impact is much larger than can be understood today. In the US alone 2.5 m workers were supported by the internet – which is more than the number of employees in communications and utilities or insurance industries. The internet economy makes up roughly one quarter of the IT economy. E-commerce – according to CREC estimations[7] – accounts for roughly 30% of the employment in the internet economy. The whole internet segment created 650,000 additional jobs during 1999. Revenues grew to $524 bn. With

[1] Department of Commerce, Digital Economy 2000 (DE2000), www.ecommerce.gov.

[2] DE2000, p. 44

[3] DE2000, p. 46

[4] DE2000, p. 45

[5] DE2000, p. 27

[6] A. Barua et al., Center for Research on Electronic Commerce, Measuring the Internet Economy (II2000), 2000, Austin, www.internetindicators.com.

[7] II2000, p. 3.

the projected growth to $850 bn in 2000, the sector will surpass the automotive industry. Revenue growth in the sector was 15 times the average rate for the US economy.

At the moment e-commerce is driving the development of IT and the internet economy. E-commerce creates employment and competitive advantages. It is a decisive factor in the competition for

- *locational advantage*,
- *Intellectual Property Rights* (IPR),
- *productivity advantage*,
- *customer relationship advantages* and
- *logistics, marketing and distribution advantages.*

Globalisation has accentuated the role of *locational advantages*: as e-commerce creates well-paid jobs, it is an important issue in the competition for talent and – indirectly, via the ICT cluster – for the allocation of R&D. Of special interest in this respect are start-up firms with new business models and cultures. These firms are not only themselves dynamically growing, they also drive the development of e-commerce in "traditional" firms. A retarded development, be it in start-ups or the adaptation by "traditional" firms, has led to a migration of talent to the US.

Intellectual Property Rights in brand names, Top-Level-Domain (TLD) names or (patented) business models[1] are of clearly higher importance to "digital firms" than to "physical firms"[2]: they represent very important parts of their economic value. Limits in TLD names, US dominated awarding, influences from trademark law or the controversial patenting of business models potentially impede the development of late adopters. They probably also have impacts on physical firms by increasing the competition via new distribution channels or models.

[1] P.H. Lewis, Web Concern Gets Patent for Electronic Business Model, crec.bus.utexas.edu/about/nyt/10priceline.htm.

[2] Related to the definitions in II2000, p.p. 38-43; digital firms have an internet based business model without physical inputs, products or processes, whereas physical firms represent the prevailing traditional business model.

Productivity advantages have been discussed[1] and dismissed for a long time. Stigler's productivity paradox, though, was due to incorrect measurement: the role of complementary innovation and necessary time lags for making it were, as I have shown,[2] not taken into account. Only recent research for the US converges now on positive effects on the macroeconomic[3] and the firm level[4]. The industry level still shows mixed perceptions;[5] these contradicting results on sectoral averages are not astonishing, given the usually large size differences between firms in industry sectors, on the one hand, and measurable productivity effects predominantly for the bigger firms, on the other. Productivity gains in the internet economy have been very strong: they exceeded 19 per cent from 1998 to 1999 for the whole segment and 36 per cent for e-commerce[6].

Brynjolfssons work[7] strongly hints at the importance of intangible investment: labour skills, organisation, networking and knowledge management. These intangible investments stand for the necessary complementary innovation in ICT, which allows for the reaping of productivity gains. The present accounting system – which is very often the basis for the strategic planning of firms – neglects these basic factors for the creation of added value. This may lead to wrong

[1] T. Murakami, The Impact of ICT on Economic Growth and the Productivity Paradox, www.tcf.or.jp/tcp/tcp11/content11.html .

[2] H. Schedl, Scenarios for ICT Influence on Employment, Tokyo Club Paper, 1997, www.tcf.or.jp./tcp/tcp11/content11.html; H. Schedl, H. Penzkofer, H. Schmalholz, Is the Productivity Paradox for the Adoption of Information Technologies a Measurement Error?, CES workshop paper on network economics 1999, schedl@ifo.de.

[3] E.g. S. D. Oliner, D.E. Sichel, The Resurgence of Growth in the late 1990s: Is Information Technology in the Story?, Federal Reserve Board, Washington, 2000, pp. 24-25; D.W. Jorgenson, K.J. Stiroh, Raising the Speed Limit: U.S. Economic Growth in the information Age, Federal Reserve Board 2000, kevin.stiroh@ny.frb.org; K. Whelan, Computers, Obsolescence and Productivity, Federal Reserve Board, 2000, kwhelan@frb.org, p. 34.

[4] Especially the work of E. Brynjolfsson and others: e.g. E. Brynjolfsson, L. M. Hitt, Beyond the Productivity Paradox: Computers are the Catalyst for Bigger Changes, Communications of the ACM, 1998 and Computing Productivity: Are Computers Pulling Their Weight?, MIT Sloan School, 2000.

[5] Positive findings were published by J.E. Triplett, B.P. Bosworth, Productivity in the Services Sector, Paper for the AEA Meeting, 2000.

[6] Our calculation of revenue per employee was based on II2000, p.3 tables 1 and 2.

[7] E.g. E. Brynjolfsson, S. Yang, The Intangible Costs and Benefits of Computer Investments: Evidence from the Financial Markets, MIT Sloan School, 1999, and also with L.M. Hitt, Intangible Assets: How the Interaction of Computers and Organizational Structure Affects Stock Market Valuations, ccs.mit.edu/erik.

choices. Therefore Bounfour[1] has developed a systematic approach to evaluate the impacts of new technology on intangibles and, indirectly, on competitiveness. First results[2] indicate that these marked effects on intangibles, which precede productivity gains, are usually strongly underrated by business leaders.

Customer relationship advantages will allow for increased customer loyalty through improved and personalised service, mass-customisation and product differentiation via data-mining – especially if there is a large number of customers. Regaining a lost customer will become more expensive.

New forms of e-markets – aggregators, auctions, exchanges – potentially lead to considerable changes in distribution channels, market structure and the distribution of margins between producers, net-agents and service providers. This may create significant *advantages in logistics, marketing and distribution*.

These competitive advantages of e-commerce have led to scenarios predicting important *shifts in value-added*, the *organisation of industries* accompanied by an unbundling of companies, *a higher vulnerability* especially of customer relations management from e-competition and *different paths of development* for different industries.

A *shift in added value* away from the production of goods towards the creation of demand is assumed: Gensollen[3] sees this shift via free access to services, intermediation and demand structuring. The latter implies the constitution of virtual system product groups including complementary know-how and professional services. This may imply a shift from personal interfaces to non-personal interfaces in customer contact.

Rapid and dramatic *reorganisations of industries* are seen as the consequence of significant changes in transaction costs over this medium. Outsourcing of traditional functions of the enterprise to specialised providers could be a result:

[1] A. Bounfour, Intangible Resources and Corporate: Towards a Dynamic View of Corporate Performance, in A. Jacquemin (ed.), Intangibles and Competitiveness: An Empirical Approach, Edward Elgar Publishing, 2000, a.bounfour@wanadoo.fr .

[2] A. Bounfour, K. Flanagan, I. Miles, H. Penzkofer, H. Schedl, H. Schmalholz, How Esprit Contributes to Building Intangible Assets of European Industry, publication forthcoming.

[3] M. Gensollen, The Internet: A New Information economy? in: Communications & Strategies No. 32, www.idate.fr/maj/publi/revu/n32.

according to Hagel and Singer[1] the unbundling of corporations into one of their businesses which they differentiate into product innovation, infrastructure management and customer relationship management will be induced. They see inherent conflicts in these businesses as product innovation depends on speed, infrastructure management on scale and customer relationship management on scope. Specialised networked competitors are thought to outperform traditional "bundled" corporations. They cite the computer industry, regional Bell operating companies, and newspapers as examples where huge vertically integrated companies specialise or will have to specialise on one business. Thus customer structure may change significantly from end-users to mediators.

