Global Opportunity and National Political Economy: The Development of Internet Ventures in Germany

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Abstract

In the late 1990s, the internet was heralded as a global opportunity for new ventures. One aspect of this opportunity was the innovation of including small firms and consumers in seamless 'business webs.' The second aspect was the distance insensitivity and internationality of the internet.

New ventures appeared in different countries responding to this seemingly global opportunity. In Germany, this response appeared especially strong against the background of years of slow development of the domestic information technology (IT) sector.

This thesis examines the role of national government policy in a world being transformed by technology. 'Network thinkers,' following Schumpeter's concept of 'creative destruction,' believed the internet represented a global innovation opportunity. They emphasised the independence and self-governance of globally networked market players, arguing that the territorial basis of national government policy has eroded. The problematique guiding this research effort has emerged from this thinking. Can the concepts associated with network thinking account for the apparently strong entrepreneurial response to the internet in Germany?

A detailed study of the development of internet ventures in Germany was carried out to examine this guiding question. The study was supported by quantitative data supplied through a 123-firm survey conducted in the Spring of 1998. This research revealed that the entrepreneurial response in Germany was much weaker than it appeared to contemporary observers. New ventures had to adopt a 'mixed-play' approach which placed them on a less innovative and less international, slower growth trajectory.

Two key policy arenas were identified which constrained the development of German internet ventures: (1) The course of telecommunications liberalisation and (2) the initial lack of venture capital. Practitioners have long been aware of the importance of these two determinants for internet development. The main contribution of this thesis has been to add to the understanding of *how* these two factors have operated in a national environment conditioned by distinctive institutions.

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Chapter One

Continuity or Rupture – Interpreting the German Internet "Wunder"

> "Germany excels at, and is stuck in, mid-level technologies – great cars. But it has little of the upper-level technologies that matter today to be a frontrunner, nor the mindset or the structures to quickly become a player" (Dornbusch, 2000, 74).

From the 1970s onwards, German government and private sector initiatives tried to boost their country's innovation capacity in information technology (IT). Germany's position in this key sector was behind that of the United States and some Asian countries. Initially, under Social Democrat leadership, government tried to support German efforts in IT by financing co-operative, large-scale research programs involving multinational European corporations.[1] They were programs co-ordinated at a European policy level, and indeed, the problem was perceived as a European challenge. But these initiatives did not meet their ambitious goals. One target of these efforts, Siemens, did not manage to achieve global leadership in basic information technologies such as data networking equipment or personal computing. In 1998, Siemens outsourced its Nixdorf computer production arm to Acer of Taiwan and indigenous computer manufacture ceased in Germany.[2]

In the 1990s, the Christian Democrat-led coalition revised these sectoral initiatives in accordance with perceived lessons from the United States. The first of these lessons was technological, the second organisational. First, the technologies driving IT, media and telecommunications were becoming strongly interdependent. Innovative efforts were focused on the convergence of these previously technologically distinct sectors. Second, innovations in converging technologies seemed to emerge not out of large, established companies, but, instead, from new ventures. Observing these developments, members of the Christian Democrat government tried to accelerate telecommunications liberalisation in Germany with the objective of stimulating competition as well as entrepreneurship and innovation. Furthermore, government experimented with alternative research policy involving innovative small and medium-sized enterprises (SMEs). The emphasis shifted

[1] For a brief account how intervention was justified in Germany as supporting the free market economy see Starbatty (1999, 175-177).
[2] Many interpreted this as the final surrender of Germany and, in fact, Europe, from the contest for IT leadership (see, for example, Thurow, 2000, 85).

from promoting upstream innovation to downstream support in bringing the innovation to the market. In parallel, powerful actors in the financial sector promoted the establishment of an alternative technology stock exchange, the Neuer Markt, as part of their efforts to modernise German capital markets along Anglo-Saxon lines.

However, the results of these initiatives were not immediately apparent. While IT growth rates in Germany rose significantly in the mid-1990s, they were until 1998 still lagging the rates of market growth in the United States and also those of some European countries such as France and the UK (EITO, 1999, 344, 350). Overall economic growth rates did not compare well to other countries and unemployment was a problem.[3] A lack of entrepreneurship was cited by many commentators and policy makers as an important aspect of the malaise.[4] In 1999, the economist Paul Krugman wrote a short practitioner piece called "Why Germany Kant Kompete," citing rigid regulation and lack of dynamism.[5] The introductory quote from fellow economist Rudi Dornbusch illustrates this mood as well.

Parallel to domestic efforts in Germany to rekindle innovation, the dual developments of convergence and entrepreneurship achieved greater momentum in the United States. From the mid 1990s onwards, technological convergence between IT, media and telecommunications began to be focused on a single data networking platform, the internet, which had already been long in existence but was registering very strong adoption rates among consumers and business users. The importance of the internet was not at first recognised by established players in IT, media and telecommunications, which were working on convergence projects with their own proprietary technologies. The internet was a classic case of a *disruptive technology* (Christensen, 1997), where innovation was driven by entrepreneurial initiatives. The commercialisation of internet technologies occurred during a five-year period beginning with the initial public offering (IPO) on NASDAQ of the first significant internet start-up, Netscape Communications, in August 1995 and ended in a stock market bubble which peaked from late 1999 to Spring of the year 2000. Within this five-year commercialisation phase, hundreds of new ventures in the United States pioneering internet technologies

[3] Discussed in Chapters Four and Seven.
[4] This belief was shared by policy makers regardless of party orientation (compare Kleinert and Mosdorf, 1998, 214; Henzler and Späth, 1997, 153-156).
[5] In his monthly column "No Free Lunch," *Fortune*, July 1999.

were financed by a continuously growing inflow of venture capital amounting to over 100 billion USD.[6]

After this growth, boom and bust period, only a small handful of significant internet ventures survived, yet these had in a relatively short period of time managed to build sustainable, international operations in the USA, Europe and Asia. More importantly, and this is subject of intense, ongoing debate, established US companies in IT, media and telecommunications as well as firms in other industries may have increased their productivity, either by acquiring internet ventures or by generating internal technology know-how in adopting internet innovations.[7] In some industries, internet adoption evoked a shock effect by increasing price competition and lowering profit levels (Porter, 2001). In this case, productivity gains will only appear when these industries restructure. Other diverse economic effects may also set in such as a lower level of inventory in the economy (DeLong, 2001).

While the longer-term economic impact of the internet is still difficult to ascertain, it is clear that this impact will not only manifest itself in the United States alone. In fact, at the turn of the century, something happened in Germany which was quite unexpected. IT growth picked up in Europe, including significant two-digit growth in Germany. These rates began to match those of the United States.[8] Established companies in Germany intensified their efforts in telecommunications, media and IT. Siemens, for example, successfully entered computer chip design and manufacture and successfully spun off this unit, called Infineon. The engineering conglomerate Mannesmann launched a successful mobile telecommunications division which developed into the strongest competitor of the Deutsche Telekom. Most surprising, however, was that German private and public capital markets were registering similar enthusiasm for young

[6] Statistics from the "PricewaterhouseCoopers MoneyTree Survey in partnership with VentureOne" ("Q4 2000") including restated historical data from 1995 to 2000. Also see the article in the PricewaterhouseCoopers MoneyTree newsletter, "Venture Capital Investing Survey: Quantifying What A Long, Strange Trip It's Been," "Nextwave Q4 2000" as well as further PricewaterhouseCoopers MoneyTree Surveys cited in Chapters Two and Seven of this thesis.

[7] Any definite conclusions about the level of productivity gains brought about by internet innovation are premature. Economists are still discussing if conventional means used to measure industrial productivity need to be revised with a rising proportion of information goods in an economy. For one view, see the summary by J. Bradford DeLong (2000).

[8] Press release by European Information Technology Observatory (EITO), "EITO 2001: Strong accelaration in Net Economy development expected to continue in Europe, despite present storms in capital markets. ICT market in Europe grows by 13% in 2000, outdistancing US growth rate (8.2%)," Brussels, 28.02.01.

technology companies as the US capital markets; only, funding was pouring into indigenous new IT, media and telecommunications ventures. From the end of 1999 to the turn of the century, growth rates on the Neuer Markt were identical to those on NASDAQ. In the two months prior to consolidation from March 2000, the Neuer Markt actually had grown twice as fast as the booming NASDAQ.[9] By the end of 2000, 344 IT, media and telecommunications companies, including 67 internet ventures, had listed on the new German technology exchange.[10] While it was surprising that entrepreneurship had apparently re-awakened in Germany, it was noteworthy that this re-awakening had occurred in telecommunications, media and IT and not in traditional German areas of leadership such as the engineering-based industries. The question which stands at the beginning of this thesis is: "What happened here?" So far, the available answers do not seem satisfactory.

One could argue that the transformation in dynamism was the result of public and private sector initiatives in Germany to foster telecommunications competition and entrepreneurship. One could discuss in detail the initiatives of Christian Democrat government and the financial sector. While this argument needs to be duly examined, it would not be correct to view this transformation as a purely domestic phenomenon. Stock market investors in Germany were trying to emulate gains observable in the United States. Many of the German internet ventures had business models which were identical to those adopted by start-ups in other countries. One needs to also examine to what extent there was more to this development than merely 'blind' copying among investors and entrepreneurs. One argument is that actual structural shifts were occurring in the global economy. These were driven by disruptive technological developments on an international scale affecting a wide variety of economic sectors (see Cohen et al, 2000). German entrepreneurs were responding to these fundamental global changes. One important aspect of these changes was the spread of international data networks, which began in the financial services sector, moved to multinational enterprises (MNEs) and, with the commercialisation of the internet, reached small enterprises and consumers.[11] Other European countries were apparently undergoing a similar

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[9] Over the year 2000, NASDAQ had lost 56% of its value, while the Neuer Markt index, NEMAX, lost about 80%. „Falscher Glaube an eine neue Ära. Aufstieg und Fall des Neuen Marktes: Wie die Euphorie entstand und wer sie antrieb," *Financial Times Deutschland*, 15.03.01, page 21.
[10] DG Bank Deutsche Genossenschaftsbank AG Research, "Neuer Markt," Februar 2001.
[11] For the spread of international data networks before the commercialisation of the internet, refer to Dicken (1992) and Cash, McFarlan, McKenney (1992).

transformation to Germany. World-wide networks, especially the internet, may have led to unprecedented, world-wide 'leapfrogging' opportunities.

One of the objectives of this research is to explore the hypothesis of a global opportunity for technology innovation delivered via world-wide data networks.[12] During the 1990s, this promise was contained in a popular vision of a so-called 'Digital Revolution,' promoted with missionary fervour by technologists and writers close to technological developments. It was adopted by entrepreneurs and investors. Aspects of this vision were further developed by critical scholarship, especially by sociologists who studied technological change as part of a 'globalisation' research agenda. The vision of a Digital Revolution, however, conflicted with current research on innovation and technological development in economics and the political sciences. This existing research adopts an institutionalist approach and emphasises the existence of distinct local structures determining innovation capacity. Yet, for this very reason, institutionalist scholarship has difficulties explaining global innovation opportunities which seem to rapidly travel across borders and across distinct institutional landscapes. The approach taken with this thesis was to select a large national economy and to understand the validity of these conflicting visions of technological change by studying actual development in a specific setting. An economy was chosen in which a strong entrepreneurial turn-around in response to global technological opportunity had apparently occurred: Germany. The apparent entrepreneurial turn-around refers to the number of new ventures appearing in Germany targeting the global internet opportunity. Their appearance in a country marked in previous years characterised by a lack of entrepreneurial dynamism seemed to validate the popular vision of the Digital Revolution.

In this introductory chapter, the most important themes which will be part of this thesis will be presented and placed in a theoretical framework. Firstly, the theme of a global innovation opportunity associated with the spread of international data networks will be explored. Practitioners closely involved with IT developments as well as scholars, mostly with a sociology background, have extensively described the nature of this innovation opportunity. The second theme to be discussed in detail in the Introduction is the role of national institutions in promoting or constraining innovation. After a discussion of these two themes, the central research framework will be described; based

[12] For a critical examination of leapfrogging opportunities provided by innovation in the telecommunications industry in developing countries see Singh (1999).

on a novel concept called *refraction*. Refraction is the distorting effect national institutions have on a global innovation opportunity. The refraction framework is used here as an analytical tool to study the role of national institutions vis a vis global shift in the setting of a particular domestic economy, in this case, Germany. The main domestic agents and policy arenas in Germany influencing internet development as well as the empirical basis of the study will then be presented. Before moving to the closing comments of the Introduction, the reasons for selecting Germany as the main focus for the study are reviewed.

Global opportunity

A body of work has appeared since the early 1990s which seeks to explain a contemporary and universal shift in the international economy related to innovation in information technology (IT), media and telecommunications. In some of the literature the internet manifests this structural shift. While some authors emphasise that the internet merely accelerated existing changes, other commentators suggest that the internet represents rupture. It is important to emphasise, however, that most of the work drawn upon here pre-dates the time when it became fully apparent that internet technologies would be adopted by established industries. While financial services firms and industrial MNEs were using proprietary networks, it was mostly researchers who were communicating over the internet platform. This body of work, therefore, also appeared long before the most extreme manifestation of the stock market bubble. This writing is different from money-making guides for internet business or airport bestsellers containing internet investment advice- although it probably inadvertently helped contribute to the ideas contained in these texts.

Instead of using the emotionally charged term Digital Revolution, the body of work under examination here is referred to here as *network thinking*. Network thinkers are contemporary observers who have privileged access to new developments in IT. Examples of these vocal observers are the futurist George Gilder (1989; 2000), the technology analyst Esther Dyson (1998), the business strategists Michael Cusumano and David Yoffie (1998) or the writer and *Wired* magazine editor Kevin Kelly (1994; 1998). Their thinking diverges on a number of issues, but, beginning from a premise of technological innovation, all discuss global shift wrought by technological innovation, and all heralded the arrival of new types of players in the economy as well as new rules for competition. In addition, a wide array of issues such as the role of policy or social effects are discussed. For them, convergence between IT, media and telecommunications results in the birth of a so-called *new economy*, eventually encompassing all industries.

At the same time that practitioners were promoting network thinking, academics began to concern themselves with similar themes. This body of literature did not emerge from within those areas of scholarship which have traditionally analysed innovation capacity, such as economic history or management studies. Much of this literature is associated with new directions in sociology, such as urban sociology (Sassen, 1996; Castells and Hall, 1994), post-structural economics (Lash and Urry, 1994; Harvey, 1990) or the analysis of the information age (Castells, 1996). As part of a detailed exploration of *globalisation* as a contemporary social shift, sociologists early on addressed the significance of the spread of global data networks in financial services and among industrial MNEs. Here, the discussion of social effects in this body of work will remain in the background while emphasis is placed on technology and the economy. Nevertheless, the theme of globalisation is such a crucial element to understanding current sociological research that it has to be addressed in the thesis.

But not only sociologists, also researchers in business strategy and economics concerned themselves with the so-called new economy. This work starts with the premise that anyone who offers information goods or services over the internet potentially has global reach at no additional cost. Barriers to entry and also to innovation are lowered. In the words of Cusumano and Yoffie:

> "For companies competing in the new information economy, the internet is forcing managers and employees to experiment, invest, plan and change their ideas constantly *while* [italics in source] they are trying to build complex new products and technologies. The internet also requires companies to face the reality that competitive advantage can appear and disappear overnight... It was the electronic distribution capability of the internet that allowed Netscape to burst onto the scene in 1994 and, in only a few months, emerge as one of the most serious threats Microsoft had ever faced. This sudden rise to prominence of new companies can and will happen again." (1998, 5).

Cusumano and Yoffie emphasise that it took Netscape only three years to reach annual sales of more than half a billion USD, whereas the software giant Microsoft reached comparable revenues in fourteen years (1998, 10). The basis of this rapid growth was what economists have labelled *network effects.* Network effects appear when the value of a good increases with the number of users. In this environment, users themselves recommend their good to others, leading to rapid distribution. But advantages of network externalities benefiting a single company need not be sustainable; competing companies can also benefit from these effects. The economist Danny Tyson Quah states this in the following way: "Superstar successes are in turn replaced, and easily" (1998). And in attempting to benefit from network effects, companies sometimes begin to compete in ways that erode their own established competitive advantages and can lower their profitability (Porter, 2001).

Beginning from a similar premise as business strategists and economists, network thinkers such as Esther Dyson go a step further in describing the consequences of a networked international economy: "Analysts and investors wonder who will replace Microsoft the way Microsoft replaced IBM as the information industry's standard. The answer is that no one will: The model of an industry revolving around a central leader will give way to a new decentralised market" (1998, 20). Kevin Kelly states similar thoughts differently: "The world of the made will soon be like to world of the born: Autonomous, adaptable and creative, but consequently, out of control" (1994, 4). The sociologist Manuel Castells writes: "The information technology paradigm does not evolve towards its closure as a system, but towards its openness as a multi-edged network" (1996, 65). The vision is one of a fluid world marked by constant change which is hazardous to those established players who cannot adjust.

This volatile environment is deemed to lead to two possible structural consequences. First, the literature seems to suggest that a shift away from established innovation clusters such as Silicon Valley is in progress. Stated differently, a "Silicon Valleyisation" of the world is occurring. "[The internet is] a powerful tool for integrating local economies into the global economy and for establishing their presence in the world," writes Dyson (1998, 17). Yet, the new centres of innovation need not be greenfield projects, they can also be old cities which assume new roles in the world economy. Castells contends that, "...the largest, old metropolitan areas of the industrialised world are the main centres of innovation and production in innovation technology outside the United States " (1996, 57). Regarding the new role of global cities, disagreement exists weather they represent forces of decentralisation or centralisation. A further influential urban sociologist, Saskia Sassen, for example, shows that the global digital era has brought with it concentration in power (2000, 104-112). One key theme of most of this work, however, is that the new regions or cities are perceived as having their own dynamics independent of the specific country they happen to be in. Sassen speaks of "a partial denationalising of national territory" (Sassen, 1996, xii). She emphasises the partial nature of this process because: "The state itself has been a key agent in the implementation of global processes, and it has emerged quite altered by this participation" (1996, 29).

A second possible consequence of technological change is the transfer of innovation capacity away from the industrial laboratories of large enterprises and research universities to new entities. These are new ventures but could also be enterprising individuals or newly organised, decentralised large corporations (Castells, 1996, 156). New ventures also do not need to stay small, they can leverage the network to become large very fast.[13] International data networks are purported to enable new global business processes involving new types of specialised business entities. Related to this are trends towards outsourcing in industry, the increasing value of services as well as an emphasis on cultural production, these will be discussed in Chapter Two. Castells believes that the economic operating unit in the new global environment is the network itself and has ceased to be the firm. The name he assigns to the new organisational form is the *network enterprise* (1996, 171).

Thus, while some work focuses on new geographies, such as the appearance of new regions and cities, other work highlights the emergence of new organisational units such as start-up companies. In some of the writings discussed here, these two possible consequences are described as part of a general trend. New geographic regions appear outside of the established clusters, and they are populated by new ventures. What is more interesting, however, are differences implied by these two perspectives. While it is still very much possible to speak about the importance of unique local determinants specific to the new regions, work that focuses on new organisational units can almost

[13] See, for example, George Gilder's discussion of the fibre-optics venture Global Crossing (2000, 183-192) as well as his critique of U.S. anti-trust policy (2000, 165-180).

completely ignore specific local factors. Kelly states: "People will inhabit places, but increasingly the economy inhabits a space" (1998, 95). Castells, citing a fellow sociologist, David Harvey, refers instead to a process of *time-space compression* (Castells, 1996, 434-437; Harvey, 1990). The second organisational perspective thus represents a radicalisation of thinking. It will be argued here that, while this perspective is- especially with hindsight- easily susceptible to refutation due to its naïve simplicity, it is also the most consequent description of contemporary technological shift available. It provides one explanation how technological opportunity can rapidly move across borders by allowing enterpises to integrate themselves in and contribute to new types of networked business processes.

On the whole, research within sociology is more critical of technological development and emphasises that while specific regions or new types of enterprises can have immense success, others are marginalized further (Sassen, 2000, 33-57). In contrast, network thinkers are optimistic, believing that technology can reduce global inequality on the whole and provide leapfrogging opportunities. To understand this stance better, it is important to emphasise that what is called network thinking here contains elements of both equality-oriented social democratic thinking as well as elitist, libertarian economic ideas. The Digital Revolution is an American invention, with strong influences from the 1960s and not without jingoistic elements as evident in George Gilder's book *Microcosm* (1989, 344, 346). This set of ideas has early on been masterfully analysed and critiqued in terms of a 'Californian Ideology' (Barbrook and Cameron, 1995).[14] The Digital Revolution was spread over the internet, through bestsellers and periodicals such as *Wired* magazine and prepared the ground for the 'investment stories' of internet entrepreneurs. Yet network thinking also is a set of ideas born directly out of the technological experience of the past decades. The next section will discuss why unique aspects pertaining to new technologies have to be taken seriously by scholarship.

[14] See also the instructive German-language article on the demise of the so-called New Economy by Peter Glotz, "Aus der Traum," *Die Woche*, 23.03.01, page 14. Also: Nicholas Garnham (2000, 63-81) and Brian Winston (1998).

Structures and agents: Institutionalist theory

In the previous section, recently occurring technological changes were presented as part of a global structural shift, the so-called Digital Revolution. In the very beginning of the chapter, a contrasting, 'heroic' explanation was considered. Using the case of Germany, policy makers and the financial sector were considered agents of change. These two explanations cannot be reconciled. The structural view of the Digital Revolution suggests that global shift provides new opportunities for a diverse group of new entities such as regional clusters and enterprises. The role of national governments in being able to implement change is seen as severely compromised. Even the new entities favoured by global shift are merely participants; they are not agents driving the change process. Technological change is seen as a powerful, exogenous force.

In this sense, network thinking shares similarities with Neo-Marxist theory, which views structural change as a constant, driven by very generalized forces such as the accumulation of capital (Wallerstein, 1979, 272; Cox, 1987). Underlying these approaches is an implicit belief in linear progress. A diversity of outcomes caused by the existence of individual agent choice was purposely excluded from the model. As Geoffrey Hodgson points out, however, the Neo-Marxist approach can account for structural change but not for the simultaneous existence of different types of capitalism, in Hodgson's words, *impurities* within capitalism (1996, 416- 419).

This leads to a third explanation which can be entertained to account for recent events, which meshes agent-induced, 'heroic' change with a structural framework. Here, actors are both contributors to structural shifts as well as captured within structures. Outcomes are not fixed. Therefore, change opportunities exist, but they are scattered and refracted. The exploration of local differences within political-economic structures is possible. To emphasise the less deterministic and less universal use of the structure concept (compared to Marxist work), the term institution is used. The term has been defined as: "The rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction" (North, 1990, 3).

As is evident from this definition, the distinction in institutionalist research between the realm of politics and economics begins to fade. In fact, it is this blurring of distinctions which characterises 'new' political economy (Gamble, 1995) as well as 'new' economic history (Wischermann, 1993). Economics itself has become 'broader' and has, in the words of Mancur Olson, "expand[ed] into the suburbs " (Olson and Kähkönen, 2000, 1). According to Peter Hall, a political economist, institutions play a role in: "the definition and articulation of interests, the dissemination of ideas, the construction of the market behaviour and the determination of policy" (1986, 5). In this view, the market is itself an institution, as not only Hall but also the economist Geoffrey Hodgson and the economic historian Douglass C. North would point out (Hall, 1986, 12; Ash et al, 1994, 9; Wischermann, 1993, 250). Especially financial markets seem to, as institutions, play a critical role in fusing the political and the economic (Zysman, 1983, 7, 8). This approach to the role of institutions can be summarised with the phrase "institutions do matter" and can be found in the disciplines economics, economic history and political economy.

Broadly, two approaches of institutionalism can be differentiated. Historical institutionalism explains differences in structures through historic development (North, 1990). The key concept here is that present structures were influenced by historic development. Institutions thus follow certain trajectories, this concept is called *path dependence* (Hill and Deeds, 1996, 435- 437). Related to this, institutions tend to be *sticky*; they define actor relationships most of the time and can preserve these over longer terms. This flavour of institutionalist scholarship is popular with scholars describing technological change because it allows insight into the origins of sustainable innovative capacity. The second approach, rational choice institutionalism, focuses on structures and information asymmetries at a specific period in time (Milner, 1997; see also Garrett and Lange, 1996, 49). Game theory is used as an analytical device to discuss rational choices among different policy options. This is only a rough categorisation; institutionalist theory has been applied to a wide variety of research agendas. The similarities of the institutionalist approaches found in these disciplines, in emphasising the role of agents and their relationship to institutional structures, are more important for this study than their differences (discussed in Steinmo, Thelen and Longstreth, 1992, 8).

In discussing actual cases, however, the reconciliation between agent choice and institutional structure is not straightforward in instituionalist scholarship. As Helen Milner has pointed out, 'new institutionalism' has often tended to emphasise institutional constraints over actor-induced innovation of institutional structures (1997, 14-17). Yet, the theory allows for the possibility of significant agent-induced structural change. In the classic object of study for technological innovation, the Industrial Revolution, a radical sea-change occurred resulting in institutional changes brought about by specific actors. Yet, even during and after the Industrial Revolution, older institutional structures continued to exist and exert influence (Landes, 1969). Thus, the tension between actor-centric and structure-centric explanations exists also within institutionalist thought itself.

Major contributions to institutionalist theory originally emerged out of the detailed study of technological change by economic historians such as Douglass North. Economic historians examining the history of innovation have found technological explanations alone insufficient as an explanatory framework and have extended the discussion to a wide variety of political and cultural factors. Economic history therefore frequently approaches technological change by identifying groups resisting innovation and those promoting it. But interaction always occurs within a given historical institutional environment market by path dependence (Olson and Kähkönen, 2000, 13). Therefore, the inventive achievements of the entrepreneur are not sufficient alone to bring about change, despite popular prevalence of what Mancur Olson calls the "parable of the self-made entrepreneur" (Olson, 2000, 183).[15]

The guiding premise of new institutional economic history regarding technological innovation can be summarised in the following way:

> "But the market is by no means the only way of aggregating the gains and losses from adopting an innovation: A variety of regulatory or political processes can be used to determine whether an innovation is to be adopted, and each will in general aggregate the gains and losses differently and thus will often come up with different answers about whether an innovation should be adopted."[16]

A further body of work studying innovative capacity which is closely related to economic history in its approach is *national innovation systems* (Nelson, Ed., 1993) and *sectoral innovation systems* research (Mowery and Nelson, Eds., 1999). This research approach focuses on the impact of institutional factors on the innovation capacity of

[15] Douglass North also "downgraded" the significance of the entrepreneur and innovator (1966, 8).
[16] Excerpt from an editorial introduction to an essay on resistance to technological innovation by Joel Mokyr (Olson and Kähkönen, 2000, 12).

contemporary economies and emphasises, for example, differences in national educational systems. This work also highlights differences among distinct types of technologies and industrial sectors, as does economic history. Systems technologies such as electrical systems or aeronautics, for example, require a complex combination of improvements while other technologies do not (Nelson and Rosenberg, 1993, 13-15).

A related direction of innovation research can be labelled the *resource-based* view found in management studies and within a research agenda called *evolutionary economics*. Here, attempts are made to describe the origins of innovation within the firm and pry open the "black box." Firms are seen as independent agents capable of change. Their potential for innovation is limited by their internal resources, their management capabilities, for instance. These resources are mostly intangible; Nelson and Winter therefore call them *routines* (1982). In this view, firm strategy should focus not on pursuits such as erecting entry-barriers but on nurturing, accumulating and deploying resources (Penrose, 1966; Foss, 1996, 1). Thus, routines can be compared directly to institutional linkages, the *habits* found in institutionalist scholarship. They exhibit path dependency but can, at times, be changed accidentally (*mutations*) or purposefully through individual agency.

A final, influential body of work discussing innovative capacity is not directly related to institutional scholarship. Industry organisation research and the *industrial cluster*-based theory is closely associated with Michael E. Porter (1990).[17] While the cluster-based theory of national industrial competitive advantage does not explain the rise of a new industry or a new technology, it is an extremely instructive research tool for comparative work in innovative capacity. The objective of this research is to identify country- or region-specific factors that lead to international competitive success. Porter focuses on microeconomic factors such as local demand conditions, regional industry structure and the intensity of local competition. Advanced local demand structures, for example, allow enterprises to develop products and services which excel in international competition. However, the industry cluster is a mostly static framework. Porter's recent work shows how change occurs within these clusters, yet he still relates it to largely exogenous factors such as technological change, changes in demand structures and an ebbing of domestic rivalry (Foss, 1996, 4, 9- 12; Porter, 1990, 166-173).

[17] For a discussion, see Hill and Deeds (1996, 429- 431).

Institutionalist research has come a long way towards understanding the forces driving innovation. It is viewed not as an exogenous force, but as a capability which can be nurtured by policy-makers, entrepreneurs and managers. Yet, in different historic periods, innovation capability itself differs and industry structure evolves (Mowery and Nelson, 1999, 370-375). Because of the possibility of significant change, the danger implicit to active, sectoral technology policy is that policy may very well be promoting the 'wrong' players. Whereas chemical-pharmaceutical and electrical innovations at the turn of the 20th century emerged to an extent out of the industrial research laboratories of large concerns and the research university, IT innovations at the turn of the 21st century may instead favour different organisational entities.[18] Innovation opportunities need to be understood not in general, but in specific terms related to the sector and the time period, and this has deep implications for domestic policy intending to promote national innovative capacity.[19]

Change in innovation patterns seems to be currently occurring even in the 'old' industries due to developments in global communications. Engineers and applied scientists seem to be increasingly forming a "transnational technological community."[20] This interesting development, however, may be even more significant in the converging sectors of IT, media and telecommunications. To arrive at a better understanding of the specific nature of an innovation opportunity, voices close to that technology need to be heard and their views considered.

Institutionalism versus network thinking

The previous section explained the view that "institutions do matter." The institutionalist approach was developed within political economy and economic history as an analytical tool to account for subtle differences in diverging paths of developments during the Industrial Revolution and the 20th century. Network thinking emerged out of the

[18] See the section "The Best of Times" in Thurow (2000, 16-22). For a short discussion about industrial research laboratories: Nelson and Rosenberg (1993, 10-11).
[19] Mowery and Nelson developed the term *sectoral innovation system* to reflect this insight (1999, 369, 370).
[20] The increasing transnationality of the industrial research community is briefly discussed by Nelson and Rosenberg (1993, 17-18).

experience with information technologies in the past three decades. Yet, there are similarities between institutionalist scholarship and the vision of the so-called Digital Revolution. Both emphasise interconnections, one in institutional arrangements, the other in networks. For this reason, both see little chances for attempts of imposing complete control from a single point. No one actor can alone drive all the multiple layers of interconnectivity.

However, independent agent-influenced change is possible in institutionalist analysis, although continuity is more usual (Steinmo, Thelen and Longstreth, 1992, 15). Government bodies involved in a catching-up process of national competitiveness can purposefully strive to make improvements in their institutional structure; their success usually depends, however, on whether they can 'get it right' and among other things such as the participation of other agents in the financial establishment.[21] Technological change is endogenous and can be explained through the interplay between agents and structures. All this stands in strong contrast to network thinking, under which technological change is exogenous. Change is not independent actor induced, but deterministic, thus bearing ironic similarities to Neo-Marxist views of structural change.

Both views have incorporated evolutionary models. Institutionalists such as Hodgson have pointed out that evolutionary change is driven by the necessary existence of diversity among institutional arrangements (Hodgson, 1996, 417). The impurities of capitalism trigger change. In the network thinking of Kelly, evolution and diversity are also stressed. They are based, however, on what Hodgson would call a populist, Darwinian interpretation of evolution. In contrast, recent biological studies emphasise the fact that evolution does not always guarantee the 'survival of the fittest.' In fact, the criteria of *fitness* very much depends on the current evolutionary landscape and is continually subject to change (Hodgson, 1994, 209, 210). A domestic institutional environment which has been successful as an export-based industrial economy does not have to be suited to perform successfully in a post-industrial world. 'Populist' interpretations of evolution, therefore, assume the world is static and a certain winner type remains a winner for all time. The approaches utilised in this study, institutionalist political economy and economics, evolutionary economics and the resource- based view in management studies emphasise the necessity to examine not only corporate successes,

[21] See the classic comparison between Russia and Germany during the Industrial Revolution by Alexander Gerschenkron (1962).

but also failures (see Schendel, 1996a, 1). Firms or even whole nation states surviving for many years on the brink of bankruptcy may contain resources that lead to success in another environment.

The main concepts of network thinking are summarised in the table below and compared to institutionalist scholarship.

Table 1. Differences in network thinking and institutionalist views.

	"Networks matter."	**"Institutions matter."**
PROCESS OF CHANGE	Deterministic global structural change. Schumpeterian creative destruction.	Refracted and scattered change taking place within institutional constraints. Path-dependence. Stickiness.
ACTORS	New actors and regions are favoured by change, but they are not driving it.	Firms, national governments, lobbying groups, regions, institutions of all types.
RESULT OF CHANGE	More chaos. Less political and economic hierarchy. 'Dinosaurs' left behind. New actors emerge as winners. 'Leapfrogging' by new regions or cities.	All institutions involved in incremental change. New roles for 'old' actors.
POSSIBILITY OF INDIVIDUAL AGENCY	None.	Difficult but possible within institutional constraints. Most probable through influence over powerful central institutions, especially financial institutions. Contest between groups resisting and groups promoting innovation.
TYPE OF INTERCONNECTIONS	Open computer networks. Low barriers to entry.	Historically formed institutional relationships.
TECHNOLOGICAL INNOVATION	Exogenous.	Incremental. Path-dependent. Endogenous.

The two opposing lines of network and institutionalist thinking presented here echo to a certain extent contrasting views on technological change found within the work of Max Weber and the early work of Joseph Schumpeter. In fact, juxtaposing the two scholars has been a popular academic activity recently (Hamilton, 1996; Galambos, 1996). Interestingly, the work of the German sociologist resurfaces in the technology perspective of economists, management theorists and economic historians, whereas sociologists and popular network thinkers are referring to the Austrian economist. At the end of this thesis, these two great thinkers will be returned to.

Refraction

The thesis explores to what extent world-wide developments in information technology lead to new, unprecedented global innovation opportunities, enabling groups of ventures regardless of location to participate in new global business processes. This interpretation has been borrowed from network thinkers and research in sociology. In contrast, institutionalist scholarship itself does not supply us with a ready interpretation of technological opportunity created 'externally' by global data networks and convergence. This is, in part, because it cannot: Technology is viewed as an endogenous factor. It is difficult to describe universal, global structural change through the theoretical framework of new institutionalism alone. However, what institutionalist thought can do is provide us with an understanding of the activities of new ventures within their domestic environment. It furthermore helps illustrate why national government acts in a certain way to promote start-up activity or to liberalise telecommunications.

The approach taken here is to focus on a specific, large national economy where institutional factors influencing information technology innovation initially seemed especially constraining but where, nevertheless, a significant entrepreneurial wave did seem to materialise, apparently in response to 'outside' global developments. This economy could not be the United States, since as the originator of the internet wave, it does not contain the potential conflict between domestic institutions and a global technology opportunity arriving from the 'outside.' And it is exactly this conflict between 'inside,' domestic agents acting within the constraints of domestic structures, and 'outside,' global structural change, which is the focus of the thesis. In Germany, this conflict seemed especially severe. Many Germans and observers in other countries had almost completely forsaken the thought that Germany could achieve prominence in IT and participate in global IT innovation when, apparently, a significant wave of entrepreneurship in IT suddenly did materialise in Germany.

This thesis evaluates in what specific ways global technology interacts with national institutions. To do so, a novel framework for the study of cross-border innovation is introduced, based on the concept of *refraction*. Refraction is the distorting effect national institutions have on a global innovation opportunity. Change agents, for example new ventures, respond not directly to global shifts but to their refracted state. The refraction effect can either magnify or reduce opportunity for new international ventures and therefore directs the path of development of new ventures in a specific country. Other actors, for example, government bodies or established enterprises, also act within this framework. Refraction is a hypothetical framework, the assumption made is that both global structural change as well as domestic institutional constraints can co-exist. In fact, the concept inversely measures the strength of global technological change. The stronger the refraction effect is, the weaker is global shift.

The refraction framework is closely indebted to work in international political economy (IPE). IPE began as a field of international relations (IR) which can be defined through its object of research, the world economy and the role of international and domestic institutions in the world economy. IPE from the early 1970s onwards wrestled with the concept of systemic changes in the world economy (see Katzenstein, Keohane, Kransner, 1999, 15–17). Much of the debate was focused on the role of multinational enterprises (MNEs). A debate emerged between scholars emphasising global change and the retreat of the state (Stopford and Strange, 1991) and those pointing to the continuing role of the nation state (Waltz, 1979; Krasner, 1994, 15; see also Inayatullah, 1997). In the United States, this debate has been seen as a contest between so-called liberal and realist camps. In Europe, the discussion was much less focused on the liberal/realist contest and led to original research approaches. Sally, for example, began with an IPE inquiry to carry out what he called a micro-political examination of *embeddedness* (Sally, 1994; Sally, 1995). Embeddedness describes the extent to which multinational enterprises (MNEs) are rooted in their home countries. The concept is similar to refraction, however, the analytical emphasis is different. The objective when measuring embeddedness is understanding home country linkages of global enterprises abroad. The focus when measuring refraction is the distorting effect of national institutions on globally oriented enterprises at home. Most importantly, the refraction concept attempts to build a makeshift bridge between network thinking and institutional scholarship for analytical purposes.

Within IPE, the refraction framework reflects a current debate surrounding the resilience of national institutions vis a vis internationalisation. Increases in international economic interaction in recent years have been linked to domestic political instability, "political entrepreneurship" and domestic institutional reforms (Milner and Keohane, 1996, 16-20). However, while technology is seen as a key influence in globalisation, IPE research has not explicitly explored the relationship of power and technological innovation. This is why the refraction framework has borrowed from different sources: Sociological studies of globalisation, and what is called here network thinking- contemporary popular accounts of technological opportunities wrought by global networks- as well as institutionalist scholarship on the history of technology and innovation.[22]

The concept of refraction is put to active use to study the case of Germany. The interplay of global technology and specific domestic agents in specific domestic policy arenas is analysed through a close qualitative and quantitative examination of the development of new internet ventures in Germany. The resource-based view on enterprise development is drawn upon to gain a better understanding how different types of external factors influence the development of company resources at an early stage of formation. Two specific factors examined here are local demand structures and the availability of risk capital. Economic history and research in national industrial competitive advantage, especially the cluster-based theory, are consulted as well, and the determinants are linked to two policy arenas, telecommunications liberalisation and research policy.

The apparent blurring here of national determinants 'external' to the firm and resources 'internal' to the firm is purposeful and reflects the contention that they are different perspectives of the same phenomena.[23] The new ventures themselves are, metaphorically, the "vessel" in which different influences make themselves felt. The measure of success is *industrial leadership* of the start-ups as a group and not solely of one exceptional venture. Mowery and Nelson define the term as "being ahead of one's

[22] Interestingly, this echoes yet another, theoretical debate within IPE scholarship in the United States between sociological and institutionalist accounts of change in the international economy. However, this debate is broad and has not explicitly focused on technology either. Refer to Katzenstein, Keohane, Krasner (1999, 30 – 42).
[23] The economists David Mowery and Richard Nelson have dedicated a section in their recent book to the difficulties of distinguishing between resource availabilities, institutions and domestic market conditions (1999, 5-7).

competitors in production or process technology, or in production and marketing, [giving] firms an advantage in world markets" (1999, 2). Mowery and Nelson differentiate the term industrial leadership from the term *competitive advantage*, which may confuse because it is often used to refer to the success of specific firms. It is important to reiterate that some network thinkers have explicitly stated that leadership in a network economy is not sustainable and this view contradicts, to a certain extent, the concept of industrial leadership which is used here as a yardstick. However, what is attempted here with the refraction framework is to find common ground in comparing two very different sets of ideas; establishing this common ground may at times be problematic.

The author is aware that the task taken on here is complex. What is attempted in the thesis appears here to be very abstract. This is not the case. The focus on quantitative and qualitative data on new ventures in Germany serves as a backbone of this effort, allowing research from different sources as well as insight from different theories to be incorporated in a structured way. In addition, the study is organised around a limited number of specific domestic agents and specific policy arenas.

Three domestic agents and two policy arenas

To understand how domestic institutional structures operate, it is necessary to adopt a *micro-political*, detailed perspective on individual agents and policy arenas (see, for example, Sally, 1995, 206, 207). Different types of agents, not simply government bodies, contribute to policy decisions. To describe the complex structure policy decisions are typically made in, Helen Milner uses the term *polyarchy*. Polyarchy refers to power sharing arrangements among domestic groups. The distribution of power in given historic situations is always more complex than in a simplistic hierarchy- even in what appears on the surface to be extremely hierarchical, totalitarian regimes (Milner, 1997, 11-14).

Three types of domestic agents and two policy arenas are regarded as being especially relevant for this study of Germany. The three domestic agents in the polyarchy are national government bodies, the former monopolist telecommunications operator and young, innovative internet ventures. The policy arenas are telecommunications policy, which influences internet access and demand, and national research policy, especially the promotion of venture capital.

What were the reasons for selecting these agents and policy arenas? National government, for example, needs to be differentiated from other state actors such as regions and supranational policy bodies, both of which are playing an increasingly strong role in Europe. At least three German regions, Baden-Würtemberg, the city-state of Hamburg as well as Bavaria, were very active in subsidising small firms in IT and telecommunications. The European Commission was also engaged in different initiatives to support small firms in this area, some programmes were being carried out with other G7/ G8 members. National government, was, therefore, not the only actor involved in competitiveness policy directed at internet start-ups. National policy makers were not even necessarily the most active; regional and supranational incentives both tended to specifically target individual firms or groups of firms with support packages including network access subsidies or free consulting services. One of the reasons why national government is central to this study, however, is because of its role in telecommunications liberalisation and national research policy. The contention made here is that these two policy areas, by influencing demand structures and the supply of capital, are crucial determinants for start-ups success; they are, thus, strong contributors to refraction. Within other industries or other historic periods, however, the national perspective may be misleading (Mowery and Nelson, 1999, 366-370; Nelson and Rosenberg, 1993, 15-18).

When speaking of national government, this study is referring to different policy bodies which do not always have compatible interests. National government policy almost always is the result of intense internal negotiation, causing policy inconsistencies and contradictions. In this case, three specific ministries are of greatest interest. These three are the Ministries of Finance, of Economics, and of Science and Education. The democratic representative bodies also play a role, as well as intermediary organisations placed in between the private and public sector. One such intermediary, parapublic organisation is a very important public/ private SME financing institution, the *Deutsche Ausgleichsbank*.[24] These different bodies were central in framing both

[24] For a discussion of parapublic institutions see Webber (1994, 156).

telecommunications policy, as well as research policy- which included a program to promote venture capital. Scholars analysing the German policy-making process in comparative studies have classified German politics as *corporatist*. In Chapter Four, this term will be examined for its usefulness in understanding the decision-making process among different national policy groups.

The second agent to be introduced here is closely linked to German national government. However, the Deutsche Telekom AG (DTAG) needs to be understood as an independent economic and political agent. Its interests have been shaped by a unique historical trajectory, which cannot simply be equated to a purported unified government interest. Six historical themes stand out; they have shaped today's DTAG. They are the universal telephone system, the technological capabilities of DTAG, the former monopolist's involvement in the roll-out of a modern telecommunications infrastructure in the so-called "New German States," the privatisation and stock market listing of the company, its desired transformation from a domestic to a global player as well as its response to the decisive action of the regulatory authority after liberalisation in 1998.[25] Through its near-universal ownership of all means of consumer internet access before liberalisation, it is not possible to understand the development of internet services in Germany without analysing the role of the Deutsche Telekom and its historically determined interests.