Some of the businesses are thought to be *more vulnerable* than others: Customer relations and infrastructure management are thought to be especially vulnerable to changes in competition from e-commerce. Customer relationship management is supposed to be influenced by decreasing contact cost and competitive gains from related back office reorganisations. Kalil[2] thinks that the main impacts will come from knowledge management, data mining, conditions based maintenance and modelling and simulation.

The same *paths of development* may not be valid for all products: Arlandis[3] pointed out that the industrial aspect has received little coverage. Especially the influence of specific products, production processes, distribution and market structures has to be assessed. The scenarios are probably valid for mass products. Are they also valid for individual construction or complex products with a high demand for explanation? The development may not arrive at the same speed at which the internet is growing: According to Arlandis the growth will be influenced by the slower social evolution. This corresponds to our findings on the diffusion of networks and use patterns in industry[4]. Nevertheless many internet business processes in the economic domain will probably be settled within the next five years.

[1] John Hagel, M. Singer, Unbundling the Corporation, Harvard Business Review, March-April 1999.

[2] Thomas A. Kalil, Information Technology for the Twenty-First Century: Implications for E-business, iMP Magazine, April 1999, www.cisp.org/imp/april_99.

[3] J. Arlandis, Economic Rationales and Strategic Stakes, in: Communications & Strategies No. 32, www.idate.fr/maj/publi/revu/n32.

[4]

The advantages of e-commerce can be realised to their full extent only if the majority of enterprises (in business to business commerce) and consumers as well as all levels of government participate. Late starters in the private sector will lose market share if their application lags as direct competitors grow. The "first click" will be with the early innovators. Late starting countries will lose locational advantage and the competition for talent.

Currently, business to business (B2B) e-commerce accounts for approximately 70 per cent of total e-commerce value[1] (US 1999: $171 bn). This share is bound to grow to 80 per cent by 2001[2] whereas business to consumer e-commerce (B2C) is bound to lose 10 points. B2B thus is the dynamic driver of development.

It is important to disaggregate the analysis into two layers: one layer should analyse the developments from a customer point-of-view and separate into B2B and B2C commerce, the other should analyse the development from the point-of-view of firms separated into start-ups and traditional firms.

Technological and operational experience, speed to market, scale of operations and knowledge management may be critical success factors which may have already tipped the scales in favour of US e-commerce competitors. The US cluster of IC hardware and software development, on the one hand, high diffusion and use rates of net access and new business models with venture capital financing and high incentives for co-operating, on the other, gives American players further potential advantage.

Is the often predicted boom in e-commerce imminent? Will digital firms supplant physical firms? Will e-commerce develop similarly in all sectors or will it be limited to certain domains? Is there a competitive gap and if so, where? Can faster e-commerce development help laggers or are barriers too high for fast change? Can policy contribute to a faster development or a reduction of barriers? I will try to find some answers based mainly on information about the German situation, comparing it – as far as possible – to other findings for the US or, in some

[1] FTAA-Joint Government-Private Sector Committee of Experts on Electronic Commerce, September 1999, www.ecommerce.gov/pressRelease/ecom-01.htm

[2] II2000, p.p. 69-71, citing the Internet Commerce Market Model by C. Glasheen and J. Gantz.

cases of, to other European countries. The analysis will stress B2B commerce in manufacturing based on a survey we conducted for this occasion. A second part will deal with diffusion in B2C commerce; a third with the "new" internet oriented firms. Based on these findings we will try to find answers to the questions posed and review potential policies for a stimulation of e-commerce.

2. The situation in Germany

2.1 Outlines of the general position

The general position of a country might be approximated by the country's share in world domain names, as these are a prerequisite for e-commerce. This supposes that mainly firms with a commercial interest will pay for the registration of a domain name – be it a generic Top-Level-Domain (gTLD in the categories com, org and net) or a country code Top-Level-Domain (ccTLD). According to recent results of Zook,[1] for January 2000 roughly 75 per cent of the selected TLD's are generic (among them 60 per cent com domains) and one quarter ccTLDs. These domain names are highly concentrated: half of them belong to US organisations, nearly another quarter is held by the next four countries Germany, UK, Canada and France (see table 1).

However, the global domain name share probably reflects other influences: e.g. the differences in the year of significant internet use growth per country and country size. These distortions can be corrected for country size by calculating the domains per 1000 inhabitants. This way we arrive at three groups of countries:

- group one with more than 20 domains per thousand inhabitants including the USA and Denmark,
- group two consisting of the UK, Germany, Canada and Sweden with 14 to 19 domains and

[1] M. Zook, Internet metrics: using host and domain counts to map the internet, in: Telecommunications Policy 24(2000), pp. 613-620.

- group three with two to nine domains comprising Finland, France, Italy and Japan

Table 1 Distribution of domains for selected countries

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	Share in world TLD[1)]	Share of gTLD[2)]	Domains per 1000
Country	**Names (in %)**	**Per country (in %)**	**Population**
USA	50	100	24
Germany	8.6	22	14
UK	8.5	33	19
Canada	3.6	86	16
France	2.1	80	5
Japan	1.6	71	2
Sweden	1.5	73	15
Italy	1.4	55	3
Denmark	<0.5	28	24
Finland	<0.5	80	9

1) com, net, org or ccTLD; 2) only com, net, org in % of total.

Source: M. Zook, Internet metrics, Telecommunications Policy 24 (2000), pp. 617-18.

Groups one and two may converge rapidly due to further strong growth in group 2 registrations. Group three may catch up only a little later.

A completely different picture emerges when secure server and internet host numbers – two frequently used indicators for e-commerce – are used (see table 2). Secure servers that enable encryption, for example of credit card numbers, and thus facilitate payments may be a reasonable measure for e-commerce. The distribution of these servers concentrates on North America; roughly 50,000 of 67,000 throughout the OECD are located here. The USA, Canada and Sweden are among the countries with above OECD average diffusion, the UK, Finland, Denmark and Germany have below average numbers of secure servers per million inhabitants, and the other countries have significantly lower figures.

The host count, which can only estimate the minimum size of the internet, shows above average diffusion for North America and the Nordic countries and below average values for all others.

Table 2 Distribution of servers and hosts for selected countries

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	Secure servers[1)]		Internet hosts[2)]	
Country	**Number (in 1000)**	**Per m inhabitants**	**Number (in m)**	**Per 1000 inhabitants**
USA	47.1	170	44.2	160
Germany	2.8	34	1.7	20
UK	3.2	55	2.1	35
Canada	2.7	87	2.3	76
France	1.1	18	0.8	13
Japan	1.9	15	2.4	19
Sweden	0.6	71	0.6	69
Italy	0.6	11	0.5	9
Denmark	0.2	40	0.3	60
Finland	0.3	54	0.6	123
OECD average	-	60	-	54

1) Servers that enable encrypted information (March 2000); 2) Connected computer systems with IP address, not including computers behind firewalls (September 1999).

Source: OECD (www.oecd.org/dsti/it/cm/), Netcraft (www.netcraft.com), Telcordia Technologies (www.netsizer.com).

2.2 Measuring e-commerce diffusion

E-commerce – the execution of commercial transactions via networks – is not clearly defined: neither the extent of what might qualify for commercial transaction nor what might qualify for a network. A wide definition might contain every electronic transaction with a customer aimed at a contract, including information, the search for alternatives, price and service; a very narrow definition might only cover electronic contracts, delivery and payment (the purely digital commerce). Does e-commerce include EDI systems on proprietary networks or is it limited to competitive transactions on the internet? Does it include "intermediaries" like online agents (e.g. travel and brokerages), portals, advertisers, content aggregators and auctioneers, or is it limited to firms selling their products and services online? There are good arguments for all alternatives. The ambiguities of definition translate into difficulties of measurement.

The advantages of e-commerce – productivity gains, increased customer service and "lock-in", higher efficiency in logistics, marketing and distribution – can only be realised through the adoption of automated processes. They usually imply integrated communication and information technologies, networking, reorganisation and central databases inside a firm; and, based on existing technology, high investments in ICT systems and software, training of personnel, restructuring of processes and the maintenance and update. Thus two kinds of e-commerce may exist in parallel: one based on fast, automated processes with low transaction cost, the other one using the new medium in a traditional way as another channel of distribution. This difference should be captured as well by the method of measurement.

As usual at an early stage of development there are no available statistics. Typically heuristic approaches are chosen where results may not be comparable. The important differences in revenue estimations could be cited as an example: the CREC estimates for US e-commerce in 1999 were $171 bn, Forrester estimated $70 to 170 bn[1] and Keenan[2], IDC[3] and e-Marketer[3] $95 to 98 bn; Boston Consulting Group[3] $1000 bn for the same year; the estimates thus vary from 0.4 to 11 per cent of GDP.

The aggregate measure "revenues" contains no information about other important aspects of development like the number of participating firms and customers, the frequency of use or the adaptation to necessary preconditions of e-commerce like the installation of one accessible central database on customers, the automation of routine processes, the use of an integrated IT and communications infrastructure (e.g. Computer Integrated Telephony (CIT) or call centres) which would make it easier to evaluate the state of diffusion. Furthermore, B2B and B2C commerce must be separated, as their dynamics of development are seen to be quite different. A further differentiation between "traditional" and new, e-commerce oriented firms also seems necessary to assess the dynamics of

[1] Cited after J. Coppel, E-commerce: Impacts and Policy Challenges, Economics department working Paper No. 252, OECD, p.7, www.oecd.org/eco/eco.; Another Forrester estimate was published in: E-biz, Business Week, October 7, 1999. Total internet economy $128.3bn) – Infrastructure ($27.3bn) – access providers ($19.7bn) – intra-business ($42.1bn) – a remaining position, which might be called external e-commerce (39.2).

[2] The Keenan Report (cited after DE2000 p. 57).

[3] Cited after J. Coppel, E-commerce: Impacts and Policy Challenges, Economics department working Paper No. 252, OECD, p.7, www.oecd.org/eco/eco.;

development. Start-ups in e-commerce have the role of the drivers whereas the traditional "physical" firms are mostly reacting to the challenge. Graph 1 gives an overview of the scope and differentiation of our analysis.

Evaluation of diffusion is facilitated by comparable information. We mostly use the US – the leading e-commerce economy – as a benchmark. We found some detailed numbers on B2B e-commerce activities only in a recent US manufacturing survey. We therefore chose to conduct a German manufacturing survey to cover the B2B aspects for traditional firms. Our choice to limit the survey to manufacturing led to the neglect of many sectors with fast growing, digital firms as in software, financial services, music distribution and travel services. We hope to cover these aspects via our "new firm" segment. There are seemingly similar problems in obtaining information on the service sector in other countries, so comparable information is lacking. Access and use patterns serve as an estimator for e-commerce potential. The figures for both the actual B2B and B2C e-commerce use are based on surveys.

For B2C aspects we used information from a Spring 2000 survey of the Gesellschaft für Konsumforschung (GfK) and MMXI Europe. The evaluation of the "new firm" scene in German e-commerce oriented firms uses a report from Bain & Company from July 2000. In this instance we had no comparable US information.

Several problems are closely related to the measurement of B2B e-commerce diffusion using a survey: We usually have one respondent per firm who may not know about all activities in the firm. A precise answer might need information from DP, purchasing, sales and accounting. We thus had to limit our questions to the use (or absence of it) and activities conducted via the internet; we could not ask for figures. In order to qualify the use, we asked for frequencies of use in a qualitative, not strictly comparable way for the same reasons as above. We could further qualify by access criteria and the application of integrated IC technology.

Another problem consists in the separation of B2B and B2C activities. If only sales via internet are regarded from the point of view of the firm, the activities

Graph 1

may be mixed and inseparable in cases where consumer products are produced. We thus included e-purchasing in B2B in our questionnaire. We further disaggregated our material by sector and size group.

Our B2B survey in April 2000 led to 2067 responses, which is a larger number in international comparison. A recent US survey[1] conducted by the National Association of Manufacturers is based on 2500 answering firms.

2.3 Business to business e-commerce

2.3.1 Diffusion and use in traditional firms

On average, more than half of the German firms in manufacturing search the internet for information on suppliers, products, prices or data. A significantly lower share purchases (19% on average) or sells (11%) via this channel. Roughly one third of the firms conducts these activities on a test base, one quarter conducts these operations regularly and only 5 per cent very often. There are significant differences by sector and size group. We would define the share of German firms in manufacturing doing e-commerce by the purchasing activities.

The most advanced among the selected sectors in German manufacturing is automotive: more than two thirds of this sector's firms search, nearly one third orders and 15 per cent sell via the internet (see table 3). These firms also have the highest share in very frequent activities: nearly 16 per cent (see table 4).

One of the least advanced sectors is non-metallic mineral products: Only 39 per cent of the sector's firms search, 11 per cent order and five per cent sell through the internet. The frequency of activities is also significantly below the manufacturing average. Just one firm of 188 in our sample used the net very often.

[1] National Association of Manufacturers (NAM), First Quarter Survey on E-commerce, 2000, www.nam.org.

Table 3 German firm's activities on the internet by sector

... (Manufacturing sample)

Sector	Activity	Search	ordering	selling
Automotive	cases	31	14	7
	%	*68.9*	*31.1*	*15.6*
Chemical	cases	36	14	10
	%	*63.2*	*24.6*	*17.5*
Machinery	cases	241	89	38
	%	*64.4*	*23.8*	*10.2*
Food, tobacco	cases	67	25	16
	%	*53.2*	*19.8*	*12.7*
Electrical M.	cases	154	43	21
	%	*68.4*	*19.1*	*9.3*
Total	cases	1150	390	232
(average)	*%*	*55.6*	*18.9*	*11.2*
Paper & printing	cases	117	44	41
	%	*46.6*	*17.5*	*16.3*
Textile, clothing	cases	66	23	17
	%	*40.2*	*14.0*	*10.4*
Wood/ products	cases	93	22	19
	%	*46.7*	*11.1*	*9.5*
Non-metallic	cases	73	21	9
mineral products	*%*	*38.8*	*11.2*	*4.8*

Source: ifo Konjunkturtest, April 2000.

The marked difference between search and purchasing activities – on average orders represent one third of search activities – indicates that most of the orders are still effected via traditional channels.

Another striking difference exists between the number of firms purchasing and the number of firms selling over the net: while on average 19 per cent of the firms in German manufacturing purchase, only eleven per cent sell. Similar results – higher degrees of purchasing compared to selling activities via the web – showed in the second quarter NAM survey[1].

These differences are especially high in automotive and machinery and nearly non-existent in paper and printing or wood and wood products. The sectoral

[1] NAM, Second quarter survey, 2000, www.nam.org/search/printissue.asp? ID=1048.

differences hint at the problem of product complexity differences: commodity product transactions are relatively easily transferred to the net whereas complex final products – like machinery – are still dependent on traditional communication patterns and distribution channels.