The final type of agent to be introduced here is the new internet venture. While only a limited amount of research has been carried out on internet start-ups in particular, scholarly attention began in the 1980s to be focused in general on the innovative capacity of small- and medium-sized enterprises (SMEs) (Rothwell and Zegveld, 1982; Curran, Stanworth and Watkins, 1986; Haskins, 1986; Klandt, 1987; Bannock and Albach, 1991; Mullineux, 1994; Baker, 1996). The innovation capacity of small- and medium-sized enterprises has been discussed with German cases as well (Koschatzky, 1997; Harhoff, Ed., 1997). Scholarly efforts initially were directed at showing that small firms can indeed be innovators. Traditionally, dominant views, also in political economy, emphasised the power of large firms in terms of market domination and

[25] For excellent research on the origins of the universal telephone system in Germany and the unique path of development of this system, refer to the work of Frank Thomas (1995).

innovative potential.[26] Work on SMEs has often been accompanied by research exploring the role of regional networks for SME development. One of the best-known of these efforts is AnnaLee Saxenian's work which explores the advantages of Silicon Valley over Route 128 in Massachusetts (1996). In Europe, it was hoped that SME growth would be a solution to unemployment problems. This work has been accompanied by parallel developments in government programs targeted at the needs of SMEs. Aspects of this body of scholarship are very helpful here, especially analysis of the symbiotic relationships between large and small firms (Rothwell, 1986) and the significance of regional networks of large and small firms. German research specifically was invaluable to provide insight into the effects of research policy targeting SMEs in Germany. However, the usefulness of SME research for this study is restricted due to the focus of much of this work on older industries, not the role of new types of ventures in areas undergoing rapid technological change and supported by venture capital, such as software development or internet services. Perhaps this is the reason why a few of the SME studies cited above come to the conclusion that SMEs are better suited at primary inventions but do not have the financial resources to bring these to the market (Carnoy et al, 1993, 8; Rothwell, 1986, 134, 135).

The reason research on SMEs has not delved into the role of new ventures in IT, media and telecommunications innovation is obvious; much of SME research predates these development. For this study, recent work examining the role of small firms in Silicon Valley is important to gain comparative insight. Serious work in business strategy on Silicon Valley firms has emphasised both the equally innovative role of specialised "pure play" small network players and the support given to them by experienced venture capitalists and private investors (for example, Cusumano and Yoffie, 1998). Steven S.

[26] It was small firms which were seen as anachronistic elements obstructive to progress which cannot afford extensive research programs. Business historians such as Chandler showed how large firms developed powerful efficiencies of scale and scope. The political economist J. K. Galbraith in 1957 emphasised the importance of large firms in technological innovation, made possible through the deployment of additional resources for R&D within the firm. The later Schumpeter tended to agree with this view when discussing the 20th century (1975). Williamson used the concept of transaction costs to explain the efficiencies of large firms (see, for example, Williamson and Winter, 1992). In the global economy, the advantages of large firms were compounded. Multinational enterprises (MNEs) were linked in works in International Political Economy (IPE) to national governments in terms of their power and wealth. IPE has, to a great extent, been preoccupied with MNEs (Carnoy et al, 1993, 8). MNEs used their transnational structures in order to allocate their resources more effectively and cut their costs. They negotiated with governments, using their global mobility as a powerful bargaining chip. Susan Strange and John M. Stopford called this "new diplomacy" (1991). In a similar way, John H. Dunning, who has extensively studied international business and multinational firms, recognised the contributions of small firms in the global economy, but saw their activities very much as "orchestrated" by MNEs (1993b).

Cohen and Gary Fields have recently re-emphasised the regional advantages of the success-driven, networked and highly diverse environment of Silicon Valley (1999). But regional differentiating factors associated with Silicon Valley are not the only reasons why a small number of US internet ventures managed to achieve a sustainable global presence.[27] As Germany, two national policy arenas were especially important for the development of the internet in the United States, namely, telecommunications policy influencing local demand structures for internet services as well as policy influencing venture capital financing.

Business press articles discussing the contemporary development of the internet have repeatedly pointed out the importance of internet access and the availability of venture capital as crucial country-level institutional factors. As such, the identification of these factors is not unique to this thesis. These popular accounts, however, fail to examine *how* these institutional factors influence internet entrepreneurship. In addition, they often discuss either internet access or venture capital, not the combined impact of two factors. This applies also to academic research, which tends in the German case to *either* discuss internet access and local call fees while analysing telecommunications liberalisation (Gerpott, 1998) *or* the availability of venture capital (Leopold and Frommann, 1998; Kulicke, 1993; Lessat et al, 1999).

The Case for Germany

German history is a popular subject of study for "economic backwardness." Germany "caught up" during the Industrial Revolution and, after the destruction due to the Second World War, again regained economic strength. Although this is a subject of particularly fervent debate, part of the success of the Federal Republic after the Second World War was due to financial initiatives targeting SMEs, the so-called 'Mittelstand.'[28] In

[27] Mowery and Nelson have argued recently that a narrow focus on industrial districts does not do justice to the variety of networks firms are linked to at different geographic levels: Regional, national and global. They prefer the term *sectoral innovation systems* (1999, 9-10); previously, the emphasis was on *national innovation systems* (Nelson, Ed. 1993).

[28] Werner Abelshauser disagrees that the economic foundation of Germany in terms of capital equipment and know-how was destroyed during the Second World War and therefore downplays the impact of the Marshall Plan (1983). Alan S. Milward emphasises the importance of the Marshall Plan and widens the debate to its role in having promoted European economic co-operation (1984). Christoph Buchheim discusses the role of the Marshall Plan in the development of a post-war multilateral free trade system involving Germany (1990, 99-107).

accordance with the Marshall Plan, so-called parapublic institutions extended credit for rebuilding businesses. Germany historically has a very strong small- and medium-sized enterprise (SME) base.[29] Ergas described German technology policy as *diffusion oriented* meaning that it is primarily concerned with encouraging the spread of technology throughout the economy and especially to the smaller, export-oriented firms (1987).

Yet, by the 1980s, entrepreneurial dynamism in Germany seemed to have all but disappeared, including in the key sector of information technology. For this reason, the seeming resurrection of the *Wirtschaftswunder* in the late 1990s came as a surprise and was featured in the media, for example, in two memorable cover stories in the newsmagazine *Der Spiegel.*[30] In no other country in Europe, including the United Kingdom, was the entrepreneurial boom surrounding the converging technologies and the internet so apparent as in Germany- in fact, it could be directly compared to what was occurring at the same time in the United States, albeit on a much smaller scale. In the year 1999 alone, German venture capital funds invested in 510 IT and communication technology companies, including 117 internet start-ups.[31] By the year 2000, dozens of internet start-ups had been listed on the Neuer Markt. The seemingly strong reappearance of entrepreneurial activity makes Germany an especially rewarding subject of inquiry.

Yet, while Germany was exceptional in the number of listed internet companies and the apparent suddenness of this entrepreneurial activity, it was not the only country where the boom was felt. The internet was generally perceived as a cross-border phenomenon, a technology which did not only enable the world-wide exchange of goods and services, but which could serve as a global entrepreneurial platform. Should the entrepreneurial turn-around in Germany be understood as a development with mostly domestic or mostly global origins? The objective of this thesis is to explore this question using evidence gathered directly from the new ventures themselves.

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[29] In 1986, SMEs, defined in Germany to be firms with under 500 employees, accounted for 46% or private sector GDP- compared to 32% in Britain (Bannock and Albach, 1991, 56).

[30] "Hilfe gegen Arbeitslosigkeit? Ehrhards Enkel. Gründungs-Boom durch junge Unternehmer," *Der Spiegel*, Nr. 3, 13.01.1997; "Die 68er regieren – und ihre Kinder gründen Unternehmen. Generation Ich. Von der Revolte zur Rendite," *Der Spiegel*, Nr. 21, 22.05.2000.

[31] Statistics from the Bundesverband Deutscher Kapitalbeteiligungsgesellschaften e.V. for 1999 (dated 31.12.99, accessible on the web site http://www.bvk-ev.de/).

Company focus and empirical research

A close look at the firm level is necessary to fully understand the origins of apparent entrepreneurial revival in Germany. The delicate linkages between firms and policy-making on a micro political economy level (Sally, 1995, 206, 207), should help expose the importance of specific global or domestic determinants. Without detailed analysis, US, German and other experiences can easily be conflated into one universal, world-wide structural phenomenon or, alternatively, domestic developments can be cited as sole determinants.

An awareness of timing is crucial for this thesis. It is important not to equate the stock market bubble with the entrepreneurial wave surrounding the internet, at least not off-hand without detailed analysis. Initial entrepreneurial activity in Germany in response to converging technologies, online services and data networks clearly began before 1995 (Waesche, 1999a). Furthermore, even the first generation of German internet entrepreneurs who founded their companies around 1995 and 1996 could not have predicted the future course of the stock markets, especially the development of the alternative stock market Neuer Markt. The Neuer Markt started only in 1997 and its first year of activity was relatively slow. The same applies to the first generation of internet start-ups in the United States, although here stock market growth was evident much earlier. 'Irrational exuberance' on the stock markets was identified in a frequently cited speech by Alan Greenspan in 1996. First generation internet start-ups in the United States were founded in 1994 and 1995. It cannot be denied, however, that strong stock market growth until consolidation in the year 2000 greatly benefited the first generation of US internet entrepreneurs. Stock market growth provided these companies with a considerable flow of funding through secondary stock offerings as well as acquisition opportunities based on high valuations. With this advantage bestowed by the capital markets, a limited number of first generation US internet companies could pioneer new, networked business models, achieve sustainability and seriously establish their presence in international markets in Europe and Asia.

In order to compare first generation internet venture activity in Germany to that of the United States and other countries, the intentional choice was made to collect empirical data early, in this case, in the Spring of 1998. If indeed a seemingly instantaneous global shift had arisen which provided unprecedented technological opportunity, the effect of the shift should be observable in the development of the first generation of internet ventures. The fact that the early date of data collection is close to the founding of the first generation internet start-ups in Germany also bestows an additional benefit. Resource-based management studies emphasises the crucial first stages of enterprise development as a time when important future competitive capabilities are defined. At the same time, it is clear that the conclusions drawn here apply to the first generation of internet ventures and not necessarily to future entrepreneurial activity in Germany.

But the year 1998 was important also for another reason. It was the year in which basic telecommunications services were liberalised in many European countries including Germany. The demand structure for internet services would be considerably influenced by the actions of the new regulatory agency for telecommunications in Germany operating from 1998. By analysing the innovative capabilities of internet ventures in Germany at the beginning of this crucial year, the perspective gained is that of internet entrepreneurship before the demand effects of liberalisation could unfold. Demand structures changed significantly after 1998, but by that time the competitive capabilities of the first generation of German internet start-ups had already been defined. Liberalisation in Germany simply happened too late to be of benefit to these companies in their early stages of formation.

The challenge to this research approach was that, in 1998, there was a lack of quality information about internet ventures in Europe. At the time of research, Europe was still populated mostly by privately-held internet start-ups. For this reason, the country case study of German internet ventures is supported by empirical research carried out by the author in early 1998. Together with a major German business publication, data from over 120 German internet start-ups was collected. The empirical data and the qualitative information supplied by the entrepreneurs of these firms allowed a detailed analysis of *how* the two key domestic determinants under examination impacted on the path of development of the ventures. Again, the intention is to understand the actual means by which demand structures and financing influenced entrepreneurship in Germany.

Despite the insight provided by this data, the conclusions that can be drawn from a single-country empirical study are to a certain extent limited, if they are not put into the perspective of the experience in other countries. The trade-off between the level of detail provided by a single country empirical study and the comparative insight of a multi-country study is apparent. To overcome the limitations of this trade-off, a brief survey of three further European countries is included in this thesis in the final chapter before the Conclusion. In this European survey, the time period under examination is extended to early 2001, when this study was completed.

While a key year for this study was 1998, the full time period surveyed in this thesis extends from the 1970s, when the first corporate data networks were implemented and the internet was developed as a research network, to the end of 2000. At the end of the year 2000, the downturn of the stock markets had already begun to make itself felt, ending a period of innovation and entrepreneurial activity surrounding the internet. Despite this long time period under consideration and the detailed case study of actors and actions in the year 1998, it is crucial to add a note of caution. The history of internet entrepreneurship is a very recent development and many of the conclusions will need to be regarded as tentative.

Chapter breakdown

The chapters of this thesis are arranged in the following way. The thesis begins with an analysis of global structural shift and the spread of international data networks, moves to the domestic level with a detailed examination of Germany and ends in a four-country comparative overview. Thus, initially, the thesis is concerned with insight emerging from sociology and network thinking. The focus is not broadly on technological convergence or the commercialisation of the internet. While these themes have to be addressed to provide a basis for further discussion, Chapters Two and Three are explicitly dedicated to the global nature of the internet opportunity. How did it arise- what were the economic and political prerequisites for the internationalisation of the internet? The theme of globalisation will also be explored. Globalisation is a strong social shift some researchers believe is occurring; it could also have played a crucial role in the spread of international data networks.

The first, global section serves as an entry point to a detailed single country study, which stands at the centre of this effort. While the global internet infrastructure is being built and extended, policy-makers are at home pondering national competitiveness in a networked world. But to what extent is internet entrepreneurship driven by global or domestic developments? To answer the main research question, one domestic economy was selected and analysed on micro-political and enterprise level. The following three chapters on Germany successively discuss the three main agent types in relation to the development of the German internet: The role of national government bodies, the Deutsche Telekom and the internet ventures themselves.

Chapter Four has a dual function. It broadly describes the policy-making process in Germany. It also discusses decisions made in the policy arena of research policy, including venture capital support programs and the promotion of the national online service BTX. It focuses on the research policy shift under Christian Democrat-government from a digigiste program to an initiative emphasising public/ private partnerships and indirect financial support. Chapter Four also has an important introductory role. It is difficult to understand the strategy of the Deutsche Telekom as an independent agent without discussing German government policy first.

In the fifth chapter, telecommunications liberalisation is analysed, especially how it impacted on the demand for internet services in Germany. The chapter concentrates on the role of the Deutsche Telekom and why it was unable to act as a catalyst for the uptake of internet services in Germany. To do so, it traces the historic transformation of former postal and telecommunications ministry to the Deutsche Telekom. When DTAG was partially privatised and listed as a public company in 1996, it needed to modernise its technological base, reduce its debt burden and internationalise. The result was a large cash requirement which was generated by comparatively high basic telephony tariffs as long as possible until and immediately after liberalisation in 1998. High prices restricted demand for internet access until 1998. From that year onwards, however, prices fell in Germany due to controversial but determined action by the regulatory authority, especially the innovative introduction of far-reaching unbundling measures.[32] For the

[32] Some commentators have argued that decisive, far-reaching unbundling has not only weakened the Deutsche Telekom but has lowered incentives to build competing networks (Engel, 2001,37). Others have

purposes of thus study, the period from privatisation in 1996 to liberalisation 1998 is critical. During this time period, Deutsche Telekom (DTAG) has to be understood as an independent agent, despite its links to German government, especially in the the Finance Ministry. The objectives of DTAG were very different from those of other policy bodies, although these differences were perhaps not even understood by the policy-makers themselves.

Chapter Six builds upon empirical research- a survey of over 120 internet start-ups in Germany- to gain a detailed look at the enterprise level. The intention was to expose linkages with domestic research policy and telecommunications liberalisation and discuss the overall impact of different policies of competitiveness. In this chapter, the refraction framework, presented in the theoretical part of this introductory chapter, is put to use. A detailed analysis of the trajectory of German internet start-ups allows us to understand the strength of the refraction effect and, also, *how* it operates. We can attempt to answer the main research question framed here about the interaction of the global technological shift and domestic institutions using the specific case of Germany.

The last chapter before the Conclusion again revisits the international level, here the development of internet start-up firms and policy conditions is compared with that of three other European countries. The purpose of this section is to understand better what was learned in the one-country study of Germany and to place these learnings in an international context. The international focus at the end of the thesis essentially returns to the theme of the first two chapters, however, under consideration of possibly unique national characteristics. The exploration of global technological shift and a specific, institutionally conditioned domestic environment can then be concluded.

Was it merely 'irrational exuberance?'

Before beginning with this study of internet entrepreneurship, it is important to recall that the period under examination here coincided with a massive bubble on the international stock markets and with unprecedented investor interest in internet companies. From the 1995 listing of the first public internet company, Netscape, to the

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lauded the regulatory authority's action and the continual fall in telecommunications prices, including internet access prices.

downturn from the year 2000 onwards, the stock markets seemed to temporarily have believed that the world was, indeed, undergoing an 'Internet Revolution' of sorts. Public preoccupation with the stock market bubble and the subsequent loss of considerable sums of money by small investors tended to overshadow some of the underlying currents of internet development. An important example of such an underlying current was the relationship of internet entrepreneurship to telecommunications liberalisation.

One of the intentions here is to expose some of these underlying currents, an activity which seems to the author to share similarities with an archaeologist scraping at a slab of ancient material to isolate some fossilised bones. At times, an archaeologist may find that the fossil he worked so hard to uncover was an insignificant, common find, not particularly beautiful and not adding to his knowledge of the era. Considering the amount of work involved, this is, indeed, a frightening thought. This thought continually accompanied this research task. It is crucial to consider the hypothesis that internet entrepreneurship may actually not have been an overly significant aspect when viewed against decades of telecommunications and information technology (IT) development. An accurate portrayal of internet entrepreneurship and innovation should, perhaps, emphasise a longer-term, continuous development of telecommunications and IT technologies with a definite leading role occupied by the United States. It seems possible that the global Internet Revolution, a glorious neo-Schumpeterian vision of discontinuity and *punctuated equilibria*, was exaggerated.[33] The internet was perhaps inflated out of proportion by stock market interest in a number of new ventures which disappeared soon after the market downturn.

These ruminations strike the core of the central research question: What explains the apparent surge in IT and internet entrepreneurship in Germany in the final years of the 1990s? Was it a global, discontinuous wave, representing an unique innovation opportunity? Or was the surge in entrepreneurship the result of carefully orchestrated national policy in Germany? Alternatively, perhaps there was no substantial

[33] Within economic history, the theme of continuity versus disruption is a familiar one. Economic historians such as Joel Mokyr have examined occasional, disruptive periods of intensive innovation activity which may be accompanied by significant economic and political changes. These periods are called *punctuated equilibria*, leaning on lessons from modern evolutionary biology (2000, 69-72). These periods can be triggered by events not directly related to technology, such as changes in the social environment. An example was the Glorious Revolution of 1688 in Britain which was an important precursor to the technological breakthroughs of the eighteenth century (Mokyr, 1990, 298, 299). It is, therefore, legitimate to ask if the commercialisation of the internet represented such a disruptive period and was accompanied by social changes.

entrepreneurial surge at all, the phenomenon was merely the result of 'irrational exuberance' on the stock markets which inflated some insignificant venturing activity.[34]

[34] As early as 1996, Alan Greenspan used the term 'irrational exuberance' to refer to the situation on the capital markets (see Schiller, 2000).

Part I – Global Opportunity

Chapter Two

Explaining the Global Growth of the Internet

This thesis seeks to understand how a global innovation opportunity impacts on a national political economy. Specifically, the international diffusion of the internet in the late 1990s is examined on a global scale as well as its reception in one particular country, Germany. This first part of the thesis, comprised of Chapters One and Two, is dedicated to understanding the world-wide diffusion of the internet. Only then will the German example be addressed. Three aspects need to be reviewed when seeking to explain the internationalisation of the internet. The primary aspect was economic and social. The cross-border success of the internet can be viewed as the result of a demand- and supply-driven development. The second crucial aspect was technological. The internet was technologically very different from other types of networks, such as the digital telecommunications systems of the 1980s and 1990s. The unique technological basis of the internet had a profound influence on both demand and supply. The third aspect was political. As in the case of the technological underpinnings of the internet, the international demand and supply of internet services cannot be explained without examining the role of public policy. These three aspects were deeply intertwined; yet, a segregation into three aspects is helpful as an explanatory tool. The first two aspects are addressed in this chapter. The role of policy is the subject of Chapter Three.

Before addressing cross-border demand for the internet, it is useful to review the history of international data networks within the corporation. This is because the demand for the internet as a cross-border network was linked to the demand for the internet as a cross-corporation, ubiquitous solution. Effectively, the internet supplanted previous company-only as well as country-only networks. The question asked is why company- and country-only networks did not survive and how the internet became the dominant world network platform. The chapter starts with companies and then moves to countries. It maps the early use of electronic networks in the financial services industry and multinational industrial concerns from the 1960s and 1970s onwards. Global corporations used network-based services to co-ordinate their world-wide activities. Within these businesses, the use of electronic networks was steadily expanded from "controlling" functions, within manufacturing processes and accounting, to "communication" and "collaboration" functions- still using proprietary solutions. In the second half of the 1990s, internet standards were steadily introduced into multinational concerns as a means to solve the problems that were associated with trying to forge a multifunctional, multinational corporate network composed of different proprietary systems. In a period with frequent mergers, acquisitions and increased outsourcing activity, the internet was attractive because it was a flexible and open system.

The chapter then discusses consumer use and the rapid spread of the internet itself across borders, to become competition for country-only systems. But the sequence here is distracting: The internet came to replace company-only systems at about he same time it moved with strength into the consumer sphere. The premise to be explored here is that the two are deeply dependent upon each other. International pioneer users, the "early adopters" of the internet, belonged to an elite group of mobile knowledge workers and students, whose work was affected by the interlocking of world-wide business processes. Because they were working within an environment which was increasingly globally integrated, they demanded a correspondingly international network standard which their peers abroad could also use. They had little use for consumer online networks which were exclusively domestic. Thus, the rising integration of global business processes is an important force explaining early adoption of the internet internationally both among firms as well as consumers. Without this development, company-wide and country-wide solutions would have gone a longer way in satisfying compatibility demands.

It is crucial to note, however, that the internet was particularly well suited for its role as a cross-border, cross-corporation ubiquitous system. The technological underpinnings of the internet made it adaptable to a wide variety of different services. In fact, internet technology encouraged innovation. This is because internet technologies allowed innovation to occur on the periphery of the network. Small, new ventures could invent and provide new services on a global scale as easily as large network providers such as telecommunications operators could. Thus, the late 1990s was a time of experimentation with a rapidly growing supply of new internet services.

An overview of internet "take-off"

None of the basic technologies involved in offering network-based services were entirely new in the 1990s. Neither were the majority of network-based service types offered unknown before the 1990s. To understand why the period of the 1990s was unique and could be characterised as a period of "take-off," for a single network standard, the internet, it is important to look at the history of network-based services and their uses within business and consumer spheres.

In the 1970s, the first network-based services were born out of necessity due to the high cost of computing. Time-sharing systems allowed several users to share computing resources. With the rapid fall of computing costs, however, computer network technologies were put to new uses because they allowed exchange of data among remote locations, including international locations. Here, three different areas within which new services appeared internationally will be described briefly, within the financial industry, multinational industrial enterprises and for consumer use. The financial industry had a pioneering role in the transnational, corporate use of network-based services. This role has been described numerous times in political economy literature; therefore, it is not necessary to dwell upon details here. Largely as a result of financial deregulation starting with the Eurodollar market in the 1960s, the volume of transnational currency market transactions grew in the 1970s and 1980s, reaching a much-quoted figure of US$1.2 trillion daily (Dicken, 1992, 365-367; Castells, 1996, 434-437).

The role of networks within the global financial industry had two main characteristics which could be attributed to the use of transnational network-based services generally. The first was that network-based services allowed what Dicken called a "new global division of labour" to come into existence. In the instances where this occured, the result was increasing interdependence. The second was the arrival of a new temporal division of labour, the "new time regime" of Castells (Castells, 1996, 429). It was the possibility for 24-hour trading which Susan Strange referred to in the title of her book "Casino Capitalism."

If financial services, especially currency markets, were a case where network-based services were put to truly transnational use, it was also a very limited example. Although the negative impact on world-wide political and economic stability was emphasised by contemporary observers, this was due mostly to the deregulated environment in which international currency trades took place and not to the transformational character of network-based services. Although modern financial services involved highly sophisticated uses of computer and network technology,[1] the basic transmission of price information itself did not require more than a telegraph. In fact, the financial system can be described as being global already in the late 19th century. Although global financial markets were an especially spectacular example of how network-based services could be put to transnational use, the limited number of players[2] and the long communications technology tradition made it less interesting as an example of the transformation brought about by the combination of low-cost computing and data networks. Much more

[1] See the survey "The frontiers of finance" (The Economist Newspaper Ltd., 1996, 265-297).
[2] Castells quotes François Chesnais with an estimate of 50 major players in world financial markets (Castells, 1996, 435).

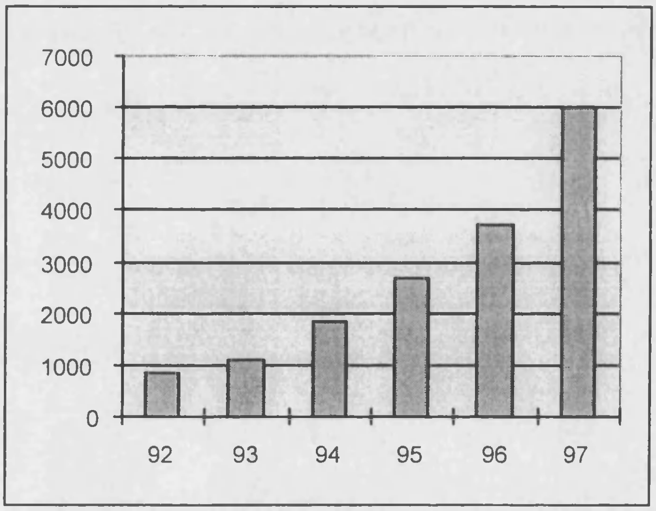
instructive was the use of network-based services within multinational industrial corporations and the evolution of network services for consumers (including, incidentally, significant changes in business models for consumer financial services).

From the 1950s, industrial enterprises had mainframe computer systems installed primarily as a means to make the organisation of structured data more efficient. Payroll, accounting, production scheduling and order entry were some of the first tasks these systems were put to use for. Some of these systems were networked and could already be transnational in scope; writing a paper for the *Columbia Journal of World Business*, Nanus coined the term 'multinational computer' in 1969, reflecting this development (vol. iv, No. 6; cited in Hagström, 1991, 19). The first network-based services within industrial enterprises moved beyond the experimental stage only in the second half of the 1970s, however. At that time, SKF, the Swedish ball-bearings manufacturer, for example, integrated its production in Europe with the help of computer networks. By 1979, five computing centres in five countries, Sweden, West Germany, Italy, France and the UK had been linked through the corporate "Global Forecasting and Supply System." The internal efforts by SKF were supported by a third party, General Electric Information Services (Hagström, 1991, 221- 223).

One way to map the spread of network-based controlling and production systems within international corporations is through the growth of the enterprise resource planning (ERP) applications market. The birth of the ERP market dates to the late 1970s and early 1980s, when the first standardised software replaced custom controlling or production systems in large companies. Standardised software could be applied throughout the corporation and later allowed separate systems to be linked via corporate networks. One ERP market leader, SAP, was founded in 1972 in Mannheim, Germany, and launched its mainframe ERP system in 1979. Two international clients, US based firm John Deere and UK-based Imperial Chemical

Industries, persuaded SAP to develop English and French versions of its software in the early 1980s. Growth really took off, however, when a client/ server-based version of the SAP software was introduced in 1992, allowing individual units within companies with world-wide operations to be linked more effectively. A large number of Fortune 500 companies use SAP applications, including Coca-Cola, Chevron and General Motors. The growth of SAP derives from the success of its software in implementing the network-based services necessary to support globalisation of large companies. Chart 1 shows the "take-off" of SAP in the 1990s; it had a 30% share of an estimated US$7.2 billion market.[3]

Chart 1. Revenue growth of SAP AG, a major vendor of enterprise resource planning (ERP) applications (in DM million)[4]



ERP systems had one thing in common with their in-house predecessors. They were company-only systems, which until the late 1990s communicated only in rare instances with the outside world. These drawbacks led to the rapid adoption of

[3] SAP is present in 40 countries, the software is avaliable in 24 standard language versions and first-level system support can be called upon 24 hours via four centers in Germany, USA, Singapore and Japan. Information was obtained from the 1996 annual report of SAP AG as well as "SAP's Worldview," *Red Herring*, November 1988, p. GG6-GG10 and "Baan's Voyage," *Red Herring*, August 1998, p. 66-68.

[4] From annual reports 1996 and 1997, SAP Aktiengesellschaft, Walldorf/ Baden.

internet-based standards businesses which could be used across company borders. Internet systems, which were open and flexible, furthermore represented a means by which corporate Information Technology (IT) departments could regain cost control over their systems; they had become aware of strong dependence on vendors of proprietary software.[5] The shift towards internet standards within the corporation was so strong that proprietary SAP systems were made internet-compatible.

Whereas some corporate networks in the 1980s and early 1990s already carried international traffic, consumer use of network-based services was for the most part domestic. This was due to the fact that the greatest number of consumers subscribed to on-line services which were initially national in focus.[6] In the US, it was mostly new entrants that began to offer on-line services to consumers. Examples were CompuServe, America Online (AOL), Prodigy or Delphi.[7] In Europe, consumer use was initiated in the late seventies by national telephony operators, BTX in Germany, Prestel in the UK and Minitel in France. Yet, the growth of country-only networks was comparatively slow. In Germany, the service developed by the Deutsche Bundespost languished throughout the 1980s and early 1990s; it reached its target user base of one million only at year's end 1995, after it had opened itself to the internet. Only Minitel in France was a real initial success; by the mid-1990s,

[5] The advantages of the deployment of internet technologies within corporations can be illustrated with the case of Reuters. In the late 1990s, Reuters expanded its supply of industry information to global industrial enterprises. This new, lucrative client base had been made possible through the proliferation of internet standards. For the first time, Reuters did not have to worry about the underlying network infrastructure because it simply provided its information on top of internet standards. In the 1980s, when Reuters intended to provide the financial services industry with a similar network-based service, it had to finance the network infrastructure itself. Reuters, then the largest international news agency with an annual income in 1984 of UK £313 million and a profit of £74 million had to undergo public flotation in order to finance its proprietary news network for the financial industry (Boyd-Barrett, 1989, 108, 125).

[6] With the exception of CompuServe. CompuServe was the first on-line service to venture abroad, and therefore to offer a transnational service; the first countries it expanded into included the UK and Germany in 1991. By Fall 1995, CompuServe provided access to users in more than 140 countries.

[7] Among established players, the telephone operator AT&T planned a service called Interchange, Microsoft launched Microsoft Network and Apple started eWorld, but these services did not meet expectations as on-line services. At the high point for on-line services with their proprietary business model, Fall 1995, the following subscriber numbers were avaliable (in millions): AOL 3.8, CompuServe 3.5, Prodigy 1.7, Microsoft Network 0.2, Delphi 0.1, eWorld 0.1 (listed in OECD, 1996).

it was offering 23,000 services and 6.5 million terminals were in use. Next to the free distribution of terminals, one of the main reasons for its success was that France Telecom opened the system to private providers of services, foreshadowing the success of the internet in this regard (Castells, 1996, 343-345).[8]

Many of these country-only subscriber on-line services included basic services such as communications, information and some instances of transactions already in the 1980s. On-line banking was popular in Germany, for example, Americans developed on-line discussion forums into "communities" and the French used a telephone directory database.

In contrast to on-line services, the internet was internationalised quite early in its existence. But its use was initially limited to the research community. The military and research precursor network to the internet, ARPANET, was extended outside of the United States in 1973, when University College in London and the Royal Radar Establishment, Norway, were connected. It was in the late 1980s- when it was still used almost exclusively by research institutions- when the internet began to develop into the global network it is today. In 1988, all Scandinavian countries as well as Canada and France were connected to the internet via the US National Science Foundation Network (NSFNET). A year later, Reseaux IP Europeens (RIPE) was started to co-ordinate collaboration on extending the internet into a Pan-European network. It was in 1989 as well that further countries joined NSFNET, including UK, Germany, Japan and Australia.

Although the internet was a computer network standard comparable to its company-only and country-only peers, it had two distinguishing characteristics: It was "open" and "stupid." Both of these technological characteristics encouraged adoption as

[8] Sex services accounted for more than half of Mintel use in 1990, this dwindled later with the commercialization of the internet. Up to 60 to 70% of internet traffic may be sex-related. Sex services seem to be a major force driving the use of commercial network-based services. See Susanna Glaser, "Sex Drive. Pornography is pushing the pace of technology," *i-D Magazine*, December 1998, 62.

well as innovation. In addition to these, internet uptake and innovation can be explained by two further supportive factors, which can be labelled a "business" and an "economic" explanation.

The designers of the internet had intentionally created a technology which was "open."[9] This meant the internet could be used by anyone without paying licence fees. More importantly, the designers created institutions which insured that the system remained open in the future, such as the Internet Engineering Task Force (IETF). "Open" also meant that changes and improvements to the internet could be made in a peer selection process based on the principle of merit. Just as importantly, the internet encouraged innovation due to its architecture. Isenberg labelled the internet a "stupid network" to contrast it to the "intelligent networks" which were engineered by telecommunications firms. "Intelligent networks" require central control, "stupid networks" only function as pipes, with networking instructions coming from participating computers all along the network. It is impossible to take central control, and this also means that it is easy for an entrepreneur to offer new services at the periphery of the network.[10]

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[9] The technological basis for the internet actually consisted in combining two "open" technologies: the networking computing platform UNIX (developed by Bell Laboratories in 1969, but widely used only from the 1980s) and the communication protocol TCP/IP used on the ARPANET from 1983 (after more than ten years of development) which allowed computers to exchange data over a decentralised network. These technologies were made publicly available, improvements were the result of an open exchange between developers that were also openly accessible, the so-called "Request for comments" (RFC). The RFC series was introduced in 1969. In addition, an array of different boards and task forces were formed by the publicly and privately funded research community to co-ordinate the various development activities surrounding the internet. From 1989 to 1994, a third open technological concept was introduced to the internet community: The World Wide Web, a decentralised means of sharing information. See the section "Formation of the broad community," in: Leiner et al, 1998.

[10] In an article, David Isenberg summarises how the "Stupid Network" encourages innovation: "Stupid Networks make no assumptions about voice or other content. Users can put bits in one end, and the same bits come out in the other. Unlike the Intelligent Network model, the Stupid Network features abundant infrastructure, not carefully engineered scarcity. Addressing, features and class of service are specified in the user's terminal, at the edge of the network. Furthermore, the Stupid Network's simple interface makes underlying network complexities irrelevant to the user. This creates an environment that fosters wild-eyed innovation, in which users can try out harebrained ideas without asking permission of a big bureaucracy. This unimpeded ability to innovate is most crucial. Think of the cost to humanity had Mosaic, the first internet browser, not been invented. The 'Next Big Thing' is likely to come from a hacker's terminal than from an engineer at a central switching office, or a telephone company marketing department" (1997). Further information is

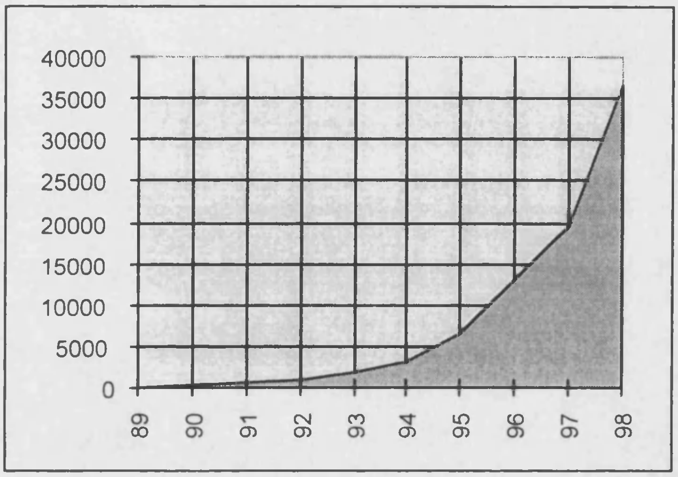
In addition to these two technological factors, the internet was a classic example of a "disruptive technology," to refer to Clayton Christensen's useful concept (1997). This business factor encouraged innovation as well. Although large corporations were already using computer networks for several decades, entrepreneurs could act upon the window of opportunity associated with potential ubiquity, especially the possible mass use of the internet by consumers. The promise of a seamless computer network linking consumers and businesses was a powerful proposition enabling wholly new ways of conducting business. Entrepreneurs recognised this opportunity of potential ubiquity early, during a phase when internet use was still limited to pioneer adopters. They realised also that it would take time before established players would fully understand the potential of the internet. Indeed, established players at first underestimated and therefore bypassed the internet allowing newcomers to step in and innovate.

Lastly, the rapid uptake of internet standards among both businesses and consumers calls also for an economic explanation: "Network externalities." When network externalities operate, each additional user of a given technology in a network causes the value of that piece of technology as a whole to grow. A fax machine is the classic example of network externalities. A single fax in the world linked up to the telephone system is not worth anything. But the value of that one fax machine is increased with each additional facsimile hooked up to a telephone line. Because of the linkage between value and user numbers, a technology that has become adopted by a certain critical mass of users can, at times, capture the whole market almost exclusively, leading to the exponential growth mapped in Chart 2 below. It is here that an effect called 'lock-in' sets in. It does not have to be the superior technology that succeeds; in fact, historical chance events can lead to the adoption of inferior

contained in a series of three articles, in which Isenberg debates with an Ericsson executive: Isenberg, 1998a and 1998b as well as Jomer, 1998. See also Niko Waesche, "Clever servers hold the key to dumb networks," *CommunicationsWeek International*, 18.01.99, page 9. Thanks go to Kenneth Niel Cukier of *CommunicationsWeek International* for pointing me towards this debate and allowing me to join the discussion.

technologies.[11] Network externalities can occur without an overt network being involved, too. It works with computer operating systems or software when compatibility issues raise the value of a program. It is for this reason that the debate surrounding network externalities was introduced in the US government case against Microsoft.

Chart 2. Growth of internet host computers (thousands).[12]



The economist Danny Quah disagrees with some of the conclusions of network externality research, however. He does not believe that products or services that have won the game of network externalities have captured the market indefinitely. They can be toppled by a new standard just as rapidly as it took them to lock in. Because of this, he re-introduces the term "superstar economics" as a substitute for

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[11] Realising how network externalities operate, users, when given a choice between incompatible standards, try to use the information they have to select the technology that will be successful in the future- meaning the technology does not have to be superior today. Michael L. Katz and Carl Shapiro have studied the formation of standards and cases under which inferior technologies capture markets (Katz and Shapiro, 1986). See also Arthur, 1989.

[12] An internet host is a computer connected to the internet with a unique address (Internet Protocol IP address). The number of hosts is the most accurate indication of internet growth available. Usually, several users connect through a single host. The source for these figures is Network Wizards (http:///www.nw.com/). Because some organizations restrict access to their network data, a new survey method was used from July 1998. The host data from the years 1997 and 1996 may therefore need to be corrected upwards. All host figures are from the months of July except for 1990,

network externalities. The basis of superstar economics is the infinite expansibility of a commodity which can be secured by reproducing digital content, for example. In fact, Quah believes that trade will increasingly involve reproduction and not exchange.[13] Quah describes the consequences of superstar economics in this quote:

> "A weightless-economy industry cannot erect entry barriers in the form of set-up costs to protect its established successes. Rather, ongoing success has to come from continual innovation and perpetual paranoia... The upshot is the economics of superstars, where the top few supply the entire market, and are rewarded far beyond what would have been initially expected of them. But the picture is dynamic. Superstar successes are in turn replaced, and easily" (Quah, 1998).[14]

World demand by consumers for the internet took off in the second half of the 1990s. This is when network externalities set in. Chart 2 shows the growth of internet host computers- these are the main access points to the internet (located at internet service providers (ISPs) and which are usually shared by several users). UUNET, one of the largest internet backbone providers, estimated that internet traffic doubled every 100 days in the 1990s. Country-wide network efforts as well as commercial on-line services eventually adopted the internet model and became part of the "network of networks." The internet was simply "backpacked" on their existing infrastructure. The applications run on the old networks were supplanted by "superstar" internet applications; only the network infrastructure remained.

The "take-off" of the internet coincided with the commercialisation of the research network. In 1988, the privatisation of the internet began and was a carefully government-orchestrated process that ended with the defunding of the NSFNET

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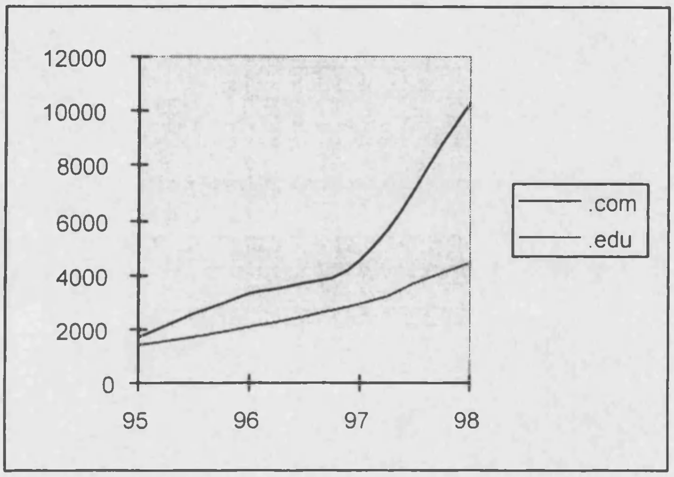
where an estimate was conducted in October. The data: 1998 36,739; 1997 19,540; 1996 12,881; 1995 6,642; 1994 3,212; 1993 1,776; 1992 992; 1991 535; 1990 313; 1989 130.

[13] The concept of superstar economics was introduced in 1981 by Sherwin Rosen. Superstar economics and weightless economics has been popularized by Danny Quah and also by Diane Coyle with her book "The Weightless World."

[14] For the concept of infinite extensibility see also Quah, 1997.

backbone in April 1995.[15] Whereas educational traffic expanded steadily, commercial services boomed in the months following after 1995 (See Chart 3). This short history of the rise of the internet, however, does not reveal much about the drivers behind growth. Here, demand-side drivers will be discussed first, then supply-side factors.

Chart 3. Commercial versus educational host computer growth (thousands).[16]*



* The "dip" in 1997 is due to a change in measurement methods only.

Rise in transnational demand for internet services

The purpose of this section is to discuss the demand-side factors driving the adoption of the internet among different countries and companies world-wide.

[15] Initially, NSFNET encouraged the use of its networks by commercial organisations on a local and regional level, while prohibiting commercial usage of the backbone. The idea was to stimulate the emergence of commercial backbone services such as PSI and UUNET (Leiner et al, 1998).
[16] This data refers to the number of hosts with the top level domains .com (commercial) and .edu (educational) only. There are numerous other domains which are owned by commercial as well as educational organisations. One example are the country domains, for example .de for Germany or .jp for Japan, which include both types. A comparison between .com and .edu indicates the rapid growth of commercial hosts in contrast to the stable growth of educational hosts, however. The source is Network Wizards. The same cautionary note applies as in footnote 12.

Multinational enterprises used the internet to restructure their world-wide businesses, using it to replace different proprietary systems existing in different countries. They also used internet standards to integrate smaller firms, usually suppliers, and thereby extended the reach of their cross-border network-based services. New internet-based linkages among firms allowed tightly integrated world-wide processes to an extent that older, proprietary networks could not. Effectively, qualitative changes in global business processes were evoked through the use of internet technologies at the same time as consumers began to reject country-only networks.

Before the rise of the internet, demand for transnational network-based services within industrial enterprises was linked to the increase in globally co-ordinated production efforts. A short excursion in history sets the stage for this discussion. From the Second World War until the 1970s, multinational enterprises (MNEs) enjoyed average profit margins above 20%. Corporate profits dropped precariously in the 1970s to levels between 10 and 20%. The G7 average rate of return in the manufacturing sector fell from 25% in 1965 to 12% in 1980. This resulted in what was labelled by some as the "Crisis of the Large Corporation" and by others as "The Great Profits Squeeze" (Castells, 1996, 152-168; Harrison, 1994, 125-127). Falling profits were due to rising overhead costs and rising volatility in the international economy. Two events can serve as markers, one was the so-called oil shock, the other the collapse of the Bretton Woods system and the ensuing uncertainty in the foreign exchange system.

Rising costs and increasing volatility were responded to with a drive towards increased flexibility within MNEs as well as an increased appetite for experimentation. In fact, researchers from different disciplines state that the 1980s and 1990s were a phase of unprecedented organisational experimentation within corporations. The demand for increased foreign direct investment (FDI) as well as transnational computer networks within firms can both be attributed to this need for experimentation (see Castells, 1996, 81-86).[17] Little choice existed but to do so: either one withdrew from a global presence and its attached "immense fixed costs" (Ohmae) or one sought to make the most of it. This resulted, among other things, in a wave of massive FDI increases: "This new logic forces managers to amortise their fixed costs over a much larger market base and this drives them towards globalisation" (Ohmae, 1994, 6, 7). The average annual growth in FDI from 1983 to 1990 was 34% compared to growth in global merchandise trade of 9% (Hirst and Thompson citing UNCTAD and other sources, 1996, 54, 55).[18]

In fact, the massive growth in FDI was the most noticeable change in the world economy from the 1980s onwards. It is also the main quantitative change in the world economy which can clearly be associated with the controversial term "globalisation."

> "In the period 1945-73 the dominant factor driving the world economy was growth in international trade; from the early 1980s onwards, we argue, it has been growth in FDI" (Hirst and Thompson, 1996, 51).

Management studies literature shows how increased FDI efforts were accompanied by organisational changes within enterprises. These have been described as the shift

[17] For an investigative and critical account of MNE experimentation see Harrison, 1994. Explicit references to experimentation and management information systems can be found on pages 9, 10. See also Beck, 1986, 345-357. On p. 345, Beck writes (in the 1980s): "Wir befinden uns am Beginn einer organisationskonzeptuellen Experimentierphase, die dem Zwang der Privatsphäre, neue Lebensformen zu erproben, keineswegs nachsteht" (italics removed) ("We are at the beginning of an experimental phase focusing on organisational concepts, which is in no way less profound than the experiments occurring in the private sphere." My translation). The management theorists Bartlett and Ghoshal cite "traditional" and "emerging" motivations for globalising tendencies in MNEs. The first group includes: secure key supplies, market seeking and access to low-cost factors of production. The second group includes: increasing scale economies, ballooning R&D investment costs, shortening of product life cycles, global scanning and learning capability (Bartlett and Ghoshal, 1995, 5-9; Hirst and Thompson, 1996, 62).

[18] Measured in relation to domestic investment world-wide, FDI in the 1980s eclipsed the previous period of FDI growth in the 1960s by a factor of two (Julius cited in Dicken, 1992, 51). Of global merchandise trade, approximately 1/3 is conduced within MNEs on an intra-firm basis. Outward FDI stock stood in 1992 at $2.6 trillion. Global sales by foreign affiliates stood in 1992 at $5.2 trillion, compared to the world-wide export of goods and (non-factor) services of $4.9 trillion- again, including intra-firm trade (UNCTAD, 1995, xx, xxi, 3, 4; the approximation of inta-firm trade levels was derived by US data; Intra-firm trade is also mentioned by Hirst and Thompson, 1996, 53).

from the multinational to the global enterprise. Whereas the multinational enterprise replicated its functions to serve local markets, the global enterprise goes one step further. It tries to decrease redundancy by concentrating different parts of the business process in the region where this part is best carried out. Production centres can be distributed world-wide. Service activities within industrial enterprises, such as R&D and design, were distributed globally, taking advantage of the uneven global distribution of labour and know-how. The globalisation of production processes has been described and discussed frequently, for example within 'global commodity chain' (GCC) research (Gereffi and Korzeniewicz, 1994).

Transnational computer networks have been installed within firms in all of the cases just described in order to co-ordinate and control the global division of labour. They have also been instrumental in speeding up global activities in those instances when time-based competition is critical and 24-hour processes are necessary (Cash, McFarlan, McKenney, 1992, 226). Interestingly, organisational change and organisational experimentation have to a degree been implemented by management via the introduction of new computer-network-based services. Technology has purposely been used as a catalyst for change. The "Transformation of the IT function at British Petroleum" is just one example. Here, "The drive for a new, global [IT] architecture confronted local and cherished technical beliefs head-on" (Cross et al, 1998, 34).

Computer networks carrying corporate services do not always have to be installed "from above" within the firm. Even before the rise of internet technology, research into the global networks of the Swedish multinational ball-bearings producer SKF revealed that the world-wide corporate network was being used by employees to form their own "rebellious" ad hoc network-based services. These led to examples of "spontaneous co-ordination" among organisational units which were hierarchically not directly linked (Hagström, 1991, 107, 108, 123, 124). Hagström calls this "revealed demand" (Hagström, 1991, 110). Noticing this, the management of MNEs has in some instances introduced network systems explicitly to break up traditional hierarchies within firms.[19] This tendency increased when cheap software for information-sharing with open standards proliferated due to the rise of the internet.[20] By 1997, most of the largest MNEs had so-called "intranet islands" that had been initiated "parasitically" on top of corporate networks through ad hoc initiatives without central control.

It is a controversial question how many multinational enterprises have thus far transformed themselves from above or below into global firms by means of a computer network. Hirst and Thompson refute the existence of many more than a handful of such globally networked, globally oriented companies (Hirst and Thompson, 1996, 11, 76-98).[21] FDI itself is strongly concentrated and the 100 largest MNEs account for a third of total FDI stock (Hirst and Thompson citing UNCTAD, 53). Even the usually enthusiastic Dicken states that:

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[19] Although the rationale for introducing network systems has shifted with time, and the emphasis on control has declined, it has to be stated that even decentralised intranet-type approaches can be used for the purposes of control as well as for "empowering" non-hierarchical project groups. Hagström elegantly views control as just one among a diverse set of types of services that can be carried by corporate networks (Hagström, 1991, 58, 98, 106). It has been emphasised that networked IT systems are being viewed in corporations both as a means to achieve more central control as well as a means to limit the control of the centre (Cash, McFarlan, McKenney, 1992, 82). (For the classification into three eras of corporate computing see Cash, McFarlan, McKenney, 1992, 10). Both strategies of control and decentralisation were empirically found to exist side by side within one MNE, the Swedish roller-bearing producer SKF (Hagström, 1991, 100).

[20] The following articles refer to the adoption of internet standards within German multinational corporations. Claudia E. Petrik, "Intranet krempelt hierarchische Strukturen um. Außer Kontrolle," *Gateway Magazin für Daten- und Telekommunikation*, Heise Verlag, September 1996, p. 44 – 46; „Chemie- und Pharmakonzern experimentiert mit internem Web. Hoechst: Intranet-Guerillas unterwandern Infokultur," *Computerwoche*, Nr. 27, 05.07.96, p. 69, 70; Niko Waesche und L. Nikolaus Guntrum, Hoechst AG Frankfurt am Main, „Realisation einer Intranet Kultur – Am Beispiel des Hoechst Wide Web," *Industrie Management*, Nr. 6, Dezember 1996, p. 39 – 42; „Intranet/ Die elektronischen Medien befinden sich auf dem Vormarsch, Der PC dient als Informationsmittel und Arbeitsinstrument," *Handelsblatt*, 25.11.96, p. 28.

[21] The World Investment Report cites a total of 40.000 parent MNEs with 250.000 foreign affiliates for 1992 (UNCTAD, 1995, xx, xxi); it is obvious that the great majority of these corporations are not installing computer networks to conduct global business strategies. In fact, the same report labels 40 MNEs as being very transnational, measuring over 50% on the UNCTAD's composite index of transnationality (UNCTAD, 1995, xxvi, xxvii). UNCTAD has published an index of global corporations by using estimates of the proportion of foreign employees and foreign turnover. Only the largest companies are included in the list. Through these statistics, it is evident that only a small proportion of today's large multinational firms are becoming truly global. It has been pointed out

> "In fact, only 4 or 5 per cent of the total population of TNCs [transnational corporations] in the world can be regarded as truly global corporations" (1992, 49).

It is, however, not necessary for a multinational firm to be global in order to take advantage of transnational computer networks, although the intensity of use and the dependence upon these services probably increase as the firm starts integrating its world-wide activities to a greater extent. In fact, it does not even have to be the case that the firm is located in more than one country. Companies in just one location can be integrated into transnational computer networks. An interesting case are smaller firms, usually suppliers for industrial enterprises that are integrated into the international networks of their clients. In the 1990s, it became evident that, although FDI boomed, ownership was not necessarily the only means the experimentally inclined MNE globalised its business processes; this is, in the words of Dicken, "an unsatisfactory narrow view of its geographical scope and influence " (Dicken, 1992, 48).

The trend in linking large corporations to smaller firms through computer networks originated in what was called electronic data interchange (EDI). EDI services allowed flexible manufacturing techniques to be implemented and shift holding costs and business risk from the manufacturer to the participating supplier (Cash, McFarlan, McKenney, 1992, 71, 72). In the USA, more than 60% of all firms apparently utilised some form of EDI in the mid-1990s (Wigand et al, 1997, 260).[22] Yet, EDI was no more than a set of standards to facilitate data interchange among different company networks. EDI standards have been eclipsed by internet standards for data transfer, which serve as a common standard. Internet standards

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that although foreign direct investment is growing rapidly, much of this is generated by firms with a single location abroad.

[22] An externalisation of risks and costs can take place in subcontracting relationships between large and small firms also without EDI services, of course. Although subcontracting has existed since the beginnings of industrialisation ("putting-out"), network technologies have allowed the development

meet an acute demand. Data interchange among firms has grown tremendously, accelerated through outsourcing.[23] By building shared network structures it is conceivable that new enterprise structures appear that function as a whole, yet are separate entities. [24] Management literature has referred to this as the "boundaryless corporation."[25] This trend climaxes in the widely publicised corporate models Toyota, Nike and Benetton, all so-called "hollow firms" because they largely consist of subcontracting networks of hundreds or thousands of suppliers.[26]

But network enthusiasts have not stopped here. The last bastion of the spread of corporate networks has been the consumer.[27] If consumers can be integrated into the network, not only as a receiver but also as a sender of information, business processes can be further optimised. Thus, when the individual becomes part of the network, it is possible to create a complete "network economy"[28] in which, for example, a computer order placed by an internet user results in an immediate signal being sent to the assembly plant which automatically manufactures the product

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of 'just-in-time' systems which intensify the externalisation of risks and costs. (Dicken, 1992, 216-220; Rabach and Kim, 1994, 128; Cash, McFarlan, McKenney, 1992, 71, 72).

[23] For an in-depth overview of outsourcing, see "Outsourcing: The new IT strategy," the 6th chapter of Currie, 1995, 130-153.

[24] Given this background of EDI and internet-based data exchange, demand for network-based services can be divided into "purposive" and "passive" adopters. The first group are early adopters, users who want to be on the forefront of technology or firms seeking competitive advantage. The second group are users who adopt a technology only when has become widespread or who are asked to adopt network-based services by their industry, by either dominant customers or suppliers. Firms leading in the adoption of inter-organisational computer networks can also be labelled "facilitator" or "electronic market maker" in contrast to the "participant." For a concise discussion of reasons for adoption and a classification of adopters into 'purposive' and 'passive' see DTI, 1987, "Executive Summary" and 49, 50; for inter-organisational systems initiatives see Cash, McFarlan, McKenney (1992, p. 74); for the term "electronic market maker" see Wigand et al (1997, 275, 276).

[25] Seen another way, computer networks make transaction costs affordable for certain less hierarchically organised tasks even in inter-organisational exchanges (for a discussion of transaction costs in the light of IT systems, see Wigand et al, 1997, 37-42).

[26] The Toyota, Nike and Benetton examples can be found in Dicken (1992, 221, diagram 222, 251, 281). These subcontracting networks were primarily organisational and not necessarily supported by IT networks.

[27] Consider the quote from the back cover of an American bestseller: "The individual will become more of an entrepreneur, a private contractor, in complete control of his or her finances, with easy access to enormous computing power- in fact the sovereign individual" (Davidson and Rees-Mogg, 1997).

according to customer specifications. Many of these transactional services are of the "self-service" type.[29]

Thus far, these schemes have been realised only in a few instances such as computers as well as in the travel and financial industries. Customised manufacturing processes such as the so-called "Dell system," named after a computer manufacturer, are thus far only feasible in highly modular segments. It is important to note here, that, on the internet, there is no distinction in network costs whether the networked individual is abroad, thus sparking a transnational transaction, or within the same country as the company offering the service. Some cases are known in which internet firms have provided services which have involved significant cross-border transactions. One example is Tiss, a two-person German internet start-up in Heilbronn selling flight tickets mostly to consumers in the USA and generating substantial, nine digit DM revenues already in 1997 and 1998.

Recent work in sociology has researched the use of the internet by individuals. Sociology has also been an avid contributor to literature about "globalisation." Although the amount of people actually working outside their home country is very limited and the percentage of these that are globally mobile workers is even smaller,[30] sociologists have attempted to show why even those living in their country of origin are feeling more aware of global interdependence. The work ranges from examining how the identity of individuals may be affected in a global

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[28] For an ode to demand power updated to the age of the internet see McKenna, 1997. Like so many other books in the popular management literature segment, it is based almost entirely on anecdotal evidence.

[29] From the view of the economy as a whole, the proliferation of these services partially results in a transfer of labour from paid, employee jobs to unpaid labour carried out by the client herself. This has been pointed out by Beck (1986, 352), who, however, does not consider new jobs created by computer network maintenance.

[30] The group of truly globally mobile can be reduced to a small group of highly skilled, highly paid professionals, the so-called "club class" (Hirst and Thompson, 22-31) or "transnational kernel" (Sunkel quoted in Stopford and Strange, 1991, 21). Only 1.5% of the global labour force worked outside their country in 1993. In the EU, despite the existence of only a few restrictions of labour mobility, this figure was only 2% (Castells, 1996 I, 232, 234).

environment to discussing the risks or fears people may feel.[31] The possible effects of a parallel increase of self-employment and independent contractorship as well as increasing uncertainties regarding retirement have been debated (Coyle, 1997, xiv, xv, 216).[32] Another strand of work has culminated in the concept of the "knowledge worker," or, what Robert Reich called the "symbolic analysts" (Reich, 1991).[33] A growth in cultural production has been noted in industrialised countries.[34] In the United States, the number of "teleworkers" working from home via a network connection has been estimated to be as high as seven million by the Department of Transportation (US Department of Commerce, 1998, 48, 61). Castells generalises

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[31] Regarding the question of identity in a global age, it was Akio Morita of Sony who coined the phrase "global localisation" (See Ohmae, 1994, 8, 9). Globalisation is viewed by sociologists as a force that redefines what is meant by the "local." Globalisation and "deglobalization" thus go hand in hand (Robertson, 1992, 8, 10). Whereas in "traditional" societies the "local" was simply what was commonplace and usual, the "local" now is something that constantly interacts with the "global." The "local" thus is not what it used to be, but instead is a "tricky version of the local which operates within, and has been thoroughly reshaped by the global and operates largely within its logic" (Wilson and Dissanayake, 1996, 5). The "local" covers a diverse range of phenomena from from food to forms of "communal resistance" such as religious fundamentalism (Castells, 1997, 11,12). Global risks and uncertainty play a role in the global/local nexus as well. In the case of Ulrick Beck, this is fueled by fear, in the case of Giddens, by an increasing need to understand identity in a global context. (Beck, 1986). Within international relations writing, James Rosenau has called this the "emergence of global issues" citing AIDS and atmospheric pollution (Rosenau, 1990, 12, 13). World society thus becomes a "community of danger" (Waters, 1995, 62). Others argue that there is a trend for more people to be involved in cultural production itself and that this type of production is inherently globally oriented. With the real or perceived changes of the 'Information Society' came new insecurities and the need for experimentation, felt by businesses as well as individuals. Kenichi Ohmae points out that "Nothing is 'overseas' any longer" (Ohmae, 1994, viii).

[32] Part-time and temporary work has increased by about 30% in industrialised countries to about 50 million workers (Castells, 1996, 266).

[33] Michael S. Scott Morton defines the 'knowledge worker' as a fraction of the work force working with information and adding value to it. Morton believes that in the manufacturing industries 40% of employees and the service industry 80% of employees are 'knowledge workers' or 'information workers' (who process information without significant modification) (1991, p. 10).

[34] Harvey discusses the growth of cultural production citing the rising numbers of artists as an example, "and this is only the tip of an iceberg of cultural production." Harvey then names local entertainers and graphic designers, "as well as those who are the 'culture transmitters'," in publishing, magazines, broadcast media. Paris apparently boasted only 2.000 artists in the last century, whereas New York City in the 1980s was the home for 150.00 artists exhibiting in 680 galleries (Harvey, 1990, 290). The cultural or design services are, furthermore, becoming increasingly international in scope. King cites the importance of international contracts for US architectural firms as an example of this trend (King, 1990, 398-400). It could be added that, due among other things to changes caused by the internationalisation of media, firms are aware of the need to communicate on a political and moral level; one of the contentions of some sociologists is, therefore, that corporations are becoming more like cultural institutions and are in increasing need of cultural-type services. Beck describes how business is acquiring a new moral and political dimension (Beck, 1986, 304, 305, 356).

these trends into a development he calls the "individualisation of work" (Castells, 1996, 201-326).

This thinking has also begun to inspire writers within the field of political economy leading to alarmist as well as enthusiastic ruminations. Rosenau stresses the reflexive self-consciousness of individuals exposed to globalisation (Castells, 1996, 229, 230; Rosenau, 1990, 13, 15). Stopford and Strange contend how the transnational flow of ideas and beliefs, reflected also in consumer expectations and demand, can result in pressure on governments (Stopford and Strange, 1991, 20). Ohmae has stated the same even more idealistically:

> "Governments can still arbitrage information or otherwise protect their markets by forcing citizens to buy high-priced beef (as is the case in Japan) or poor-quality automobiles (the case in India and Brazil), but product labels are spreading all over the world and news of product performance is harder to suppress. Information has empowered consumers" (1994, 4).

Discussing the effects of globalisation on the individual was, as this brief excursion into sociology shows, very much en vogue in the late 1990s. It is indeed quite possible that early consumer demand for internet services in the late 1990s was, in part, related to the global reach of the network, in contrast to older, country-only on-line services. It is also true, however, that most internet services are devised for a local audience, despite the possibilities of global reach. A study of the European Commission showed that 42% of all European internet services are offered only in the local language, not in English (European Commission, 1997, 29). The key to understand more about internet uptake among consumers would be to segment users into early adopters and mass users. This is not the place to follow this lead, but the contention made here is that internet demand was pioneered by early pioneers who explicitly searched for international services. These early adopters also were witnessing increased "globalisation" in their careers and private lives.

It can, however, be safely said that the demand for internet services and other network-based services at home is highly dependent on cost. Cost has thus far prevented video-on-demand or interactive television from being realised on a broad scale (Wigand et al, 1997, 277). For private consumers, the cost of internet access depends largely on the cost of telephony services, because usually they "dial into" their internet service provider over a local phone line. Regulation is an important issue affecting the cost of telephony services as well as influencing the growth of internet infrastructure directly, as we will see in the next chapter.[35]

Given cost sensitivity, it is important to bear in mind, however, that internet use may be growing, but that it is far from being ubiquitous, even in the Triad countries. In this thesis, therefore, the author refers to the potential for ubiquity which acted as an important incentive for entrepreneurship. The use of global computer services, among consumers as well as among firms, was largely an experiment which considerably slowed its pace after market downturn from the year 2000. Similarly, the transition to the 'global' corporation (as opposed to the 'multinational' enterprise) itself is on precarious grounds; the period of transition coincided with a period of strong economic growth in the USA. Some sociologists and management theorists, even political economists, can be criticised for forgetting this when extrapolating trends from the late 1990s into the future. This speculative section on the origins of demand will be concluded with a reminder that similar issues to those discussed here already at an earlier point in time were popular in international relations and political economy. The 1970s heralded the rise of the "international society" and an increasingly interdependent world.[36]

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[35] In some countries, internet access is restricted, for example in Vietnam, where an internet user requires a police permit. In India, a monopoly for internet service existed until Fall 1998.

[36] There were important differences, however. Whereas the growing interdependency of the world was in the 1970s seen as strengthening international organisations such as the UN, it is today viewed more ambivalently. Interdependency means new opportunities as well as new risks. Computer networks allow "minority" forms of personal and collective identification- some sociologists refer to a rise of "sub politics" (for example, Beck, 1986, 304, 238, 329)- to be established world-wide. Globalisation thus involves complexity and density, not homogeneity. In fact, heterogeneity is a response to globalisation (Robertson, 1992, 98-105, 188; Featherstone, 1990, 1, 2, 10). Despite the apparent proliferation of American television programmes and other aspects of US culture, an

Entrepreneurial activity and supply boom

The founder of Amazon.com, an internet service company with one of the highest profiles in the late 1990s, described how he had originally perceived his chances of success in an FT interview:

> "Yes. I find [the growth of Amazon.com] surprising. Anyone who had predicted what has actually happened would have had to be institutionalised."[37]

Growth in the demand for internet services was accompanied from the mid-1990s to the end of the decade by a period of massive investment and company foundation in the United States. The years after 1995 saw a rise in venture capital investment in internet-related companies from US$ 134 million to almost two billion dollars in 1997. This figure rose to almost 20 billion US dollars in 1999 (refer to Table 2). This private investment activity was accompanied by dozens of stock market listings of internet service and software companies, a small number of which were spectacular, fuelling the imagination of the financial industry and further inciting investment. Already at the end of 1996, there were more than twenty internet companies listed on NASDAQ (Reid, 1997, xvi). This section will examine the key drivers fuelling this boom, especially venture capital investments in the United States, as well as explore the internationalisation of US internet start-ups.

Three main types of internet start-ups will be examined here: Web development agencies, portal and community sites as well as electronic commerce companies. All three types of firms have contributed to the commercialisation and international success of the internet, yet they have distinct revenue models. Indeed, one could

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"Americanisation," or "Coca-Colonization" as a form of homogenisation is not taking place; the response to global/American culture is varied (Featherstone, 1990, 10).

[37] "Billionaire nerd on his own bandwidth," *Financial Times*, 13.11.98, 13.

extend this list much further. The internet has created a great variety of companies with different business models many of which will disappear, be adapted or consolidated. Missing from the list of types of firms to be examined here are internet service providers (ISPs), internet software companies and so-called business-to-business (B2B) start-ups. All of these firms which dominated the initial stages of internet development also underwent rapid change of their business models. All three company types, furthermore, had their greatest window of opportunity where the "disruptive" potential of the internet was the largest: In linking consumers to businesses and enabling seamless network transactions.

Of the three internet businesses discussed here, web development companies employ the most traditional revenue model: Professional services. In the mid-1990s, web development companies appeared in large numbers all over the United States and the rest of the world. They helped other companies establish a presence on the internet; especially lucrative opportunities were those in which client systems were extended to consumers and new interfaces were formed between businesses and consumers. Here, the web developers had clear advantages over the traditional consultants working with established companies, the IT consultants and systems integrators. The top web developers, firms such as USWeb, iXL and Agency.com, grew rapidly in the USA and abroad, mostly by acquiring smaller firms in their field. In Europe, all three were active in several countries, giving them pan-European scope. Internationalisation was a key growth strategy, because the most lucrative clients are multinational companies, which demand that global accounts be executed by several world-wide offices in concert. The three players mentioned here were well financed, either through venture capital-groups or, in the case of Agency.com, through a global advertising holding company. All were listed on NASDAQ. The acquired firms often are smaller companies, which are undercapitalised and focused on a local market- this is true for in Europe as well as the USA.[38]

The second basic type of internet start-up to be discussed here is the portal and community site. It obtained its revenues mainly through advertising targeting consumers. The most successful portal players from the USA, Yahoo!, Excite and Lycos, all internationalised quickly in an effort to extend their "mindshare" and "brand equity" (see Table 1, below). In its internationalisation strategy, Yahoo! was an innovator by first realising it needed to enter each foreign market separately with its own presence instead of trying to use the global reach of the internet to host an internet service for several countries from a single location.[39] Organic growth was the main internationalising strategy of this type of player since the number of employees required to run an international office is small. A local presence was important, however, not only to intensify the advertising sales effort in each country, but also to adapt content to local language and culture. Despite organic growth strategies, establishing a significant international brand was costly, due to marketing measures, and the majority of European start-up portals were not able to extend their reach beyond at most a few direct neighbours. As a consequence, in Europe, internet brand building was dominated by established media and telecommunications companies, or US start-ups.

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[38] They mostly financed their growth through earnings. Web development firms are the easiest type of internet company to launch, with minimal capital requirements, making it also the most popular type of internet player in all countries.

[39] This was the initial European strategy for France and Germany followed by Excite from its London office. See Niko Waesche, "Building a Global Brand Name that the Locals Can't Spell, Excite Takes on American and Indigenous Portals in Europe," *Tornado-Insider.com Magazine*, April 1999, Number 1, pages 67-70, 103.

Table 1. International presence of the three most important internet search services ("Portals"), Fall 1988.[40]

	Yahoo	Excite	Lycos
UK	•	•	•
Germany	•	•	•
France	•	•	•
Italy	•	•	•
Spain	•		•
Austria			•
Switzerland			•
Luxembourg			•
Netherlands		•	•
Belgium			•
Sweden	•	•	•
Norway	•		
Denmark	•		
Japan	•	•	•
China	•	•	
Korea	•		
Singapore	•		
Australia	•	•	

The last type of internet start-up to be discussed here are the so-called "electronic commerce" firms. They generated revenue by selling products or services to consumers through the internet. Some of the highest profile US start-ups here were Amazon.com (books) or E*TRADE (internet broker). In the beginning, these firms did not internationalise through offices abroad. From a single location, Amazon.com sold books in 160 countries; E*TRADE carried out transactions for

[40] Data obtained from company information on the internet (http://www.yahoo.com/, http://www.excite.com/, http://www.lycos.com/). Only in a few cases is a national presence actually provided for out of that country. Mostly, a targeted service in the country's language is created in a centralised regional office. The European activities of Lycos Inc. are carried out in a joint venture with Bertelsmann AG.

investors in 119 countries.[41] The possibility of "exporting" goods and services via the internet to consumers is why these firms were slower to internationalise than the first two types of internet companies described here, which were dependent on catering to local businesses as clients. Nevertheless, the global electronic commerce model reached a certain natural limit. By early 1998, Amazon.com expanded internationally through acquisition of existing foreign players in Germany and the UK.[42] E*TRADE launched its third international web site in France in March 1999 together with a local investment bank, CPR.[43] US electronic commerce players found that the foreign companies they bought and partnered with were well-established in their local market- similar to the web development companies. But, most had not built an extensive international presence themselves; they were domestic players.

To a great extent, the new US ventures mentioned here can be credited for inventing new revenue models or adapting existing ones to new circumstances. These innovators, however, also benefited from the unique opportunities available in the US through sophisticated internet demand structure and aggressive private and public capital markets. Their internationalisation was carried by the strength of their home base. US internet demand was early on marked by both high absolute user numbers, with the number of internet users in 1998 estimated at 79 million, as well as high penetration in the population, 29%.

Whereas high absolute user numbers represent large potential market size, high penetration rates and time spent online are indicators of sophistication of demand. Unlike most other markets, US internet demand already in the 1990s moved from early adoption to mainstream use. All three types of revenue models described here rely, directly or indirectly, on sophisticated internet demand structures. High

[41] According to company web sites accessed on 28.11.99.
[42] In Germany, Amazon acquired Telebuch ABC Bücherdienst and in the UK, Bookpages. Amazon.com press release, "Amazon.com Acquires Three Leading Internet Companies, Acquisitions Extend Company's Ability to Serve International Customers," Seattle, 27.04.98.
[43] Previous international launches were in Canada and Australia.

penetration rates, for example, are crucial for web development companies. Their clients, such as banks or airlines, only considered an extensive internet presence and advanced internet service offerings if they could be sure that these new services would be able to reach a significant proportion of their customers. This was echoed in a *Financial Times* article on Sweden: "Once Internet penetration reaches a certain point, the development of services such as internet banking can take off."[44] Established firms such as the aforementioned banks and airlines also invested in internet advertising only if their advertising demonstrated adequate reach; thus, advertising expenditures were also dependent upon penetration. Portals, in turn, relied on advertising revenues. Lastly, penetration also was important for electronic commerce companies- if internet penetration had not increased in the US and spread the internet more broadly in the population, Amazon.com would not have sold more than computer books. Time spent online also was crucial for some of the same reasons. For users to become acquainted with new service offerings over the internet, it was important that time spent online was not discouraged by metered pricing in the USA. In all of Europe, metered pricing discouraged internet use in the late 1990s, slowing down the development from early adoption to mass use.[45]

Michael Porter, who has helped popularise the concept of home demand conditions in the analysis of internationalisation, argues that advanced domestic demand is crucial for the long-term competitiveness of internationally oriented companies (Porter, 1990, 86-100). US internet start-ups certainly took advantage of the sophistication of their home market, i.e. strong consumer penetration, to develop innovative business models which could be "exported" abroad. Start-ups also benefited considerably from aggressive and buoyant capital markets- both venture

[44] Nicholas George, "Chilly Regions of North Warm to the Net," *Financial Times*, 13.10.99, page 16.

[45] In Germany, NetCologne was unique in offering capped unmetered access for private users since early 1998. This service was available only in the Cologne area. Even in 1999, the reality for most internet users throughout Europe was access to the internet via a local, metered telephone connection.

capital and private investors vigorously pursued internet opportunities in the late 1990s.

The total public market valuation of US internet companies already in May 1999 stood at approximately USD 300 Billion.[46] Stock prices of internet firms were based on expected earnings, not on current earnings.[47] Furthermore, firms were hastened through the development stages at an extraordinary pace. The Silicon Valley newspaper *San Jose Mercury News* stated already in 1998 that it was not uncommon for an IPO to occur 18 to 24 months after a company was founded.

The massive returns possible through a NASDAQ initial public offering (IPO) in the late 1990s and the speed of the offerings made possible increasingly risky and daring venture capital investments- the most striking example being perhaps the venture capital-financed, pre-IPO acquisition strategy of the web development company iXL in the USA and abroad. To finance its pre-IPO growth, iXL raised more than USD 60 Million. From its foundation in March 1996 to its public listing at NASDAQ in June 1999, iXL acquired 34 companies. It grew from 90 employees in January 1997 to approximately 1,300 employees by December 1998.[48] It would have been impossible at the time to replicate the iXL story in Europe. Table 2 below shows the massive amount of funding poured into internet start-ups by venture capitalists in the United States in the 1990s.

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[46] European public internet companies at that time had a total valuation of less than USD 10 Billion. Morgan Stanley Dean Witter, Equity Research Europe, "The European Internet Report," June 1999, page 167.

[47] The stocks of the so-called Internet "portal" services which offer Internet search enjoyed especially high valuations. In Fall 1988, for example, the stock prices of Yahoo and Excite were 184 and 88 times (P/E) that of their 1999 expected earnings per share (EPS). The share of Lycos, a similar service, was priced 107 times of their year 2000 EPS. Internet professional services companies did not enjoy multiples that high. CKS Goup, for example, achieved a P/E of 15 times before its acquisition by USWeb Corp. (Reinvent).

[48] Filing of iXL Enterprises, Inc. with US Securities and Exchange Commission (http://www.sec.gov/), S-1, 08.02.99. See also Waesche, 1999b, 201, 202.

Table 2. Growth in venture capital investments USA in US$ billion.[49]

	1995	1996	1997	1998	1999	Growth 1995-99
All industries	7.6	9.5	13.8	14.3	35.6	368%
Technology	4.0	6.0	8.5	10.8	32.4	710%
Internet-related	0.1	ca. 0.9	1.9	3.4	19.9	19,800%

But venture capital also was important beyond the financial dimension. In the US, well-known venture capitalists "opened doors" to partnerships and other business relationships. They provided a start-up with "legitimacy." It is not objective of this study to examine this point in detail, although some researchers still feel the process of adding value beyond capital by venture capitalists is as of yet imperfectly understood (Steier and Greenwood, 1995, 340).[50] In preparation for an argument which will be made later, the following point is relevant, however: Some of these important "supportive" services provided by venture capitalists can be offered by alternative means as well. "Door opening" and "legitimacy" was provided for in Sweden by private individual investors.

In summary, it was a combination of different factors which helped US internet start-ups grow both at home and internationally. The most important were advanced demand conditions domestically- early transition from pioneer to mass consumer use- as well as aggressive capital markets.

[49] Source: Price Waterhouse Venture Capital Surveys, now the PricewaterhouseCoopers Money Tree Survey. A measurement change occurred after 1998; the numbers before that year are cited slightly lower in subsequent surveys. The most recent data used was PricewaterhouseCoopers, "Moneytree US Report, Full Year & Q4 1999 Results."

[50] For a discussion of some of these value-added services beyond capital, please refer to MacMillan et al, 1988 and Timmons and Bygrave, 1986.

The role of the USA: Multilateral or bilateral flows?

Was the internet in the late 1990s characterised internationally by multilateral flows with different parts of the world interchanging data in a complex pattern? Or should the early world-wide internet more aptly be described as a bilateral system wherein most data travels to and from the United Sates? This question will in different guises follow us throughout this study. A multilateral flow would match the vision of the networkist thinkers, which believed "their" network to be non-hierarchical and without a centre. This belief was supported by the technological underpinnings of the internet. Furthermore, the global electronic networks originally pioneered by financial services and multinational enterprises (MNEs), the predecessors to the internet, seemed to link the so-called "triad" of industrialised regions in a multilateral way.

Bilateral flows would signal dominance of the US supply of internet services; multilateral flows correspond to a scenario in which different countries are equal participants in an entrepreneurial "leapfrogging" contest. Indeed, existing data on internet flows did reveal the strong dominance of the US at the time and was highly bilateral. Unfortunately, it was impossible to tell whether this was due only to the architecture of the network. Data was often transported via the US while moving from one international location to the next.[51]

In the second half of the 1990s, however, the United States dominated the internet not solely in terms of its architecture. The largest group of internet users by far were located in the United States. It was, furthermore, very clear that the wave of entrepreneurial activity surrounding the commercialisation of the internet had its centre in the United States. This activity was financed by enthusiastic capital markets including a buoyant venture capital industry.

In fact, a strong case can be made that internet flows among businesses were, in the late 1990s, multilateral, whereas consumer flows were to a large degree still bilateral. As described in this chapter, internet innovations had their greatest "disruptive" potential in networking consumers and linking them to businesses. Most of the new services for consumers were pioneered by US entrepreneurs acting upon this opportunity. The timing in the mid- to late 1990s was perfect: Internet usage was moving in the United States rapidly from early adoption towards mainstream penetration rates. Approaching ubiquity increased the disruptive potential of the internet, a clear signal for entrepreneurs (Christensen, 1997). This was not the case in most other countries. There, early pioneers existed but the movement towards mainstream use was not apparent. The early adopters outside the United States took advantage of North American internet service offerings. Local offerings or services from other non-US countries did not seem as innovative and did not have a comparable depth.

Some of the more successful of the public and private firms in the United States soon realised that their services were attractive for international users as well. Some began to internationalise their business, by creating more targeted services for international users and by opening offices in other countries. Internationalising American firms did not enter virgin territory, however, but rather markets in which local entrepreneurs had been active for some time. Yet, these entrepreneurs could not address consumer opportunities with the same vigour and breath as in the United States. Entrepreneurs abroad were facing "unbalanced" demand for internet services due to some promising business use but laggard mainstream uptake among consumers. In addition, the start-up activities were undercapitalised. As a result, the strongest competition abroad for the US start-ups did not come from local start-ups, but from established media and telecommunications companies. A discussion of entrepreneurial activity outside of the USA is conspicuously absent in the this chapter. Using the case of Germany, however, much of the rest of this thesis will be

[51] See the useful article by Kenneth Neil Cukier, "Global Telecom Rout," *Red Herring*, February

dedicated to explaining a case of development of internet entrepreneurship which was distinct from the United States. One of the objectives of the study is to understand *how* international growth of the internet- described in this Chapter and the next- actually signified a venture opportunity in countries other than the United States.

Before this discussion shifts to Germany, however, the next chapter, Chapter Three, will focus on the role of governments in the internationalisation of network-based services and the internet. In Chapter Three, the shifts discussed in this chapter will be linked to initial US government subsidies of the internet when it was a fledgling research network, the purposeful lack of effective direct regulation of internet services and the indirect effects of deregulation carried out by governments in financial services, telecommunications and FDI. The internationalisation of the internet cannot be correctly understood without discussing government contributions - especially US government contributions.

1999, pages 60 – 64.

Chapter Three

Regulation and the Death of Distance[1]

As described in the previous chapter, in the second half of the 1990s, the internet represented a "global window of opportunity" for small firms. For the cost of setting up an internet site, a small firm could instantaneously achieve a world-wide presence and sell products or services to customers or businesses. Exchanging data in the private "intranets" of industrial multinationals was similarly distance insensitive. Distance insensitivity was unique at the time, because it stood in strong contrast to the pricing regime associated with basic telecommunication services, in which transnational connections were both distance sensitive and costly.[2]

Drawing on a diverse set of literature, including practitioner thinking, economics and sociology, he previous chapter described the formation of two different types of globally connected data networks. One type were the private networks of industrial multinationals and their data-sharing partner companies. These networks served to co-ordinate world-wide business processes. The second type was an emerging, transnational consumer network. Both types of networks shared some common characteristics including embracing internet technologies as a world-wide standard. The most innovative internet start-ups dedicated themselves to connecting the two to create seamless "business webs" (Tapscott, Ticoll, Lowy, 2000). But the two shared a further characteristic, which was not discussed in the last chapter: They were both run over leased lines. By doing so, they bypassed the regulation regimes of basic telecommunication services. This impacted on the pricing of both, and allowed them to be generally distance insensitive.

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[1] This was the title of an *Economist* survey dedicated to developments in telecommunications and the internet. Frances Cairncross, "The Death of Distance," *The Economist*, 30.09.95.

[2] This general statement was not true in all cases. The price of cross-border basic voice services depended on bilateral agreements within an international accounting rate system. Pricing depended on the degree of competition allowed and the exact nature of the settlement. For this reason, the price of a telephone call between London and Paris could be higher than between London and New York.

Distance insensitivity is commonly associated with technological factors such as the decentralised architecture of the internet and the co-operative peering system; these factors were discussed in the previous chapter. A further enabler, is, however, often overlooked: Government regulation. This chapter serves to describe the contribution of government policy to the growth of the internet. This chapter is important because, on an international scale, it discusses determinants which are again revisited in the case of Germany in the next part of the thesis.

Telecommunications policy was a crucial determinant. Firms using data networks such as the internet ran over leased lines and benefited from asymmetric regulation. The way international data networks were regulated was very different from the way basic telecommunication services were regulated. World-wide demand for the internet by both business users and consumers was deeply indebted to this regulatory asymmetry and the pricing regime it encouraged. It was even possible to argue that, to an extent, users of basic telecommunication services subsidised the use of the internet.

Next to distance insensitivity, a further- yet not uncontroversial- factor, which may have benefited start-ups, was the intentional lack of regulation in the areas of trade tariffs and cross-border consumer protection on the internet. It is argued here that the laissez-faire approach adopted by U.S. negotiators pre-empted international agreements. These agreements could have stunted small firm innovation and experimentation with new, internet-enabled business models on an international scale. Most important, perhaps, was the abstinence of government intervention in the demand-driven process of developing world-wide internet technological standards. The recent history of internet standards has shown that top-down government intervention in some cases was unnecessary and that "unaided" pressure by business users and consumers could lead to interoperability, at least through "open but owned" standards. Given the conditions of massive investment in the late 1990s, there was no evidence that large software developers and network owners were able to use their market power to prevent interoperability. Although the largest and most influential software developer, Microsoft, at a certain point in time attempted to "embrace" the internet with its own proprietary standards, it failed. And this not because of the trial waged against it by the US justice system, but because of pressure by business and consumer users of the internet. Again, innovative small firms seem to have benefited.

In discussing this international "window of opportunity" for start-ups, it is impossible to ignore the role of the Clinton Administration. An Electronic Commerce Working Group was formed in December 1995, and Bill Clinton was proclaimed by his own officials as: "The first world leader to give the internet and electronic commerce a central role in his policy agenda" (U.S. Government Working Group on Electronic Commerce, 1998, 5). The U.S. stance was mapped out a central policy document "A Framework for Global Electronic Commerce" dated July 1997 (Clinton and Gore, 1997). It was endorsed by Bill Clinton and Al Gore. Although the principles behind this document were not new and characterised U.S. negotiations in the IT area for some time, they were clearly articulated here. Negotiation was focused on creating optimal conditions for world-wide electronic commerce for U.S. firms; according to the rule: "What is good for U.S. internet start-ups is good for the world." In the words of Al Gore: "...we are... helping to ensure that commerce goes digital, that business goes global and that innovation goes wild." (U.S. Government Working Group on Electronic Commerce, 1998, i).

The first part of this chapter will describe how data networks bypassed international telecommunications regulation. In the second part, a 'telegeography' of the internet will be presented. This section relies on research carried out by the TeleGeography research group; it showed that the global internet infrastructure was heavily dependent upon United States infrastructure acting as a world-wide "hub" and "data centre." The reason for this could be traced back to U.S. domestic policy which endorsed an important cross-subsidy privileging the internet, leading to both growth in use as well as massive infrastructure investment. The importance of this cross-subsidy shows that it was not just the fact that deregulation of the telecommunications industry was early which was critical for the development of electronic commerce in the U.S., but *the way* that deregulation came to pass. Due to the primacy of the United States in data networking, U.S. pricing of leased lines and its excellent infrastructure had an important impact on the world-wide direction of flows and usage. Infrastructure has also had a profound effect on the comparative size of national electronic commerce markets. It followed that for the purposes of many international start-ups, the world market was the U.S. market. Also for this reason, internationally co-ordinated attempts at government intervention were difficult to carry out without the participation of the United States. The third part of this chapter describes the intentional lack of regulation that existed in areas other than infrastructure, including the complex issue of technological standards. Then, an important question will be briefly problematised: Is a lack of international policy and regulation overall beneficial to small and innovative firms? There is no easy answer to this question. It seems certain, however, that mainstream success for an emerging world-wide consumer internet eventually will require government framework intervention. The last part of this chapter examines an alternative to international co-ordinated policy-spontaneous occurrence of an internationally converging policy framework though regulatory competition among national governments. The key to convergence is transnational transactions and flows. The history of financial services is instructive here.

One caveat needs to be mentioned, however, before beginning the discussion. The aim of this chapter is to describe the role of government policy in creating a global network infrastructure for internet start-ups. The main political driver was U.S. government. Due to space constraints, "U.S. government" has been used as a general category and the internal political process is not discussed, save occasional references to the roles of the Federal Trade Commission, the Federal Communications Commission, Department of Commerce, individual states and the Clinton Administration. In the subsequent analysis of the German policymaking process, efforts are made to expose the roles of different players.

Differences in the regulation of international data and telecommunications networks

A presence on the internet is automatically a global presence, at no additional cost. This is not only crucial for ventures which wanted to reach a world-wide consumer market but also for small companies that used the internet to share data with other businesses. Much has been written by network thinkers about the technological underpinnings of this 'instantaneous' world-wide reach and the rise of a global standard associated with the internet. Less credit has been given to the role of asymmetric regulation.

Internet messages could traverse interconnected, separate world-wide data networks at zero marginal cost (Mason, 1998, 937, 938). As explained in the previous chapter, there were a number of technological and organisational reasons for this. Historically, internet networks passed data along in a co-operative fashion, relying on so called "peering" agreements. Usually, data lines were leased, and were charged according to the capacity of the line and not usage. Once the network infrastructure was in place, it could be used to carry vast amounts of messages simultaneously. In contrast, basic, switched-circuit analogue telecommunications had defined capacity limits. Furthermore, analogue signals had to be reinforced across long distances. Basic telecommunication services were more sensitive to distance and were often charged accordingly.[3]

But technology alone could not explain the price differences between international data and telecommunications services and the distance insensitivity of the internet. Up to 75% of the price of an international phone call was related to the costs of international settlements (Mason, 1998, 937). The international accounting rate system, which fixes the settlement rate, was firmly re-established after the Second World War and essentially was a set of bilateral pricing arrangements between national telephony monopolies. These bilateral arrangements were supported by an international organisation, the International Telecommunications Union (ITU).[4] This international system traditionally functioned remarkably well. According to two policy experts: "The international telecommunications system is among the most successful examples of multilateral co-operation. The standards, rules, and regulations elaborated by the ITU and its subbodies have been widely respected by telecommunications common carriers, and the institutions themselves have avoided the crisis of legitimacy that has more generally affected the United Nations and its specialised agencies."[5] This "cosy club" system contributed to an elevated price regime.