Table 4 Frequency of all internet activities by sector

... (Manufacturing sample)

Sector	Frequency	Test	Regular	Very often
Automotive	cases	15	14	7
	%	*33.3*	*31.1*	*15.6*
Electrical M.	cases	73	73	18
	%	*32.4*	*32.4*	*8.0*
Machinery	cases	128	116	26
	%	*34.2*	*31.0*	*7.0*
Chemical	cases	19	18	3
	%	*33.3*	*31.6*	*5.3*
Food, tobacco	cases	49	33	3
	%	*38.9*	*26.2*	*2.4*
Total	cases	733	546	105
(average)	*%*	*35.5*	*26.4*	*5.1*
Paper / printing	cases	102	50	15
	%	*40.6*	*19.9*	*6.0*
Textile, clothing	cases	46	34	6
	%	*28.0*	*20.7*	*3.7*
Wood / products	cases	77	39	4
	%	*38.7*	*19.6*	*2.0*
Non-metallic	cases	54	33	1
mineral products	*%*	*28.7*	*17.6*	*0.5*

Source: ifo Konjunkturtest, April 2000.

There are no marked differences in test-use by sectors (see table 4). In regular use clear differences are already visible, e.g. between electrical machinery (32 per cent) and non-metallic mineral products (18 per cent) The huge differences in frequent use (between 15% and 0.5 %) already hint at an influence of firm size.

The influence of firm size, though, is limited: search activities vary from 54% in the small firm size groups to 65% in higher size groups. Ordering varies between 15% to 17% in firms with 1 to 99 employees and 19% and 21% in firms

with 200 to 4999 employees. Only above 5000 employees is the share of firms purchasing over the internet significantly higher (29%; see table 5). A similar pattern on a lower level can be found in selling activities. These differences are, in part, related to the correlation of back-office development and firm size.

Table 5 German firm's activities on the internet by size

... (Employee size groups; manufacturing sample)

Activity / Size group	Search %	Ordering %	Selling %	Search cases	Ordering cases	Selling cases
Average	55.6	18.9	11.2	1150	390	232
1-99	54.4	15.0	9.0	340	94	56
1-19	50.4	12.8	8.5	59	15	10
20-99	55.3	15.6	9.1	281	79	46
100-999	53.7	20.1	12.7	597	223	141
100-249	55.0	20.6	12.9	286	107	67
250-499	58.7	21.6	10.8	196	72	36
500-999	62.3	19.1	8.6	115	44	38
1000-4999	64.8	19.8	8.9	160	49	22
5000 +	63.1	28.6	15.5	53	24	13

Source: ifo Konjunkturtest, April 2000.

The frequency of internet activities by firm size (table 6) underlines the difference between the highest and the other size groups: in the highest group there are significantly fewer test-use cases and higher numbers of frequent users.

Table 6 Frequency of all internet activities by size

(Employee size groups; manufacturing sample)

Frequency / Sector	Test	Regular	Very often	All responses
Average	35.5	26.4	5.1	67.0
1-99	36.6	24.2	3.7	64.5
1-19	35.0	20.5	2.6	58.1
20-99	37.0	25.0	3.9	65.9
100-999	36.2	26.1	4.7	67.0
100-249	35.8	25.2	5.4	66.3
250-499	33.5	32.6	6.3	72.5
500-999	32.3	30.4	7.4	70.0
1000-4999	33.6	31.6	7.7	72.9
5000 +	22.6	32.1	13.1	67.9

Source: ifo Konjunkturtest, April 2000.

The comparison of the extent of German and US B2B e-commerce of traditional firms in two manufacturing samples leads at first sight to a further development in the US: The NAM cites 32 per cent of the firms as participating, whereas we stated 19 per cent for Germany (see table 7). A closer look onto e-commerce definitions and the use of other data show irritating results. If we included search as preparatory steps of e-commerce we would arrive at a German figure of 55 per cent. If we include all firms informing about their products on the web – which is relatively close to the NAM category product catalogue – we arrive at 71 per cent for the German sample, which is significantly above the US figure of 43 per cent. If we compare the ordering possibilities (for Germany interactive ordering over the web, for the US EDI substituting use) we arrive at slightly higher shares for US compared to German firms. A comparison of the highest purchasing category for the US (intermediate goods) leads to lower results than in Germany. The addition of raw material buying firms to this figure would lead to similar results. We therefore assume, that there are no significant differences in application.

This assumption is backed by other factors: 80 per cent of responding US and 85 per cent of German manufacturers have web presentations, about ten per cent in both countries rely on automated procedures.

Table 7 Comparison of e-commerce activities of US and German firms

... (Manufacturing samples)

Manufacturing	E-commerce according to definition	No e-commerce
USA (NAM survey)	32	68
Based on product catalogue	43	57
Based on e-ordering possibility[a]	17	83
Based on use for buying [b]	12 / 19	88
Germany (ifo survey) [c]	55	45
Based on product catalogue	71	29
Based on e-ordering possibility [d]	14	86
Based on use for buying [e]	19	81

a) Use in place of EDI; d) Fully automated processes; b) Highest percentage (use in purchase of intermediate goods / + raw materi-

als); c) Including preparatory steps (search); d) Automated ordering possibility via the internet; e) Firms buying via the internet.

Source: NAM survey, February 2000; ifo Konjunkturtest, April 2000.

B2B e-commerce of "traditional" firms – in German manufacturing as in the USA – is still in an early phase of diffusion. In order to assess the question of digital divides between small and large firms (brought up by the second quarter NAM survey finding[1] that there is a striking gap between small and large firms in the deployment of in-house technology and staff) and the medium term growth potential, we went into further details of access and technology used.

2.3.2 Are there digital divides?

A closer look into access conditions in our manufacturing sample shows no enormous differences in access between small business, where 87% of the firms had access, and big business with 99 %. Of course there were stronger differences in the number of access lines but no marked differences in the capacity of these lines, big business (5000+ employees) apart, where about one third has access lines above 150 k/s (see table 8).

Table 8 Access conditions in manufacturing

(By size group, responses in per cent)

	Access		***Access lines***			***Access technology***		
	yes	***no***	***1***	***2 to 4***	***5 plus***	***modem***	***ISDN***	***>150 kb***
Average	*88.4*	*9.6*	*16.4*	*20.1*	*44.1*	*9.9*	*52.7*	*11.6*
1-99	86.7	11.4	*17.4*	*23.4*	*38.2*	10.6	54.4	9.0
1-19	83.8	12.8	24.8	20.5	33.3	6.8	53.0	8.5
20-99	87.4	11.2	15.7	24.0	39.4	11.4	54.7	9.1
100-999	87.5	10.3	*18.2*	*20.0*	*42.3*	10.4	51.6	11.9
100-249	86.9	10.8	13.8	18.5	46.7	9.6	48.5	15.0
250-499	92.8	4.5	*13.5*	*18.6*	*56.3*	9.6	51.5	15.0
500-999	89.9	5.1	*10.1*	*17.1*	*53.3*	8.2	55.6	9.3
1000-4999	93.5	5.3	*10.5*	*17.8*	*55.5*	8.5	57.9	9.7
5000 +	98.8	1.2	*3.6*	*4.8*	*78.6*	3.6	40.5	32.1

Source: ifo Konjunkturtest, April 2000.

[1] NAM, Second quarter survey, 2000, www.nam.org/search/printissue.asp? ID=1048.

Neither were there strong differences in the number of home pages and page content between smaller and bigger firms (see table 9) to support a thesis of disadvantaged SMEs: the groups of firms with 20 to 99 employees and above 5000 show similar – and clearly above average – figures for digital ordering. The relation of .com and .de domains in manufacturing differs significantly from the average cited in table 1.