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[3] Analogue technologies are being improved and these statements may be invalidated in the near future.
[4] For a discussion on the "Future of international settlements" see Cave and Waverman, 1998.
[5] Ergas and Pogorel continue: "Compared with areas such as trade, finance or development assistance, international co-operation in telecommunications has been distinguished by the resilience of the institutional

However, private leased lines lay outside the international accounting rate regime; and the internet used leased lines. This position was confirmed in the agreements for services within the Uruguay Round (1993).[6] In many developed countries, leased line data networks were liberalised before the GATS negotiations were completed. In Germany, for example, the PTO lost its monopoly on selling value-added network-based services (VANs) in 1989.[7] Thus, the process of liberalisation of basic telecommunication services on a world-wide level always was a step behind data lines- which were never regulated to the same extent. It should be noted that a WTO agreement on basic telecommunication services was achieved four years after the completion of the Uruguay Round, in 1997.[8] Yet, the international accounting rate system still stayed untouched until the year 2000 due to a "gentlemen's agreement" between the signatory governments (see Cave and Waverman, 1998, 888, 889).

Regulatory asymmetry and competition led to massive investment in data networking infrastructure throughout the world. In the 1980s and early 1990s, the largest providers of VAN network services in Europe for business-to-business use were American firms; at that time they already were generating considerable revenues with data services.[9] During the 1990s, rising world-wide demand further accelerated investment decisions. In addition to investments by traditional telecommunications companies which wanted to benefit from

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mechanisms on which it is based, the widespread acceptance and observance of multilateral rules and regulations, and a relative lack of conflict between the technical function of solving immediate problems and the claims of contrasting ideologies and interests" (Ergas and Pogorel, 1994, 17-19). Among the reasons for this stability, the authors cite the necessity that international linkages between two domestic monopolies had to be provided jointly as well as "the small total number of participants and the high degree of control exercised by each over its environment, by the dominance of an engineering/ public service culture and by a technological context whenever change was evolutionary" (Ergas and Pogorel, 1994, 18).

[6] In the GATS Annex on Telecommunications, special considerations in the national schedules were made for private leased line data networks (Feketekuty, 1998, 82, 85).

[7] Previously, the 1987 European Commission "Green Paper on the Development of a Common Market for Telecommunications Services and Equipment" proposed a fully open competitive environment for new, data-based services. The Green Paper influenced proposals for reform on a national level in two key markets with a strong public-service telecommunications tradition: Germany (the Witte Report, September 1988) and France (Thimm, 1992, 191).

[8] The General Agreement on Basic Telecommunications Services (GBT) entered into force on February 1998 and included 69 signatory countries. Liberalisation of basic telecommunications in the EU was secured in accordance with the WTO schedule and went into effect in January 1998.

[9] Noam lists the largest firms in the European VAN market in 1991: GTE Telenet ($500 million), IBM ($500 million) and GE Information Services ($450 million). The top markets were the UK ($918 million), France ($665 million) and Germany ($428 million) (Noam, 1992, 372, 373).

offering international data services, new companies began to build extensive world-wide networks. One example was the CTR Group, New Jersey, whose project Oxygen was an unbroken, undersea fibre-optic network connecting 175 countries. Its estimated cost was $14 billion.[10] These additional capacities were intended to be leased to internet service providers as well as other resellers of data services. In the late 1990s, investors thus expected that the demand for data lines would increase even more in the future. Although unlikely to be proved wrong, their prospects depend on government intervention. In several OECD countries some types of value-added data services were illegal.[11] Furthermore, governments could theoretically intervene to break the asymmetry in regulation between international telecommunications and data network regimes.

In its technological structure, the internet is decentralised and this would make it difficult for governments or corporations to impose distance pricing even if they wanted to. But it would not be impossible. Despite its technologically rooted decentralised nature, the internet internationally was (and still is) subject to a high degree of ownership concentration as well as high traffic concentration in certain key points. One company, MCI WorldCom, owned a significant proportion of all world-wide internet lines, despite a ruling by the European Commission which forced it to sell part of its internet holdings. Furthermore, intercontinental internet traffic between Europe and the United States travelled mostly through a few, highly concentrated paths, mainly between Amsterdam and New York and London and New York. Both the largest owners as well as the data hubs represented possible loci for intervention. It would not have been impossible in the late 1990s to meter intercontinental traffic and to charge distance-sensitive fees. In fact, a volume-based charge for incoming transcontinental internet traffic was levied on academic users of the UK JANET network as of August 1998.[12]

Although the positioning of data networks outside the basic telecommunications regime seemed an established fact from a contemporary viewpoint, this was not always been the

[10] Jonathan Burke, "Submarine Attack," *The Red Herring*, November 1997, 104, 106.
[11] Such as voice over data services ("internet telephony") which was banned in one-third of OECD countries if it involved a telephone on at least one end of the line (Mason, 1998, 937).

case. Historically, there was tension between the two worlds. Incumbent telecommunications carriers tried to bring data networks back into the comfortable fold of telecommunications, resorting to both political and technological means. One example was the push for ISDN in Germany. ISDN was originally introduced as a data networking alternative to leased lines and the data networking standards of IBM, IBM-SNA. Although this undertaking probably was chimerical from the onset, it shows that the data network regime was perceived as a real challenge to PTO-style telecommunications already in the early 1980s. An account by Jill Hills described this conflict from the perspective of a contemporary, passionate observer (Hills, 1986, see especially the Introduction, 1-23).

The subsidised U.S. internet acts as a global hub

The U.S. in the late 1990s was the network hub and data centre of the world, both for business and in consumer use. Already in the late 1970s, the French Nora-Minc Report noted the preponderance of U.S. data centres.[13] This was related to the fact that a large proportion of multinational industrial as well as financial corporations was American. The competitive advantage in data centres for business use was extended in the late 1990s to the commercial internet. During the 1998 football World Cup, for example, internet coverage of the French event was served mostly out of the United States for a mostly European audience. Hosting the service in Europe would have been less economical and less efficient. Disney's web sites for the European market were formerly hosted by AT&T in Amsterdam- they were moved to Hawaii in 1999 to benefit from its better network infrastructure.[14] 60% of all users of the internet were located within the United States. An estimated 80% of all electronic commerce transactions occurred within the U.S.A.

[12] The "Announcement of the Start of Usage Charging for Transatlantic Traffic" from 31.07.98 can be found on the web page http://www.ja.net/press_release/charging.html.
[13] Eli Noam mentioned the U.S. headstart in on-line databases in his book on telecommunications in Europe. He cites an OECD report that listed 1983 sales of on-line data services in Western Europe as amounting to less than 10% of sales in the United States (Noam, 1992, 402).
[14] Kenneth Neil Cukier, "Global Telecom Rout," *The Red Herring*, February 1999, 60-64.

The research group TeleGeography analysed the global data network at length in 1998. Not only did most of the data originate from the United States; often, data flows between different countries, for example Germany and France, were channelled across the U.S. as well. One statistic was especially instructive: In Europe, no two nations were connected to each other through more than 700 mbps, whereas total bandwidth to the U.S. amounted to 4 gbps.[15] There were two related reasons for this. One was that the internet backbone network in most countries outside the United States was not centrally planned. Most internet service providers, noting that much of the flow was between their users and servers located in the United States, leased a network connection to the U.S.A. and did not bother with domestic connections. The few domestic or intra-European requests could be routed across the U.S.A. The second reason for the global hub function of the U.S.A. was that the network infrastructure within the States was excellent. New ventures such as Level 3, Qwest, IXC and Williams invested large sums in building a long-distance domestic data infrastructure which could be put to use for both corporate as well as consumer data networks (Pospischil, 1998, 747, 748).

The excellence of the domestic U.S. internet infrastructure was, in part, due to direct and indirect subsidies which promoted usage growth and acted as an incentive to investment. The internet backbone network was originally constructed as a research network connecting several universities scattered across the United States. This centrally planned and federally financed research network was the foundation for the later, privatised internet.

Even more influential for user demand and private infrastructure investment, however, was the indirect subsidy of the internet in the United States. This indirect subsidy began as an unintentional consequence of evolving regulation in the aftermath of the AT&T break-up and was later supported by the federal government in order to encourage growth of the internet. U.S. regulation historically dictated that local telephony service should be packaged with the connection fee. In much of the U.S.A., therefore, a flat fee was charged for unlimited local service. This local service was cross-subsidised through a charge on long-distance service, which represented about 40% of long-distance carrier's costs and was

[15] Kenneth Neil Cukier, "Global Telecom Rout," *The Red Herring*, February 1999, 61.

levied by local telecommunications carriers. This charge, however, did not apply to internet service providers.[16] The emerging commercial internet thus profited in two ways from this regulatory structure. Firstly, local access to an internet service provider was part of the flat local fee and thus appeared "free" to the user. Secondly, internet service providers did not have to contribute to the upkeep of this cross-subsidisation because they were a data and not a voice service. It could be argued that this regime effectively meant that long-distance telephony users subsidised internet use through their payments (see the excellent discussion by Pospischil, 1998, 750, 751). With the growth of internet use, this imbalance was bound to upset local telephony carriers. The FCC considered in April 1998 to amend this asymmetrical regime, but postponed a decision in this sensitive area (Pospischil, 1998, 752, 753). Throughout the 1990s, federal policy emphasised the protection of the emerging internet industry.

The dominance of U.S. networking infrastructure in the global system of flows is one example of how domestic policies "spill over" into the international realm. Very apparent were the advantages for companies that chose to host their international services from a location within the United States. From the dominant U.S. position in data networking followed some critical realities for both business and government. Start-ups from countries outside the U.S. adjusted to U.S. standards and usage patterns. The world market was the U.S. market. Attempts at international co-operation between governments would probably have failed without participation of the U.S. For this reason, U.S. policymakers could act in a strategic and pre-emptive way, blocking any possible international agreements which could be based on the strong, international and co-operative regulatory traditions in telecommunications.

[16] Rachelle Chong, "Controlling Tendencies," *The Red Herring*, January 1999, 116.

Intentional lack of regulation in other areas

> "...The Administration wants the internet to provide an open and stable environment with a minimum of government regulation for trade and commerce."[17]

> "For all the rhetoric of an internet free trade zone, will the United States readily accept an internet that includes Thai child pornographers, Albanian tele-doctors, Cayman Island tax dodgers, Monaco gambling, Nigerian blue sky schemes, Cuban mail-order catalogues? Or, for that matter, American violators of privacy, purveyors of junk E-mail or 'self-regulating' price-fixers? Unlikely. And that other countries will feel the same on matters they care about" (Eli Noam quoted in Magaziner, 1998, 534).

The international reach and pricing structure of the internet and other data networks would in itself have been sufficient to amount to a massive window of opportunity for small firms with global ambitions. It is possible to contend that the international manoeuvrability of firms was further increased by an intentional lack of regulation in other areas, this applies especially to the lack of international technical standard-setting through governments. But what appeared to some as a welcome recess from government intervention seemed to others an uncertain, volatile environment. And the debate needs to be clearly differentiated according to specific issues; in some areas, government intervention may seem more necessary than in others.

In this section it will be shown that, if it wanted to, the U.S. government could have, alone or in co-operation with partners, intervened and significantly have changed the course of development of the internet.[18] In various issues and in various multilateral and bilateral fora, however, U.S. government negotiators argued for a temporary "hands-off" stance. Laissez-faire was the cornerstone stance of U.S. policy towards the internet, heralded on the 1st of July 1997, when Bill Clinton and Al Gore released the "Framework for Global

[17] Testimony of John McPhee, Director, Office of Computers and Business Equipment, International Trade Administration, U.S. Department of Commerce, before the Senate Committee on Finance, United States Senate, July 16, 1998.

[18] In a thought-provoking article, Eric Helleiner described the many ways in which governments could co-operate to control monetary transactions in the age of the internet. Some of the examples he cited were the 1988 Basle Accord on capital adequacy standards as well as the OECD Financial Action Task Force (FATF), designed to combat international money laundering (Helleiner, 1998, 392).

Electronic Commerce."[19] The document contained the key foreign policy stance of the U.S. and was designed by Ira Magaziner, who was Senior Advisor to the President until November 1998.[20]

In May 1998, 132 WTO member countries signed a one-year moratorium on any form of internet tariffs.[21] U.S. negotiators claimed it would be difficult to retract on this concession and viewed this agreement as one of their greatest successes in 1998.[22] At that time, the easiest to implement form of tariff on internet transactions and services would been a "bit tax" on traffic volume. Luc Soete, Professor of International Economics at Maastricht University, was its most vocal advocate. As Chairman of the European Commission's High Level Group of Experts on Social and Societal Aspects of the Information Society (formed in 1995), he proposed that the idea of a "bit tax" should be further studied as a redistributive mechanism in a world moving from tangible to intangible goods and as a substitute for European VAT and U.S. state sales taxes. It was also suggested as a means of combating "information pollution" on the internet (Soete and Kamp, undated).[23] Soete's call for study was misunderstood as a policy recommendation and was quickly rejected by both the European Commission (EC, 1997-157, 19) as well as by Ira Magaziner, who took credit for preventing a "bit tax" from materialising. Nevertheless, the concept refuses to die, especially among those constituencies that stand to lose the most from eroding VAT and

[19] The "Framework" represented a departure from previous National Information Infrastructure policy. Announced on September 15, 1993, as "The National Information Infrastructure: Agenda for Action," this initiative emphasised a greater government role in promoting private sector investment via tax and regulatory policies as well as 'universal service' goals. Essentially, it was a domestically oriented document (Neuman, et al, 1997, 20-23).

[20] Magaziner was the key person in pushing the U.S. stance in international fora as well as the main contact for the U.S. internet industry, the "evangelist for the internet industry in a global marketplace." Jeri Clausing, "Magaziner, Head of U.S. Internet Policy, Plan to Resign," *New York Times*, Cybertimes, 06.11.98.

[21] In addition to this agreement, passed on May 1998 as a "Declaration on Global Electronic Commerce," 44 WTO members in March 1997 signed an agreement to eliminate tariffs on computer and telecommunications equipment trade from the year 2000 (Information Technology Agreement, ITA). This should boost U.S. exports and contribute to a growing data networking infrastructure throughout the world.

[22] According to an IDG News Service story from 29.05.98, "Magaziner outlines U.S. Internet policy, white paper expected soon," by Nancy Weil.

[23] One redistributive use that was recommended by the High Level Group was financing the European social security system. A detailed information archive on the "bit tax" issue can be found on the "Taxing cyberspace" home page of the Maastricht Economic Research Institute on Innovation and Technology (MERIT): http://meritbbs.unimaas.nl/cybertax/caybertax.html. On that site one can also access Soete and Kamp, undated.

sales taxes.[24] Jörg Tauss, a German parliament member from the Socialist Democratic Party, joked in an interview that one fourth of Bill Gates' wealth stems from unpaid German value-added taxes.[25] Serious studies of tax effects of internet transfers are thus far not known to the author, however. They would have to take into consideration the economic effects of greater cross-border trade including lower input prices of digital goods and services purchased and accessed over the internet.

Next to a "bit tax," other modes of imposing tariffs on international electronic transfers would also have been possible. Points of data flow concentration were not the only "bottleneck" points of government intervention. The international payments system also was a very promising target.[26] The majority of payments over the internet were carried out with credit cards, and credit card transactions were controlled by a limited number of players.[27] There were further examples of centralised financial "choke points." 95% of all international dollar transactions moved through a central clearing point, the CHIPS network in New York (set up in 1970). It is important to note, however, that the most potent financial control points were located in the United States and to a lesser degree the United Kingdom, giving policy makers in those countries greater power to intervene in worldwide financial flows. This was demonstrated when the U.S. threatened to cut off access to CHIPS to encourage international co-operation in combating money laundering initiatives (Helleiner, 1998, 394-396).

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[24] The size of internet-based transactions was significant already in 1998. That year, internet consumer sales amounted to $8 billion. In the United States, all but five states collect sales taxes, and they derive half their total revenue from them. John Simons, "States Chafe as Web Shoppers Ignore Sales Taxes" *The Wall Street Journal*, 26.01.1999. Many countries outside of the U.S. also fear loss of value added taxes. It was estimated that Germany forfeited about DM 5 billion alone in 1999 in lost VAT due to goods and services sold directly to German customers over the internet instead of from a German location. Ulrike Wirtz, "Steuerkick im Internet," *impulse Das Unternehmermagazin*, 3/99, 164-168, estimate p. 168.

[25] Meeting with Jörg Tauss, MdB, 25.03.99, Bundeshaus, Bonn.

[26] A further "strategic site" that Saskia Sassen identified was the digital production process, involving the multimedia industry. It was located in the world's largest cities and was very concentrated in terms of infrastructure, talent and buildings (Sassen, 1998, 178).

[27] Even if electronic cash as a more anonymous transaction form would have been popular in the 1990s- which it was not- it would been linked to institutions transparent to government, such as banks or other financial services corporations. The reason for this was that most consumers would have not trusted electronic cash distributed by organisations unknown to them. This argument regarding electronic cash can be found in Helleiner (1998, 400-403).

Most of the literature discussing internet policy issues today in the late 1990s argued that government intervention on the internet in any form would have been very difficult. Common statements ran like this: "The generic properties of the new networks render them inherently unfriendly to monopolies, hierarchies and centralised control" (from Neuman, et al, 1997, xvii). Examples such as Singapore are cited; governments are unable to control unwanted information flows into the country. What was often unmentioned was that Asian states such as Singapore or even China viewed the internet as a means of modernisation and access to a global electronic market. If they had wanted to reduce access massively they could have. In other countries, the internet naming system (Domain Name System, DNS) was used to impose payments on content or service firms who want to register themselves with a native address.[28] Japan was a prime example here; in order to qualify for a .jp-Address, companies had to have a business location within the island country and pay relatively high fees.

The most direct way governments could have intervened was by directly approaching key firms developing internet services or software. Both the U.S. and French governments, for example, negotiated with Netscape on the issue of encryption policy. Building on a very useful metaphor proposed by Peter Swire and Robert Litan, "elephants" were difficult to hide- even on the internet- whereas "mice" could easily escape government control (Swire and Litan, 1998, 200-204). An international start-up company with expectations to become a major, high-growth public company had to act like an "elephant" and not like a "mouse." The laissez-faire choice the U.S. government made and endorsed internationally could therefore not be fully explained with the impotence of governments in internet issues; rather, it was an intentional choice. As Magaziner remarked in an interview when asked to look into the future: "I think there are possibilities for establishing agreements for international tax standards" (Magaziner, 1998, 532).

The United States, however, argued that trade tariffs at an early stage would have inhibited the development of electronic commerce: "We... think there should be no discriminatory

[28] Mueller argues that national entities as Top level Domains (TLDs) such as .de for Germany provide national authorities with welcome points of control (Mueller, 1998, 103).

taxes on the internet, no bit taxes, no internet access taxes and no internet telephony taxes that would stifle the development of the medium" (Magaziner, 1998, 530). And, indeed, the non-imposition of tariffs was a benefit to firms selling goods and services over the internet. Mostly, these were American companies, however. It would be amusing to imagine a counter-factual scenario of U.S. trade policy within a reversed situation where most electronic commerce would have originated from Europe.

Regarding tariffs, U.S. negotiators maintained that they were acting in the interests of an emerging industry. This was consonant with U.S. policy on consumer protection issues. Here, U.S. federal officials endorsed self-regulation and technological solutions.[29] Self-regulation was the central policy concept of the White House; it was viewed as a natural means of governance for the internet. This was argued also by lobbying groups from the internet, hardware and software industries, as well as some non-profit associations that were associated with internet self-governance.

In an interview Ira Magaziner explained the U.S. stance in the following way:

> "As we discussed [industry self-regulation]... with others around the globe, governments that tend to be more regulatory by instinct, we tried to explain it as a matter of practicality rather than ideology. It's not that we don't care about privacy; we do care very much, but we think this is a more effective way to enforce it" (Magaziner, 1998, 529).

He continued:

> "Part of what we see as a paradigm shift in the Digital Age versus the Industrial Age is that, increasingly, government's role will be to empower people to protect themselves rather than having them rely on their government for protection" (Magaziner, 1998, 535).

However, just as it was unrealistic to believe that governments could not have enforced trade tariffs if they had wanted to, it was equally unrealistic to state that governments could

[29] One technological solution was the PICS rating system for content advocated by the private internet standards body World Wide Web Consortium (W3C).

not have acted directly to protect consumers on the internet from fraud or misuse of private data if they had wanted to. 68% of internet fraud, for example, occurred on popular and well-known internet auction sites such as eBay.[30] This was because the well-known internet brands were also what most consumers were attracted to and which they trusted. These firms were "elephants," not "mice." Self-regulation in the U.S.A. resulted in insufficient consumer protection on the internet, as U.S. trade authorities noted in an extensive survey of electronic commerce sites.[31] A spokesperson from a U.S. consumer group stated that "self-regulation has been a lot of smoke and mirrors."[32] The first annual report by the federal government admonished private industry that progress was required in self-regulation in 1999. The status quo at the end of the 1990s thus benefited firms and emerging internet business models, but not necessarily consumers. But also here, benefits for consumers in terms of lower prices especially of digitally accessible goods and services need to be taken into consideration. Most importantly, the long-term benefits for consumers from innovation in business processes catalysed by the new ventures should not be ignored.

U.S. negotiators extended the argument for self-regulation into the international arena whenever different types of key issues were raised. Thus, they opposed the imposition of what they called non-tariff barriers in three main areas: Cultural safeguards, digital signatures and privacy protection laws. In the cultural realm, the U.S. secured bilateral agreements with Japan and France in May and June 1998 that internet content should be exchanged openly and not be subject to cultural or language quota provisions of any sort (U.S. Government Working Group on Electronic Commerce, 1998, iv). The latter two areas, digital signatures and privacy protection, were more controversial, because they involved not only a means by which government could block imports but also promote exports. They also involved technical standards. U.S. negotiators were suspicious of all European attempts that aimed at standard setting, the general U.S. opinion being that: "Concerns about the American communications infrastructure are deepened by the realisation that extraordinary well-financed, co-ordinated plans for system enhancement are

[30] Louise Kehoe, "Microsoft and eBay in 'piracy' row," *Financial Times*, 26.02.99, 21.
[31] The report, dated June 1998 and titled "Privacy Online: A Report to Congress," can be accessed on the U.S. Federal Trade Commission web site http://www.ftc.gov/. According to the report, 85% of commercial sites collect personal information, but only 14% notify consumers of the company's data practices.

being undertaken in Europe and Asia" (Neuman, et al, 1997, 14-18). These types of fears were strongest in the 1980s and early 1990s, when U.S. economic ascent was not yet apparent. Nevertheless, they still lingered on in the 1990s and could be encountered in policy statements and academic literature.

Although fraught with internal contradictions,[33] a Europe-wide law for data protection was passed in 1995 and came into effect in October 1998. The main goal of the law was to remove significant differences within the European Union regarding data laws, which made it difficult to operate across borders. Although an issue apparently restricted to the internal market, the law also forbade the export of personal data into countries which had data protection laws that the European Union regarded as insufficient, including the United States.[34] In this way, the law threatened U.S.-based data centres, including those run by internet services, which contained information on citizens of European countries. As in other examples, the transnational nature of data networks operated to "export" essentially domestic laws into other countries. Again, U.S. negotiators viewed European data protection laws as "non-tariff" barriers and instead argued for self-regulation. In doing so, they elevated the goal of nurturing a new business sector over consumer privacy concerns.[35]

There were two major areas in which U.S. government principles were not in line with the overarching goal of encouraging entrepreneurship and innovation, however. These were legislation on encryption and intellectual property. In both areas, the emphasis on self-regulation was reduced and government intervention was advocated. To support domestic law enforcement efforts, the White House continually attempted to enact so-called "key-escrow" legislation. Key escrow legislation would have made it obligatory for companies

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[32] Jeri Clausing, "Internet Commerce Study Stresses Self-Regulation," *New York Times*, Cybertimes, 30.11.98.
[33] Especially when applied to client-server systems, intranets, extranets and laptops. The inconsistencies were pointed out in the timely book by Peter P. Swire and Robert E. Litan (1998, 58-75).
[34] United States data protection laws were not uniform. In some specific instances, for example, academic records and video rental facilities, it was very strict, in others, almost non-existent (Swire and Litan, 1998, 170-172; Noam, 1992, 398).
[35] One study commissioned by the industry privacy group TRUSTe tried to show that electronic commerce would double if web sites widely adopted privacy programs. This argument tried to support the contention that consumer protection would have been good for internet business. The conclusion was partially invalidated by another result from the same research, which showed that up to 40% consumers do not distinguish privacy from security issues.

offering encryption products to include a "back door" for policing efforts. Lobbying by industry and consumer privacy groups prevented federal government from progressing on the law's introduction (Magaziner, 1998, 532, 533; U.S. Government Working Group on Electronic Commerce, 1998, 22, 23). It was ironic that such a law, if passed, would have been regarded as a "non-tariff" trade barrier- just like European digital signature or personal data privacy legislation. Furthermore, non-U.S. politicians pointed out that U.S. government control over encryption keys in electronic commerce had the ability to enable U.S. industrial espionage activities on foreign firms.

A parallel and related issue to key-escrow was barriers preventing the export of strong encryption outside of the United States.[36] The export barriers were opposed by internet start-ups such as Netscape who would have liked to develop and export strong mass consumer encryption products. The export barriers allowed several non-U.S. companies, such as the German firm Brokat, to sell encryption products to the world-wide market.[37]

The U.S. policy emphasis on self-regulation was not applied in the area of intellectual property rights either. It was frequently argued that strong intellectual property rights encouraged innovation and investment by allowing companies to cash in on their achievements. Some researchers pointed out, however, that intellectual property protection could stifle innovation if it is too rigidly defined. Discouraging reverse engineering of software products, had the potential, for example, to limit the possibility for incremental innovation of existing products. The relationship between intellectual property and contract laws in the information age also was unresolved. Some argued that the ease of digital replication mandated an extension of contract law, i.e. previously non-licensable products such as information should be licensable. Others believed that this would inhibit innovation by further increasing possibilities for protection. In the United States, this debate was waged around the proposed model law Article 2B of the Uniform Commercial Code

[36] An update on export guidelines in 1998 enabled the export of encryption products in some areas and to some countries (U.S. Government Working Group on Electronic Commerce, 1998, 23).
[37] In a California state report, drafted by state and industry groups, addressed the issue is explicitly: "Therefore, while U.S. policies are not keeping strong encryption technology out of international markets, they are keeping out U.S. encryption technology" (Electronic Commerce Advisory Council, 1998, III-9).

(Samuelson, 1998, 809-826). The model law seemed to serve not only as a model for state legislation, but was also meant to inspire globally recognised commercial law rules.

The complex issues raised in the late 1990s have not been resolved and it is certain this political process – especially at an international level- will continue to unfold. In the meantime innovation and investment continue despite regulatory uncertainty.[38]

The issue of technological standards

> "The benefits of electronic commerce will only be achieved if interoperability is ensured at a global level. The European Community and its member states have consistently been committed to international standards, and expect its major trading partners to act likewise" (EC, 1997-157, 11).

The issue of technological standard-setting is a difficult one and it was a major issue of contention between the United States and the European Union.[39] The European Commission, as well as specific countries such as Germany, formulated policy "ensuring interoperability in a competitive environment" (EC, 1997-157, 5, 6), one example was the further support of standardisation projects.[40] This emphasis on standardisation as a policy tool dated back at least to the 1978 Nora-Minc report to the French president.

A good example was the issue of digital signatures. The digital signature was an encryption technology used to authenticate messages sent over a network. Using digital signature technology, for example, signed contracts could have been exchanged electronically. Widespread use of this technology would have been beneficial for diverse business-to-

[38] Most recently, for example, in the music industry in the case surrounding the venture capital-financed internet start-up Napster.

[39] U.S. negotiators viewed it as a major achievement that they were able to convert a world-wide conference in Brussels on standards "Building the Global Information Society for the 21st Century" in October 1997 into a business-dominated affair, although the original plans called for a forum directed by governments and international organisations (U.S. Government Working Group on Electronic Commerce, 1998, iv, 20).

[40] Despite its emphasis on interoperability throughout its central policy document "A European Initiative in Electronic Commerce," the possibility of de facto interoperability achieved through industry collaboration was recognised (a U.S. document would call this "self regulation"). But this not without pointing to the role of the European standards bodies CEN, CENELEC and ETSI. (EC, 1997-157, 10, 11).

business uses as well as government procurement initiatives. The emphasis, however, was on the word "widespread." As with any other network technology, digital signatures also are subject to network effects, meaning that the technology becomes more valuable and useful the more users put it to use.

Two different policy approaches were followed regarding digital signatures: Germany domestically introduced a legislative foundation for the use of digital signatures; the Clinton Administration heavily opposed any government intervention arguing that industry has to develop the technology further- although several U.S. states went ahead regardless and introduced their own digital signatures legislation in the late 1990s. German legislation only dictated procedures such as the setting up of "trust centres" which would distribute signature IDs. It also contained some technological remarks, pertaining to the use of smart-card hardware systems. At the time the law was introduced, German policy makers stressed the model character the law could have on EU and other supranational rule-making. At the time, the European Commission also supported a "necessary regulatory and institutional framework supporting such technologies," (EC, 1997-157, 13) and recommended that world-wide agreements on digital signatures" be adopted (EC, 1997-157, 18).[41] The result was an EU directive based on the German precursor. U.S. federal government seemed to fear any initiatives in the realm of digital signatures, especially those which were directed at introducing international standards. Despite the non-technological framework character of the German law it was understood as an international standard-setting initiative much like other technological standard-setting efforts.[42]

This was not the first time U.S. policy has been suspicious of international technological standard-setting initiatives. The role of standards as a tool for competition policy was

[41] The Commission from the mid 1990s began to move towards a more U.S.-style self-regulatory approach (see EC, 1998-586, 3).
[42] "The United States believes it is not wise at this time to attempt to identify a single model that these transactions will use or to develop a legal environment using a single model. Indeed, such an approach would prevent the market from testing different possible approaches and prematurely impose a particular model on all electronic commerce, inevitably limiting its growth... A few governments... are establishing detailed rules for electronic authentication which the United States considers to be premature, burdensome, or unnecessary" (U.S. Government Working Group on Electronic Commerce, 1998, 14, 15).

described in the following words by American telecommunications specialist Alfred Thimm:

> "National governments have employed various aspects of industrial policies to help their national telematics champions obtain the global market share necessary for survival. In this context international telecommunications standards have not only become a device to assure network interconnection, compatibility and interoperability but a complex policy system to attain strategic enterprise objectives" (Thimm, 1992, 221).

For example, in the early 1980s, the U.S. held the view that it was too early to implement an international standard for videotex systems.[43] The debate surrounding ISDN and the international CCITT-ISO standard was similar; only AT&T expressed its support.[44] The U.S. Department of Commerce officials viewed all European standard-setting initiatives and the telecommunication monopolies that proposed them, especially the German Post and Telephone Administration as "mercantilistic enemies of free trade," according to Thimm (1992, 225).

In these two instances, however, U.S. worries were misplaced and the international standards initiatives failed to achieve the business breakthrough its advocates from the telecommunications industry expected.[45] Digital signatures did not achieve the level of

[43] A videotex standard was promoted through the international standards body Consultative Committee on International Telephone and Telegraph (CCITT). It was supported by European and Canadian telecommunications carriers as well as AT&T, but not by the U.S. computer industry (Noam, 1992, 382, 383).
[44] Again, European telecommunications companies accepted an open, international standard for digital networking as an alternative to private standards used by the computer industry. Firm European standards for ISDN were established by the European Telecommunications Standards Institute (ETSI) in July 1990. The international standard forwarded by the Consultative Committee for International Telephony, Telegraph-International Standards Organisation (CCITT-ISO) was used as a basis for the European standard. Contemporary analysts, such as Thimm (1992), praised European policy on ISDN standards and the resulting uniform telecommunications landscape in contrast to heterogeneous U.S. implementations. Already then, however, Thimm warned that "The rate of technological innovations, however, has made the ISDN copper cable 64 kbits networks obsolete almost before they will have become operational" (Thimm, 1992, 192-204, quote p. 193, AT&T note p. 226). And: "...The PTTs, especially the DBP, emphasised investments in ISDN network transmission systems and switches, and failed to encourage the equipment manufacturer to develop attractively priced business or residential terminal ISDN equipment until the physical network was almost completed." Thimm calls ISDN an "engineering-driven innovation" and mobile telephony a "market-driven innovation" (Thimm, 1992, 235-236, quote p. 236). Compare to Noam, 1992, 360-368.
[45] On a domestic level, however, ISDN was a platform that was used to justify massive modernisation investments on the part of the German PTO and Siemens. It can also be linked to the efforts of the German Bundespost to introduce usage-based pricing for data lines (Noam, 1992, 355, see discussion 360-368). The

importance in facilitating electronic commerce its proponents had supposed. In another case, however, European standard-setting was highly successful in an economic sense. This is the oft-cited example of the European digital mobile telephony standard GSM (Général système mobile). GSM created a unified, European mobile telephony space and contributed to the success of European players Nokia and Ericsson on the world market. GSM was a typical, European-type standard which closely defined technological specifications. Thimm has described it thus: "A tightly written book of technical specifications the size of a medium city's telephone book" (Thimm, 1992, 102). Two UK network operators, Vodaphone and Cellnet, adopted the standard even before it was fully approved by the newly founded European Technical Standards Institute (ETSI) and launched GSM services in 1992 (Thimm, 1992, 172). The recent history of GSM has served as a justification for standard-setting policy in other areas. German businesses were very competitive when it comes to encryption and digital signatures and a successful international agreement at this time would support their export activities- thus German policy-makers argued.[46]

But the discussion surrounding technical standards culminated in the final years of the 1990s in the debate surrounding the next generation mobile telephony standard, UMTS. Given the success of GSM, the United States felt that this time it needed to participate in the definition of a world-wide standard. The agreement between the major telecommunication equipment vendors surrounding UMTS was heralded as a victory for European telecommunications. The delays required in bringing about this standard were, however, detrimental to start-ups in Europe which wanted to introduce innovative new services based on next generation packet-based mobile telephony. The Japanese operator DoCoMo, on the other hand, did not wait for UMTS to materialise, and introduced its own standard, "i-mode," early.

ISDN roll-out did provide national market opportunities for some German family-owned enterprises such as Hagenuck and ANT (Thimm, 1992, p. 232, 233).

[46] In Germany, at least four different start-ups were competing in this space: Brokat Infosystems, Utimaco, Netlife and Me-Technology. Brokat and Me-Technology announced a merger in March 1999 ("Die Softwareanbieter Brokat und Me-Technology fusionieren," *Frankfurter Allgemeine Zeitung*, 18.03.99, 23). Already in the late 1990s, Germany had a 15-year tradition in online banking and businesses had managed to gather substantial experience in the related technological issues: secure transactions, encryption and authentication.

The European approach is deeply influenced by traditions from the telecommunications world and can be labelled "engineer-driven." The policy on UMTS is but the most recent example in a history of public standard-setting digital signatures, ISDN and GSM. PTOs have used standard-setting as a means to introduce greater flexibility in their purchasing decisions and thereby reduce their dependence upon equipment suppliers- which would have more to gain by implementing proprietary standards. The same conflict existed in the internet world; open standards were advocated by service firms that demanded interconnecting software and hardware. Despite their touting of open standards in the age of the internet and their desire to gain more users through interoperability, firms that were overwhelmingly software-based still viewed proprietary standards as the "breadwinners of last resort."[47] In their perceptive commentary on recent software business models, Michael Borrus and John Zysman introduced the concept "open but owned." "Open but owned" systems were open systems meant to be interconnected while their core functionality remained proprietary (Borrus and Zysman, 1997, 151). "Market-driven" U.S. policymaking sided with the software industry and denounces international standard-setting initiatives as premature and elements of European industrial policy. Arguably, the U.S. approach amounted to industrial policy as well. The "hidden agenda" to U.S. negotiation is to delay rule-making while the dominant players in the internet field, mostly U.S. firms, established themselves and their "open but owned" standards. The benefits of "engineer-driven" or "market-driven" technological standards are not clear-cut, and vary according to the specific historical moment.

The debate on small firm innovation and regulation

In their recent book on privacy and data protection, Swire and Litan briefly summarised the debate on innovation and regulation. On the one hand, the existence of rules and regulations seem to dampen innovation especially on the part of small start-up companies. Start-ups

[47] Sun's strategy with Java software is instructive here (see: Luc Hatlestad, "Briefing Java," *The Red Herring*, June 1998, 84-140). See also Saskia Sassen's insightful discussion on standard setting and business objectives in the age of the internet: "The issue today, it seems, is once again to set standards, and to do this by providing

focus on change and often do not have in-house legal resources to direct at legislation. On the other hand, it is argued, for example, that lack of data protection has not benefited firms because privacy concerns have prevented more consumers from using the internet. The authors conclude that privacy protection rules would have a beneficial impact on the development of the internet over time, but the lack of rules on an international level has not had much of an impact on rapid, pioneer growth. Thus far, user growth has been strong and most users seem to be more concerned about security than about privacy issues (Swire and Litan, 1998, 76-89).

Start-up firms frequently do not have the necessary legal resources required for competition in environments with significant regulation. This was confirmed by the experience of internet companies which were addressing divergent legislation in different European countries.[48] The same problem existed in the United States as well, as the country has 30,000 tax jurisdictions.[49] As a result, specific national laws of other countries on the whole were being ignored by internationalising internet start-ups, and this even applied to firms operating in subnational entities when faced by considerable regulatory and taxation differences within a country (as is the case within the United States). Start-ups were concerned that their disregard for national and state laws would one day be used against them – but it was impossible to take into consideration every myriad country law a global service might have infringed upon.[50]

Ambiguity on issues such as the taxation of cross-border sales as well as in trademark protection, consumer protection or commercial codes will, over time, hurt companies as they and the markets they operate in become more mature. It is important to note that there

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the software for free, eventually, to control access and browsing standards and thus be able to charge" (Sassen, 1998, 185-188).

[48] A survey undertaken within the European Commission in which 80 responses by internet firms were studied revealed that legal costs for cross-Europe services already were considerable in the late 1990s. One figure cited was DM 70.000/ year (EC, 1998-586, 8,9). In the study of German internet start-ups presented in subsequent chapters, 77% of selected firms called for internationally harmonised laws and controls (Appendix B, Main Survey Results, Table 30).

[49] John Simons, "States Chafe as Web Shoppers Ignore Sales Taxes," *The Wall Street Journal*, 26.01.1999.

[50] Research in the field of management studies and entepreneurialism has shown that internationally oriented start-up companies are very concerned about regulation. The research is inconclusive, however, in establishing

is an essential difference between international business-to-business electronic transactions, which existed for a long time and have reached stages of maturity, and business-to-consumer transactions, which raise new, unresolved issues when they are conduced electronically across borders.

Internationally operating rules or a correspondence of national rules will be necessary over time. Parts of an international rules framework are already in place. The WTO Agreement on Trade-Related Intellectual Property Rights (TRIPS) seeks to protect copyrights through an international dispute settlement mechanism. The WTO General Agreement on Trade and Services (GATS) has- at an early date- addressed some of the unique issues arising from the electronic trade of services, including the division of services into four "modes" of supply, one of which includes electronic cross-border transmission (previously, services were considered non-tradable).[51] The WTO Declaration on Global Electronic Commerce, which was announced at the May 1998 Ministerial Conference, included a one-year customs duty moratorium on internet transactions and was complemented by the mandated formation of a WTO work programme to study electronic commerce policy. The goal of the work programme was to "confirm the rules on electronic commerce that already exist in the WTO [such as TRIPS and GATS]- to avoid undermining existing rights and obligations by treating electronic commerce as if it were outside the normal trade regime." A further intention was to "identify any weaknesses in the existing legal structures that need to strengthened or clarified."[52]

In addition to the WTO, the issues surrounding electronic commerce attracted the formation of committees and work groups in a wide array of different international organisations at a very early stage. Within the OECD, a "neutral, fair and simple" framework for electronic

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whether internationalisation occurs in a quest to actively seek out areas with the least amount of regulation or whether the regulation problem simply increases when firms internationalise (McDougall, 1989, 388, 398).

[51] Services transmitted transnationaly across data networks are labelled as "cross-border services" and are defined in the following way: "Services supplied from the territory of one member to the territory of another" (Altinger and Enders, 1996, 307, 308). Jagdish Bhagwati pointed out already in 1984 that in extending GATT to services, the "disembodiment" of services through technologies should be taken into consideration (Bhagwati, 1984). For a discussion of trade in services and the WTO see Feketekuty, 1998.

[52] See "A Borderless World," a speech by Renato Ruggiero, Director-General, World Trade Organization, to the OECD Ministerial Conference, Ottawa, 7. October 1998. Other speeches by Ruggerio are relevant as well and can be accessed over the WTO web site.

taxation was worded on, similar issues were being discussed in the Asia-Pacific Economic Cooperation (APEC) forum and within the Free Trade Area of the Americas (FTAA). A government-private sector Committee of Experts on Electronic Commerce has also been established. A G-10 "Working Party on Electronic Money" has been established. The Basle Committee on Banking Supervision issued a "Risk Management for Electronic Banking and Electronic Money Activities" report in March 20, 1998 which outlined key issues relating electronic money and financial services technologies for banking supervisors. Already in 1996, the United Nations Commission on International Trade Law (UNCITRAL) developed a "Model law on Electronic Commerce" which suggested some guidelines for migrating from paper to digital contracts. In 1997, UNICTRAL proposed to examine the issue of uniform rules on digital signatures.[53] Finally, further international treaties relating to intellectual property protection and electronic transmission were forwarded through the World Intellectual Property Organisation (WIPO).[54]

However, neither the existing framework nor some of the newer initiatives effectively address some of the more subtle, yet profound challenges that global electronic commerce poses for the first time. A good example of some of these issues is trademark law and the internet domain name system (DNS). It is clear here that the trademark system, which has thus far operated territorially, is ill-equipped for an aterritorial system such as the internet. US attempts to solve the problem on an international scale have been highly controversial. One central question always recurs: "Who supervises what?" This question relates to a wide range of issues such as taxation and consumer protection. The difficulties of addressing the questions raised by electronic commerce on an international level become clear when one examines the attempts by the European Commission in building a coherent legal framework in Europe by the year 2000 (EC, 1998-586). It achieved some of its objectives. For example, the European Commission instituted a country of origin principle in determining jurisdiction (EC, 1998-586, 13, 14). In the United States, the opposite stance was taken in targeting the jurisdiction of destination (Magaziner, 1998, 531; The Electronic Commerce Advisory Council, 1998, B-1).

[53] "Planning of Future Work on E-Commerce: Digital Signatures, Certification Authorities and Related Legal Issues," from February 1997.

The tasks ahead are complex. The issue here is the creation of a efficient and fair worldwide market mechanism, including consumer protection, for goods and services exchanged over the internet. This market mechanism would replace the currently operational myriad domestic markets. There are *two* possible ways through which rules could internationally converge. International co-operative agreement is only *one* of these. Competition and the convergence of national, unilateral policy-making can have definite cross-border cumulative effects as well. The subsequent section will discuss how the latter process has already set in. The history of national policy convergence in the financial services and telecommunications, even environmental regulation, is instructive.

International policy convergence: The lesson from financial services

The lack of specific, international laws in the electronic commerce area could be contrasted to the considerable array of domestic laws that affect electronic commerce. In theory, a firm exporting its services through a global network needed to be concerned about legislation in every country in which it may have a client. Especially in the consumer area, would have been a very difficult task- as pointed out in the previous section. Considerable legal costs would have to be borne in order to operate in several countries at once. It is in this instance that the global logic of the internet seemed at first glance to make national lawmaking redundant at best and obstructive at worst. Writing about the privacy protection rules of the European Union, Swire and Litan concluded that enforcing the rules unilaterally in Europe would have required severe enforcement efforts:

> "If, however, the Directive is primarily hortatory,... crash efforts to comply will seem expensive and unnecessary. Many businesspersons have expressed the view that 'they just can't do that'- the European Union will simply not be willing or able to enforce the directive as written" (Swire and Litan, 1998, 156).

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[54] The "WIPO Copyright Treaty" and the "WIPO Performances and Phonograms Treaty" of December 1996.

The overall effect of the U.S. negotiation stance endorsing non-intervention and self-regulation was that firms could proceed with international expansion and a development of their innovative online business models without being obstructed by globally co-ordinated policy efforts. U.S. policy was mainly pre-emptive and tactical. It was designed to prevent co-ordinated supranational efforts that could have seriously harmed international electronic commerce development of U.S. firms- at the time.

While the 'mice' were perhaps unconcerned, the 'elephants' were worried. Those firms that did worry about legislation in the late 1990s were significant ventures which were establishing foreign subsidiaries in the main electronic commerce markets. Some American internet companies based in Germany, for example Yahoo!, were at pains to adhere to local data protection laws. Before they were removed early in 1999, French laws prohibiting the use of encryption were a major block to the development of online business models in France. The export barriers on encryption technologies had a similar impact on internet firms based in the United States.

It is obvious that, in some cases, it is advantageous to operate from a location with the least domestic legislative burdens. A tendency for countries to compete for entrepreneurs could, therefore, lead to a so-called "race to the bottom." This has been called the "Delaware effect" after the U.S. state that adopted relatively lax incorporation laws. It is the "Delaware Effect" which the European Commission wanted to avoid by initiating its harmonisation project targeting electronic commerce-relevant laws in Europe. But there are also well-documented cases in which local policy-makers adopted the laws of a strict legislative entity. One of the cases is environmental standards on automotive emissions. It made sense for multinational automotive manufacturers to adhere to the toughest local laws for reasons of corporate image and uniformity on production. The toughest laws were found in California. The state had a broad impact on laws in other states and countries. David Vogel, studying the worldwide impact of Californian emission regulation has termed this the "California Effect" (Vogel, David, 1995).

The lessons from the worldwide financial services industry are very important in this discussion. They show that industries that are intensely globally connected do not necessarily tend to "race to the bottom." Instead of the "Delaware Effect," the "California Effect" in many cases more aptly describes regulatory trends in financial services. The basic argument runs thus: The more globally interconnected an industry becomes, the more important it becomes to establish rigid business standards and transparent, codified rules. This spells an end to the "cosy clubs" of the past (Cerny, 1996, 92). In an article on regulatory competition, Henry Laurence describes how financial services players themselves proposed to be regulated more strictly for two reasons: They wanted to enter foreign markets which they wanted to be as transparent as their own and they wanted foreign, mobile investors to have confidence in their own services (Laurence, 1996). Within a very short amount of time, both Britain and Japan- joined later by Germany- enacted strict rules devised to prevent insider trading. In Germany, bankers were very aware of the fact that transparency would be the price for participation in the global game (Lütz, 1996, 10). Another author discussing financial sector reform, Andrew Sobel, uses the term "inside-out" to explain change initiated by domestic groups which strategically use international pressures to overcome domestic opposition (Sobel, 1994, 1-20). This is not the place to discuss the considerable differences approaches and conclusions of the aforementioned authors (Sobel emphasises domestic actors, Laurence focuses on the role of mobile consumers of financial services), but they all describe how domestic shifts can lead to an overall, world-wide policy convergence and more transparent, codified systems, without the involvement of internationally co-ordinated public policy initiatives.

Researching the telecommunications industry, Steven Vogel has arrived at a comparable conclusion in his book *Freer Markets, More Rules*: "Hence we have wound up with freer markets and *more* rules. In fact, there is even a logical link: liberalisation requires reregulation" (Vogel, Steven, 1996, 3, author's italics). The European telecommunications industry has moved from informal, opaque regulation to a more transparent, rules-based regime. Deregulation of telecommunications has gone hand in hand with the establishment of new regulatory agencies. This is an American model that was adopted first in the UK in 1984 in the guise of OFTEL. Again, a global logic of international convergence of regulatory regimes seems to be at work, the common explanation being that global market players demand transparency and similar market conditions in the different countries they operate in. In an important essay, Eli Noam asks if instability in the form of either regulation or liberalisation in an interconnected system does not work globally like a contagious process (Noam, 1994). Echoing the roles taken by the London Stock Exchange and by Japanese banks, Siemens itself was instrumental in tearing down the "court supplier" system it has most befitted from historically (Humphreys and Simpson, 1996, 114).

In studying the "California Effect," however, David Vogel hastens to point out that one of the main reasons why California's strict standards triumphed was that its automobile market was substantial; it was especially important for German exporters, who had a major influence on the EU (Vogel, David, 1995, 261-263, 268-270). It comes as no surprise, therefore, that, according to some researchers, global convergence in different industries is leading not only to greater transparency and more formal rules, but also to specific types of governmental roles which most closely approximate the current U.S. approach.[55] A further example is the increasingly important role competition policy plays in the European Union, a role again foreshadowed by competition policy in the U.S.A.[56] In his essay, "The Rise of the Regulatory State in Europe," Giandomenico Majone summarises this trend:

> "In sum, neither privatisation nor deregulation have meant a return to laissez-faire or an end to all regulation... Thus neither American deregulations nor European privatisations can be interpreted as a retreat of the state, but rather as a redefinition of functions. What is observed in practice is a redrawing of the borders of the public sphere in a way that excludes certain fields better left to private activity, while at the same time strengthening and even expanding the state's regulatory capacity in other fields like competition or environmental and consumer protection" (Majone, 1998, 195).

[55] But even U.S. policy has been attracted to "ill-advised attempt[s] to micromanage" (Neuman et al), one example was the U.S. Telecommunications Act of 1996 with its "100 pages of detailed legal mandates" and "90 bureaucratic inquiries" (Neuman et al, 1997, xiv). Another example, possibly, is intellectual property protection.

[56] Anyone discussing the hands-off policy U.S. federal government adopted to promote the growth of the nascent internet industry must also mention how it simultaneously has acted to curtail the powers of firms that have achieved considerable size and influence, Microsoft and Intel. In both the hands-off approach as well as the anti-trust action, the US government arguably acted to protect start-up interests.

Despite policy convergence and the trend towards independent regulatory agencies and an emphasis on competition policy, the permanent differences between the United States and Europe are worth emphasising. One of the primary differences that remain despite some movement towards each other is in the area of technological standard-setting. From about 1998 there have been indications that on the level of the European Commission, on the one hand, a convergence in legislative approaches with the U.S. approach favouring industry-led interoperatability initiatives is occurring.[57] In the United States on the other hand, there seems to be the realisation that government can have a limited role in standard setting together with industry; the definition of the UMTS standard is the example here.

Conclusion

Global data networks- both the consumer internet and corporate internet-based data networks- are today remarkable in two ways. First, they are distance insensitive. Second, they embrace internet standards as world-wide standards. Both the "Death of Distance" as well as the world-wide adoption of internet standards provide especially start-ups with unique opportunities. This chapter was dedicated to describing how distance insensitivity was not just related to much-touted technological aspects of the internet and the unique co-operative peering arrangements that characterised it throughout much of the 1990s, but also government regulation. Government regulation was asymmetrical; the internet enjoyed a favoured position outside international telecommunications arrangements. Regulatory asymmetry was a critical factor without which demand for worldwide standards and data services cannot be properly explained.

The notion of global networks should not be misunderstood, however. To a large extent, the world-wide network was the U.S. network. The United States was the world's network hub.

[57] A communication by the European Commission emphasised "a light, enabling and flexible approach" and self-regulation (EC, 1998-586, 3). The "U.S.-EU Joint Statement on Electronic Commerce" released in the U.S.-European Union Summit in Washington on 05.12.97 stated: "That industry self-regulation is important. Within the legal framework set by government, public interest objectives can, as appropriate, be served by international or mutually compatible codes of conduct, model contracts, guidelines, etcetera, agreed upon between industry and other private sector bodies" (see http://www.useu.be/).

It also was the location where the most value was added to network services, were the majority of electronic commerce services and data centres were hosted. And the majority of internet users and consumers were located there. This was a result of many factors, but prominent among those was domestic telecommunications deregulation, which privileged internet services and thus encouraged network investment and use. Politically, the network topography of the U.S. also put the Clinton Administration in a privileged position in international electronic commerce framework negotiations.

In contrast to distance insensitivity, government intervention was not a factor in establishing the internet as a world-wide network standard. One of the main objectives of the Clinton Administration was to keep the development of internet standards "market driven." The critical role of standards was obvious to all policy-makers involved in international negotiations. Without a minimum degree of international interoperability, the world-wide network would fragment into different isolated parts. A global network exists only as long as there are global networking standards.

Standards can range from minimum-level basic networking protocols to complex "digital signature" systems, which establish authenticity. The latter include both technological specifications as well as organisational arrangements. In the previous chapter, the point was made that global demand, generated by businesses as well as consumers, led to the widespread use of internet standards in both corporate and consumer networks. Corporate users sought independence from software companies such as IBM and abandoned "company-only" standards. This led to the rise of "intranets" and "extranets." Consumers forced change upon traditional proprietary online services such as AOL and Microsoft Network and on "country-only" online services such as Germany's BTX or France's Minitel. Today, it seems that the internet will remain open, benefiting users and those small firms developing services for the internet. Nevertheless, the balance that existed regarding internet standards during the late 1990s was precarious; the largest software companies tried vigorously to introduce proprietary elements. *The standards balance was actually being propped up by a massive 'investment bubble,' which sped up development of open systems, privileging users over company revenue generation.* Without the 'bubble,' internet commercialisation would have taken a far more proprietary course. And the openness of the system in more general terms still now could be reversed, as one scholar has argued (Lessig, 1999).

The 'window of opportunity' created by distance insensitivity and demand-driven world-wide standards needs to be put into perspective, however. Local laws and politics did matter as well, affecting the extent to which small firms could take advantage of the "window." Although start-up firms largely ignored the domestic legal and taxation frameworks of the numerous countries they were "exporting" their services into, they were affected by the laws of the country they operated in. And the legal framework was only one aspect among many influencing the domestic conditions for entrepreneurship which also included local internet usage patterns, the effects of telecommunications deregulation, investment patterns, partnership opportunities and the quality of staff and managers. National governments played prominent roles in influencing many of these factors. In fact, the role of U.S. government in developing a global marketplace by promoting internet technologies domestically was just discussed in this chapter. As a result, the U.S. electronic commerce market was the global market.

In non-U.S. countries, government policy acted to "refract" the opportunities posed by global networks, causing small firms to develop along unique, national trajectories. The effects of government actions are explored in the subsequent chapters, which focus on the German case. Yet, the degree of "refraction" may be decreasing as governments outside of the US have become aware of the determinants which were linked to the success of new internet ventures. Although major differences in policy approaches persist (main examples are standard-setting initiatives and SME policy), policy competition has already lead to policy convergence. The world-wide harmonisation effects of unilateral, domestic efforts in areas of strong international flows have already been observed in the case of the reform of financial markets and telecommunications. There are few alternatives to convergence if flows are to remain global. In the longer term, convergence caused by competition will be combined with some form of international policy co-ordination as the electronic commerce market matures.

Policy convergence does, however, raise new questions, which will be explored in the next chapters. One of these questions is the distinct timing of policy convergence in different countries. Policy convergence often does not happen simultaneously in different countries. Even in moments of simultaneous convergence, the involved institutions can remain distinct. This has been demonstrated by Mark Thatcher using the example of telecommunications policy in France and the United Kingdom (1999). For these reasons, it seems crucial to study the timing of policy convergence and the institutional landscape in detail, i.e. the specific, national pattern of policy convergence. One of the main objectives of such an effort would be to understand the economic effects of such specific patterns of convergence. In this study, dedicated to policy convergence in the internet era, the specific economic effect studied is the impact of entrepreneurial innovation. If the internet did represent a global innovation opportunity in a Schumpeterian sense, policy convergence may simply have come too late in some countries to be of help to ventures addressing this unique opportunity. To arrive at answers, a detailed country-level examination seems to be necessary; this is offered in the subsequent Part Two of the study.

Part II – National Political Economy

Chapter Four

Policy Shifts and Political Compromise in the Kohl Era

The division of this thesis into two parts, the first international and the second national, is deceiving. The objective of the first part was to show in what ways the two realms have been fused into one. Formerly separate marketspaces have become enmeshed by technology to such an extent that domestic agents such as small firms could become 'instant internationalisers.' But it is also the objective of this thesis to discuss ways in which the international and the national remain distinct despite the opportunities presented by the internet, thus the division of the thesis into two parts. To show distinctiveness, we will depart from the world-wide perspective and zoom into one geographic segment of the global network: The German economy.

As outlined in the Introduction, Germany is interesting because of the apparent reversal of entrepreneurial dynamism towards the end of the 1990s. While small German firms have been at home in the world market for decades, the economy seemed to have become rigid and unentrepreneurial in recent times. In terms of telecommunications policy, Germany embarked much more slowly on liberalisation than the first tier reformers, USA, UK and Japan and Scandinavia. Enterprises in the IT industry were regarded as domestic adopters and not global leaders, with the exception of a single company, SAP. This seemed to suddenly have changed in the last years of the 1990s, as numerous internet ventures were founded and listed on the stock exchange.

To understand how the national economy is both part of and yet distinct from the international network economy, the concept of "refraction" was discussed in the first chapter. Why not just use the term "distortion" used by neo-classical economists for decades? Whereas "distortion" is negative, "refraction" is a neutral term, a term that emphasises that government policy may have positive as well as negative effects. Another quality of the term "refraction" is that it emphasises the fact that government policy is not simply a one-way effect on firms. “Refraction” is not a direct relationship, instead, it is distributed. It is the combined result of the activity of several different players embedded in an institutionally conditioned domestic environment.

In this case study on Germany, which together with a comparative chapter makes up the second part of the thesis, the effect of "refraction" on internationally oriented start-ups will be examined in depth. To do this, the roles of three different types of actors need to be discussed: National government, the incumbent national telecommunications operator and new ventures. This chapter focuses on relevant national government policy but is sensitive to how different types of firms participate in the policy-making process. Most instructive is the policy relationship between government and the dominant national telecommunications operator. This chapter and the next will focus on this relationship and examine it from the perspective first of government and then of the operator. In both chapters, the involvement of the small players, the start-up firms themselves, will be analysed as well. For example, in Germany, their voice was less influential in the formulation of telecommunications policy than in the government scheme promoting venture capital. In the end, an integrated picture can be presented in which interconnections between the actors are emphasised. To start, however, the focus is on policy-making on a national level. Two specific policy arenas were especially relevant for internet start-ups: Telecommunications liberalisation and technology policy. Technology policy included programs supporting venture capital.

Policy changes in both arenas were initiated during the Kohl era. The ruling coalition from 1982 to 1998 consisted of the conservative people's parties CDU and CSU as well as the liberals, the FDP. When they assumed power, this constellation emphasised that they stood for change, a "Wende." In both policy arenas discussed here, policy shifts actually took place. In telecommunications liberalisation, the outcome was influenced by political compromise.

In the first part of the thesis, the choices made in the U.S.A. regarding telecommunications liberalisation were described. These choices had an impact on the pricing of internet access for consumers and firms. This was because, during the commercialisation of the internet, basic telecommunication services still provided the main access route to the internet. Since the liberalisation of basic telecommunications followed different paths in different countries, the impact of liberalisation cannot be generalised and equated to the U.S. experience. In the 1980s, when liberalisation of basic services was underway in the U.S.A., the UK, Japan and the Scandinavian countries, German policy-makers generally thought this step to be unnecessary. The focus was on global competition in telecommunications equipment, mobile telephony and value-added services; these were the primary candidates for liberalisation. Only some policy makers and advisors saw the importance of basic services competition in sparking consumer and firm uptake of "information society" services.[1] The backers of full liberalisation gained ground only in the 1990s, after a more than a decade of CDU-led government. And, although liberalisation of basic services was decided upon in 1996, the results of corporatist policy compromise as well as the specific liberalisation schedule contributed to a continuing regime of high and metered internet access prices well into 1999.

Whereas German economic policy makers were laggards regarding basic telecommunications liberalisation, they were among the first in the world on the level of national government to institute new framework legislation for the "information society." Already 1997, a so-called "Multimedia Law" was designed by the Ministry of Research and Technology (BMFT, actually the BMBF)[2] and passed by parliament. The law enshrined a basic stance towards "information society" issues, which was held by the BMFT as well as the Ministry of Economics (BMWi) in the Kohl era. The "Multimedia Law" pre-empted policy by the Interior Ministry and the federal states ("Länder") which both for different reasons were regarded as potentially able to stifle the development of the "information society" in Germany. Although it was developed in consultation with individual start-ups in

[1] One of these was Wernhard Möschel, who fittingly described Germany's first step towards telecommunication liberalisation in the late 1980s as "nibbling on the edge of a monopoly," ("Knabbern am Rande eines Monopols"). Quoted by Susanne Schmidt in her footnote 35 (1991, 216). Möschel is a professor of economic law and a member of the liberal Kronberger Kreis. (Lehmbruch, 1992, 38).

[2] Depending on the emphasis of the ruling coalition, the focus of the Ministry of Research and Technology (BMFT) has changed. Under Kohl, the scope of the Ministry was extended and it was called the "Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie" (BMBF) the "Federal Ministry for Education, Science, Research and Technology." Journalists usually referred to it simply as the "Future Ministry." To avoid confusion, the old term will be used here and the ministry will be consistently called the Ministry of Research and Technology (BMFT).

multimedia and internet fields, the law was a state-led initiative, the objectives of which had been defined by policy-makers and reflected their perceptions of the needs of entrepreneurs.

For well over thirty years, the German federal government has sought to close the "technology gap" between Germany and the U.S.A.[3] From the beginning, policy-makers had sensed that their dual approach to "catching up" was insufficient. This approach consisted of combining industrial policy focused on subsidising research and development in a few privileged electrotechnical firms with a broad, "diffusion-oriented" programme emphasising technological uptake of the SME sector. What was missing was specific policy targeting young, high-growth technology companies. U.S. leadership in IT and biotechnology was clearly attributable to young companies. To emulate this development at home and enable the formation of innovative start-ups, German policy-makers experimented with different types of programmes from the late 1970s. By 1989, the Ministry of Research and Technology had veered away from credits and subsidies in this area and launched two successful schemes promoting private venture capital investments. The best known of these was developed in close consultation with individual entrepreneurs; here, however, in a formal, specialist forum supported by the work of the independent Fraunhofer research institutes.[4] It was carried out by a public/ private body, the Technologie-Beteiligungs-Gesellschaft (tbg) of the German Equalisation Bank (Deutsche Ausgleichsbank, DtA), an institution founded in 1950 and very firmly rooted in the German tradition of promoting SMEs.

Before looking at these three policy areas individually, however, the chapter will begin by discussing the status quo in Germany towards the end of the 20th century, in terms of its economy and its policy-making approach and institutions. An important issue is to what extent the German policy community was dependent on corporatist compromise in the Kohl era. When attempting to roll back the state in telecommunications the ruling coalition could

[3] Peter Humphreys has described how the "technology gap" was thematised by the ruling Social Democrats in the early 1970s, leading, among other things, to the founding of the Ministry of Research and Technology (BMFT) in 1972. Furthermore, the first commission was put together at this time to examine the "expansion of the technical communication system," the KtK (Humphreys, 1988, 187-189).

only overcome institutional barriers to change through a corporatist compromise. This had a detrimental effect on the opportunities for internet ventures in Germany.

The German economy: Impact of unification and social programs

Key policy decisions which have had an effect on internet entrepreneurship in Germany were made against an backdrop of macroeconomic and fiscal developments. In contrast to the "long boom" of the "new economy" in the second half of the 1990s in the U.S.A., Germany faced increasing hardships, which began to recede only in 1999.[5] Among these were the costs of unification, the social program "crisis," high "structural" unemployment and a net outward FDI balance. The first three factors contributed to a continual budget deficit, which lingered in the background of all policy-making. Although the budget deficit was smaller in 1998 compared to 1997, this was in large part attributable to singular income flows such as privatisation income and investment reductions (Sachverständigenrat, 1998, 10, 127-141). The privatisation and sale of shares of the telecommunications incumbent, the Deutsche Telekom, was one of these singular income flow sources. Under the Kohl administration, therefore, telecommunications policy was influenced by two contradictory policy objectives: Maximising the value of the incumbent and introducing competition into the industry. Selling shares of the former monopolist carrier offered only short-term financial gains. A German panel of economists concluded that achieving longer-term financial sustainability would mean cutting subsidies dramatically and a thorough reform of social programs- challenging objectives that were not achieved in the Kohl era (Sachverständigenrat, 1998, 10).[6]

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[4] For a history of the Fraunhofer research institutes, see Trischler and vom Bruch (1999).

[5] Average estimates for the period from 1996-1998. USA: GDP growth 3.6, unemployment 5%; Germany: GDP growth 2.1, unemployment 10% (Sachverständigenrat, 1998, 29,32, 33).

[6] The Kohl era will be remembered also as one in which, despite its liberal leanings, extended support to ailing coal industry up to the year 2000- in response to massive coal worker demonstrations joined in by leading SPD politicians (Donges, 1997, 208). Agriculture and other areas were a special cases which was subsidised already under Erhard and were excluded from the "Cartel Law" (Donges, 1997, 203). For an overview of subsidies see OECD (1998, 124).

Although it faced high unification costs, the Kohl administration was unwilling or unable to radically cut government spending in subsidies and social programmes. The emphasis was on compromise. This section will focus on three related economic policy issues especially important to the entrepreneur: taxes, labour market regulation and labour costs. An examination of these factors affecting small, "knowledge-based" firms comes to a more or less balanced combination of negative and positive factors. Economic policy certainly left much room for improvement, but in itself did not represent a severe handicap for entrepreneurs based in Germany relative to other, more specific pressing issues such as telecommunications liberalisation.

There was disagreement in Kohl's Germany about the actual gravity of the problems the economy and its enterprises faced as a whole. Left-leaning press and politicians- then in opposition- often argued at the time that the problems were not as bad as they seemed. Their agenda was to keep some of the social market policies in place and modernise others to create a new version of a flexible yet socially acceptable social market economy, a "participatory Society" ("Teilhabegesellschaft") (Kleinert and Mosdorf, 1998, 173). Instead of a conflict between the state and the market, synergies between market, state and society were emphasised (Kleinert and Mosdorf, 1998, 182). At the time, it was not evident that this agenda would under SPD rule be used to initiate cost cutting and reform to a far greater degree than attempted under Kohl's Germany. Cost cutting and reform were actually strongly advocated at the time only by the conservative and liberal press in Germany, which was joined by Anglo-American publications in painting a "sick man in Europe" image.[7] The main problems raised were high government spending levels and inflexibility and over-regulation in many areas of the economy, especially the labour market. Both the right and the modern left were united in one belief, however: "Germany needs a new entrepreneurial wave."[8] In fact, the new Social Democrat-led coalition that assumed power in the Autumn

[7] The title of a study by Merrill Lynch from March 1999 described Germany as the "sick man of Europe." Cited in Tony Barber, "German Economy: Structural Weaknesses are Seen as Bar to Recovery," *Financial Times*, Survey, "The Pink Book, The European Economy," 28.05.99, p. 8.
[8] The quote comes from the Social Democrat and Green politicians Hubert Kleinert and Siegmar Mosdorf (1998, 214). See also the section "Innovator und Firmengründer: Die Säulen eines Standortes" ("Innovators and Entrepreneurs: The Pillars of the Economy") in a book co-authored by Lothar Späth, a former leading CDU politician who now is in industry (Henzler and Späth, 1997, 153-156).

of 1998 identified the internet with entrepreneurship and job-creation. One statement does not require translation into English: "Internet-Business ist Jobmaschine."[9]

Despite this pessimistic view from commentators more or less sharing a similar ideological platform, Helmut Kohl's coalition government did not conclusively address the symptoms of the "sick man." Although a "Wende," a change, was announced when the Kohl coalition replaced the Social-Liberal government in 1982, significant changes were not realised in those economic policy areas where it would be most controversial, such as simplification of the corporate tax system and reduction of the personal income tax burden.[10] Some singular initiatives, which were important to entrepreneurs and their financiers, were successful, such as the removal of personal taxes on capital in 1997. In general, many entrepreneurs were dissatisfied with policy-making. Their dissatisfaction, however, had its origin in disillusion with the scope of reforms and a pragmatic forecast of where Germany would be heading if it further travelled down the road of "rotten compromise."[11] The actual conditions "knowledge-based" entrepreneurs faced regarding taxation levels and the labour market were surprisingly positive, although they could certainly have been improved as well.

The largest tax disincentive entrepreneurs face in Germany were in the form of high personal income taxes. These were aggravated by the so-called "solidarity tax" instituted to cover part of the costs of unification.[12] High personal income taxes were a barrier to hiring skilled "knowledge" employees from other parts of the world. One entrepreneur based close

[9] Part of the title of a press release by the Economics Ministry. The complete title reads "Internet World '99 in Berlin. Mosdorf: Innovation partnership between the state and the economy marks Germany's path into the information society – Internet-business is a job machine." Press release number 74/99, Bundesministerium für Wirtschaft und Technologie BMWi, Dienstbereich Berlin, 18.05.99.

[10] Germany was known for the Byzantine complexity of its corporate tax system. Speed was lost as entrepreneurs adjusted their operations to the tax system. Several proposals were made during the Kohl administration to simplify the tax structure across the board and thereby also make it more palpable for entrepreneurs. One example was the Ulldahl model, preferred by many entrepreneurs. Under Helmut Kohl, however, tax reform was severely compromised. Gerhard Schröder managed to address these issues more effectively.

[11] One entrepreneur equated Kohl coalition with the politics of "rotten compromises." (Interview, Living Systems AG, 18.04.99).

[12] Due to unification tax, Germany is the only OECD country which saw its peak income tax rate rise overall in the past decade, to 57%. This rise was only 1% if viewed over the whole period, but this must be compared to falling rates in most other OECD countries by over 10% (Sachverständigenrat, 1998, 192).

to the Swiss border, for example, had little success is attracting Swiss physicists to complement his team as programmers.[13] The success of Silicon Valley was to a great extent based on highly skilled employees arriving from all over the world and a rapid demographic turnover (Cohen and Fields, 1999, 109, 126-127). Yet, one of Silicon Valley's barriers to further growth was quotas on visas imposed by U.S. government. Therefore, whereas the problems were of a different nature in the U.S. and Germany, the constrained flow of immigrants seemed a growth barrier in both countries. Although entrepreneurs could easily have employed more highly skilled people and the study carried out in this project suggested that most ventures were chronically understaffed, the labour market was apparently not worse than in other highly industrialised countries.

In one respect, however, the labour market for "knowledge workers" such as programmers or consultants seemed better in Germany than in California. Anecdotal evidence suggested that in contrast to the high workplace mobility in California, highly skilled employees were both more loyal as well as cheaper in Germany. The German internet software start-ups Intershop, Brokat and Poet, for example, had sales offices in the U.S.A. but carried out most of their programming in Germany.

Were corporate taxes high or low in Germany? It depended on whom you asked. On an international scale, corporate taxes were not among the top in the world.[14] They were to a great part tied to the profits of the company (with the sole exception of property taxes), and a start-up without profits was hardly subject to taxation. To an extent, the same conditions exist in the U.S.A., U.K. and the Netherlands but not in France (Licht, Hemer and Kulicke, 1998, 26, 27; see also Sachverständigenrat, 1998, 193). A big plus for German entrepreneurs, however, was the capital gains tax structure, which serves as a start-up incentive. In fact, share holdings under 25% which were held for more than six months were not subject to a capital gains tax (Licht, Hemer and Kulicke, 1998, 27).

[13] Interview with Living Systems AG (18.04.99).
[14] This point is emphasised by Stefan Welzk in an instructive but emotionally charged paper (1998).

Assessing the balance of benefits and obstacles faced by firms in Germany became the national sport of almost all publications in the 1990s- the "Standortdebatte." One recurring aspect of this debate was the attempt to gauge the overall state of the German economy by examining foreign direct investment (FDI). From the mid-1970s to the late 1990s, the net balance of FDI for the past years in Germany was negative, suggesting to some observers that Germany was steadily losing comparative locational advantage. Outward stock increased from DM 100 to DM 223 billion when the period from 1983 to 1989 is compared to 1990 to 1996. Inward stock also increased, however, from DM 23 to DM 47 billion (Tüselmann, 1998, 296, 297).[15] While more recent figures show a strong increase in FDI inward stock in 1999, it is still dwarfed by outward flow. Much of the rise in inward stock reflects the global trend of consolidation and merger activity in specific industries.[16]

The world of multimedia and internet start-ups also saw increased cross-border merger activity. Here, however, the balance between outward and inward FDI seemed reversed. New technology players were interested in a German location because of its large absolute number of internet users, the corporate market, its favourable know-how base and its position in Europe. In 1998 and 1999, at least five German internet and multimedia start-ups were acquired by U.S. or Swedish firms.[17] German internet start-ups, on the other hand, only in May 1999 began to acquire U.S. companies.[18] If there was a net FDI inflow when

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[15] Heinz-Josef Tüselmann has contributed to the location debate by compiling different studies on the motivations for FDI by German firms. He argues that FDI is motivated by the lure of foreign markets and not the pressure of rising locational costs. Rising FDI is a global, not a German trend. Furthermore, he demonstrates that capital investments abroad contribute to job creation at home, negating the common argument that "jobs are exported." As a consequence, what worries the scholar is not outflow of capital but rather the relatively meagre trickle of funds being invested in Germany by outsiders. This indeed seems to indicate the unattractiveness of the German location in a world that is becoming more interdependent (Tüselmann, 1998).

[16] Birgit Marschall, "Großfusionen treiben Direktinvestitionen in Deutschland auf Rekordhöhe. Finanz-Engagements von Ausländern 1999 nahezu verdreifacht. Deutsche Unternehmen sehen Auslandsinvestition als Standortsicherung," *Financial Times Deutschland*, 15.08.99, page 11.

[17] In 1998, three German internet and multimedia start-ups were bought by U.S. players, InnoMate (by USWeb), Lava (by iXL), ABC Bücherdienst (by Amazon.com). Another small German multimedia start-up was acquired by the Swedish player Spray. On 04.01.99, Adobe Systems Incorporated acquired internet software start-up GoLive Systems, Inc., which had a sales office in Menlo Park, California, but carried out its software development in Hamburg.

[18] The first purchase abroad was a small New York-based firm, Fountainhead Management, Inc, which was bought by Intershop. Two weeks later, Brokat Infosystems AG bought Transaction Software Systems (TST), Norcross, Georgia. Purchases by large German firms in the internet sector such as Bertelsmann's acquisition of a share in Barnesandnoble.com date back to 1998. "Intershop kauft sich in New York ein," HighText

looking exclusively at technology start-ups, this would not only suggest the importance of the German location but also the handicap of German small firms in embarking upon international expansion. This is the question that will be examined in the next chapters.

Policy-making in Germany

Most legislation in Germany is a joint effort of parliament and the responsible ministry. In both policy-making arenas, specialists are often charged with working on legislation proposals and drafts. This is especially the case with technical issues.[19] Ministry bureaucrats, for example, are able to work in their areas of proficiency with a minimum of interference from other ministries. They have been described as "experts with specialised knowledge for problem solving" (Mayntz and Derlien, 1989, 295). The German parliament ("Bundestag") combines responsibilities of public, partisan debate with legislative output. It is, therefore, a mixture of the British "debating parliament" and the U.S. style "working parliament" (Sontheimer and Bleek, 1998, 278). Much of the legislative work in Bundestag is carried out in working committees staffed by specialised parliamentarians of different parties.[20] It is said that cross-partisan consensus is enhanced by these committees, where the opposition works together with the coalition government in an environment which is removed somewhat from public scrutiny and thus also party politics. They are also sites for corporatist compromise, because representatives of interest groups can participate either as

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Verlag, 03.05.99; "Brokat übernimmt Softwarehaus TST," *Frankfurter Allgemeine Zeitung*, 11.05.99, page 24.

[19] According to Ziegler, technological issues require long-standing specialist relationships between scientists, engineers, technicians and skilled workers (Ziegler, 1997, vii-ix). "Age-old political tasks" include those of "exercising power, brokering interests and negotiating compromise." Technology issues, however, involve "establishing technical parameters, exercising expertise and fulfilling performance standards" (Ziegler, 1997, 9). In the German case, it seems very relevant to describe the specialist orientation of both parliamentarians and ministry officials as relating to technology issues and labelling them with Ziegler's term "politics of competence" (Ziegler, 1997, 2).

[20] Other factors further reinforce the specialisation of parliamentarians. A contest of specialised proficiency takes place during the negotiations between parliamentarians and ministry officials. Parliamentarians need to be able to "stand up to" the arguments of ministry bureaucrats (Sontheimer and Bleek, 1998, 293). In contrast to some other countries, a large proportion of parliamentarians in Germany are politicians who have made politics their exclusive career (Sontheimer and Bleek, 1998, 296-298).

members or invited speakers.[21] In summary, specialisation in policy-making is reinforced by political institutions. Specialisation also synchronises nicely with two important aspects of German policy-making: The Rule of Law and corporatism. It also needs to be seen in conjunction with the distributed nature of executive power in Germany.

Instead of a pyramid, the German system spreads executive power into the separate ministries in the shape of a "focused network" (Mayntz, 1980, 144). Katzenstein has used the term "Departmentalisation" (Katzenstein, 1978, 319, 320). In fact, the term "Chancellor Democracy," introduced to describe the powerful institution of the chancellor during the times of Adenauer, cannot really be applied to the contemporary system. Helmut Kohl, for example, is regarded as having acted more as a manager and mediator, a guardian of the status quo and not a strong executive force (with the exception of his role during unification).[22] Individual ministers are autonomous and powerful. A chancellor can usually reshuffle them only after an election. The chancellor is constrained by party politics since the party is his prime vehicle through which he can carry decisions into the ministries, the parliament (Bundestag) and the federal states (Länder).[23] For all of these reasons, chancellors "will actively set policy goals and directives in only one or very few selected fields, limiting themselves to managing the process of collective decision making" (Mayntz, 1980, 139, 146). Telecommunications policy was not one of Helmut Kohl's highest priorities; it was not on "the agenda of the boss" ("Chefsache").[24] Instead, it was a steady, continuous process which conformed to German policy-making.

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[21] In media and telecommunications policy, commissions are a preferred policy instrument, starting with the "Commission for the Development of the Technical Communication System" ("Kommission für den Ausbau des technischen Kommunikationssystems," KtK), established by the ruling Social Democrats in 1974. Hoffmann-Riem discusses the role of commissions explicitly in relation to media policy (1990, 174).

[22] See the paper by Clay Clemens, "The Chancellor as Manager" (1994). For a well-written popular account of Helmut Kohl, read Johannes Gross' chapter on the chancellor (1995).

[23] Yet, parties are also under pressure in some issues to bow to the fundamental obligations of consensus. In opposition, the SPD was very much conscious of this and tried not to appear as a "policy blocker." In a different context, Gordon Smith has called this phenomenon of German party politics "Yes-But" opposition (Smith, 1976, 392; see also Sontheimer and Bleek, 1998, 287).

[24] Johannes Gross describes how Kohl ignored his obligation to set a key policy orientation ("Richtlinienkompetenz") and instead used the more flexible propagandistic device of the "Chefsache" (1995, 82, 83).

German economic policy making has been equated with two very different traditions: The "Rechtsstaat" (the Rule of Law) and a reliance on corporatist methods and institutions to carry out certain programs and solve deadlock. The Rule of Law describes the state as the originator of a legally defined order and leads to what Dyson has called a "juridification of policy" (1992, 9, 10). It reflects the Hegelian vision of an independent, enlightened state that guides its people (Smith, 1976, 398, 400, 401). This idea transcends party differences in the Federal Republic. Both 1950s Ordoliberal free-market thought as well as the German interpretation of Keynesian supply-led economics in the late 1960s were enshrined in what were meant to be landmark laws. When Ludwig Erhard was Minister of Economics, the so-called Cartel Law of 1957, the "Law on Restrictions on Competition," was enacted.[25] It was the first important German competition law, a previous effort in the interwar period was largely ineffective.[26] A decade later, in 1967, the Social Democrat Economics Minister Karl Schiller contained his countercyclical policy in the "Law for the Promotion of Stability and Economic Growth." This was accompanied with prescriptions for economic and technological progress, which contradicted Erhard's previous emphasis on fair competition (Küster, 1974, 78). The limited practical success of both laws, however, illustrates that although much of the political process sees its objective in law-making, other forces are at work.

Embodied in the institutional landscape is the reliance on corporatism in responding to challenges and change. Although the Cartel Law was meant to break the power of large corporations in Germany whose market powers had begun to limit competition, the law in its four decades of existence was not wielded as was intended. To a great extent, large enterprises managed to retain the dominant hold they had in their national economies (Vernon, 1974, 6) and played political roles within a corporatist system. Similarly, despite Schiller's attempt to contain Keynesian economic policy in a law, this policy was not followed through in Germany as it was in other countries (Kreile, 1978, 199; see also Sally, 1995, 88-93). Also, in the 1990s, law making targeting telecommunications and multimedia

[25] Walter Eucken, one of the founders of the Freiburg School and influential Ordoliberal thinker in Germany immediately after the Second World War, thought one of the most important obligations of a Rechtsstaat was to prevent the distortion of markets through monopolies and oligopolies (Sally, 1998, 109).

was one of the main responses by German policy-makers to the perceived challenges of the "Information Society." But, telecommunications legislation also included the formation of a new regulatory body which was equipped with carefully prescribed power to meet its objectives, which included lower internet access prices in the "local loop." Until this body could begin its work in 1998, however, corporatist compromise had delayed and limited the scope of liberalisation leading to high access prices well into 1999.

There are two interrelated uses for the term corporatism in political science. The first refers to a theoretical framework for analysing the politics of interest groups. It can be contrasted to institutionalist and pluralist approaches, if the former is seen as focusing on the structure of particular public agencies and the latter as discussing the formation and power of interest groups. While pluralist approaches emphasise the bottom-up formation of interest groups, corporatist literature investigates the top-down involvement of different interest groups by the state (Streeck, 1994, 9-11). The role of government as instigator is critically important. Corporatist literature has in the last decade been combined successfully with institutionalist approaches to emphasise diversity in capitalist systems (Streeck, 1994, 8, 9, 19-21). As noted by Razeen Sally, however, all these approaches share a preference for analysis in aggregate units, such as national government, industry associations and trade unions (Sally, 1995, 2).

A second use of the term corporatism occurs when it is applied to actual structures and methods in policy-making. Here, a triangular relationship between the state, peak industry associations and trade unions is being referred to. Another important force is the banks, which have historically maintained close linkages to top industrial concerns via board membership and shareholdings. The economic historian Werner Abelshauser calls corporatism a "triangular pattern of wheeling and dealing" (Abelshauser, 1984, 286). Although found in most countries during the 20th century, including Europe, Asia and South America, formal corporatist structures are often identified with Germany, especially during the interwar period. Corporatism arose out of a desperate attempt by the bourgeoisie

[26] In the U.S.A., the Sherman Act dates back to 1890 and the Clayton Act to 1914. For a brief comparison, see Herdzina (1993, 133).

to retain political and economic control in the light of imminent anarchy- as described by Charles S. Maier in his classic book on the subject (1975). For many years, corporatism was exclusively identified with this undemocratic alliance between the three main economic groups. It has often been noted how, until 1992, the *International Encyclopaedia of the Social Sciences* defined the term Corporatism as: "See fascism" (Czada, 1994, 39).

Pre-war "authoritarian corporatism" mutates into "neo-corporatism," "liberal corporatism," or "democratic corporatism" (Streeck, 1994, 11).[27] Although he was forced to revive corporatist administration of the economy temporarily during the Korean Crisis, Erhard tried to cleanse German government from the stigma of corporatism.[28] Similarly, the classic industry peak association, the "Bundesverband der Deutschen Industrie" (the "Federation of German Industry" BDI), dominated by the largest German corporations, saw itself as an independent entity after the war. Its own perception of its mission was to respond in strength to the "corporatist stranglehold of the state" (Czada, 1994, 58, 59). This reflected the fact that industry structures gradually opened up with ongoing Americanisation after the

[27] Social science sometimes can be short-sighted, as Czada's analysis of the "career" of the term corporatism shows. Just a few years ago, the term was almost exclusively equated with what we would today call pre-war, authoritarian coporatism. Today, a very broad interpretation of the term corporatism is used so frequently, that it almost becomes meaningless. "As a theory, corporatism did not so much gain depth as breath," Czada writes. Nevertheless, the scholar believes the diversity of the term is one of its strengths (1994, 39-41). With this blessing, corporatism is also in this thesis used to refer broadly to a process of a negotiated, distributed decision-making supported by government between key interest groups. It fits very well with an institutional analysis of Germany, which is part of a general research agenda emphasising the diversity of capitalist systems. The broad definition of corporatism resembles what other commentators have called the typical "stakeholder" model of German capitalism and what yet others label a consensual system. It corresponds to John Zysman's "negotiated" power system in a taxonomy relating to financial systems, which also includes "state-led" and "market-led" (Zysman, 1983, 7, 233). Using Arend Lijphart's model of "majoritarian" and "consensual" democracies, Humphreys states that Germany is marked by a complex mix of the two, but emphasises the "consensus" elements, which lead to slow change and incremental policy making (1992, 105-107). Katzenstein emphasises the stability of the German system as well, but notes how it was combined with "widespread experimentation" from the 1980s (1989, 6). Much of this analysis goes back to Andrew Shonfield, who emphasised the unique aspects of German capitalism. Shonfield prefers, however, to use the term "organised private enterprise" (Shonfield, 1969, 239-264).

[28] See Abelshauser (1984) for a brilliant and succinct analysis of this historical development. In Germany, the corporatist system received its severest blows in the first few years after the Second World War, when U.S. occupation forces delegated a dismantling of industry concentration. This policy was supported by the post-World War mood as well as by Erhard's disdain of industry associations (Lehmbruch, 1992, 39). The industry associations persisted, however, and already in the 1950s, Erhard was forced to co-operate with them. During the Korean Crisis, Erhard was faced with the task of implementing a partially planned economy with explicit orders from the U.S.A. Instead of embarking upon a dirigiste course, however, he took recourse to what he saw as the lesser evil by allowing high-level joint economic administration of peak associations and government. But the form of co-operation was very different from the period before the Second World War, and became increasingly different after the Korean Crisis.

war (Berghahn, 1985, 324-330). Due to globalisation, further erosion of the power of the main institutions of corporatism such as the BDI can be observed today. The third corporatist partner, the unions, also started to become more independent-minded. In the 1970s, critical currents appeared, which attacked the co-operative stance the German unions traditionally occupied.[29]

It is important to note, however, that although formal corporatism has disappeared, the tendency for government, industry and the unions to co-operate on policy formation is still strong in Germany. In fact, it appeared again prominently in the issue of telecommunications liberalisation. But other aspects of Germany policy institutions also reappear in this chapter. The promotion of venture capital was carried out very effectively in a "departmentalised," specialist forum. "Rule of law" concepts are evident in the need felt by German policy makers to design a general legal framework for the "information society," a need which was at the time not shared to the same extent by entrepreneurs. Before these specific policy instances can be discussed, however, two important preambles to the discussion taken from the history of German policy-making in the field need to be briefly highlighted.

Preamble one: The national videotex debacle

The development of the videotext system in Germany in the 1970s and 1980s was an example of state-led technology policy. It was also, incidentally, a showcase for corporatism at work in post-war Germany. The story is told in detail by Volker Schneider (1989, 69-167). A British public telecommunications engineer invented the videotex system in 1972. The invention consisted of the clever combination of different, already existing technical systems. It immediately caught the attention of the German Postal and Telecommunications Ministry, the BPM. An independent commission examining the

[29] Humphreys cites the heavy industry union's slogan "Microchip = Jobkiller." Another trade union slogan was: "Defend against the dangers of the new media" (1988, 197).

German communication system, the KtK,[30] also identified it as an important issue for examination. After videotex, called Bildschirmtext (Btx) in Germany, was demonstrated at the 1977 broadcasting trade fair in Berlin, the BPM invited all important industry associations to discuss the development of the system. Three key industry sectors saw it as a chance to either corner a new market (the banks and retail industry) or as a potential threat (the newspapers). As groups that supplied the services for a public teletex network, they formed their own industry organisation in 1982, the Btx-Anbietervereinigung (Btx-AV). It had approximately 100 founding members. Btx-AV was dominated by larger businesses; only one out of 40 seats in the Kuratorium was reserved for small service firms. This association acted as the main spokesperson for business groups and was a negotiation partner for the BPM, which developed the system together with IBM. In addition, the association was instrumental in convincing state governments to find a political compromise over jurisdiction of the new system. Lastly, the unions were also involved in the development of Btx. Together with the Social Democrats and the state governments they demanded that the system be heavily regulated: Service suppliers had to register themselves, there were certain consumer protection and data security features. The SPD also successfully defeated a proposal for self-regulation by the industry groups.

The German approach to videotex was secured in a state law, the Staatsvertrag for Btx, which was signed in early 1983. Of the three countries developing videotex as a public system, Germany was the only one which regulated it through legislation (see Schneider, 1989, 127, 128). One and a half decades later, the architects from the BMFT of the 1997 "Multimedia Law" sought to avoid that the federal states could hold a similar gateway function in the commercialisation of the internet.