Table 9 Internet pages in manufacturing

(By size group, responses in per cent)

	Page name with			Page content with		
	.com	.de	other	Product information	Service information	Ordering possibility
Average	*42.8*	*49.6*	*1.8*	*70.9*	*45.3*	*14.1*
1-99	42.2	49.8	1.9	67.5	39.5	16.2
1-19	39.3	48.7	1.7	59.8	34.2	12.0
20-99	42.9	50.0	2.0	69.3	40.7	17.1
100-999	43.0	47.4	1.7	70.7	46.3	13.3
100-249	43.5	49.2	1.9	73.5	48.3	13.8
250-499	49.1	51.5	0.6	77.8	56.3	12.6
500-999	41.6	51.4	1.2	73.9	47.9	10.9
1000-4999	43.3	53.4	1.2	76.9	49.8	11.3
5000 +	42.9	65.5	3.6	82.1	61.9	17.9

Source: ifo Konjunkturtest, April 2000.

In-house servers could be another estimator for the diffusion of e-commerce. Regarding the availability of in-house servers, a clear difference shows up between big enterprise and the other firms (see table 10).

Table 10 Server locations in manufacturing

(By size group, responses in per cent)

	Server location	
	in house	external
Average	32.8	43.8
1-99	29.1	45.9
1-19	28.2	41.9
20-99	29.3	46.9
100-999	33.7	41.7
100-249	33.8	41.5
250-499	40.7	42.5
500-999	27.6	51.0
1000-4999	28.7	53.0
5000 +	60.7	28.6

Source: ifo Konjunkturtest, April 2000.

This difference can also be found in the firm's equipment for integrated information and communication technology: call centres or computer integrated telephony (see table 11). These technologies are based on an integrated central client database and rely on well-defined interfaces and standardised input processes. Here, too, only the highest size group shows massively stronger use.

Table 11 Use of integrated information and communication technology

(By size group, responses in per cent)

	Use of integrated ICT*		
	CTI**	Call centre	Central client database
Average	8.0	6.9	11.5
1-99	6.2	6.1	9.9
1-19	9.4	5.1	9.4
20-99	5.5	6.3	10.0
100-999	7.5	6.6	11.3
100-249	8.8	7.1	13.8
250-499	7.5	7.5	10.5
500-999	5.8	7.8	10.1
1000-4999	6.1	8.1	10.5
5000 +	33.3	14.3	29.8

Source: ifo Konjunkturtest, April 2000.

According to our manufacturing sample there are no hints for digital divides, rather for a divide in automated processes in e-commerce. SMEs have disadvantages as they are not using data warehouses; thus their potential for realising productivity gains is limited. Only the biggest firms in our sample are clearly advanced in this direction. Will these differences fade with increasing diffusion? Are there obstacles for the development in SMEs with existing technology? Or are there different paths of development in e-commerce with a continuing "automation" divide?

Regarding the average figures, the potentials for e-commerce – whether it be it all firms, the firms with internet access or the firms with internet presence – are actually used only to a low extent if we only consider purchasing or selling as e-commerce (see graph 2). There must be, firm size apart, other factors as well which cause this below-capacity use.

Graph2

These questions can rarely be answered in surveys. We therefore also recurred to detailed interviews we conducted in 40 manufacturing firms in 1999 on the future developments of customer contacts with business and private customers. Our interviews pointed at some, often neglected issues which translate into obstacles for SMEs and highly specialised firms.

2.3.3 Obstacles to development for traditional firms

We identified five potential obstacles to the diffusion of e-commerce in manufacturing firms (which probably are valid for other sectors, too)

- The allocation of *strategic responsibilities* for e-commerce,
- *Transaction costs* of automated processes and the frequency of contact with customer or supplier,
- *Missing appropriate interfaces* which do not demand attentive use and *technological competition* with other communication solutions
- Persisting *transaction patterns* and
- The *complexity of products.*

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Strategic responsibilities

It is widely agreed upon that successful development of e-commerce necessitates a top management vision and strategic responsibility. The allocation of strategic responsibility in Germany is mostly very far from this ideal (see table 12). From the roughly two thirds of firms with one to 4999 employees who have an e-commerce strategy, management was responsible in about 16% of the cases whereas between 20% and 35% named the DP or IT department as responsible. All other departments or external specialists arrived at values between 4% and 14%. It must be noted that roughly 36% of these firms answered that they had no strategy.

Table 12 Responsibilities for e-commerce strategies

(By size group, responses in per cent)

	No	Who is responsible for e-commerce strategy				
	Strategy	DP or IT department	Sales	Other department	Manage-ment	External specialists
Average	*36.0*	25.4	10.4	5.8	16.1	9.7
1-99	*38.6*	20.6	7.8	4.6	15.0	9.3
1-19	33.3	23.1	6.0	7.7	14.5	4.3
20-99	39.8	20.1	8.3	3.9	15.2	10.4
100-999	*36.1*	25.3	11.4	5.3	16.7	10.1
100-249	35.0	26.7	12.1	6.9	17.9	9.6
250-499	*33.2*	35.6	14.1	6.0	13.5	10.5
500-999	*36.6*	28.8	9.3	3.9	16.0	8.2
1000-4999	*38.1*	30.0	9.7	4.0	16.6	8.5
5000 +	*10.7*	50.0	16.7	26.2	13.1	11.9

Source: ifo Konjunkturtest, April 2000.

Significant differences again show for the firms with 5000+ employees. Here only ten percent said they had no strategy. In half of the firms DP or IT departments are responsible, in one quarter another (specialised) department. Management is responsible for strategy in 13% of the firms.

According to the February survey of NAM there are quite distinct differences in the allocation of strategic responsibilities between German and US firms: here 35% of the firms named top or senior management as responsible (see table 13; on average 20 percentage points more than in Germany), 22% said that responsibilities were with the DP/IT department (approximately similar to the German average of 25 %) and 5% named the sales and marketing department (about half the German average). The differences in management responsibilities, though, may be overstated as the American survey included senior management, which should not be included in the German figures.

Table 13 Comparison of e-commerce strategy responsibilities

In charge Country	Nobody	DP / IT	Sales	Management
USA	10	22	5	35
Germany	36	25	10	16

Source: NAM survey, February 2000; ifo Konjunkturtest, April 2000.

Transaction costs

Transaction costs may decline in automated e-commerce processes, but only, if the decreases in total external customer/ supplier transactions are higher than the investments for hard- and software, training, restructuring and other complementary innovations from definition of interfaces to standardisation of processes (see graph 2). These investments increase the internal costs of transactions

Graph 3

considerably. The internal cost increases can only be offset by external decreases in the medium term, when there are frequent transactions and /or transactions with large numbers of clients. This probably is valid for many firms with more than 5000 employees in Germany.

In our interviews we assessed the frequencies of customer contact for different types of firms in order to have a rough estimator for the balancing potential between external and internal transaction costs. We defined four types of firms: *Type one* includes small to medium sized firms without own customer relations management with end users; this function and distribution logistics are transferred to trade organisations. The firms quite often are oriented at regional or national markets.

Type two comprises small to medium sized firms with a small scope of products or small scale of production, strong global orientation (export shares mostly above 50%), own customer relations management and own distribution. Markets and competitors are usually well known by these firms. Long standing relations exist with (industrial) end-users. Products tend to be complex and necessitate extensive explanation. The firms are mostly oriented at an innovation management business model. We might call this group small-to-medium-sized specialists.

Type three contain firms with more than 500 employees and a medium to large scale of production. These firms tend to profit from automated communication processes. Six of the nine firms in this group did not reach the end user of their product in pre sales transactions. Call-centre or internet are the two – quite different – solutions to get closer to the end user.

Type four consists of firms above 1000 employees with at least an important share of complex and/or expensive products that are customised. These firms – though big in size – are specialists in transparent, competitive and global markets, where they were among the leaders.