It is astounding in what short time period a successful corporatist system unique to videotex developed. This system comprised technological development, roll-out, supply of services and a legal and political framework. When Btx was officially launched at the Berlin

[30] The "Kommission für den Ausbau des technischen Kommunikationssystems," KtK, was instituted by the Ministry of Research and Technology, BMFT, to discuss how technological progress in communication systems could be promoted in Germany. It began its work in 1974 and submitted a report in 1975 (Schneider,

broadcast fair in 1983, all major elements were in place. Despite this effort, Videotex itself was not successful. In contrast to France, the German government did not heavily subsidise the use of the system. Government involvement was focused only on building the infrastructure and acting as an instigating partner in a corporatist alliance. Little effort was spent on reducing the price for using the system to be borne by consumers.

Preamble two: The research network debacle

It has often been pointed out that German policy-makers tend to shy away from direct involvement in the economy (Katzenstein, 1978, 305; Vernon, 1974, 1974, 7). In fact, corporatism can sometimes provide a means to (co-) manage the economy without direct control or ownership.[31] But there have also been numerous instances of dirigiste intervention historically.[32] In recent times, the government ran or financed economic activities or was involved directly in major technological decisions, mostly via what Juergen Donges has disapprovingly called the "sectoral ministries" (1997, 202). Examples were the BPM or BMBF. These direct efforts were so widespread, another economist, Joachim Starbatty, labelled them: "The reality of daily mercantilism" (Starbatty, 1999, 170, 171). One such story has just been told: The development of a public videotex system.

1989, 83-86). See Humphreys (1988, 187-199) for an English-language description of the role of KtK and the development of Videotex in Germany.

[31] A specific example can be found in Abelshauser (1984, 308) and a general mention in Czada (1994, 42, 43).

[32] In early 19th century industrialising Prussia, liberal policy-makers had to engage in drawn-out conflicts to dismantle many mercantilist state initiatives intended to promote industry and innovation. Through its mining corps, Prussia directly owned several mines. The glamorous historical accounts of industrialisation written in the 19th century by Heinrich von Treitschke and Gustav Schmoller emphasised and greatly exaggerated the pioneering and direct role of the Prussian state. For an excellent description of the battle between liberals and mercantilists in Prussia's early industrialisation, read Eric Dorn Brose's account (1993). Today, some economic historians believe Prussia's direct involvement was counter-productive. In a later phase of industrialisation, during the construction of the railroads, the Prussian state was initially not involved in any way. The railroads were privately financed and built (Fremdling, 1975, 129). But the historical debate continues today. The founding myth of the Federal Republic and its "Wirtschaftswunder" is universally attributed to the Marshall Plan, a substantial transfer of funds to jump-start the economy. The Marshall Plan has had an impact on policy-making ever since its inception. A similar jump-start based in some ways on the experience of the Marshall Plan was attempted in the new, East German states. The actual effect of the Marshall Plan on the German economy, however, is object of a highly contested debate. For example, the prominent economic historian Werner Abelshauser tried to show very early that it was not the Marshall Plan that was responsible for the "Economic Miracle," but rather the largely intact capital base of Germany in terms of machines and know-how (Abelshauser, 1983). A further interpretation of economic revival emphasises the Erhard's liberal free-trade stance of the young nation after the Second World War (Buchheim, 1990).

Although government adopted a corporatist approach to secure the supply of services and reach political compromise with the states, it set up and ran the infrastructure. Through the Bundespost, it was also involved in technological decisions such as making the system compatible to IBM mainframe computers. The second milestone in the development of a communications infrastructure in Germany was the construction of an academic and research network in the 1980s and 1990s, the "Deutsches Forschungsnetz" (DFN). DFN was a debacle as well.

The fact that the DFN was a child of the Kohl era would lead one to assume that the public sector would take care not to involve itself directly or would, alternatively, plan for a withdrawal as soon as the system stood. As in other countries, the deployment of a network linking universities and research institutions was subsidised by government, in this case the BMFT. Unlike other countries, however, the network was not run in a way that would prepare it for privatisation, nor did it encourage spin-offs to industry. In fact, as described by a well-known German internet expert, Werner Zorn, in a short and precise paper (1998), the German research network organisation was antagonistic to private business.

Interestingly, the German research network ("Deutsches Forschungsnetz" DFN) was founded in 1984 under the auspices of BMBF Minister Heinz Riesenhuber. In his Ministry, Riesenhuber emphasised a reduction of subsidy programmes. He also intended the DFN to be a catalyst for "entrepreneurial spirit" ("Unternehmensgeist"). This is why the DFN was founded as an association ("Verein"), which was officially independent of the BMFT. But the DFN promptly veered into a different direction as intended, partially because it was dependent upon government funding. From 1984 to 1990 it exclusively promoted the use of the ISO open networking standard OSI and not any other alternatives, such as the internet protocol TCP/IP. In Europe, the UK and the Scandinavian countries had a more open and experimental approach, which also allowed the implementation of the U.S. research networking standard. Furthermore, the DFN realised its network not in co-operation with private enterprises, but with the government-owned Bundespost. The Bundespost ran its service to the DFN using the ISO/OSI affiliated standard X.25 CCITT/ISO.[33] Furthermore, the DFN even after 1990 fought to keep its domain of universities and research institutions a monopoly by refusing access to its network by private internet providers. It was, therefore, very difficult to establish private internet access providers in Germany; as in other countries, most of the initial content was to be found on academic servers linked to the DFN (Zorn, 1998, 203, 204). Zorn concludes his paper by writing: "Today we know that the internet established itself in Germany not because of BMFT subsidies but despite them" (1998, 198). In fact, internet ventures established themselves in a space that was, albeit strongly dependent upon telecommunications infrastructure and other political conditions, not a direct result of German policy-making.

Taking the long road to telecommunications liberalisation[34]

Today, Germany is frequently described as one of the most liberal telecommunication regimes in the world. Foreign telecommunications firms can enter the market on the same terms as domestic players. An independent regulatory body, the RegTP, watches over an asymmetrical regulatory regime, which imposes price controls on the incumbent operator, the Deutsche Telekom AG (DTAG). It ascertains "fair" prices derived from data obtained from outside the DTAG. In fact, the prices for interconnection fees charged to competitors are considered low even by the competition itself. As a result, prices- especially long-distance prices- have fallen rapidly. The complaints about the RegTP and its President, Klaus-Dieter Scheurle, by DTAG executives can be seen as a further sign that the regulatory body is doing its stipulated task well. The market share of the incumbent has

[33] X.25 CCITT/ISO was a hierarchical packet-based service and was very different to the decentralised networks that TCP/IP systems enabled. In a research project at the Max Planck Institute for the Study of Societies, Dr. Raymund Werle and his colleagues are analysing the development of research networks under technological and political aspects. Werle emphasises the open, decentralised capabilities of TCP/IP. In fact, TCP/IP was used to replace the "Network Control Program" of the U.S. research network Arpanet in January 1983 precisely because it did not require a centralised network architecture. Werle contrasts TCP/IP to the hierarchical approach of ISO/OSI and X.25, which was used by the Bundespost. At that time, every X.25 switch needed to be told the route it should send its packages on by a (central) computer. This approach was both more costly and required a centralised "watchdog" authority such as the Bundespost. With technological advance over time, the difference between TCP/IP and ISO/OSI became less relevant.

[34] Susanne Schmidt used this phrase to describe German telecommunications liberalisation in the title of one of her papers: "Taking the long road to liberalisation" (Schmidt, 1991).

actually fallen more rapidly than in other countries that underwent liberalisation. These observations seem even more surprising given the fact that 10 years earlier, Germany was universally seen as one of the closed markets in the world, dominated by a monopoly and a clientist purchasing system favouring a handful of domestic "court suppliers" (Lehmbruch, 1992, 40). Germany was criticised as being the "Fortress on the Rhine," as cited by Humphreys (1992, 111).

In telecommunications, Germany moved from public to private ownership and from direct involvement to regulated competition. This instance of reregulation has also led to German government removing itself from direct involvement in technological decisions in the telecommunications realm. The commercialisation of the internet began in the midst of this process and took place outside of government's auspices- unlike the development of earlier networks such as public videotex Btx and the research and academic network DFN. This does not mean, however, that government did not influence the development of the internet. The telecommunications regime, especially the pricing of local basic services, had a critical impact on the development of the internet in Germany. Government policy in other areas also needs to be examined, such as legislation targeting internet services. Lastly, government policy as it impacts the formation of venture capital markets was important.

Rolling back the state in telecommunications was not easy. It was only possible with significant compromise involving what essentially were the three corporatist partners, because major institutional hurdles had to be overcome. One of these was changing the German Basic Law, and this required a parliamentary majority of two thirds. Another was dismantling the public ownership system with its thousands of employees, some of whom had the status of public servants. Given this constellation, corporatism mattered. In the United States, interest group resistance was much weaker and institutional barriers preventing change were low.[35]

[35] In a recent book on comparative telecommunications policy, Volker Schneider depicts this contrast in a very useful chart (1999, 257).

For these reasons, liberalisation was a drawn-out, three-step process: The first postal reform of 1989 divided the Bundespost into three separate services, the postal (Deutsche Post), banking (Deutsche Postbank) and telecommunication services (Deutsche Telekom). The second postal reform was passed in 1992 and came into effect Summer of 1994. At this stage, the Deutsche Telekom and the other services were privatised. No market liberalisation occurred at this stage. Finally, the Telecommunications Law ("Telekommunikationsgesetz" TKG) of 1996 instituted asymmetric regulation and unrestricted competition in basic services. A new regulator, the Regulierungsbehörde für Telekommunikation und Post (RegTP) was set up under the auspices of the Economics Ministry to ensure and maintain a competitive landscape.

Marked by a process of political compromise, it was clear that the outcome of liberalisation would be unique to Germany. Essentially, it required that the telecommunications landscape be liberalised while trying not to weaken the incumbent carrier, the DTAG. Realising these two contradictory aims required a lot of imagination on the part of the proponents of liberalisation in the political process. They placed their hopes on the financial muscle and business acumen of new telecommunications competitors coming from other industrial segments: heavy industry and energy. It was hoped that these giant conglomerates would speedily become "national full service carriers." These conglomerates- some of them were monopolists in their sector- were unable to launch full services, however, and entered the competitive era in 1998 only with so-called 'Call-by-Call' or 'Pre-Selection' services (Gerpott, 1998, 263). This led to severe competition in long distance telephony. Internet access pricing over local telephone connections remained untouched by competition for a long time, however.

Another hope of the political proponents of change was technological: They believed in an alternative means of access by which competitors could bypass Deutsche Telekom's local phone lines. This was "wireless local loop" technology. One of these wireless systems, DECT, was a standard defined by the European standards body ETSI in 1992.[36] According

[36] For a short discussion of DECT as it pertains to Germany, see Gerpott (1998, 38-54). Gerpott lists eleven different wireless local loop pilots in Europe in December 1997 (1998, 48).

to Dr. Martin Mayer, a CSU parliamentarian who was active in a number of relevant commissions: "At that time, we all believed that competition would come through the wireless local loop. Everybody spoke about DECT. Cable telephony, on the other hand, seemed an experiment. I must note, however, that the association of private telephony carriers (VATM) did argue for a separation [of the cable TV network]." (interview 23.04.99).[37] But although DECT indeed had looked promising in 1996, in 1999 it was still in the pilot phase in most countries. It also required greater investments than was originally anticipated.

These hopes turned out to be wishful thinking. The first companies that after liberalisation in January 1998 actually offered internet access packages in a bundle with telephony services were the "regional full service carriers." One of these companies, NetCologne, offered a combined flat rate fee access package including 60 hours of internet surfing a month for DM 65 (interview, NetCologne, 30.04.99). But only a few "regional full service carriers" launched their services in the first year of liberalisation. In fact, for a long time, NetCologne was the only provider offering flat rate internet access. The great majority of internet users in Germany still had to pay local, metered connection fees to the DTAG for many months after liberalisation occurred.

Most policy-makers and observers acknowledged that, even in 1999, pricing of local calls had a prohibitive effect on internet usage.[38] *It is interesting to note that before 1982, local calls in Germany were charged according to a flat rate of 0.23 DM per call.* Even after this time, however, local calls continued to be cheap: One minute for 0.03 DM. It was only in

[37] This view about the viability of DECT was confirmed in interview 31.05.99 with Greens parliamentarian Dr. Manuel Kiper. He added, however, that the access solution over cable TV already at that time was considered more readily available and less costly to develop. Arne Börnsen, a parliamentarian who is currently the Vice President of the RegTP, also believed in DECT in late 1996. In a newspaper article, he emphasised that a greater allotment of frequencies for the wireless local loop. Arne Boernsen, "Wirtschaft: Serie: Mit dem Ende des Telekom-Monopols ist es nicht getan: Wettbewerb erfordert Marktregulierung: Plädoyer für eine Liberalisierung mit Augenmaß," *Süddeutsche Zeitung*, 07.11.96, p. 36.

[38] "We desperately need competition in the last mile to the user," says the CSU parliamentarian Dr. Martin Mayer in an interview (23.04.99). The same view can be found in the statement by the FDP party in the Enquete-Kommission. The FDP calls for: "A reduction in internet access tariffs through regulation, because new competitors will not be active in reducing local call prices in the near future" (Enquete-Kommission, 1998, 149). The same view is echoed by the statement of the SPD and Bündnis 90/ Die Grünen (Enquete-Kommission, 1998, 141-144).

preparation for competition that prices were raised 400% to 0.12 DM per minute (Kubicek, 1998, 1098). DTAG lowered its prices only in those areas where there was serious competition. In fact, the development of prices seems to indicate it was even able to raise prices for local access. Dieter Wolf, the president of the German competition authority, the "Kartellamt," stated in early 1998: "The cartel fortress of the Deutsche Telekom are local calls."[39] Even some politicians of the former opposition, the SPD, acknowledge this in 1999. In an interview, Jörg Tauss, Social Democrat Member of Bundestag, succinctly stated: "Prices for long-distance calls have fallen, the problem is with local calls" (Interview 25.03.99). Siegmar Mosdorf was clearer: "Obviously, the Deutsche Telekom will use her traditional advantages derived from the former monopoly structure as long as possible" (Interview 10.05.99). Competition in internet access pricing began to arrive only after April 1999.[40] Phil Dwyer of the research firm Jupiter Communication's London still wrote in 1999: "Telephone usage is metered and that alone will continue to hold back the growth of online advertising, content and commerce ventures in Europe by inhibiting internet usage."[41] It was a telling statistic that users of AOL spent an average of 55 minutes a day online in the U.S.A., whereas in Europe this figure was just 17 minutes.[42]

There was ample opportunity in 1995 and 1996, when the Telecommunications Law, the TKG, was drafted, to create an alternative, competitive direct access network by splitting the cable TV system off the incumbent.[43] It is ironic that this network was originally built

[39] "Telekom weist die Vorwürfe des Kartellamts zurück. Wolf: Die Telefonpreise sind rechtswidrig genehmigt worden. Rexrodt will vermitteln," *Frankfurter Allgemeine Zeitung*, 09.02.98.

[40] Only in Spring of 1999, three years after liberalisation was decided upon, the conditions for internet access began to change in Germany. From the 1st of April 1999, DTAG used its ownership of both local phone lines and its ownership of the largest ISP, T-Online, to offer cheaper combined access to the internet. Thereby, it vastly undercut its competitors, whose customers have to pay the phone connection and the ISP separately. This was seen as a misuse of DTAG's market power in local telephony services as well as internet service provision and was attacked by its main competitor, AOL Europe. Ralph Atkins, "Interview: Andreas Schmidt. Preaching the Internet Gospel across Europe," *Financial Times*, 27.05.99, p. 13.

[41] Henrik Ravn, "Jupiter Communications: European Online Households Triple by 2003, But Usage Will Remain Low. Free Access Will Not Cure European Internet Woes Without Incentive Programs," Press Release, Jupiter Communications, LLC, London, 18.05.99.

[42] Ralph Atkins, "Interview: Andreas Schmidt. Preaching the Internet Gospel across Europe," *Financial Times*, 27.05.99, p. 13.

[43] The economists Andreas Freytag and Bernd Jäger urgently recommended a separation of cable TV from the Deutsche Telekom (Freytag and Jäger, 1996, 232). In 1999, the cable TV network was estimated as feeding 6.5 million households in Germany and partially connecting another 11.5 million. William Boston, "Microsoft, Bertelsmann Are in Talks For Stake in Deutsche Telekom Unit," *The Wall Street Journal Interactive Edition*, 21.05.99.

by the Postal and Telecommunications Ministry under CDU leadership to activate competition in the media industry. Since its inception, it lost money because DTAG was unwilling to cannibalise its own ISDN telephony and multimedia services by upgrading it for two-way usage.[44] DTAG management themselves had always been aware that splitting cable TV would have been an obvious thing to do from a competition policy viewpoint. Already at the end of 1997 the Deutsche Telekom started to outsource its cable TV services into a separate company, "DeTeKabel." It may have hoped that by bringing other shareholders into the company, it could pre-empt a complete loss of control. The sale process started only in 1999 and would continue for several years. And it was not German government action that DTAG management feared, but the EU (Gerpott, 1998, 70,71). EU competition authorities had earlier also prevented an intended partnership between the DTAG and the German media giants Bertelsmann and Kirch.[45] This section will discuss why the incumbent was kept whole in 1996 and also why two other important concessions were made: Retaining control over the largest national online service, T-Online, as well as allowing the Deutsche Telekom one and a half years to prepare for competition.

Liberalisation was marked by a tough battle between the ruling coalition and the opposition. To change the existing public telecommunications regime, the Basic Law needed to be changed with two-thirds majority in both houses of parliament. Change was therefore only possible with concessions and the Telecommunications Law marked a compromise. In order to describe the nature of the compromise adequately, however, a closer look needs to be taken at the partisan conflict. In fact, there were modernisation proponents and staunch advocates of the status-quo on both sides, and it was the modernisers on each side which contributed to the eventual success of liberalisation. But the modernisers had significantly different visions of the future: The ruling coalition parties were opposed to state involvement in technology policy and had earlier criticised the Bundespost's involvement in technological decision-making. The opposition SPD advocated technological innovation

[44] Although a separation of cable would have allowed competition to begin offering alternative access services, converting coaxial cable into broadband internet services is not a simple task. An upgrade for internet services in 1999 was estimated in 1999 to cost DM 3.4 billion. William Boston, "Microsoft, Bertelsmann Are in Talks For Stake in Deutsche Telekom Unit," *The Wall Street Journal Interactive Edition*, 21.05.99.

[45] "Telekom: Oberflächlich und falsch," *Der Spiegel*, Number 17, 20.04.98.

under the auspices of a national champion.[46] This difference is crucial and reaches back to the beginnings of the "technology gap" discussion in the 1970s.[47]

From the 1980s, the process of telecommunications deregulation has been described in terms of a battle between a coalition for change and its opponents. And it was only in the 1990s that the coalition for change began to gain ground. From 1985 to 1987, the telecommunications policy commission, the so-called "Witte Commission," named after its chairman Professor Eberhard Witte, which included the broad scope of concerned interest groups, was marked by heavily dissenting positions (Schmidt, 1991, 214-215). Its corporatistic mission resulted in the moderate first postal reform of 1889, the "Bill to Restructure the Post and Telecommunications of the German Bundespost" ("Poststrukturgesetz"). To describe how difficult it was to pass the reform bill, Humphreys cites Schneider and Werle that 50 different organisations participated in bitter hearings by the Bundestag committee. In the end, however, the bill was passed more easily than was expected- thanks to the corporatist process it had been through (Humphreys, 1992, 118, 121-124).

The first proponents of change were the computer industry, especially the German company Nixdorf and, to a lesser extent, IBM, who attacked the purchasing policies of the state-

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[46] This point is made by Herbert Kubicek, basing himself in part on a dissertation by Dieter Klumpp (Kubicek, 1998, 1094).

[47] One of the major economic and social policy debates in the 1970s and early 1980s surrounded the issue of media liberalisation. The question whether to allow private broadcast media or not was at first glance a conflict that ran along party lines. The CDU and CSU, at that time in opposition, believed that the existing public media system was left leaning and blamed the media for an erosion of their power (Hoffmann-Riem, 1990, 180). The SPD was staunchly opposed to private media. Media jurisdiction lay with the federal states, not with the national government. After the CDU and CSU assumed power in 1982 together with the FDP, Postal and Telecommunications Minister Christian Schwarz-Schilling used his control over the federal telecommunications system to build a nation-wide coaxial cable network (Hoffmann-Riem, 1990, 182). This development added complexity to the debate. It became apparent that modernisers were to be found in both parties. Especially relevant is that some policy-makers in the modernisation faction of the SPD emphasised technological progress without emphasising competition. Technological progress was viewed as a result of enlightened state policy. In contrast to Schwarz-Schilling, these SPD modernisers advocated the instalment of a nation-wide broadband fibre optic cable integrated services network (Hoffmann-Riem, 1990, 181). This was a technology that still had to be developed instead of the widely available, standard, relatively low-cost coaxial system. SPD modernisers also were responsible for launching the nation-wide public teletex Btx service. For a good overview of the media policy battle, see the chapter "The Controversy over the Introduction of New Media" in Humphreys (1994, 193-238).

owned carrier.[48] They were backed by the rising frustration which was felt among the German Chamber of Commerce, the BDI and the Bundespost adversary, the Association of Bundespost Users ("Verband der Postbenutzer," VPB) (Humphreys, 1992, 115).[49] Another critical player in the late 1980s was the BPM, the Bundespost Ministry itself. It was convinced reform was necessary to address the "technology gap."[50] In fact, the BPM was generally perceived by other participants as the central policy actor advocating reform (Humphreys, 1992, 124).[51] Lastly, the EC also played an important role. The European Commission's influential telecommunication Green Paper of 1987 called for liberalisation.[52]

In the 1990s, however, the position of the proponents of change was considerably strengthened through Siemens, the former "court supplier" now intent on entering the U.S. market and thus favouring liberalisation at home. Siemens had an important role to play in the corporatist system of telecommunications policy; this role was institutionalised it by being a member of the Administrative Council ("Verwaltungsrat") of the Bundespost (Humphreys, 1992, 110). The important shift was first signalled during the CeBIT computer trade fair in Hanover early in 1987, when a Siemens Vice President expressed approval of greater liberalisation of the Bundespost (June, 1989, 272-273). Siemens was crucial in tipping the balance also because of its direct and indirect links with large industrial companies and banks as well as its regional importance to Bavaria, home of the ruling

[48] To reduce pressure, the state-owned carrier included these companies in its circle of equipment suppliers (Schmidt, 1991, 212-215).

[49] It is important not to overemphasise the role of the group of corporate users. However, Schmidt has included them in the "telematics coalition." In the UK, the "telematics coalition," also consisting of suppliers of value-added services and data-processing companies, were a powerful force for change. In Germany, the Bundespost was one of the main suppliers of some of these "telematics" services for businesses and made sure its most important clients, such as the banks, were given special concessions (Schmidt, 1991, 213-214).

[50] German policy-makers were not alone. Indeed, scholars have observed this development all over the world and have characterised it as a "complex interweaving of liberalism with mercantilism" (Dyson and Humphreys, 1990, 2).

[51] This matches Steven Vogel's observation of privatisation world-wide that it was the state, and not interest groups, that were decisive for reform. Vogel mentions that interest groups were hopelessly divided; Knudsen adds that most beneficiaries of the reform were new market entrants that did not exist yet when the reform is first embarked upon (Vogel, Steven, 1996, Introduction; Knudsen, 1998, 29, 30).

[52] On "indirect effects" of EC measures, see Mark Thatcher's paper on the subject (1996, 179, 185, 195). Schmidt examines the underlying conditions that favoured a progressive stance of the EC in telecommunications in comparison with the difficulties the Commission encountered in the energy sector (Schmidt, 1998, 180-181). Knudsen describes how the EU level contributed to a breaking of the German "joint-decision trap" (1998, 35-37).

coalition partner CSU (Junne, 1989, 271-272). An exogenous factor was the unification of Germany and the accompanying budget deficit. Building up a new telecommunications infrastructure was very costly: An estimated DM 60 billion was estimated to be spent from 1990 to 1997. It was argued that part of these sums would be shifted to the private sector through telecommunications reform (Thatcher, 1996, 193, 194).

The opposition included the SPD and the Postal Union. The loss of 60,000 jobs was forecast.[53] The opposition also included representatives of rural areas, especially in the CSU, who were against liberalisation because they believed that the concept of universal service would be compromised. By the end of the process, however, the SPD and the Postal Union, the Deutsche Postgewerkschaft (DPG), carried the measure. The DPG, although it is one of the more left-wing unions, from the mid 1990s emphasised the competitiveness of the DTAG which it equated with employment opportunities and high-skill quality competition (Darbishire, 1995, 177). In doing so, the Union showed that corporatist support of modernisation outweighed leftist critique.

Without the modernisers of the SPD and the union, the shift to support liberalisation would not have succeeded. The SPD, however, saw the DTAG as the motor of innovation and thus wanted to keep the former PTO integrated. Cable TV and the online service were for this reason not considered for separation. Reaching a compromise was so important that the CDU/ CSU did not further press for a separation either. In fact, only one Member of Parliament had publicly appealed for a separation of the cable network from the Deutsche Telekom, the Greens politician Dr. Manuel Kiper.[54] In believing that an integrated "national

[53] In contrast, the telecommunication industry as a whole grew by 102,000 from the passing of the Telecommunications Law in 1996 and in 1999 another 91,000 were estimated to be employed by the new telecommunications competition. Frank Dohmen, "Telekommunikation: An der falschen Stelle. Ist die Telekom für den rauhen Wettbewerb noch nicht stark genug? Die rot-grüne Regierung in Bonn will nachhelfen – Zum Nachteil der Kunden," *Der Spiegel*, Number 46, 09.11.98; see also a newspaper article from 1996: Gerhard Hennemann, "Wirtschaft: Serie: Eine Behörde auf dem Weg zum Weltunternehmen: Die Konkurrenz der Telekom ist auf Draht: Nicht nur am lukrativen deutschen Markt formieren sich potente Wettbewerber," *Süddeutsche Zeitung*, 17.10.96, p. 30.

[54] Dr. Kiper viewed a reduction of the breath of the Deutsche Telekom's services as necessary for a full and speedy development of a competitive landscape (interview, 31.05.99). Dr. Kiper was a member of both the "Ausschuß für Post und Telekommunikation" as well as the Enquete-Kommission "Zukunft der Medien." He evaluated the position of ANGA, the association of small- and medium-sized cable TV companies and had, together in a delegation with with other parlamentarians visited Californian technology companies during the

champion" would become a prime force of innovation, the SPD disregarded completely the contemporary discussion in the U.S.A. and the rise of new data-networking competitors. In this way, German telecommunications liberalisation embarked on its own, particular "Sonderweg." In the U.S. Telecommunications Act of 1996, the so-called "Baby Bells" or local phone services, were not allowed to own more than a 10% share of cable companies. In the U.K., the incumbent was not allowed to own any share cable TV networks (see Freytag and Jäger, 1996, 231). In fact, the main competitive threat to the incumbent carriers in these two countries came from the cable TV companies (Gerpott, 1998, 283).

It turns out that for the commercialisation of the internet in Germany and in influencing usage patterns, two further concessions that were granted the newly formed DTAG also were crucial: Retention of the largest national online service, T-Online, and a period of one and a half years from Summer 1996 to the End of 1997 during which it could prepare for competition.[55] Just as the cable TV issue, these concessions can be traced back to the SPD vision of an innovative "national champion" as well as the fiscal considerations of the Finance Ministry, which wanted to sell its stakes in the DTAG for a high price. To cite the dry commentary of Dr. Martin Mayer, a Bundestag Committee member addressing the issue of the Telecommunications Law: "The SPD wanted to prevent liberalisation; this is why there were concessions such as the grace period" (interview 23.04.99).[56]

Even after liberalisation, the DTAG retains "excellent networks" in Bonn "dating back to the days of public ownership," according to an article in the newspaper *Handelsblatt*. For this reason, the article continues, "political attacks at the regulatory agency mirror almost verbatim statements of the Deutsche Telekom."[57] After election of the SPD-Greens coalition in late 1998, the new Economics Minister Werner Müller publicly announced that

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deliberations for the Telecommunications law and had studied both wireless local loop technologies as well as cable TV access for internet and multimedia.

[55] Andreas Freytag and Bernd Jäger argue that there are no "economic reasons" justifying the grace period and that the competition should have been allowed to enter the market right away (1996, 219, 237).

[56] Arne Börnsen, an SPD-parlamentarian and later Vice President of the RegTP, criticised the widespread arguments heard within the SPD that competition would hurt the IPO of the Deutsche Telekom. Arne Boernsen, "Wirtschaft: Serie: Mit dem Ende des Telekom-Monopols ist es nicht getan: Wettbewerb erfordert Marktregulierung: Plädoyer für eine Liberalisierung mit Augenmaß," *Süddeutsche Zeitung*, 07.11.96, p. 36.

[57] Donata Riedel, "Meinung und Analyse: Regulierungsbehörde für Telekommunikation gerät unter Druck der Partien. Politiker mißtrauen dem Wettbewerb," *Handelsblatt*, Number 129, 09.07.98, p. 2.

he was the "agent for the people and the employees of the Deutsche Telekom."[58] The SPD Minister of Economics of the State of North-Rhine Westphalia, Wolfgang Clement, as well as the Chairman of the Postal Workers Union (DPG), Kurt van Haaren, recommended changing the Telecommunications Law to the benefit of the incumbent operator.[59] The Finance Ministry also complained to the chief regulator and warned him not to attack the DTAG too much. The financial pressure on German policy-makers as well as the emphasis on preserving current employment bolstered the "national champion" view in which the DTAG was seen as the main German global competitor, chief employer and sacrosanct contributor to the coffers of the Finance Ministry.[60] Even Mosdorf, one of the main modernisers and as the top "Information Age" expert of the SPD supposedly a champion of start-ups, subscribed to this view: "We want the DTAG as largest player in her field to be in the global top league. We have no interest to break it up and sell it off cheaply" (interview 10.05.99). In contrast to the SPD-view, the Managing Director of a competitor to the DTAG viewed "the obvious mingling of regulatory and finance policy as standing in complete contrast to international rules and can be compared to market behaviour in the Third World."[61] Despite strong opposition against its work and the fact that its scope for action was limited and predefined, the RegTP was able to usher competition into the German telecommunications landscape effectively. The effects of competition were not felt by internet users immediately, however.

It is the strikingly persistent faith in the "national champion" which has stifled the entrepreneurial process, by preventing effective competition in access through preventing

[58] Frank Dohmen, "Telekommunikation: An der falschen Stelle. Ist die Telekom für den rauhen Wettbewerb noch nicht stark genug? Die rot-grüne Regierung in Bonn will nachhelfen – Zum Nachteil der Kunden," *Der Spiegel*, Number 46, 09.11.98; "Regulierung: Bericht des Wirtschaftsministers. Kabinett stellt sich hinter Telekom," *Handelsblatt*, Number 214, 05.11.98, p. 1.

[59] Heinz Stuewe, "Leitartikel Wirtschaft. Die Telekom und die Wahlen," *Frankfurter Allgemeine Zeitung*, 10.09.98; "Boernsen warnt SPD vor Änderung des TKG," *Süddeutsche Zeitung*, 11.09.98, p. 24; "Postgewerkschaft attackiert den Regulierer. Kurt van Haaren: Bonner Behörde setzt nur auf Preissenkungen, 'Rexrodt ohne Sachverstand," *Süddeutsche Zeitung*, 15.09.98, p. 17.

[60] "Scheurle: Telekom-Aufsicht muß politisch unabhängig entscheiden. 'Regulierungsbehörde trägt nicht nur die Verantwortung für den größten Anbieter," *Frankfurter Allgemeine Zeitung*, 04.05.98.

[61] Frank Dohmen, "Telekommunikation: An der falschen Stelle. Ist die Telekom für den rauhen Wettbewerb noch nicht stark genug? Die rot-grüne Regierung in Bonn will nachhelfen – Zum Nachteil der Kunden," *Der Spiegel*, Number 46, 09.11.98; Donata Riedel, "Meinung und Analyse: Finanzstaatssekretär Jürgen Stark kritisiert die Regulierungsbehörde. Telekom baut Druck auf Scheurle auf," *Handelsblatt*, Number 080, 27.04.98, p. 2.

the sale of cable TV and through delaying the process of liberalisation until 1998. Policy makers could theoretically have stimulated internet uptake by consumers and small firms much more rapidly and effectively than was the case. But policy makers had to operate in a corporatist environment. The "national champion" view, which was embraced especially by the Social Democrats, also allowed the ownership of the local access network as well as content and services through T-Online to remain in the hands of a large former PTO. And this despite the fact that the entrepreneurial and innovation process took off in the U.S. precisely because the internet drove a wedge between network owners and firms offering new services.

Multimedia legislation: The "Rechtsstaat" offers its services

As was pointed out in the beginning of this chapter, German economic policy makers see themselves primarily as law-framers. This corresponds to the vision of a "Rechtsstaat." The German approach has often (but not always) been characterised by the attempt to create a legal framework without getting directly involved in an industry through ownership or mandate. The framework does, however, contain extensive security and quality considerations. Government involvement in traditional German industry sectors such as machine tools is typical of this approach: Government combined non sector-specific general market rules as well as sector-specific encouragement of standards and certification schemes. The objectives of these secor-specific initiatives were to provide a secure and high-quality work process and work environment with a maximum of industry self-regulation. Certified occupational categories are one example.

The arrival of the internet age put German policy-makers once again into the perceived position of having to define a general legal framework to increase business certainty and introduce quality certification schemes. The implicit objective was to use such initiatives to bolster the international competitive advantage of small- and medium-sized German firms and start-ups. Standard-setting attempts were extended as offers to firms, not as mandatory, market-restricting obligations.

The "Information and Communication Services Act" (Informations- und Kommunikationsdienste-Gesetz" IuKDG), in short, the so-called "Multimedia Law," was passed by the Bundestag in July 1997 and came into effect on the 1st of August 1997. Its main intention was to pre-empt the possibility at a federal level that state jurisdictions enact licensing obligations for providers of "individual communication services" such as online and internet services (Gerpott, 1998, 329). Whether this would have been a real threat at that point in time is debatable, as will be discussed below. The law also contained other elements, such as defining responsibility over content and reducing the scope for over-zealous policing efforts. It offered a certification and standards scheme for digital signatures as well as data protection legislation. Here, the main aspects of the law will be discussed briefly together with its intended objectives. Overall, this legislative initiative did not harm the entrepreneur in Germany but it is also not clear whether it thus far has been of great advantage.[62] It seems to have arisen more out of a need perceived by policy-makers than out of acute entrepreneurial issues.

The German digital signatures law which was passed together with the so-called "Multimedia Law" was to a great extent misrepresented in the international press. It also was the implicit target of criticism by the Clinton Administration Working Group on Global Electronic Commerce. It was viewed as an initiative of the German government designed to create a mandatory global digital signatures standard for the benefit of its own growing encryption and smart card sector. When asked about this perception on the part of press and the U.S. Working Group, a parliamentarian involved in the legislation stated: "If the Americans really think this, that is fine. This is precisely what we want to do, to challenge them" (Dr. Michael Meister, Interview 22.03.99). The objective of the law was indeed to improve the competitive advantage of domestic industry. But it addressed this task by providing an institutional, legal framework typical of other efforts in German industry. It was not designed in the market-closing way in which it has been internationally represented, but as a non-mandatory offer. Its main elements were the establishment of

[62] Except in the niche sector of encryption services, where German firms profited immensely from a lack of export, import and domestic use prohibition.

standard recommended guidelines and a certification scheme.[63] Certification schemes have been used in German industry for decades to insure a high standard of industrial production. German policy-makers had hoped that voluntary standards and a certification scheme would encourage internet users to conduct more transactions such as the 'signing' of legally binding documents over the internet and to carry out these tasks using German software and hardware products. It could be argued that these ideas were too early for the market; consumers were just becoming acquainted with the internet and the services policy-makers had in mind did not exist yet. Although entrepreneurs at the time regarded digital signatures and encryption in principle to be important issues, especially in an international context, they did not believe the law had any impact on their business.[64]

The "Multimedia Law" contained data protection and privacy stipulations in the Teleservices Data Protection Act ("Teledienstdatenschutzgesetz" TDDSG).[65] This Act mandated how private data can be collected, how it is stored and how it can be sold. There is also an identification obligation for service and information providers. The stipulations in most cases are straightforward to apply and do not extend the scope of European Data Privacy legislation. Like its European counterpart, however, the data protection law was generally viewed as necessary by most internet firms to establish consumer trust, even if they would theoretically rather do without laws.[66] Unlike European privacy law, however,

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[63] It purposely did not contain any barriers to entry by foreign firms and no import restrictions. It cannot be seen as "engineer-driven" since it did not contain any technological stipulations (in contrast to the GSM standard, for example). "Technical openness" was one of the main concepts of the bill (Engel-Flechsig, Maennel, Tettenborn, 1998, 30). Furthermore, it was compatible with other digital signature schemes and companies are free to choose which systems to use. The setting up of trust centres, necessary for signature certification, was devised as a third-party initiative controlled by the telecommunications regulatory body RegTP. The RegTP merely issued "root" rights. What the law did do, however, was set high obligatory requirements which a digital signature must adhere to if it was to be used as a legally binding, non-reputable confirmation of identity. Given these standards, it was necessary to use devices such as smart cards and special hardware to make the signature secure. Nevertheless, the law remained an offer. The same principle was in 1999 adopted in EU advanced electronic signatures legislation, where two different digital standards levels were introduced as offers from which industry can choose. It was conceivable that for "signing" a tax form, a high German-type standard would be used, but for purchasing a book over the internet a lower security level would be sufficient.

[64] According to the globalstartup survey, only half of the entrepreneurs thought the "Multimedia Law" was relevant to their business. Appendix A, Table 26. For international laws, see Table 27.

[65] For detailed analysis of the TDDSG see the overview by Engel-Flechsig, Maennel and Tettenborn (1998, 22-28).

[66] An excellent discussion of the TDDSG from the viewpoint of firms is contained in a report by the BMBF (1997, 41-62).

the TDDSG does not contain "export" clauses, which could be viewed as an electronic trade barrier.[67]

The “Multimedia Law” was also driven by another objective, which was political. Already in 1992, Kenneth Dyson wrote about "a new contest for power within German regulation" (Dyson, 1992, xiv, xv). Especially intense was the battle in Germany between federal government and the states (“Länder”) over control of what is widely seen as the next leading economic sectors. As the political scientist Fritz Scharpf pointed out, the advantages of federalism were often emphasised in the post-war period as a device to prevent the abuse of state power. Now, however, it seems to be fashionable to criticise federalism as a system that reduces the ability of federal government to act flexibly and decisively in an environment marked by change. Although Scharpf framed his analysis on the European Union and on the system of interlocking federalism- in which legislative and fiscal powers are wielded by the federal government and implementation is the responsibility of the individual states- it can easily be generalised (Scharpf, 1994, 221).[68] This has led to an even more intensive criticism of the federal system, under the label "particularism" ("Kleinstaaterei"), where state power is seen almost universally as blocking effective new media policy.

In contrast to this prevailing view, it could be hypothetically argued that the needs of entrepreneurs could be met by less centralised responsibility and more flexibility and competition on a state (“Länder”) level. In the 1980s, inter-state competition insured that even SPD-led states staunchly opposed to media liberalisation would soon jump on the bandwagon and encourage the formation of private broadcasters, led by Hamburg and North-Rhine Westphalia (Hoffmann-Riem, 1990, 190; Humphreys, 1988, 205-206).[69]

[67] The EU privacy law stipulates that personal data of EU citizens cannot be exported into or stored in countries in which a similar standard of privacy legislation does not exist.
[68] Although Germany has a system of interlocking federalism, this is not the case specifically in media policy, where the individual states have powers that transcend mere rights of implementation. Scharpf notes this on page 225 (1994).
[69] Interestingly, a similar phenomenon occurred over a century earlier during the industrialisation of Germany. It is commonly argued that the splintered and fragmented nature of the German territories into many small states has hindered the development of the railroad network. The economic historian Rainer Fremdling has argued that quite the opposite was true, namely, that inter-state competition led to rapid growth of the railway system (Fremdling, 1975, 132).

The possible lesson to be learned is that state-level competition can lead to overall convergence of policy without the need for centralised authority. “Spontaneous harmony” can come about through policy competition, as discussed in the previous chapter. Local resistance to convergence and the establishment of an isolated "fortress" could cause electronic flows to be diverted and could cause harm to the local economy. Today, local state governments are intent on attracting internet entrepreneurs and multimedia firms. Some of their policy, such as some ill-constructed technology parks and wrongly staffed and positioned venture capital companies under state control (MGBs), was misguided and has at best contributed to learning.[70] This will be discussed in more detail in the following section on the promotion of entrepreneurship in Germany. Newer efforts tend to head into a different direction by emphasising network access as well as urban small-firm clustering. But although the regional policy goals are largely the same, a diversity of approaches existed at the end of the 1990s. North-Rhine Westphalia (NRW) and Bavaria both emphasised internet access. Through its municipal energy companies, NRW was an indirect owner of NetCologne, a privately operating "regional full service carrier." Bavaria directly launched its own online service which generated much enthusiasm for the internet in rural areas. A plethora of other regional initiatives exist across the country. The "California/ Bavaria Business Forum," for example, was an attempt to help Munich-based start-ups in their internationalisation strategy. The most active state governments were NRW, Bavaria as well as Hamburg and Berlin which combined to form a "Multimedia Corridor."

Although regional policy competition can be viewed as positive and differences are reduced over the longer term in areas in which successful policies establish themselves, the federal government tried to centralise jurisdiction of the internet and multimedia services by arguing that while regional policy was laudable in principle, specific responsibility of the states over internet issues would lead to fragmentation and inefficiencies. This view could be found both in the Bundestag, the former Ministry of Research and Technology (BMFT)

[70] There are, however, examples of successful technology parks as well as successful MGBs.

as well as among other contemporary observers.[71] This issue is what the so-called "Multimedia Law" was about. Its intention was to stipulate responsibility over content ownership and, by doing so, explicitly removed most state control in new media issues. One parliamentarian involved in multimedia legislation asked: "What if local states would ask for licences modelled on radio licences from firms that run large web sites? The imagination of state leaders goes wild if they are provided with too much power." Officials in the Economics Ministry rightly pointed out that individual states had rights over the Btx videotex system and that this was a barrier to development. With the "Multimedia Law" the BMFT succeeded to a great extent in limiting state power, although, even here, a "Media Services State Contract" ("Mediendienste-Staatsvertrag" MDstV) was necessary and the compromise solution required allowing states power over broadcast-like media services, "Mediendienste" (in contrast to "tele-services" targeting the individual user).[72] This was probably the greatest weakness of the law, since firms offering video services for individuals seem to be in an overlapping, uncertain legal space. One lawyer therefore called this compromise the "Achilles Heel" of internet development in Germany (BMBF, 1997, 27). This interpretation was probably exaggerated, however: In designing the "Multimedia Law," the BMFT actually minimised the power of the states and in this regard, and it was much more successful than others before them in meeting this objective. The Media Services State Contract was seen as the lesser evil necessary for compromise.

Next to a policy battle with the states, however, stood another objective- reducing the possibility for over-zealous policing efforts in on-line content. These efforts were pronounced in the Interior Ministry as well as among local prosecutors for different reasons. The content ownership issue was an important one for all firms offering content or internet access.[73] The law reduced the amount of responsibility that network providers had over

[71] "Medien: Rechtsexperte plädiert für Grundgesetzänderung und einheitliche Rahmenbedingungen. Ein Mister Internet für Investoren in den Multimediastandort Deutschland," *Handelsblatt*, Number 143, 29.07.98, p. 6.
[72] For detailed description see Engel-Flechsig, Maennel, Tettenborn (1998).
[73] The seriousness of this issue for firms became evident in two issues involving local courts: XS4All as well as the Felix Somm case in Bavaria. One well-known internet expert in Germany has apparently commented that the one active contribution Germany had for the development of the internet is the criminal indictment of internet access providers (BMBF, 1997, 114). XS4All: This case involved radical left-wing content located on a server in the Netherlands. German authorities tried to stop German web site owners from linking to this content. Felix Somm: The former managing director of CompuServe in Germany was charged by a local

third party content they carried. A criminal law and computer law expert praised the "Multimedia Law" as a very clear and liberal law. His only worry is precisely that local policing efforts misunderstand the implications of the law (BMBF, 1997, 94).

It needs to be noted, however, that the German federal government responded quickly to the early stage of internet commercialisation by using the law as an nonintrusive means to experiment with new policy frameworks. Exactly this learning, experimental approach to regulation is what the German internet and media expert Axel Zerdick from the Freie Universität Berlin recommends and believes is suited to "the internet economy" (Zerdick et al, 1999, 260). Specific law-making on a federal level in the multimedia and internet sector did not harm electronic commerce and did not stunt entrepreneuship in a major way. Perhaps it has also prevented some contra-productive legislation on a state level, and also stifled possible initiatives by the Interior Ministry.[74] However, policy-makers on a federal level looked down upon the ability of state level policy makers to design regional initiatives to encourage internet uptake and start-up activity. Actually, policy experimentation on a state level was vibrant and led to some successes- the best example probably was the aforementioned initiative NetCologne.

The entrepreneur community was only dimly aware of the "Multimedia Law," however. The law has to be characterised as a government initiated project, which arose out of the perceived needs of entrepreneurs as envisioned by federal specialists. It failed to address many of the real issues faced by internet entrepreneurs which existed in the areas of regulation, taxation, financing and internet access. Although the designers of the law had actively sought out the advice of entrepreneurs, the general feeling among policy-makers on a federal level in general was that entrepreneurs were themselves not politically active enough. One member of staff on the Enquete-Kommission, for example, was a little hurt by the lack of desire on the part of entrepreneurs of a strongly proactive government: "And those start-up firms that we did talk to gave us very little to work with. They do not have a lobby and do not frame political demands. They only kept repeating they wanted lower

Bavarian court for hosting pornographic content which members of his service had privately placed on their home pages.

telecommunication prices" (Lutz Reulecke, interview 25.03.99). In fact, until July 2000, there was no political lobby group for internet entrepreneurs.[75]

Promoting the "garage entrepreneur"

A vast number of programs exist at the EU and national level directed at small and medium-sized enterprises (SMEs).[76] Germany is, in fact, known for its innovative, "diffusion oriented" programs encouraging technological uptake among a broad range of SMEs (Ergas, 1987). These programmes targeted at SMEs generally on the EU need to be differentiated from more focused support schemes for high-growth technology start-ups. Whereas the SME support schemes are focused on the needs of SMEs in more traditional sectors of the economy such as machine tools or medical research, newer programmes such as BioRegio,[77] InnoNet, Business Angels Netzwerk Deutschland (BAND) e.V. are tailored specifically to the needs of technology start-ups. Others, such as MEDIA@Komm., seek to encourage the use of digital signatures by public administration. All these initiatives intend to promote the formation of new, high-technology networks in Germany involving entrepreneurs, private financiers and regional and national policy-makers.

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[74] The Interior Ministry sought to enforce strict encryption laws.

[75] Internet entrepreneurs did not feel well represented in other groups that existed historically, such as the German Multimedia Association (dmmv), formed in August 1995. As a result, the European Net Economy Forum (ENEF), was founded as a political lobby group by 15 German internet start-ups on 24.07.00. The speaker of the ENEF, Kilian Lenard, explained his reasons for helping launch a new association: "To build our own representation within an existing association would have been much more difficult than starting an association of our own. The dmmv, for example, still has not formed a division concerned with the issues faced by internet entrepreneurs." The first issues the ENEF addressed were immigration laws for IT specialists (the German "Green Card" debate) as well as capital gains taxation for private equity investments by private investors and venture capital groups.

[76] The efforts by German government directed at SMEs need to be seen in conjunction with the European Union 4th and 5th Framework programmes. Although the initial EU Framework Programmes in the early 1980s focused on the "Technology Gap" and benefited the so-called "Big 12 Roundtable" companies in the information technologies sector, newer programs have a strong SME focus and their primary goal has been co-operation between SMEs of different European countries. The EU have promoted the G7, now G8, program on "Global SMEs" in which essentially the same emphasis on small firm cross-border exchange is lifted from an European to a global scale. It has to be furthermore pointed out that domestic support for SMEs did not wane while EU support was on the rise. On the "Big 12 Roundtable" and a concise comparison of EC and national R&R expenditures see John Peterson's research (1996).

[77] More praise for BioRegio: "Deutschland 2000: 'Es gilt, einen Schatz zu heben,' *Der Spiegel*, Number 35, 24.08.98.

Yet, is important to emphasise that there were links between traditional programs for SMEs and the institutions charged with carrying these out and the newer, high-growth schemes. Some already have been discussed, such as the certification program for digital signatures. This section will focus on the promotion of venture capital in Germany, two institutions oversaw the effort, the Technologie-Beteiligungs-Gesellschaft (tbg) of the German Equalization Bank (Deutsche Ausgleichsbank, DtA) and the German Development Bank (Kreditanstalt für Wiederaufbau, KfW). The DtA was founded in 1950 and extended credit to manufacturers and craftsmen. The KfW started in 1948 with the objective to finance the reconstruction of Germany. Both public/ private institutions drew upon funding provided by the Marshall Plan.

None of the diverse range of programs targeting high-growth firms mentioned at the beginning of this section such as InnoNet or BAND, were as important as the schemes promoting venture capital in Germany. While the KfW program provided a re-financing program to venture capital funds and extended guarantees, the tbg directly invested in start-ups, side-by-side with a venture capitalist or a private investor. For this reason, the tbg was the better known of the two schemes.[78] The BMFT must be credited for developing these programs without which venture capital funding would have dried up in Germany in the decade from 1989 to 1998. The mechanism used was a "co-venturing" concept in which the tbg doubled investments of venture capital firms and private investors without diluting their stake. This greatly reduced the risk that venture capitalists faced. The scheme, like that of the KfW, left the investment decisions to the market, meaning that private know-how could be exploited and governments did not have to make technology decisions.[79] The tbg and KfW programs could not be combined in a single investment.

[78] Actually, there were two important tbg programs, the BTJU and the BTU. "Business Investment Capital for Small Technology-Based Firms" (BTU) lasted from 1995 to 1999 but was recently extended into the next century. Its predecessor, "Business Investment Capital for New Technology-Based Firms" (BJTU) ran from 1989 to 1994. Both schemes were varieties of the "co-investment" concept. Including the investment activated by the refinancing scheme, the total investment through BJTU amounted to DM 314 million over six years. A total of 336 firms benefited (Kulicke, 1997b). The BJTU programme prided itself with the low failure rates of its firms. The low failure rate of 17% may also have reflected an overly cautious approach by the programme administrators, however (OECD, 1997a, p. 24).

[79] A further positive aspect of the tbg program was the speed of its investment decisions. The wait was reduced from 12 months to three weeks (TVM Interview). The institution could afford to be fast because it mainly relied on the investment decisions of its co-investors from the private venture capital market. In addition, the

tbg and KfW support was essential for the survival of the German VC sector until the Neue Markt had fully emerged as a viable exit option during the course of 1998. Without these programs, early internet start-ups such as Brokat and Intershop would not have been funded out of Germany. In interviews carried out in 1998, all venture capitalists that were consulted credited these programs with helping venture capital survive Germany in the 1990s. One high-level official in the Ministry of Economics characterised the benefits of the program in this way: "In this program, we show that the state can allow the market to handle important decisions. By the way, one cannot learn how to manage technology start-ups in a seminar. One has to do it oneself" (interview 11.05.99).

Three different developments had led to the creation of these equity investment support programmes in Germany.[80] One was the emphasis of the Minister of Science and Technology Heinz Riesenhuber on cost-savings and a reduction of what was called "Zuschussfinanzierung," subsidy financing. "Zuschussfinanzierung" was to become a word to be avoided in the Ministry. Indirect support of the enterprise was emphasised over direct subsidy of specific research projects. It was thought that government should not involve itself in making technology decisions on behalf of private businesses. Another factor was the ongoing positive experience in the Netherlands with publicly supported start-up venture capital equity programmes. The success of the self-sustaining venture capital industry also

paperwork required also matched that normally required for private investments; the business plan was the norm.

[80] A similar program emphasising equity investment had already existed in the late 1970s and early 1980s. Instead of declaring private equity investors as partners as in the later BTU scheme, the earlier equity program was launched in co-operation with 36 banks. The inspiration for the programme had come from the Netherlands, which began very early to support the growth of equity start-up investment to promote innovation and entrepreneurship. The program was discontinued in Germany, however, probably because the involved financial institutions, being banks, were the wrong partners. For several years, Germany had no equity support scheme. The Ministry of Research and Technology reverted back to credit support schemes. One of these was called "Promotion of New Technology-Based Firms" (TOU) and was comprised of non-repayable subsidies, credit guarantees and consulting services. From 1983 to 1988, a total of 319 firms received DM 240 million in subsidies for development work and 258 potential firm founders received subsidies totalling DM 8 million for perfection of their business plans (Kulicke, 1997b, p. 107, 112-114). This direct government support programme was not continued, however, after it ran out in December 1988. It was revived with some alterations for the new federal states as "New Technology-Based Firms in the new Länder" (TOU/ NBL) in May 1990 to December 1995 and "Promotion and support of New Technology-Based Firms in Selected Regions" (FUTOUR) in January 1997 (Kulicke, 1997b, p. 114). Until the end of 1999 FUTOUR is expected to support the foundation of 250 firms in the new federal states (BMBF and BMWi, 1998, p. 71).

was apparent in the U.S.A.[81] Another decisive factor was an analysis of experimental predecessor programmes targeting young technology companies on a federal level by the Ministry. The new equity-based BTU programme was merely the last in a series of federal programmes targeting young technology-oriented companies, albeit with a credit and subsidy emphasis. These programmes had been examined in detail by an independent think tank, which was part of the association of Fraunhofer Institutes. The Fraunhofer Institutes also researched the effectiveness of other programmes at a state level, such as technology parks and MBGs.

In fact, the various Fraunhofer Institutes served as an intermediary linking entrepreneurs to the public bodies. Researchers from the Institutes were in contact with entrepreneurs, collecting feedback, aggregating it and making concrete design recommendations. The forum of policy discussion therefore consisted in this case entirely of specialists, of Ministry experts from the BMFT, of the program administrators at the tbg as well as the researchers from the Fraunhofer Institutes.

Table 1. Investments by the tbg compared to total venture capital investments in technology in Germany (in EUR millions)[82]

	tbg	Total technology investments in Germany	tbg proportion of total
1996	44	182	24%
1997	109	331	33%
1998	198	664	30%
1999	388	1,317	29%

The total volume of investment in young, technology-based firms by the tbg was significant. When one compares it with the total amount of technology venture volume in a

[81] U.S. government passed legislation in 1958, which created the Small Business Investment Corporation (SBIC) program. This program included loan guarantees permitting participants to leverage their private funds. The program must be credited as an important early step towards the creation of formalised, independent venture capital industry in the United States (Kenney, 2000, 5).
[82] Technology investment data from: EVCA, *Yearbook 1998*, *Yearbook 1999 and Yearbook 2000*. Technology investments in Germany were defined as the sum of investments in the following sectors: "Communications," "Computer related," "Other electronics related," "Biotechnology" and "Medical/ health related." Constant exchange rates were used for all three years: 1 EUR equals 2.0 DM. tbg data from tbg internet site. http://www.tbgbonn.de/, data was dated 10.05.00. Accessed on 20.08.00.

given year in Germany at the time, however, its importance relative to private investments becomes even more apparent (See Table 1 above). The amounts invested through the tbg in 1997 represented a third of total technology investments in Germany.

The BMFT must also be credited for having shied away from national technology park schemes, with the exception of a series of parks in Eastern Germany. Technology parks were favourites of regional policy makers.[83] Interest in setting up these parks peaked in 1985 and 1986, with 43 new centres set up in those two years alone (Kulicke, 1997b, p. 119). Regions also extended special subsidies to entrepreneurs, but these were mainly focused on structurally weak areas.[84] Lastly, regional promoters also sought to address the financing of high-growth enterprises. Entrepreneurs- especially in IT and biotechnology- were complaining that bank officials were unwilling to extend credits to them without solid securities. Realising that bank credits were an unsatisfactory means of promoting young software and biotechnology firms, promoters were inspired by the equity financing model of the U.S. venture capital (VC) community and especially also the U.S. program surrounding the Small Business Investment Corporation (SBIC). The result was the creation of regional investment vehicles, the "Mittelständische Beteiligungsgesellschaften" (MBGs). These were founded in many states. They were, however, unable to operate like real VCs. Firstly and most importantly, their public nature dampened incentives to maximise profits. Secondly, investment managers had little know-how in software and biotechnology. As a

[83] The model for the technology park was the original "technology park" around Stanford University. In the 1980s, German local state governments wanted to promote entrepreneurship and believed the needs of start-ups were concentrated in two areas, lack of funds for infrastructure and office facilities and a need for specialised consulting services. The schemes were only moderately successful; many high-potential companies avoided the parks altogether. A problem that can be equated with some, but not all parks, was that the policy objective of promoting start-ups was combined with the objective of promoting slow growth regions, mostly in insignificant cities or rural areas. Instead of moving away, most high growth firms want to be in a city, which provides them with quality service facilities as well as easy access to other players in telecommunications, software and media.

[84] Here, objectives of promotion of structurally weak geographic areas overlapped with support objectives for small and medium-sized firms, especially if they drew on European Commission funds. Hessia, for example, offered a programme to support hiring of additional personnel (called "Programm zur Förderung der Humankapitalbildung durch Innovationsassistenten oder -assistentinnen"). They only applied to selected regions such as parts of Fulda, Hersfeld-Rotenburg, parts of Kassel. Growth areas were excluded. One managing founder described the support programme schemes with the following words: "Being in Düsseldorf, you always lose. On the EU level, the money goes to Spain. The federal government targets former East Germany. And in Northrhine Westphalia, funds go to 'structurally weak' areas, but not to Düsseldorf. We considered opening an office in former East Germany, but it would not have been worth it" (Lars Heiden Jörg Füllenbach Realisationen interview).

result, companies financed by MGBs generally did not do as well as those that were financed by private venture capital firms (Kulicke and Wupperfeld, 1996, p. 220, 221). Nevertheless, in 1995, these investment firms counted for 60% of all investments in SMEs (Kulicke, 1997c, p. 140-142).

In summary, it was the separate learning experiences on a federal and state level as well as the desire to move away from subsidy financing which resulted in the initiation of two very successful equity support schemes administered by the tbg and the KfW. The salient point was that they both involved the venture capital community as private partners. The redirection of funds from direct credit subsidies to indirect support of private investors was not accomplished without resistance. In fact, a high-level Ministry official remembers that the press as well as entrepreneurs had strongly criticised the departure from the previous subsidy scheme: "There was great lamentation by entrepreneurs, industry associations and journalists. They cried out: 'A great program will be destroyed.' At that time, the Ministry displayed a great amount of courage" (interview 11.05.99). This meant that German entrepreneurs in the early 1990s were still unaware of the benefits of venture capital investment and of the culture of Silicon Valley-style rapid growth. This was confirmed by other studies, but has changed considerably in the late 1990s, as will be shown in the subsequent chapters. What it also apparent through the episode is that the Ministry of Research and Technology (BMBF) had the ability to initiate unpopular programmes and could steer away from consensus if the issue was deemed sufficiently technical and uncontroversial. The difference to telecommunications policy was considerable. This “technical” policy-making process was highly formalised including the previously mentioned “experts with specialised knowledge” and a public private intermediary in form of a research institute. Technology policy was in this instance highly effective in reaching its target of encouraging venture capital investments in Germany at a time when public markets in Germany were still not receptive to listings of young technology start-ups.

Conclusion: The access sacrifice

Policy-makers have for thirty years tried to close the so-called "technology gap" between Germany and the United States. Policy mistakes were made and government in the Kohl era tried to learn from them. And, in fact, some mistakes were not repeated. From the 1980s, a partial shift occurred in technology policy. Instead of subsidising specific projects directly, government officials in the Ministry of Research and Technology (BMFT) tried to redirect funds at the corporate level, letting private business decide how to use the money most effectively. The most successful of these programs were the venture capital support schemes realised through the public/ private organisations Technologie-Beteiligungs-Gesellschaft (tbg) and the KfW. The funds channelled towards start-ups and the guarantees extended to venture capitalists kept the German venture capital market alive until the alternative stock market "Neue Markt" invigorated the industry. Without the tbg and the KfW, there probably would have been no German internet start-ups backed by venture capital firms in Germany in 1996 and 1997 (such as Intershop and Brokat) and know-how regarding high-growth entrepreneurship would neither have been cultivated in start-ups not in venture capital firms. Key policy-makers in the Kohl coalition such as Riesenhuber did not believe government should be involved in downstream technology decisions; he was responsible for sending the signal which resulted in the development of these public/ private promotion schemes. Interestingly, the success of these schemes also seems to have been dependent on the fact that the issue was not of interest to the general public. Policy was designed in an isolated forum by specialists, which introduced the new programs despite resistance by some entrepreneurs.

Institutions and traditions of German policy-making emphasise the idea of the Rule of Law, or "Rechtsstaat." Although there are numerous contemporary and historical examples of German government intervention, emphasis- in both popular political camps- is placed on creating a framework for the development of market and society. Framework legislation is viewed as superior to direct intervention in achieving the objective of a vibrant market economy. The "Multimedia Law" of 1997 sought to provide a straightforward legislative framework for the development of electronic commerce in its early stages. It was designed as a temporary law, set for re-evaluation. For example, it initiated a digital signature certification scheme. The law's main purpose was to insure that providers of online and internet services could offer these services freely without licensing or similar obligations. It was feared that state governments would have imposed these, as they did in the case of Btx videotex. Yet, the law was a largely state-led initiative, sparked by the German Rule of Law tradition, in areas where entrepreneurs did not perceive an obvious legislative need.

Despite public statements to the contrary, direct, state-led initiatives are frequent in Germany. One example of a state-led initiative gone wrong in Germany in the online arena was Btx, the German public videotex project of the 1980s. Again, it arose out of a perceived need by government. Initiated before the Kohl era but continued throughout it until privatisation in 1995, millions of DM were spent on Btx. Btx never proved popular because it stood awkwardly between the U.S. and French models of on-line development. U.S. government on the one hand built a public internet infrastructure but commercialised it at the earliest instance, removing its own presence almost completely. Cross-subsidisation of internet access was not paid for by government. Telephone users subsidised their own "flat rate" local access to the internet via their telephone long-distance connections. French government, on the other hand, incorporated Minitel into its universal service obligation and insured that the system was rolled out to a great number of households. In effect, in both the U.S.A. and France, access was subsidised. In the U.S.A. access was subsidised by telephone users in an intense competitive landscape and an asymmetric telecommunications regime favouring internet access providers over local telephony companies. In France, Minitel access was a government target and was publicly realised, for example, by giving away terminals. In Germany, Btx was jump-started by government initiative, but the access pricing issue was ignored. It was assumed that even though the service was prohibitively expensive, it would be used. In addition, it was a closed, country-only system which offered only selected services and no international choice.

Some German policy makers were aware of the importance of low-cost consumer access to data network such as the internet when they were drafting and negotiating the Telecommunications Law of 1996. But, despite the Btx lesson at home and the examples of the development of internet services in the U.S.A. The internet access issue was sacrificed in order to achieve the compromise necessary for achieving telecommunications liberalisation. Compromise meant incorporating at least some of the wishes of the main opposition party, the SPD and the third player in the corporatist triangle, the postal worker's union DPG. Liberalisation was carried out while letting the incumbent remain in control of both possible means of internet access in Germany: The telephony and cable TV networks. Wireless local loop technology did not appear as rapidly as expected, as an alternative, third means of access. Already in 1996 wireless technology seems to have been used merely as an excuse to justify the compromised course of liberalisation. Local access pricing could only begin to be addressed after 1998 by the independent regulatory body, the RegTP, which then, however, acted conclusively. The delay had already happened by then, and even RegTP could not end prohibitive access pricing immediately but had to wait for the market to react to its activity. This will be discussed further in the next chapter. If competition for access was not possible, what about the "French way:" Direct public subsidies for on-line access? This was out of the question given the pledge by the ruling coalition to reduce government spending and roll back the state.

It is instructive to contrast policy in the telecommunications area with that in the financing of high-growth technology start-ups. In the specialist, "departmentalised" forum charged with the promotion of venture capital a highly effective public/ private program was designed and executed. Government gave support, but it did not take full ownership. Telecommunications policy, however, was highly controversial and corporatist compromise seemed the only way forward.

But the story of high, metered internet access costs well into 1999 cannot be told by focusing on government alone; the involvement of the Deutsche Telekom is crucial as well. The next chapter will concentrate on explaining the rationale behind the actions of the Deutsche Telekom. A crucial question emerges out of the fact that Deutsche Telekom was both telecommunications operator as well as an internet provider- through T-Online. Why did the "national champion" not promote the use of its internet service among consumers and small firms more if it recognised the internet as one of its most important future areas of business? In other words, why was the Deutsche Telekom on its own accord unable to act as a force for innovation in Germany – a role that some policy-makers in Germany, especially among the SPD, had trusted her with.

Chapter Five

Deutsche Telekom and Internet Access in Germany

In Germany, a range of different government policy initiatives had an impact on the global opportunities of local ventures. Measures in two arenas were especially important for internet start-ups: Telecommunications liberalisation and the promotion of venture capital. Policy making in both arenas was discussed in the previous chapter. Both arenas require further examination, however, because direct government action alone cannot explain the evolution of internet ventures in Germany. The next chapters will focus on other actors. This chapter, which delves into internet uptake in Germany, is based on the premise that direct government action taken to encourage the growth of the internet through the research network DFN was ineffective and misguided. Much more important was the interaction between government and the dominant telecommunications player, the German postal service and later Deutsche Telekom AG (DTAG). It is this relationship which has impacted upon the mass uptake of internet services more than any other factor because it influenced the pricing of internet access for homes and small firms. The actions of the dominant telecommunications player cannot be understood merely as a straightforward consequence of government action, however. It is crucial to understand DTAG company strategy as well. Much of the focus here is on the activity of a single firm, and most of the chapter will be dedicated to understanding what caused Deutsche Telekom to act in the way it did. At the end of the chapter, however, the competition of DTAG will also be discussed briefly because of their role in introducing cheaper internet access after liberalisation in 1998.

As a result of the specific course of telecommunications liberalisation embarked upon in Germany, the formerly public, now private, telecommunications operator owns most of network infrastructure enabling access to the internet. In 2000, two years after liberalisation, Deutsche Telekom still owns more than 99% of all fixed telecommunications lines to the German home. It retains significant stakes in several cable TV broadband access networks across Germany with a total of 18 million active subscribers. It also owns a majority stake in the largest internet access provider in Europe, T-Online, with 6 million subscribers.[1] T-Online is a public company Deutsche Telekom spun off in April 2000. In the last chapter, the political compromise was described which resulted in the liberalisation of the German telecommunications market under the condition that the dominant player retain control over these key assets. Here, the emphasis will shift to how DTAG has used these assets from the year of the Telecommunications Law's passing and the public listing of Deutsche Telekom in 1996 through to liberalisation in January 1998 and the immediate period thereafter.

This study has already highlighted how growing home use of the internet and small business access transformed business processes in a wide range of consumer and business-to-business markets. Through ubiquitous internet access, consumers and small firms were integrated into electronic business networks connecting service firms, manufacturers and suppliers. The German government has been trying to encourage this development through means such as the "Multimedia Law." The most important initiative, however, with an impact on home use and small firm uptake of network services was telecommunications liberalisation. The idea driving liberalisation was that increased competition would drive down prices and benefit consumers. Policy makers concerned about the uptake of internet services in Germany among consumers were from the very beginning aware of the importance of local call prices in the "last mile," since the local telephone line was the main means of accessing the internet. And accessing the internet was prohibitively expensive in Germany due to local call tariffs. Upon liberalisation, however, these were the last prices to start falling, after international and long-distance calls. Prices started falling only when internet access pricing was introduced by the internet service providers as separate from overall local call tariffs. There were three major milestones for internet access pricing in Germany, with in all cases tariffs by Deutsche Telekom's internet provider T-Online closely following the offerings of its competitors: In Spring 1999, a significant reduction in internet access prices occurred, still, however, on a metered basis ("Internet-by-Call"). Since then, metered prices fell steadily. In Spring 2000, for the first time, ISDN-based flat rate internet access offerings became widely available throughout Germany, with monthly all-inclusive

[1] This number includes 500.000 subscribers in France, which were added through the acquisition of Club Internet. "T-Online jetzt mit mehr als 6 Millionen Kunden," Press Release, T-Online, 27.07.00.

prices falling below DM 100 (RegTP, 2000, 31, 32). For September 2000, Deutsche Telekom announced flat rate broadband access to the internet through "T-DSL."[2] The story continues to unfold, however. The low ISDN flat rate fees of Deutsche Telekom were criticised by competitors who found it unable to compete with the ex-monopolist on that pricing level. Several offerings were taken from the market, paving the way for a withdrawal by DTAG. Apparently, flat rate usage was much higher than originally expected.

Before Spring of 1999, however, internet access prices in Germany were prohibitively high, restricting usage. In fact, Germany consistently ranked among the most expensive countries among the OECD for internet access. Especially important for this analysis is the period from 1996 to 1998, from the public listing of Deutsche Telekom and the passing of the telecommunications law to actual liberalisation in 1998. This period coincided with the take-off of the internet in the United States and in a few other countries. After January 1998, the national telecommunications regulator, RegTP, controlled the prices of the Deutsche Telekom. From this moment on, Deutsche Telekom was not free to lower its prices without permission; RegTP was concerned that the dominant operator could outprice the competition and that this could act as a disincentive to infrastructure investment. A further important question to be answered here, however, is why even after liberalisation in 1998 it took another full year for the competition to introduce attractive internet access packages. After January 1998, it becomes important to analyse the competition because it was they which, initially, took the lead in establishing competitive prices.

The route taken by the Deutsche Telekom from 1996 to 1998 was by no means self-evident. It cannot be extrapolated solely by analysing government actions and viewing the actions of the dominant carrier as a direct response. A publicly listed company striving to increase shareholder value is expected to maximise profits. As a company involved in the rapidly changing "network economy," however, DTAG was also expected to justify higher valuations by positioning itself for future earnings. The internet and broadband internet

[2] See also the Press releases of T-Online: "T-Online bietet Flatrate für 79 Mark pro Monat," Press Release, T-Online, 26.05.00; "T-Online offeriert T-DSL-Flatrate für 49 Mark pro Monat," 17.08.00.

access were long before 1998 clearly viewed as one of the most promising future growth segments. It is not clear, therefore, why DTAG did not embrace this young market. Deutsche Telekom was not just the dominant telecommunications operator, it also owned the main German internet service provider, T-Online. Arguably, DTAG could actually have selectively introduced lower internet access rates while keeping general local call rates high. This strategy was actually embarked upon in April 1999. Yet, Deutsche Telekom retained a high price for all local phone calls from 1996 until liberalisation and several months thereafter. Next to the possibility that the management of the Deutsche Telekom simply underestimated the "disruptive technology" of the internet (see Christensen, 1997) there may also have been technical reasons why Deutsche Telekom could not have followed this course earlier. This theme will also be explored here. But what about the cable TV network? DTAG could also have used its cable TV network to introduce broadband internet access services to millions of households and small businesses. In this case, DTAG's defensive strategy ruled out such a move.

This chapter will focus on the issues which prevented Deutsche Telekom from acting as a catalyst for widespread internet access in Germany. DTAG's own objectives simply did not correspond to those of an ideal 'national champion,' which some politicians believed she was. It needs to be noted, however, that the same question applies also to the competition, which, although it was able to prepare for January 1998 well in advance, took so long to effectively address internet access and broadband internet access.

The global cost challenge and the telecommunications industry

Throughout the 1990s, traditional telecommunications carriers were battered by the advances of new entrants. The new players waged what one could describe as a 'cost challenge.' The cost challenge first began in the United States but quickly moved to world markets, in the wake of telecommunications liberalisation. The challenge came in two varieties, which were very much interrelated: One was in terms of market strategy. New entrants engaged in 'raisin-picking' and focused on the most lucrative clients: Multinational companies and financial services firms. These new entrants, among them the so-called metropolitan carriers, shied away from the high costs of a mass access network.[3] The second cost challenge came in the form of technological change and the fact that new internet-based networks were cheaper to install and maintain than conventional circuit-switched networks. The incumbent carriers had to react by cutting their own costs with aggressive infrastructure modernisation schemes and lay-offs while at the same time developing new strategies which would leverage their broad reach and well-known brand names. This was a difficult position to be in and Deutsche Telekom faced the challenge together with most other incumbents.

New entrants worked with a much lower cost structure than traditional carriers because they used internet-based data technologies instead of circuit-switched technologies.[4] When internet-based technologies (called 'packet-switched networks') were used by the first new entrants in the mid-1990s, they were largely regarded as technologically inferior to the circuit-switched networks of the main carriers. Packet-based networks were viewed as especially inferior for the transfer of so-called 'streams' such as voice- the bread-and-butter of telephone carriers. Obviously, circuit-switched networks, which were first developed in the 19th century, had been undergoing constant improvement. During the 1990s, for example, switches were digitised to offer intelligent services such as call waiting or call

[3] "Raisin-picking" allowed specialised telecommunications newcomers to prosper. They managed to reduce the market share of the incumbent carriers in the lucrative segment of multinational clients with large volumes of data flow. Up to one fourth of total expenditures of internationally operating financial institutions are spent on telecommunications services (Welfens and Graack, 1996, 29). In this case, scale weighs against the incumbent carriers, while new, specialised challengers build only where necessary. One of the best known entrants is Metropolitan Fibre Systems (MFS). Started in 1987, the company has built fibre rings in major financial centres including New York, London and Frankfurt. It was allowed to operate in Frankfurt even before liberalisation from September 1995 due to a special agreement with the City of Frankfurt (Gerpott, 1998, 276). MFS has since been acquired by WorldCom for $14 billion (in August 1996), whose ambition it was become the leading communications provider for multinational enterprises. Others have followed the lead of MFS, such as COLT, City of London Telecommunications. Refer to the excellent interview with Paul Chisholm, CEO of COLT in the trade publication *Global Telecoms Business*. "COLT: Building its Capital in Europe's Business Centres," *Global Telecoms Business*, July/ August 1998, pages 14-20. See also Beth Gage and Christine Heckart, "Telecoms Players Go Down Evolutionary Path," *Global Telecoms Business*, April 1998, 36-38. The barriers to entry were low in this market segment and the new challengers vigorously competed among themselves.

[4] MacKie-Mason and Varian have explained the cost advantage of packet-switched networks compared to circuit-switched networks masterfully: "[With circuit-switching,] a fixed share of network resources is reserved for the call, and no other call can use those resources until the original connection is closed. This

forwarding. To the incumbent carriers, it seemed impossible that internet technologies would be able to catch up. This type of error of judgement on part of dominant enterprises is not uncommon in the history of technology, as Clayton Christensen shows in his book: *The Innovator's Dilemma* (1997). Christensen argues that incumbents often underestimate the cost-cutting potential of initially inferior technologies. Inferior technologies thrive first in market niches, niches that are too small to warrant action by large firms. But although they are first used in low-price niches, inferior technologies can potentially threaten the incumbent's business by "suddenly" appearing in a much-improved guise.

During the second half of the 1990s, packet-based network contenders "grew up," confirming Christensen's research.[5] The maintenance of these new networks is much cheaper than that of traditional telecommunications networks, perhaps even 1/27th.[6] In the United States, new challengers such as Qwest, Level3 and IXC used internet-based architecture to offer low-cost long-distance connections to businesses and consumers. Project Oxygen ambitiously intended to embrace the world with a global, packet-based 320,000-km ring. The rise of the internet came as a complete surprise to almost all incumbent carriers.

In Germany, internet-based telecommunications contenders also thrived. Some emerged as independent internet providers in the early 1980s in Germany and are now owned by major US or European data communications challengers.[7] Although Deutsche Telekom generated more revenue from data networking than its main contenders, competition was severe and the incumbent was only able to achieve its lead in the year 1998 (see Table 3). Deutsche

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means that a long silence between two teenagers uses the same resources as an active negotiation between two fast-talking lawyers" (MacKie-Mason and Varian, 1998, 33).

5 Andy Zimmerman has examined how Christensen's arguments apply to the telecommunications industry in the late 1990s, faced by internet technologies. Andy Zimmerman, "The Innovator's Dilemma: Will 'Bad' Technologies Win?" *Global Telecoms Business*, November/ December 1998, pages 44-47. See also: Tony Jackson, "Book Review: Bad Ideas That Win Markets," *Financial Times*, 14.11.97, page 12.

6 A Level3 executive cited in Oliver Roberts and Robert Samuelson, "How Refrigerators Will Surf the Net," *Global Telecoms Business*, May 1999, 44.

7 Xlink was acquired by KPNQwest, a joint venture between Qwest and Royal KPN, Uunet by MCI WorldCom, DPN by the US venture capital-financed company Via Net Works and Nacamar by Netherlands-based World Online (whose investors included the Sandoz Family and Intel). World Online was later subject to an insider trading scandal. The German concerns Bertelsmann and Debis co-owned the data networking

Telekom therefore faced pressures from metropolitan carriers, data networks as well as from other strong contenders.

But Deutsche Telekom was not alone; most incumbents were confronted with the same challenges. At first, they addressed the strategic issue of "cherry picking." Global alliances such as Global One, WorldPartners and Concert were formed among most large telecommunications incumbents in the first half of the 1990s.[8] The concept that fuelled these alliances was that lucrative multinational business clients desired a world-wide "one-stop-shop."[9] These alliances of two, three or more operators did not fare well, however, because members viewed themselves as competitors and governance structures had not been agreed upon. Traditional telcos realised that only full network ownership allowed them to offer valuable global services to multinational clients. Furthermore, money could be made by keeping the client "on the own network" as long as possible. By this time, new contenders, especially WorldCom, had already started to build their global network through an acquisitions spree aided by capital markets. WorldCom showed the established carriers how to build a "real" global network through acquisitions based on its high valuation (the company's shares trading at the time at 40 times of the subsequent year's estimated

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specialist Mediaways over which AOL Germany was run (for the most comprehensive summary, see Lux and Heinen, 1999).

[8] During the first half of the 1990s, the initial response by the largest telecommunications firms to liberalisation and the arrival of new competitors were global alliances. For example, "WorldPartners," formed in 1993, comprised of AT&T, KDD (Japan) and Singapore Telecom. That same year, British Telecom (BT) and MCI agreed to ally as "Concert." Deutsche Telekom's group, first called "Phoenix," then "Global One," was an alliance between France Télécom and Sprint, the third largest US long-distance carrier. Neither of the carriers was allowed to enter the home market of the others. This restricted the possibilities for Deutsche Telekom to expand into the largest telecommunications market, the USA. Moreover, "Global One" was not a success. Deutsche Telekom sold its stake to France Telekom in January 2000. Nicole Harris, "Partner's Rift Spurs Concerns for Global One," *The Wall Street Journal Europe*, 10.-11.09.99, page 3. For details on "Global One" see Gerpott, 1998, 225-229.Other alliances, such as "WorldPartners," fared a little better, but did not reach expectations. "WorldPartners" was also unravelled. Co-operation between BT and AT&T was being explored from the Summer of 1998. Although BT and AT&T stated then that they did not plan to merge, BT's "Concert" would be integrated into the new co-operation and the partners would base their new alliance on common design standards and tighter network integration. Alan Cane, "WorldPartners and Unisource to be Unravelled," *Financial Times*, 27.07.99, page 27. See also on the same page: Tracy Corrigan "Deal with BT Completes Reformation of Once-lagging AT&T" and Alan Cane, "Seeds Sown Over Dinner Table."

[9] For a study in German language on globalisation and telecommunications focusing on Deutsche Telekom, see Paterna, 1996.

earnings). World-wide acquisitions were forthwith viewed as the main means to achieving a true global presence using integrated data networks.[10]

Yet the battle for multinational clients was a difficult one, and not necessarily one that the established incumbents were very well prepared to fight. Firstly, their businesses were much broader than those of the specialised challengers. Secondly, their technological base was more costly and older than that of the new entrants. Acquisition was viewed as one key to success, especially the purchase of international mobile phone networks. Yet, there were only a few good properties available. A new "story "(to use a term borrowed from financial analysts) was needed to invigorate the share values of the incumbent carriers, which were slipping compared to those of their much younger challengers. Just in time, a welcome solution for the incumbent carriers appeared on the horizon. They would be the providers of broadband mass internet access to homes and small businesses.

Incumbent carriers have three key assets: They own well-recognised brand names, have customer relationships with millions of people and are centres of expertise in mass broadband market businesses. These assets were viewed as important factors in building a service for mass internet access. Some incumbents, such the European incumbent telecommunications operators and the US regional bell operating companies (RBOCs), supply local telephone access to households and small businesses. These fixed lines could be upgraded to enable broadband internet services via ADSL or other technologies. Other telecommunications firms gained access by buying into cable TV networks. Starting from 1998, broadband mass internet access became the magic formula for almost all competition-plagued incumbents.[11] By discovering internet broadband, incumbents could

[10] MCI owned internet backbone providers previous to the acquisition by WorldCom. WorldCom had also bought IP-based networking businesses, especially important was that of CompuServe, which it acquired for $1.2 billion in September 1997. See Richard Waters, "A Bid Aimed at Domination," *Financial Times*, 03.10.97, page 26; Tony Jackson, "Internet takes on the Phone," *Financial Times*, 02.10.97, page 21; Daniel Bögler and William Lewis, "Bid Backed up by Strong Share Price," *Financial Times*, 02.10.97, page 28. The hold MCI-WorldCom had over the world-wide data network structure triggered a response by the European Union, which asked the carrier to divest part of its internet holdings.

[11] AT&T, which was excluded from local access in 1982 ("Modification of Final Judgement"), could again engage itself locally thanks to the Telecommunications Act of 1996. It did so by buying cable TV networks, such as TCI in 1998 (for $59.4 billion). See the background article by Richard Waters and Alan Cane on Telecommunications mergers and acquisitions: "Making Connections," *Financial Times*, 26.04.99, page 21.

start developing a young market using its own assets and expertise. As long-distance revenues shrink further, internet broadband will compensate – so it was hoped. But broadband internet access made sense only in combination with alternative pricing mechanisms, such as a flat fee or volume-based fees. Metered fees, even low metered fees, served as a disincentive to internet usage, especially for using the types of video or audio services which broadband access could have enabled.[12] Deutsche Telekom pursued the vision of flat-rate broadband later than other telecommunications firms. It tried to position ISDN internet access as a broadband solution until it rolled out T-DSL broadly in 2000. ISDN could not fulfil the capacity demands for broadband, internet use. And, until that year, all of its services were metered offerings. Furthermore, Deutsche Telekom succeeded for a long time in preventing cable TV to be used for broadband internet access.

Deutsche Telekom in the cost trap

> "The problem for telcos is that voice is falling in its profitability, and their revenues are coming under attack from all sides... The temptation therefore to see internet calls as a 'cash cow' to be milked while good times last is a strong one. The first provider that has the confidence to offer a cheap, fast internet service will quickly take market share. Only time will tell whether they can make money."[13]

> "Carriers are reluctant to cannibalise existing revenues, although this should be done as quickly as possible. Cannibalisation is an investment in growth, which the computer industry understands. With forward-pricing of high bandwidth

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Its long-distance competitor Sprint also provided local broadband access. Sprint began piloting a new broadband internet service called "ION" in mid-1998 (with the actual roll-out occurring throughout 1999). ION was paid for by volume ("by bit"), not by time metering. Furthermore, Sprint claimed that ION, which essentially meshes traditional with internet technologies, reduced its network costs by over 70%. See Sprint 1998 Summary Annual Report, pages 20-25. Also see: Oliver Roberts and Robert Samuelson, "How Refrigerators Will Surf the Net," *Global Telecoms Business*, May 1999, pages 43 and 44; Randall Hancock and Charles Gerlach, "IP Revolution Transforming the Global Telecoms Industry," *Global Telecoms Business*, June 1998, page 42. For a general discussion of Sprint see Gerpott, 1998, 145-147.

[12] Phil Dwyer, a consultant with the research firm Jupiter Communications, stated in May 1999: "Telephone usage is metered and that alone will continue to hold back the growth of online advertising, content and commerce ventures in Europe by inhibiting internet usage." "European Online Households Triple by 2003, But Usage Will Remain Low," Press Release, Jupiter Communications, London, 18.05.99.

[13] Chris Cherrington and Sapna Capoor, "E-commerce and the Opportunities for Telcos," *Global Telecoms Business*, May 1999, 51.

> connections, the telcos could build the growth markets of the future, right in their own backyards."[14]

In his ongoing research, the telecommunications consultant Thorsten J. Gerpott analysed the transformation of the Deutsche Telekom from a public operator to a private telecommunications group engaged in global competition. In his updated book on the telecommunications landscape of Germany from 1998- one of the few comprehensive overviews available thus far on recent developments- Gerpott presented a grim picture of DTAG's transformation process (1998, 2-3, 163-235). This was confirmed by other research (Zerdick et al, 1999, 69). Gerpott believed that Deutsche Telekom was faced with a cost trap out of which it extricated itself only very slowly. This cost trap was not only detrimental for the firm and its shareholders but also for the cause of mass internet access in Germany. This is because Deutsche Telekom, as Gerpott claimed, was using full proceeds from local phone calls to cross-subsidise its other operations and above all to disguise its efficiency figures. Indeed, data from 1995 showed that Deutsche Telekom scored extremely low in terms of employee efficiency, compared to other telecommunications incumbents.[15]

However, since that time, DTAG achieved impressive progress. In fact, the years from 1995 to 1998 were marked by a massive catching-up effort. The former monopoly carrier lowered its employee base from 1995 to 1998 by about 50,000 people, mostly through schemes such as early retirement and by not filling vacant positions.[16] Further cuts were complicated by the fact that 47% of Deutsche Telekom's employees were still classified as public servants at the end of 1998, a privilege for life that granted special status.[17] Nevertheless, through the reduction of employees from 1995, Deutsche Telekom managed to improve both its revenues per employee as well the number of phone connections per employee.[18] Despite

[14] Francis McInerney and Sean White, "Are Telecoms Giants Suffering from Tunnel Vision?" *Global Telecoms Business*, December 1998/ January 1999, page 45.
[15] For a summary of Gerpott's argument see Gerpott, 1998, page 189, especially also page 211, for price comparisons see pages 191-197. Also: "Böses Erwachen," *Der Spiegel*, 8/1999, pages 112-114.
[16] English language Deutsche Telekom Annual Report 1998, page 23 as well as Gerpott, 1998, page 187.
[17] English language Deutsche Telekom Annual Report 1998, page 23. See also Gerpott, 1998, page 102. The reduced employee base of Deutsche Telekom in 1998 was completely compensated for in the overall telecommunications industry by the hiring activity of new entrants (RegTP, 1999b, 5).
[18] Deutsche Telekom's net revenue per employee in 1998: DM 390 Thousand (in 1995: DM 305 Thousand), household connections per employee: 260 (in 1995: 183). In the number of household connections per employee (including ISDN connections) in 1998, it scored better than two very well-run incumbent operators:

these ongoing efficiency gains, Deutsche Telekom did not lower its prices for internet access, however, in the period from 1996 to 1998.

That DTAG kept its prices high is evident through international comparisons. Some researchers in Germany challenged the legitimacy of carrying out international price comparisons (Albach and Knieps, 1997). In an interview with a news magazine, DTAG Chairman Ron Sommer has also questioned the validity of international price comparisons by citing structural differences in the world telecommunications industry. One example he used was the fact that German fixed telecommunications lines are required to be placed underground, whereas in the US or France, masts can be used.[19] These arguments are difficult to prove or to disprove. True cost structures will only become apparent with strong competition in local access.

One detailed international price comparison of 1996, which was commissioned by the association of DTAG's competitors, VATM, concluded that prices paid by large business users in Germany were in line with international standards, but that local call prices were very high. This finding was confirmed by OECD estimates reported in 1997 and again in 1999 in "Communications Outlook," a useful study which actually compared internet access prices. In this study, internet access prices were split up into local call charges and internet access charges. Although independent German internet access providers (ISPs) seem to have charged very little relative to international rates, this advantage was erased by the extremely high local call prices German users are charged by the Deutsche Telekom.[20] In the 1997 survey, Germany was on rank 20 of the 25-country survey, the cheapest countries occupying the first positions. Countries such as USA, Sweden, France and the Netherlands offered cheaper access than Germany. In the 1999 survey, Germany had slipped even further, to position 29 out of 30 countries.[21]

Royal KPN (258) and Telia (207). Source: Annual Reports. In net revenues per employee, DTAG lay in-between the positions of Royal KPN (DM 446 Thousand) and Telia (DM 356 Thousand). For 1995 estimates see Gerpott, 1998, page 188.