The analysis of contact frequencies differentiated between customers by their shares in the firm's sales from very high to very low. For the types one and two the average frequencies for all customer segments did not surpass monthly contacts (see table 14), though there were some exceptions e.g. in type two

firms in daily contacts with important customers. These daily contacts were limited to the few important customers and often related to a development project; after development the contacts could become sparse. Taking account of relatively low overall customer numbers, these two types have only small chances to recover their investment in automatic processes through external transaction cost reductions.

Table 14 Frequencies of customer contact by firm type in manufacturing

Sales/client	Daily	N times/ week	Weekly	N times/ month	Monthly	N times/ quarter	Quar- terly	Less frequent
Type 1								
Very high			(max)		**x**			(min)
High						(max)	**x**	(min)
Average						(max)	**x**	(min)
Low								**x**
Very low								**x**
Type 2								
Very high	(max)				**x**			(min)
High	(max)				**x**			(min)
Average		(max)				**x**		(min)
Low				(max)			**x**	(min)
Very low						(max)	**x**	(min)
Type 3								
Very high	(max)	**x**				(min)		
High		(max)		**x**		(min)		
Average			(max)		**x**		(min)	
Low					(max)	**x**		(min)
Very low							(max) **x**	(min)
Type 4								
Very high	(max)		**x**					(min)
High		(max)				**x**		(min)
Average			(max)			**x**		(min)
Low					(max)	**x**		(min)
Very low								**x**

(max)= maximum frequency; x= average; (min)= minimum Frequency.

Source: Ifo company interviews 1999.

Type three firms are in a different situation: here also frequent contacts with important customers exist as large overall numbers of customers, which makes it probable that external transaction cost economies via automated processes are higher in medium term than internal transaction cost increases.

Similar conditions exist for type four firms, though adoption of automated processes in this category was slower than in group three. This is due to the complexity of products the firms sell.

Complexity of products

Complex products, usually specialised equipment for production, need extensive advice. Quite often they are developed in close co-operation with the customer in engineer to engineer communication. Electronic media like e-mail were less used in communication for these products because they were regarded as too time consuming. These products are supposed to be less appropriate for e-commerce. Presentations are preferred, e.g. at trade fairs.

Lacking appropriate interfaces, technological competition

SMEs complained about the high expenses for setting up and constantly updating the databases that are at the core of automated processes: too many people are implied, the technology used is too slow (you would not let an engineer key his comments on customer communications into the database), too complicated (the staff needs continuous training for problems which have nothing to do with the enterprise's objectives), and standardisation of processes for complex products is complex as well.

Appropriate interfaces using speech recognition and not demanding specific knowledge for use were seen as a solution of the problem. This would, on the other hand, demand further investment in processing power and software when the technology becomes available. Search routines may pose a problem as voice differences are ignored by the system.

For the moment e-commerce competes technologically with call centre solutions. Call centres offer the advantage of activity (the firm has the initiative) and

a high probability to contact or be reached by every customer (because everybody has a phone and knows to use it), e-commerce is a cheaper, though more or less passive option (the customer takes the initiative) with access only for a limited group of customers at the moment (and a necessity for attentive use: software knowledge is demanded).

Persisting transaction patterns

In order to assess the potential for change through e-commerce, we have to split it up into the composing transactions. We differentiate – as in graph 3 - between

- Information,
- Proposal,
- Order,
- Delivery and payment,
- Complaints and
- Service split into classical and professional.

The following evaluation of appropriateness of the use of e-media for these transactions is based on the interviews and relates to available and diffused technology, not frontier applications.

Information includes three different issues in e-commerce: Being found in a search ("getting the first click"), informing the potential customer and getting information about the customer. Even though the web potentially increases the reach of information, it may be extremely difficult and expensive to be among the first found and to get the first click. Traditional brands apart, there are few net-related brands, mainly in the hardware and software sector, in B2B e-commerce. A position has to be created with high advertisement efforts. It may be cheaper for SMEs to use direct contacts and trade fairs instead.

Product or service information for the customer via the internet is already widely available. Relatively cheap to set up if not integrated into an automated system, it can be used in parallel to other channels. There are limits through product

Graph 4

complexity and extra service demands by important customers. Other information channels have to be kept in parallel. The savings potential is low, if information is used in a traditional way. Links to related products – demanding established clusters of collaboration (and a different way of organising the business) – may considerably increase the web-specific possibilities and the success of this channel.

Information about the customer is probably one of the most important problems of automated e-commerce systems, as it allows for product differentiation, increased customer "lock in" and demand-pull development based on data-mining. These technologies are now mainly limited to big business due to the high investment cost and the limited numbers of B2B customers of SMEs. Competing traditional technologies are more expensive but also more efficient in getting extensive information via human contact, which, in turn, probably leads to a better customer relationship.

E-media seem less appropriate for B2B client-specific *proposals* as personal contact, presentation, sympathy, trust and the use of psychology are important means for a differentiation from competitors. Especially for important clients, pricing strategies, bundled offers and free extra services are decisive points which call for personal negotiation.

Even in "traditional", not web-oriented firms *orders* usually arrive over message media (e.g. letters, fax). A migration to e-media therefore is relatively simple – as long as orders do not serve as an automatic input for a logistic chain. Electronic orders are frequently used in EDI chains, where typically the savings arise at the central (large) firm and additional cost occurs at the suppliers, or in maintenance, repair and operating (MRO) purchasing, where centralisation of decisions can lead to significant cost savings.

Delivery is limited to products or services that can be digitised (e.g. software, advertising or financing). They represent a small share of B2B commerce. Electronic *payments* already play an important role.

Electronic *complaints* may have the advantage of 24 hour accessibility but they are competing with call centre solutions. The latter not only have the advantage of instant and human response but also offer the possibility of limiting conse-

quences of customer discontent and a higher precision of inputs for the central database. Both technologies are well adapted for the use in commodity products but are less apt for complex products.

Two different tendencies of e-development potential can be seen in *classical* and *professional services*. In classical (maintenance and repair) services a huge savings potential and demand is expected in remote monitoring of equipment. Many of the producing firms already have integrated interfaces for remote monitoring into their equipment. Continuous monitoring, especially if video information is required, still is too expensive. Professional services (bundled financing, consultancy and optimisation of processes) for physical goods seem less appropriate for e-commerce solutions.

2.3.4 A short B2B summary

B2B e-commerce in traditional firms in Germany is characterised by a high potential and a comparatively low use of this potential. We were not able to exclude the existence of application gaps compared to the USA, but could not detect them either. The low use rates reflect important obstacles to a fast transition from "traditional" to electronic transactions: cost, vision and management, limited migration possibilities for several transactions and the complexity cluster (complex products, complex standardisation and communication; see graph 4).

As in the USA, an "automation divide" exists in Germany between big and smaller firms. The automation of transactions and related processes not only makes it possible to realise the main savings potential of the technology, it also creates further network advantages via knowledge management and increased speed and flexibility of operations. This tends to reinforce advantages for larger firms which already may profit from higher goodwill and advertising budgets. One precondition to the diffusion of automated processes in SMEs will be the diffusion of inattentive use technology.

A fast development of B2B e-commerce will continue, fuelled by MRO purchasing, the further development of logistic chains and increasing networking between firms. A boom, though, seems overstated due to bottlenecks in resources, the amount of necessary complementary innovation (training, experi-

Graph 5

ence, reorganisation) and the necessity to preserve all other channels of customer contact. The development probably will be concentrated on commodity producing and distributing sectors or market segments.

2.4 Business to consumer e-commerce

2.4.1 Access

Household access to the internet correlates in Germany (and elsewhere) with income and age: With increasing income, PC and modem ownership as well as access service registrations increase (see table 15); with an age above 55 these numbers decrease. Both differences, though, may be reduced by further diffusion. Unfortunately the only recent disaggregated data available are from 1998. Access rates have more than trebled since: from an average percentage of 8 out of hundred households – equivalent to 3m households – they developed to 26 out of hundred in early 2000[1] (or 9.5m households). Germany had the highest home access rate among the bigger European countries (including UK with 21%, and France and Italy with 9 % each). This rate still lags behind the Californian average of 34% (see table 16).

Private access (or use for private purposes), though, is not limited to access from the home: even higher numbers can be found for private access from outside the home (see table 16). This way private use figures for Germany (35%) come closer to Californian levels (40%). Access differences against other European countries increase vis-à-vis Germany.

[1] Gesellschaft für Konsumforschung (Gfk), eCommerce in Europa, Spring 2000.

Table 15 Computers and internet access in German households January 1998

(in % of all households of the group; by age and income)

…

	Actual access						Alternative access					
	PC		**Modem**		**Online services**		**Cable TV**		**Satellite TV**		**Mobile**	
by age of main income earner	West	East	West	East	West	East	West	East	West	East	West	East
< 25	46	*36*	13	*8*	12	*7*	47	65	22	*14*	13	*18*
25-35	58	49	18	11	15	10	51	59	30	33	15	18
35-45	62	58	15	9	12	7	50	62	32	34	15	14
45-55	59	50	12	8	11	7	53	65	29	33	16	16
55-65	34	23	7	*3*	6	*3*	52	67	29	30	9	7
65-70	16	*8*	3	-	2	-	50	70	28	26	4	*3*
> 70	6	*2*	1	-	*1*	-	49	67	25	24	3	*2*
	PC		**Modem**		**Online services**		**Cable TV**		**Satellite TV**		**Mobile**	
by income	West	East	West	East	West	East	West	East	West	East	West	East
< 1400	26	17	6	*3*	5	*2*	43	65	20	17	*4*	*5*
1400-2200	22	20	5	*4*	4	*3*	49	69	23	24	5	*6*
2200-3000	28	27	7	*4*	6	*3*	52	66	27	29	7	7
3000-4000	42	41	9	7	8	6	51	64	32	33	10	12
4000-5000	55	57	13	9	11	7	52	61	34	37	14	16
5000-7000	70	70	17	14	15	11	53	58	33	40	18	26
> 7000	83	83	23	23	22	*19*	56	48	31	49	31	35
Average	***33***	***36***	***10***	***6***	***9***	***5***	***51***	***64***	***29***	***30***	***11***	***11***

Source: Statistisches Bundesamt, Statistisches Jahrbuch 1999, pp. 564-573.

Table 16 Private access to the internet

In % of population aged 14 to 69

Region	**Total**	**From home**	**From outside home**	**Population base m**
Germany	40	26	35	55
UK	28	21	22	42
France	17	9	14	42
Italy	15	9	10	43
Europe 4	31	20	25	182
California	42	34	40	23

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

Longer experience is the reason why gaps in access exist between California and some European countries. This is reflected in the shares of participating age groups in the user population as well as in the years of use. Due to longer experience, California has significantly higher shares of users in the age groups above 30 years (see table 17).

Table 17 Age related differences in use

In % of population in age group

Region	14 to 29	30 to 49	50 to 69
Europe 4	46	33	14
California	44	43	38

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

More than half of the Californian population has been using the web for more than two years. Among the European countries Britain has the highest share of users in this category. Experience patterns, though, do not differ strongly from Germany and France. Italian figures indicate a later start (see table 18). Experience and user group differences as well as the German development suggest that the existing access gap between California and the selected European countries may disappear rapidly.

Table 18 Structural differences in experience

In % of population aged 14 to 69

Region	Experience		
	up to 1 year	1 to 2 years	more than 2 years
Germany	46	27	25
UK	48	24	28
France	48	30	23
Italy	60	27	13
Europe 4	49	27	23
California	18	30	52

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

2.4.2 Use

Longer experience has influenced use structures only in a few cases like private and professional mail: here the use is higher in California and the UK. Many of the other selected uses show similar patterns for all countries (see table 19). The significant difference in e-banking use between Germany and the other countries may be dependent on a later and lesser diffusion of credit cards; the stronger diffusion of e-banking may be a potential advantage for e-commerce development on the other hand.

Table 19 Structure of private internet use

In % of population aged 14 to 69

	Region					
Use	**Germany**	**UK**	**France**	**Italy**	**Europe 4**	**California**
Private mail	44	65	36	48	49	72
Surf	36	40	40	43	39	38
Information	25	28	23	27	26	29
Professional mail	25	31	30	27	26	36
Formation	15	20	24	32	21	19
Send mail	19	19	15	25	19	20
Software	20	19	18	19	19	15
News	23	10	16	29	19	21
Economic news	23	14	12	21	18	28
Database access	20	22	15	12	19	22
Banking	25	10	8	7	15	12

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

Even though use structures are relatively similar in the selected countries there is a marked difference in the intensity of internet use: the selected European countries reach at best half of the average American time of use per month (see table 20). The potential for B2C transactions therefore is clearly lower.

Table 20 Intensity of internet use from home

	Number of days with use	Duration of use per month in min.
France	8.1	251
UK	8.8	289
Germany	10.1	306
USA	13.7	616

Source: MMXI Europe, Internet von zu Hause aus, April 2000

2.4.3 B2C Transactions

B2C e-commerce was practised by more than half the Californian and nearly half the German population aged 14 to 69 (see table 21). These are astonishingly high figures taking into account that only 0.7 per cent of US retail sales were made over the internet (comparable figures for Germany were not available). The transaction volume must be small on average. Similar structures regarding the "only product" and "only service" shares – two thirds to one third – can be found in Britain and California. About equal shares existed in Germany and Italy, whereas the French buyers seem more service oriented.

Table 21 Structure of B2C e-commerce

In % of population aged 14 to 69

Region	**only products**	**only services**	**at least one of both**
Germany	18	19	47
UK	20	10	43
France	7	14	26
Italy	8	8	17
Europe 4	15	14	38
California	27	9	55

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

The age structure of buyers suggests higher sales in California and Germany: in both countries the share of the better-off age groups between 30 and 69 is significantly higher than in the other selected European countries (see table 22). A rough estimate by Forrester Research saw annual average purchases of 490 for 7 million Western European internet buyers.[1]

Table 22 E-consumer age structure

In % of population in age group

Region	14 to 29	30 to 49	50 to 69
Germany	32	51	17
UK	43	45	12
France	48	41	11
Italy	46	43	12
Europe 4	38	48	14
California	32	47	21

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

B2C e-commerce is concentrated on a limited range of products where books are the most important group. Among other, relatively frequent bought goods – as compared to other products bought via e-commerce – are compact discs, brown appliances, presents and clothing (see table 23). One of the more important segments of e-commerce – sex – is missing in the official statistics.

Table 23 Main products in B2C e-commerce

In % of population aged 14 to 69

	Region					
Product	**Germany**	**UK**	**France**	**Italy**	**Europe 4**	**California**
Books	28	34	17	24	28	32
CDs	20	28	16	16	22	21
Brown appliances	19	17	8	3	16	19
Presents	12	23	15	3	15	19
Clothing	14	14	9	3	12	17
Telecom products	13	9	10	11	11	5

Source: Gesellschaft für Konsumforschung, eCommerce in Europa, Spring 2000

[1] Cited after Oppenheim Research, Das Internet – immer noch ein hervorragender Platz für Investitionen, September 2000, p. 16.

2.4.5 Obstacles in B2C e-commerce

The obstacles to a faster diffusion of B2C e-commerce are in some points similar to those cited for B2B commerce: they also imply missing appropriate interfaces, the high cost of participation vs. a low savings potential, a limited range of products and persisting transaction patterns.

There certainly will remain a digital divide, if the PC remains the only access medium. As the PC probably is not the appropriate medium for B2C commerce, I would see this actual divide problem as less important.

Additional problems consist of language – the prevailing language of the internet is English – payment/ trust and privacy. For the existing user, the English language probably poses no problem as the use patterns suggest. Persons that will not or cannot – due to lacking qualification – use a PC for access may be excluded from foreign language segments.

The payment problem is closely linked to trust. How can you trust a firm you do not know? This may limit the initial purchasing to known firms and brands. The other payment related problem is "micropayments" below 5 dollars (e.g. for downloads of digitised music). There is still no operational system in place.

The privacy issue – an important point in EU internet policy – has also probably slowed down B2C diffusion via the reduction of data-mining possibilities. It will force providers to build communities for this purpose.

2.4.6 A short summary

As in B2B the transaction potential in B2C commerce is far from being exhausted. Lacking infrastructure for other, inattentive-use access media (like voice controlled TV) and high bandwidth transmission of real-time video as well as competing standards are probably slowing down the take-off of B2C commerce. Therefore B2C commerce will loose further shares to B2B.

Competitive disadvantages may arrive in segments, where brands cannot be successfully established on the web.

2.5 The start-up scene

The start-up firms have been the motor of e-commerce development in recent years: they accounted for high employment and sales growth. Lacking profitability of most of the firms, high "burn rates" of borrowed funds and a necessary re-orientation of business models from B2C to B2B may slow down the speed in this market segment. We could not find comparable information for other countries. The following overview is therefore limited to Germany.

2.5.1 Segments and concentration in the new economy

The majority of the German "new economy" firms were working in the B2C market segment (51%; see table 24), only one fifth of them were B2B oriented and the rest created enabling software. Nearly 90% of the B2C activities were concentrated on shops and malls (36%), portals and communities (33%) and broker/ auction platforms (19%). Two thirds of the B2B oriented firms developed general (54%) and supply marketplaces (13%). The most important segments in enabling were general software and services (45%) with shop and marketplace software together on a distant second rank (11% each).

Table 24 Business segments of internet start-up firms

... (in % of category and % of total market)

	B2B		**B2C**		**Enabling**
General Marketplaces	54	**Shops and malls**	36	**General software + services**	45
Supply Marketplaces	13	**Portals, communities**	33	**Shop software**	11
Demand Marketplaces	5	**Broker platforms, auctions**	19	**Marketplace software**	11
B-community	5	e-marketing, games	6	1:1 marketing	8
Shops	5	Other	6	Community tools	6
Other	18			Other	19
Total share	***21***	***Total share***	***51***	***Total share***	***28***

Source: Bain & Company, One Economy, München, July 2000, p. 8.

The new economy firms are also regionally concentrated: about 30% in Bavaria (of which 19% in and around Munich), 13% in Berlin and 7% in Hamburg (thus about 40% in only three cities). Some well known start-up firms grew outside these regional clusters: Intershop in Jena, Brokat in Stuttgart, where an IT Cluster with IBM and HP exists.

The main source of revenue in the B2B segment is transaction and placement fees (50%; see table 25). Another important source were product sales which are on the second place in B2C as well. Here banner and other forms of advertising are the main source of revenue. Internet advertising still has a very low share in total advertising expenditure. World wide average estimates ran around 2% for 2000[1].

Table 25 Sources of revenue by business type

... (in % of B type)

	B2B	B2C	Enabling
Products	39	30	50
Services	11	23	50
Contact fees	50	37	-
Information	-	10	-

Source: Bain & Company, One Economy, München, July 2000, p. 17.

Regarding the considerable financial needs of new economy firms, these revenues are not sufficient.

2.5.2 Financing and development

According to the Bain[2] survey, average overall financing needs vary between twenty (for B2C oriented firms) and forty million D-Marks (for B2B oriented firms). These important differences are certainly one of the causes why more start-up firms choose a B2C orientation. The capital needs can be split into three phases: the seed financing for the development of a business plan, first round financing for business development and the second round for expansion.

[1] www.emarketer.com/estats/dailyestats/advertising/20001206_zenith.htm

[2] Bain & Company, One Economy, München, July 2000.

The seed capital needs are modest compared to first and second round financing.

As there are no returns in the early development phases of the start-up, financing of the new firms is dependent on venture capital.

Table 26 Average capital needs by business type

... (average needs in m DM)

	B2B	B2C	Enabling
Seed capital	1.2	0.9	0.4
First round financing	10.9	6.8	12.2
Second round	27.3	13.5	23.8
Total	39.4	21.1	36.4

Source: Bain & Company, One Economy, München, July 2000, p. 23.

Despite difficult financing, many firms plan to double their employment in 2000. Growth until now was mainly realised on the national market. Against the background of changing lending conditions, many of the start-up firms – especially in B2C – will have to re-orient their business strategy towards new segments of activity, alliances, internationalisation and brand development.

2.6 A Synthesis of results

We are only at the beginning of e-commerce development as a new business channel. The enormous growth stated in some estimations may be biased by measurement errors: three developments – already existing e-links were re-baptised e-commerce (e.g. EDI), an atypical "gold rush" growth of new firms, where traditional financing rules were ignored, established and traditional firms' fear of losing market share against new competitors – coming together probably have led to exaggerated expectations. The potential for e-commerce in a medium term perspective is neither all firms nor all internet users: it is due to several restrictions coming from inappropriate technology, transaction cost problems, persisting traditional transactions, complexity problems and missing strategy (see graph 6).

E-commerce as a channel will coexist with other channels of communication, distribution and service. Traditional suppliers still have important advantages against start-ups in customer relations management – they know customers and market segments and can use their knowledge via differentiation strategies -,

Graph 6

core competencies (e.g. in R&D or process management), established brands and (under normal conditions) and greater financial resources. Only if e-commerce can offer significant advantages in price or convenience may new firms have a chance. If not, alliances or other forms of co-operation between traditional and new firms seem sensible.

Existing technology is expensive, complicated and necessitates attentive use. A further diffusion, especially with SMEs and households without access, needs inattentive use devices. They require more than the available processing power and higher bandwidth in access and transmission. Thus infrastructure development is another precondition.

E-commerce technology is constantly developing, prices are falling and it is pervasive – i.e. applicable nearly everywhere. Thus e-commerce fulfils Helpman's and Trajtenberg's criteria of a general purpose technology (GPT). It is a typical feature of GPTs that the time needed for complementary innovation – e.g. training, knowledge management, reorganisation – determines productivity growth: only after all complementary innovations are made, can productivity growth be realised. Due to the complexity of the underlying structures – data warehouses, back offices, communication networks and interfaces – complementary innovation may take a long time.

There will be no revolution, however, but continuing strong growth: new market niches will be discovered, networking and creativity will increase and new technologies will enable new processes. E-commerce will also stimulate the development of network externalities via a new perception of intangibles – human capital, knowledge management or organisation – and communication as core value-added creators.

3. Where could or should policy stimulate the development

Newly developing segments like e-commerce should in principle be able to develop freely as long as they do not interfere with public interest. A policy support for the development, though, seems important in order to prevent the drift of qualified labour. The support could consist in

- education and training programmes,
- the choice of an e-channel in G2B and G2C contacts,
- the propagation of open standards in global collaboration,
- public demand in inattentive use technology and high bandwidth infrastructure,
- tax breaks for R&D expenditure or complementary innovation.

In our understanding, policy should not interfere with digital or automation divides as technological development probably will lead to different solutions. Even though new forms of distribution (e.g. demand aggregation) may be impeded by existing competition law, exemptions should not be easily granted.