[19] "Interview: Das nenne ich Enteignung," *Focus*, 28/1997, pages 202-204.

[20] Vigorous competition existed in Germany among internet providers. This is documented by the two excellent overview books to the German internet provider market, Lux, 1995 and Lux and Heinen, 1997.

[21] The OECD survey cited compared off-peak access prices based on 20 hours internet use in 1998. OECD, 1999, page 187, for calculations details please see pages 175 to 186.

A German telecommunications activist, Karl-Heinz Dittberner, examined internet access pricing on an individual company basis in 1998. In his comparison, standard internet user costs (20 hours/ month) were included as well as costs faced by "power users" and small firms (100 hours/ month). The more the internet was accessed by a single user, the more prohibitive German costs became compared to US costs (see Table 1). This was a direct result of Deutsche Telekom's metered pricing policy in the local loop until 1999, which did not differentiate if the local line was used for a phone call or for an internet connection. Other sources, which were less systematic, also indicated that the German "power user" and small firm faced phone bills of around DM500 / month due to internet use in 1997.[22] On November the 1st, 1998, internet user groups carried out a national strike in Germany in which they stopped using the internet and "blackened" their home pages.[23]

[22] For an excellent summary article which discusses many of the points mentioned in this chapter, refer to Michael Wilde, "Überdreht, Wegezoll auf deutschen Infobahnen," *c't*, 12/97, page 86.
[23] James Glave, "Germans Plan Internet Strike," Wired News http://www.wired.com/;, 01.10.98; Tilman Baumgärtel, "Internet-Streikwelle in Deutschland baut sich auf," Telepolis, http://www.heise.de/tp/, 02.10.98.

Table 1. Comparison of selected internet access costs USA/ Germany in 1998 in DM. Normal home usage of 20 hours/ month and "power use" by homes and small businesses. Adapted from a table compiled by Karl-Heinz Dittberner.[24]

	20 hours/ month			100 hours/ month		
	Local call rate	Internet provision	**Total**	Local call rate	Internet provision	**Total**
USA						
AT&T	- (*)	35.90	**35.90**	-	35.90	**35.90**
Southwestern Bell	-	35.90	**35.90**	-	35.90	**35.90**
@Home (TV Cable)	-	53.90	**53.90**	-	53.90	**53.90**
Germany, night time rates						
T-Online	36.32	62.00	**98.32**	181.57	302.00	**483.57**
Nacamar	36.32	39.00	**75.32**	181.57	39.00	**220.57**
Mannesmann Arcor (Internet-by-call)	145.80		**145.80**	721.80		**721.80**
Germany, business hours						
T-Online	96.84	62.00	**158.84**	484.18	302.00	**786.18**
Nacamar	96.84	39.00	**135.84**	484.18	39.00	**523.18**
Mannesmann Arcor	193.80		**193.80**	961.80		**961.80**
NetCologne	- (#)	39.00	**74.00**	-	159.00	**194.00**

* One-time monthly flat-rate for the local phone service was required, but is not included in this listing. All local calls are inclusive with this monthly payment. This applies to most US regions, but not all.
# NetCologne charged a one-time monthly flat-rate of DM 35 for local dial-in. This service was only available in the Cologne area. There was no difference between night rates and use during business hours. These prices were the initial prices in January 1998.

To summarise these findings: Internet access prices were high in Germany due to the metered price of the local phone call. In 1996, local call prices were raised by Deutsche Telekom and remained at this high level until liberalisation.[25] The revenue stream DTAG

[24] Internet Site: "t-off: Fakten zum Internet" compiled by Karl-Heinz Dittberner, Freie Universität Berlin. http://userpage.fu-berlin.de/~dittbern/Telekom/Internet_Facts.html. Accessed on 06.10.1998.

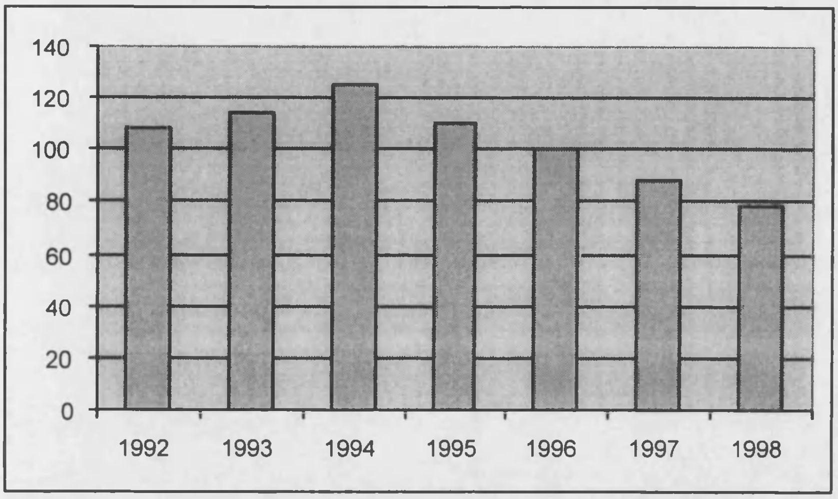
[25] It is not unusual for local call prices to rise before liberalisation of a telecommunication market. Local call prices rose in Britain, for example (Gerpott, 1998, 113). The incumbent usually wants to reap the rewards in an area which will be addressed last by the competition. It also wants to be able to start lowering its prices from a higher level rather than from an already low level. To defend this move, the incumbent usually argues that local call prices were subsidised to realise political objectives during the period of public ownership. In Germany, unification costs for a new phone system in East Germany made the issue more complex. In April 1991, a debate ensued whether a long-planned rise in local phone call rates should be increased further to compensate for these investments. Public opposition prevented this further rise and only the scheduled tariff changes came into effect (Robischon, 1999, 213-220). Finally, in 1996, in preparation for competition,

derived from internet users through its local call lines was not insignificant, but according to the author's estimates accounted only for 1% to 4% of total revenues and between 6% and 21% of local call revenues (they could lie somewhere between DM 698 million and DM 2,557 million in 1998).[26] The contribution of local calls to net income is unknown; overall, that the fixed-line telephone business generates the overwhelming amount of profits for DTAG. Deutsche Telekom used the income stream generated by its local call fees to reduce her debts.

Deutsche Telekom raised its local call prices substantially as part of a comprehensive tariff change. After an outcry that then already included internet users, Deutsche Telekom introduced "CityPlus," a local call rebate, in January 1997 (which was improved slightly in May 1998). The relief for small firms and "power" private users was minimal, however. The rebate could be acquired by paying a given fixed amount of money monthly, but a peak 50% savings was achievable only at a usage of 10 hours a month. Thereafter, the savings rate quickly fell, at 100 hours it amounted to only 5%. Internet Site: "t-off Fakten zum Internet" compiled by Karl-Heinz Dittberner, Freie Universität Berlin. http://userpage.fu-berlin.de/~dittbern/Telekom/Internet_Facts.html. Accessed on 06.10.1998. In effect, local call prices were raised in 1996 in Germany and not lowered until 1999. For a useful table summarising pricing developments in different tariff zones see Deutsche Telekom AG 20-F Form filed with the Securities and Exchange Commission, April 15, 1999, page 28. See also page 32.

[26] In 1998, there were an estimated 3.2 million internet users in Germany who accessed the net an average of 19 hours a month (the rest of an estimated 6.9 million total users accessed the internet less frequently). This was the result of a representative survey carried out by G+J EMS in August 1998 ("3,2 Millionen Menschen täglich im Internet anzutreffen," G+J EMS, Press Release, 08.09.98). EMS estimated that the most popular access times were between 09:00 and 12:00 and between 18:00 and 22:00 hours. For the first time slot, business rates would apply, for the second evening rates. For calculation purposes, I have assumed that every one of the 3.2 million users spent half of his time accessing the internet from his office computer during work hours and half at home in the evening. I assumed average use of 20 hours a month, 10 from the office and 10 from home. Some offices were connected to the internet via a local dial-up phone line provided by Deutsche Telekom, but others had a leased line connection. All home use, on the other hand, occurred over the local line of DTAG. If all internet access during office hours was made over leased lines and none over local phone lines, sales could be estimated to be DM 698 million (revenues would be generated only through home use). If all office calls were dial-up, DTAG would receive a total of DM 2,557 million in revenues (including home use). Rates for business hour and evening use are obtained from the calculations of Karl-Heinz Dittberner (see Table 1). These estimates between DM 698 million and DM 2,557 million applied only to internet access revenues generated for DTAG by local calls, not by internet provision via T-Online or selling leased line services. Total sales associated with internet access therefore were probably much greater. Local call revenues through internet access solo would have accounted for somewhere in the range of 6% to 21% of total local call revenues and between 1% and 4% of the total net revenues of Deutsche Telekom (according to Annual Report 1999 of Deutsche Telekom in English language, pages 15, 37, 112). T-Online calls accounted for about 6.5% of all local call traffic, this figure can be found in the F-20 Form of Deutsche Telekom filed with the Securities and Exchange Commission April 15, 1999 on page 54.

Chart A. Debt of Deutsche Telekom in millions of DM.[27]



The debt of DTAG was large by international comparisons.[28] In part, the debts were caused by modernisation of Eastern Germany's phone system after unification in 1989.[29] Unification investments started impacting the accounts of DTAG from the year 1991 onwards (see Chart A). But research shows that DTAG's debt was high already previous to 1991 (Gerpott, 1998, 175, 176), indicating that investments were already prior to unification financed in part not by cash-flow but by debt. This is confirmed by Chart B below, which shows that cash flow used for investments outweighed cash flow from operations in 1990, a year that does not include unification investments. This unsustainable situation continued up to the year 1994. From 1995, Deutsche Telekom's Chairman Ron Sommer focused on reducing his firm's debt burden- in part by cutting investment.

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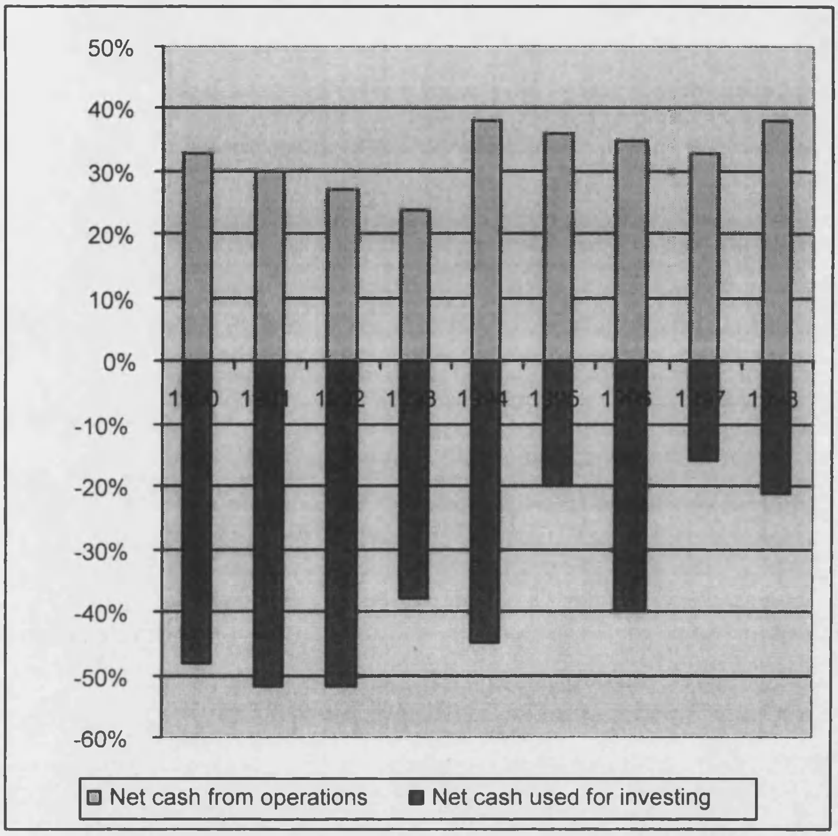
[27] Debt figures from 1994 to 1998 were obtained from the Annual Reports of Deutsche Telekom after privatisation. Debts in the years 1992 and 1993 were obtained from Annual Reports previous to privatisation.
[28] In 1995, Deutsche Telekom's debt-to-equity ratio of 15.4% was below that of most international carriers (Gerpott, 1998, 180). To reduce debt, investments were cut from a level of around 40% to 50% of revenues to around 20% of revenues. Only in 1996 did the investment level rise to 40% of net revenues, before being lowered again the next year. 1996 was the year when proceeds from the initial share offering were realised, investments were paid for by the listing proceeds, not by resorting to further debts. By 1999, the debt problem was less severe than before, as shown in Chart A.
[29] Annual Report 1998 in English language: "Networking Visions. Globalizing Actions." Page 100.

Chart B. Net Cash Flow of Deutsche Telekom 1990 to 1998 as a Percentage of Revenues[30]



But debt was only one of the financial worries of Ron Sommer. The other was earnings. But whereas debt was lowered mainly by reducing investment levels, it is probable that high earnings from local calls were necessary to boost profits. For her earnings, Deutsche Telekom was to an extremely high degree (94%) dependent on her fixed-line business, a significant part of which was the local calls service.[31] The financial industry often compares

[30] Adapted from Gerpott, 1998, 176. Gerpott's chart runs only to the years up to 1994. In its 1996 Annual Report, Deutsche Telekom applied new accounting principals in line with its privatisation and adjusted its figures retroactively up to 1993. In this chart, the adjusted figures are used from 1993 to 1998, for the previous years, figures corresponding to the old accounting principals are used. Net cash flows are calculated in percentage to total net revenues for that year.

[31] Fixed-line revenues make up a 57% of DTAG's total revenues 1998. Almost a third of fixed-line revenues are generated by local phone line service. But the fixed-line business was even more important for DTAG's profits. In 1998, an income of DM 9.4 million was generated in this business area compared to total income before taxes of DM 10.0 million. Although DTAG has been successful in developing mobile telephony in Germany despite early competition (8.6% of revenues), it has not fared well in its international acquisition strategy (3.7% of revenues). Until its purchase of One-2-One mobile phone network in the UK enabled by a second offering in 1999, DTAG's only substantial investment of real value was in the Hungarian operator

earnings per share (EPS), an indicator which Deutsche Telekom would have won beauty contest with (refer to Table 2).

Table 2. Basic earnings per share (EPS) of selected telecommunications operators in US$ and return on equity for the year 1998 (calculated from annual net income and year-end share price #).[32]

	EPS	**Return on equity**
AT&T	3.59	25%
France Télécom	2.49	14%
Sprint	1.98	7%
Mannesmann	1.79	10%
Royal KPN	1.61	12%
Deutsche Telekom	0.91	9%

Some Annual Reports simply list EPS without explaining how it was derived and not differentiating among different types of EPS calculations. Here, basic earnings per share are being referred to which is calculated using net income.

The pressure to improve DTAG's financials was high due to the planned tapping of capital markets in 1996 and 1999. These were the years in which the original listing and the secondary placement of Deutsche Telekom were accomplished. After the secondary placement, the path was clear for a fresh, future-oriented strategy. On April 1, 1999, significant price cuts for internet access through Deutsche Telekom's ISP, T-Online, came into effect.[33] There was a further reason other than the financial ones, however, why a strategy focusing on the young internet access market may not have been feasible before liberalisation. This was the outdated network infrastructure of the Deutsche Telekom.

MATÁV. The MATÁV group includes a mobile phone operator Westel 900. Global One was loss-making. Overall until 1999, DTAG was unsuccessful at developing new revenue streams; it was highly dependent upon its fixed line business. English-language Annual Report 1998, pages 60 to 62. See also the comment on Deutsche Telekom's international strategy in *The Economist*: "European Telecoms in a Tangle," *The Economist*, April 24th, 1999, page 83.

[32] Source: Annual Reports. For details on these figures, please refer to Table 10 at the end of this chapter.

[33] Earnings in the first two quarters of 1999 slipped considerably due to reductions in long-distance prices and loss of market share. These results were announced in August 1999, the secondary placement was carried out earlier, in July 1999. Reductions in internet access prices through T-Online carried out in April 1999 had only a minimal effect on earnings reports for the first two quarters of 1999.

Infrastructure challenges faced by Deutsche Telekom

As described in the previous chapter, Deutsche Telekom was highly regarded as a force for technological innovation in Germany. This image was remarkably persistent among German politicians of all parties, although it was probably most widespread among the Social Democrats, where it has a long history. The "national champion" image was surprising given the low level of service the public carrier confronted ordinary Germans with for decades. Most Germans would probably have explained this by differentiating between the service quality of the Deutsche Telekom and the actual technological quality of its network infrastructure. Thorsten Gerpott drew together different indicators of the state of DTAGs network infrastructure before privatisation in 1995 to show that at the time the technology was apparently not much better than the service (1998, 200). Deutsche Telekom vigorously modernised its infrastructure from 1995. Infrastructure investments were consistently high in international comparison (OECD, 1999, 69-84). Germany, for example, achieved 100% digitisation of its access lines in 1997 up from 56% in 1995 (OECD, 1999, 77).[34] Yet experts, such as the Bonn-based internet consultant Harald Lux emphasised that the modernisation of DTAG's infrastructure was a difficult and lengthy process. The modernisation initiative was massive, and priorities had to be set.

[34] Germany moved to a digitally switched network much slower than the other European countries, for example, United Kingdom, France, Netherlands and Sweden (Welfens and Graak, 1996. See also Gerpott, 1998, 183). Digitisation does not automatically mean better network quality; what it does mean, however, is that telecommunications carriers running a digitised network are gaining expertise in computer-based systems. Deutsche Telekom was late at acquiring this know-how. The organisational structure of the Deutsche Telekom was partly responsible for the fact that the carrier adhered to its traditional electromechanical technology base as long as possible. Compared to France Télécom and BT, the public predecessor to the Deutsche Telekom, the Deutsche Bundespost, was more decentralised and more process-oriented (Pospischil, 1993, 610, 611). The Deutsche Bundespost was very late in moving towards an objective-led management structure and strong client focus. Client focus still seemed amiss in the new organisational structure of 1999, where a single Board Member is responsible for "Sales" and no separation is made between business and private clients, as was commonplace in most other telecommunications carriers. This marks a return to DTAG's original universal "Sales" approach of the beginning of the 1990s (Gerpott, 1998, 202, 203, 207). See also "Telekom: Zaudern und Zögern," *Manager Magazin*, Dezember 1997, pages 43-47. The Deutsche Bundespost has therefore been described as a "Machine Organisation" (Mintzberg quoted by Pospischil, 1993, 610). It worked as a whole by standardising its work processes- which were linked to a historical technological base. It is not surprising, therefore, that the Deutsche Telekom was late in building an internet-based data network backbone.

As has been described in the previous chapter, the Deutsche Bundespost relied on its X.25 network for its data services. X.25 needs to be administered in a much more centralised fashion than internet-based IP networks. It is also not very efficient as a backbone network for internet access. When Deutsche Telekom began to offer indirect internet access through a gateway to its T-Online members in October 1995, it ran the internet service over X.25. It was not able to cope with the ensuing demand for internet traffic. Traffic moved slowly and the service was not reliable. According to internet consultant Harald Lux, DTAG engineers were at the time scrambling to add network bypasses (interview, 10.07.99). In contrast, other internet providers in Germany had from 1995 already build up IP-networks and were vigorously competing among each other.[35] Deutsche Telekom began building its IP trunk network in Summer 1996 and seriously expanded it only in the year 1997. T-Online became a full internet service only in 1997 (Lux and Heinen, 1997, 34, 62; Schneider, 1997, 152). Whereas in 1997, Deutsche Telekom still trailed other internet providers in Germany in revenue, it was able to assume the number one position in 1998 (Table 3).

Table 3. Top Six Internet Providers in 1997 and 1998 and their turnover in DM millions (Lux and Heinen, 1999, 9, 13)

	1997		1998
Xlink	49	Deutsche Telekom*	100
Uunet	45	Uunet	87
Deutsche Telekom*	40	Mediaways	70
DPN	39	Nacamar	60
Mediaways	30	DPN	56
Nacamar	30	Xlink	53

* Estimate without T-Online sales.

One technology has been purposely left out of the discussion thus far: ISDN. When Deutsche Telekom's network infrastructure was spoken of in a positive light, usually it was

[35] Nacamar began offering internet service in early 1995 with a leased line to the USA (interview, 12.07.99). Next to MAZ, Hamburg (provider since 1994), and Contrib.net, Berlin (started 1994), Nacamar was one of the first internet providers without links to the German DFN university network. The oldest German providers, which emerged out of DFN, were EUnet Deutschland and Xlink. The German EUnet was started in 1985 in the University Dortmund. EUnet is now part of Uunet. Xlink began offering internet provider services out of the University of Karlsruhe since the early 1980s. EUnet and Xlink were privatised in 1992 and 1993. These

ISDN which was being referred to. The ISDN initiative of DTAG was indeed remarkable. In the beginning of the 1990s, ISDN uptake in Germany was far behind that of France. By the end of that decade, Germany sported the highest ISDN penetration in the world (See Table 4). In absolute numbers also, Deutsche Telekom reigned over more ISDN connections than any other carrier (Gerpott, 1998, 201). Nevertheless, the value of an ISDN network is debatable.

Table 4. Percentage ISDN lines to main lines (EITO, 1999, 404, 405).

	1997	1998
Germany	16%	24%
France	6%	11%
United Kingdom	8%	12%
USA	3%	4%
Japan	8%	10%

Two benefits of ISDN are cited: Intelligence and bandwidth; the real advantages of both are ambivalent. In the second chapter, part of the discussion of global network developments focused on the "intelligent network," of which ISDN is the ultimate manifestation. The "intelligent network" approach is coveted by many traditional telecommunications carriers because it puts them in control of new, value-added services. It requires a centralised approach to offering these services and therefore allows little leeway for independent service offerings or innovations. Most services that can be offered over ISDN, such as call waiting, can be realised more cheaply over conventional networks. Other services that are possible by combining a "stupid network" approach such as an internet-based network with computers on the periphery of the network cannot be offered by ISDN alone at all. A further advantage of ISDN, its broadband ability to carry a large volume of data, is being overshadowed by newer technologies, especially xDSL, which allows far more data to flow over a conventional copper line.[36] By ambitiously adopting a single technology, ISDN,

providers all owned backbone access in 1995, which they resold to dozens of internet presence providers (Lux, 1995, 24-26, 57-61; Lux and Heinen, 1997, 33).

[36] "x" is a variable denoting various types of DSL technologies, such as ADSL.

Deutsche Telekom may have manoeuvred itself into its own version of a German "Sonderweg."[37]

For several years, Deutsche Telekom touted ISDN as its broadband solution. As will be discussed in the next section, it purposely ignored possibilities for developing the broadband capacities of its cable TV network. It also started late on offering broadband xDSL- announcing business service by April 1999 and home service from late Summer 1999. The mainstream roll-out of "T-DSL," as Deutsche Telekom called its service, was initiated with a flat rate offering from September 2000. Competitors such as Nacamar already offered xDSL services to its clients in the Spring of 1998 (interview, 12.07.99). At the beginning, DTAG wanted to market xDSL together with ISDN. DTAG wrapped ISDN with xDSL into a combined T-DSL/ ISDN package as part of an overall strategy to, in the words of Ron Sommer, "transform Germany into the greatest online nation" (author's translation).[38] It gave up on this strategy with the roll-out of flat-rate "T-DSL" in Fall 2000; the new service could be subscribed to over analogue lines as well. If it would have adhered to its ISDN-only strategy longer, Deutsche Telekom would have found itself technologically isolated and dependent upon a technology that may not be developed further as vigorously as other, more widely used options. Retrospectively, the ISDN effort may seem a massive and costly investment which completely bypassed market needs at a time when it would have made more sense to build a powerful internet backbone and roll out cheap mass internet access. Deutsche Telekom would have won over a user base which later would have subscribed to high-bandwidth access services over other technologies – such as xDSL or cable TV.

[37] "The adoption of ISDN may lock the system in to a distinct path of development favouring the centralised network, since future investments must also be compatible with interrelated components in the chosen system" (Davies, 1996, 1171).
[38] Dr. Ron Sommer, Vorstandsvorsitzender Deutsche Telekom, "Auf den Weg ins online-Zeitalter. Tendenzen, Entwicklungen, Strategien aus Sicht der Deutschen Telekom," "Redemanuskript anläßlich des Internationalen Presse Kolloquiums am 27. Januar 1999 in Frankfurt," could be found in press release section of Deutsche Telekom's web site. Accessed 02.02.1999. The original reads: "Unser Ziel ist ehrgeizig: Wir wollen Deutschland zu der Online-Nation überhaupt machen."

German cable TV: Left to stagnate?

Compared to other countries, Germany is generously endowed with coaxial cable TV connections. Over 18 million households are receiving cable TV services and another 7 million are connected to the network and are potential subscribers. This means that a full two-thirds of all German private households can be potentially reached by cable TV. The German cable network is the largest cable TV network in Europe in absolute numbers (RegTP, 1999b, 19; Gerpott, 1998, 8-9). Until 2000, this network was controlled by a single company, which put this enterprise in the enviable position of being able to roll out broadband internet access, cable telephony and media services directly into millions of homes and small businesses.[39] But Deutsche Telekom's vision for the German cable future was quite distinct from the mass broadband internet access initiative just described.

In the USA and the United Kingdom, cable TV access to homes was used by competing telecommunications operators to offer new telephony services. In the UK, cable TV allowed Mercury to bypass the local loop of BT. In the US, cable TV access was also used to offer broadband internet access, a prominent example was the company @Home. AT&T invested in cable company TCI in 1998 in order to offer broadband internet access to homes.

In Germany, the cable TV network was controlled until 2000 by the incumbent carrier, the Deutsche Telekom. This was the result of government compromise surrounding the Telecommunications Law of 1996. That the public predecessor organisation to the Deutsche Telekom was originally in 1982 put in control of the cable TV network and oversaw its construction was the result of political action, as well, as has been described in the previous chapter. The running of the network was also politically controlled, with the responsibility over broadcasting assumed in part by the local state governments. Deutsche Telekom was charged with carrying private and public broadcasting over its networks and was paid around DM 3 million annually for this service.[40] Although this is not a sum that

[39] A large initial investment would be required to upgrade the coaxial network for two-way communication. Various estimates for the upgrade investment exist, the highest being DM 5 billion over five years. "German cable: Telekomplicated," *The Economist*, August 21st, 1999, page 63.
[40] "Neue Goldgrube," *Manager Magazin*, Dezember 1997, page 47.

was able to cover the costs of the coaxial network, Deutsche Telekom was allowed to exploit the additional capacity largely as it pleased. From 1995/ 96, for example, DTAG set aside two channels for digital television- a project that was conceived as a joint venture between the telecommunications carrier and the two German media giants Bertelsmann and Kirch. The joint venture was not realised, a matter which is discussed below. What Deutsche Telekom explicitly avoided, however, was to cannibalise its ISDN plans by offering broadband internet access or telephony services. Deutsche Telekom separated the realms telephony, internet access and media broadcasting clearly by running parallel networks.

The investment sum required to update the German cable TV network is relatively high. In part, this is due to original government policy; in part, however, to an intentional strategy of neglect by Deutsche Telekom. In order to swiftly provide a broadcast medium for private television, the original cable TV network was built using low-cost coaxial standard technologies available at the time. As a result, cable TV in some German regions runs over old lines that are costly to upgrade to allow for the two-way transfer required for internet access (Gerpott, 1998, 36-38). On the other hand, some housing blocks in the "new" Eastern German states were connected recently and offer easy upgrade opportunities. Then there is the added difficulty that two-thirds of all customers do not receive their service directly from the Deutsche Telekom, but through one of 6,000 local, small service firms (RegTP, 1999b, 20). Some of these companies are represented in the cable TV service firm association ANGA, and the association has spoken favourably of an upgrade of the cable TV network and welcomes the offering of new services such as internet over the network. In fact, ANGA is antagonistic towards the DTAG as network owner and argues that the telecommunications carrier has purposely limited cable carrying capacity.[41] In late 1996, parts of the cable TV network were modernised but the capacity was upgraded to allow only for two additional digital TV programs- and not more, although it would have been technically feasible.[42] Six pilot projects, in which DTAG purportedly tested new, interactive

[41] "20 Milliarden-Preis für Telekom-Kabelnetz utopisch. Unabhängige Produktgestaltung der Käufer nicht sicher," Press Release, ANGA, 11.03.99. Can be accessed on http://www.anga.de/

[42] Dusan Zivadinovic, "Auf der Bremse: Telekom verzögert den Ausbau ihres TV-Kabelnetzes," *c't*, Heft 8, 1997, page 115.

cable services were run at "a pace rather below average compared to US commercialisation efforts," to use Gerpott's carefully worded phrase (author's translation, Gerpott, 1998, 218, 219).

Cable TV was a loss-making operation for Deutsche Telekom from the very beginning. The service was loss-making because it was reduced to carrying media programming and was not expanded to include lucrative income sources, especially telephony and internet access. Deutsche Telekom viewed these services as competing with its most important money-maker, the local loop. Cannibalisation was not an option for the telecommunications carrier. In fact, there has only been one attempt on the part of DTAG to generate a positive income flow from its cable TV holdings. In 1994, a joint venture for digital pay-television services over cable was announced by Deutsche Telekom, Bertelsmann and the Kirch Group. The joint venture was not realised for several reasons.[43] The most obvious reason was that EU competition authorities indicated that year and again in May 1998 that they would not tolerate the alliance, if it remained exclusive.[44] Also, as was just described, Germany's federal states had a say in the development of broadcast media and their involvement added an unknown dimension to any deal.

In addition, however, Deutsche Telekom was asking a high price for its network service, an annual payment of at least DM 12 million as well as a share of sales.[45] DTAG also charged households for its access to the cable TV network. As one editorial in a well-known German business daily stated in 1997 using a well-known German metaphor: "Like a sausage, TV cables have two ends. On both ends Deutsche Telekom cashes in... And both ends will be expensive for Telekom's clients."[46] In order to make cable TV access an attractive mass market proposition, different revenue streams need to be combined, as has just been pointed out. If media broadcasting alone is required to pay for the network,

[43] By 1999, Bertelsmann decided to move away from pay-television altogether by selling a large part of its stake in the pay-TV company Premiere. One Bertelsmann executive stated: "The television world in Germany is really complicated. We will have more freedom and more flexibility on the internet." "Bertelsmann's Big Leap," *The Economist*, August 24th, 1999, page 90.
[44] "German Television: Karel's Service," *The Economist*, May 30th, 1998, page 88.
[45] "Interview: Das nenne ich Enteignung," *Focus*, 28/1997, pages 202-204.
[46] Lukas Weber, "Im Netz verfangen. Digitale Kabelträume der Telekom," *Frankfurter Allgemeine Zeitung*, 22.05.97, page 17.

individual subscribers to the service would have to pay considerable fees. This was clearly stated by Herbert Ungerer, head of telecommunications at the competition unit in the European Commission, DGIV: "The cable network cannot thrive only on television distribution, not even on additional digital television distribution, or on attempts to monopolise programme rights to increase pay-TV rates."[47]

Since Deutsche Telekom was the only major European telecommunications incumbent with control over cable TV, the EU competition authorities were long critical of the situation. Deutsche Telekom was very aware of this and sought to delay a forced sale of its assets. It did so by publicly announcing that it intended sell the network. The actual sale began only in 2000, under optimal conditions for the Deutsche Telekom. Firstly, the cable TV network was sold not as a whole, but split up into regional units.[48] Secondly, the right to supply programs and services was secured in contracts that were transferred to the 100% Deutsche Telekom subsidiary MediaServices GmbH.[49] Thirdly, DTAG retained significant stakes in the units, which allowed it certain blocking powers. The *Financial Times* quoted a London-based analyst stating: "Telekom's whole intention is to make it very difficult [for the new entrants] to compete with them."[50]

The renaissance of T-Online[51]

The history of T-Online in its previous incarnation as the teletex service Btx has been described in the last chapter. Now, T-Online is referred to by the Deutsche Telekom as an

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[47] Ungerer was explaining why telecommunications operators with cable stakes (i.e. Deutsche Telekom) will themselves feel the need to divest their cable TV holdings: "A telco with cable in his portfolio finds it incredibly difficult to cannibalise his own operations in the telephone network. At the same time he cannot justify investments for developing rapidly the broadband capabilities of the telephone network, since he has a cable network for broadband distribution. This is a very unsatisfactory situation." "Ungerer: Levelling the Playing Field in Europe," *Global Telecoms Business*, December 1998/ January 1999, page 34.
[48] The first regional unit sold (in February 2000) was Northrhine-Westphalia; here, DTAG retained a 45% stake. Then, the Hessian network was sold in March 2000; DTAG retained 35% ownership. Baden-Württemberg was sold in May 2000; DTAG retained 45%.
[49] "20 Milliarden-Preis für Telekom-Kabelnetz utopisch. Unabhängige Produktgestaltung der Käufer nicht sicher," Press Release, ANGA, 11.03.99. Can be accessed on http://www.anga.de/
[50] Jeremy Grant, "Deutsche Telekom Keeps its Foot in the Door," *Financial Times*, 16.08.99, page 19.
[51] Refer also to an article in *Tornado-Insider.com*. Niko Waesche, "Germany Goes T-Online. The T-Online Renaissance Grips the German Internet," *Tornado-Insider.com*, September 1999, Number 5, pages 27 and 28.

internet access service. As such, it is the second largest world-wide, although it trails AOL/ CompServe's world-wide figures by a large amount. In Europe, T-Online is Europe's leader with its 6 million subscribers (as of July 2000). The true significance of T-Online only becomes fully apparent if one compares its subscriber base to the total number of internet users in Germany (see Table 5). Although the two numbers cannot be directly compared, the number of T-Online subscribers amounted to about one third of total internet users in Germany from 1997 to 2000. However, T-Online use has historically, in international comparisons, been extremely expensive. This was due especially to the metered cost of the local telephone connection, but also due to a prohibitively high original cost of using T-Online, which was itself metered.

How can this paradoxical situation be explained, namely that an expensive service such as T-Online has gained such popularity since its relaunch in late 1995? There were two reasons. Firstly, T-Online has benefited from its past life as Btx and its links to the incumbent telephone company. Secondly, DTAG has made sure that T-Online was expensive, but not much more so than other internet services, which also had to rely on access via local phone calls. In contrast to the stable (high) price of a local phone call until 1999, the price for using T-Online has been lowered several times, reflecting a defensive pricing policy, following the market.

Compared to the expectations surrounding the launch of Btx in the late 1970s, the German postal service's videotex system was a failure. Btx was heralded as a service that would revolutionise the German home. In fact, the estimated number of one million users by 1985 was not reached until early 1996 (Schneider, 1989, 119-125).[52] By 1994, the Deutsche Telekom had all but given up on the service and outsourced much of the effort associated with it. It let a small Karlsruhe-based software developer devise a more user-friendly graphic interface called "KIT." Another small company, 1&1, was charged with the marketing the service (Schneider, 1997, 151). To outside observers, the final symbol of sinking confidence was the signing of a letter of intent with Bertelsmann's brand new AOL

[52] At year-end 1995, there were 965,400 members in T-Online. Deutsche Telekom, Annual Report 1996, German language, page 30-31.

Europe service, announced in November 1995. Deutsche Telekom would give up its objective of being the main electronic link to the home- the goal of the original Btx. The agreement stipulated that AOL would be focused on an entertainment-based home service, whereas T-Online was relegated to transaction-oriented uses such as home banking.[53] The alliance eventually was forgotten as concerns were raised by EU competition authorities and the apparently imminent threat of the Microsoft Network (MSN) waned (Microsoft had cannibalised MSN in favour of its new internet strategy).[54] Nevertheless, the service that was renamed T-Online had arrived at its nadir.

Btx could claim one resounding success. During the first half of the 1990s, it had managed to establish itself securely in one industry, if sex services are ignored. Whereas the other range of retail services offered over Btx stagnated, online banking flourished and became the "killer app" of Btx. Online banking met a demand that was perhaps created in part by limited bank opening times in Germany. After Btx had reached its low point in 1994/1995, the downward trend was reversed, however. In October 1995, the service was given a new name, "T-Online" and was equipped with a gateway to the internet (Schneider, 1997, 151, 152). User numbers went steeply upwards, as is evident from Table 5 below; yet, importantly, growth did not outpace the trend of general internet adoption in Germany.

[53] "Der Markt für Online-Dienste Wird Neu Geordnet," *Frankfurter Allgemeine Zeitung*, 22.11.95, page 23; "EU-Kommission prüft Online-Kooperation," *Frankfurter Allgemeine Zeitung*, 07.12.95, page 18. A statement on the intended partnership between AOL and T-Online can be found in the English language Annual Report 1995 of Deutsche Telekom on a central spread labelled "The Forum." Here, Bertelsmann executive Thomas Middelhoff is quoted referring to AOL as "experience-oriented" and T-Online as "benefit oriented."

[54] Only a few months after Microsoft had launched the proprietary online service Microsoft Network (MSN), the software giant decided to cannibalise its own service in favour of its free software product, Internet Explorer. For commentary see Yoffie and Cusumano, 1999, pages 76, 80.

Table 5. Number of T-Online subscribers compared to total number of internet users.[55]

	T-Online subscribers	Internet users	Proportion
1997	1.9	4.9	39%
1998	2.7	6.9	39%
1999	3.3	9.9	33%
2000	5.5	18.0	31%

The companies charged with software development and marketing of Btx/ T-Online had proven that the service could be saved and that new users could be won over. In fact, most observers claim that the marketing expertise and drive of 1&1 were the main reasons behind the revitalised service; 1&1 would continue to work for the service and became one of the foremost online marketing firms in Germany. It carried out a public listing on the Neue Markt in 1998.[56] But another important factor behind the success of T-Online was that it continued to offer the core Btx service of online banking. Almost all German retail banks offered a Btx service. Thus, T-Online was the only German online service from 1996 allowing both internet access and banking. In fact, the presence of German banks on Btx and the security problems associated with the internet were disincentives for many German institutions for developing internet banking. Many banks only began to offer internet-based services independent of T-Online in 1999.

A further advantage of T-Online over other online services was its link to the telephone service. Small payments for T-Online services, such as the business information database GENIOS, were charged over the public telephone bill. Again, the insecurity associated with the internet and the reluctance of many new internet users to offer credit card information over the internet meant that the combination T-Online and phone bill was a strong one. "This advantage of T-Online in offering a micropayments mechanism very early on should

[55] The year 2000 figure of total T-Online users in Europe was 6 million, because 500.000 users in France of the T-Online subsidiary Club Internet need to be included. For T-Online data: RegTP, 1999b page 14. See also Deutsche Telekom Annual Report 1998 in English language, page 51. For 1999 and 2000, press releases of T-Online were used instead of RegTP data because T-Online's figures represent mid-year estimates and RegTP's numbers are year-end. The GfK statisticts, which attempt to capture the number of internet users in Germany are also mid-year figures for 1998, 1999, 2000 and an end-year figure for 1997. The GfK-Online-Monitor is carried out by GfK Nuremberg together with G+J Electronic Media Service (EMS). The statistics used were from the first, second, fourth and sixth waves respectively. These can be accessed on the web site http://www.ems.guj.de/.

not be underestimated," emphasised Stefan Kühler of the rival online service Callisto Germany.net (interview, 13.07.99). Germany.net tried to launch its own micropayments mechanism over the internet but the option could not compete with the ease of phone bill invoicing.[57]

Consistently from 1997 up to 2000, T-Online's lead was so great, that other online and internet services were competing only among themselves. For the press speaker of Germany.net, the third-largest online service, the objective was clear: "Our goal is to overtake AOL in Germany. AOL has 800.000 members, we have 660.000. We believe we can do it... T-Online we cannot reach. It is just impossible" (interview, 13.07.99). Yet, the price for using T-Online was high.[58] When T-Online was first relaunched in 1995, a user accessing the internet was required to pay three metered fees simultaneously: A metered fee for the local phone call, a metered fee for using T-Online (6 Pfennigs per minute during business hours) and a third metered fee for internet use via the T-Online gateway (of 10 Pfennigs per minute).[59] Over the years, T-Online became cheaper to remain competitive with services such as AOL, CompuServe, MSN and independent internet providers. Although competitive prices existed on the level of the services itself, however, Deutsche Telekom was able to extract a "toll" from all internet users regardless of which service they were using- the local phone call. It is this price tag on internet access which remained essentially unchanged from 1996 to 1999; it is discussed at length in a previous section.

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[56] 1&1 was renamed United Internet.

[57] As of December 31, 1999, the microbilling option of T-Online over the telephone invoice will be discontinued by T-Online itself. Why stop a service that has proven a competitive advantage? Jürgen Grützner, a press speaker for the association of Deutsche Telekom's competitors, VATM, speculates that this termination was a preemptive move designed to prevent the German regulator from stipulating that DTAG would have to offer the same service to its competitors- as it has done, for example, with the rebate offered T-Online for the use of its new internet backbone (interview, 14.07.99). With 3,2 million users in 1999 and rising, T-Online seemed to be strong enough to do without its link to the phone service.

[58] In a trade publication, a telecommunications consultant dryly noted that the true expertise of a telecommunications operator was in finding prices for new services which reflected the value a customer placed on it and not the cost of offering it. For many years, US telephone companies were able to charge an additional fee for touch-tone dialling although the service actually meant net savings for the companies that offered it. Andy Zimmerman, "The Innovator's Dilemma: Will 'Bad' Technologies Win?" *Global Telecoms Business*, November/ December 1998, page 44.

[59] "T-Online und drei große Konkurrenten," Table in *Frankfurter Allgemeine Zeitung*, 20.01.96, page T2.

Finally, on April 1, 1999, Deutsche Telekom reduced the overall price for accessing the internet in Germany. Internet access was forthwith available from T-Online for 6 Pfennige a minute (circa US$ 2.12/ hour), a combined price which included the local access call. For the first time, therefore, Deutsche Telekom differentiated the price of the local phone call from the price of internet access, paving the wave to further price cuts for internet users. It is crucial to emphasise the importance of this development for Germany. A new era began, one in which access prices continued to fall. Pricing reflected both cost savings through technological advances as well as access competition. An old era ended, in which the demand for internet services and time spent online was restricted by high and unchanging access "tolls." This has also led to a flood of new users for T-Online. A press release of Deutsche Telekom stated: "Now its clear: The new pricing model increases the usage of the internet in Germany."[60] This discovery came quite late: Why in April 1999, 15 months after liberalisation and three years after the passing of the Telecommunications Law? The same discovery process seemed to have occurred with the introduction of flat rate internet access through T-Online in Spring of 2000. Here, the relevant press release declared that 200,000 new clients could be won over through the flat rate in two months "even without a special advertising campaign" (author's translation).[61]

German internet consultant Harald Lux has emphasised that the April 1 pricing move of the Deutsche Telekom was, like those made previously with T-Online, a defensive strategy (interview, 10.07.99). It was a response to pricing initiatives made by newer competitors offering an internet-by-call service.[62] The reaction by the Deutsche Telekom was to

[60] "T-Online jetzt mit über 3,3 Millionen Kunden," Press Release, Deutsche Telekom, 07.07.99.
[61] "T-Online jetzt mehr als 6 Millionen Kunden," Press Release, T-Online, 27.07.99.
[62] Because it intended to give as many new competitors as possible entry to the market for telecommunication services, the German regulator has set relatively low interconnection prices to allow call-by-call competition. Call-by-call service is when a user selects to use a different telephony provider than the Deutsche Telekom by dialling an initial code before each call. Obviously, telecommunications competitors still argued that some interconnection prices were high. Yet they vastly undercut the proposals made by Deutsche Telekom and also allowed a large number of new competitors to start offering their services. Competition first focused on the long-distance market, because it sported high margins. In long-distance telephony, Deutsche Telekom purportedly lost around 30% of its market share within the first year of liberalisation, a statistic that is unmatched by previous liberalisation efforts in the US and the United Kingdom. But interconnection could not only be used to offer long-distance telephony, but also internet access. Because prices tumbled steadily in the long-distance segment, the first call-by-call internet services were introduced in Fall 1998. These new pricing schemes undercut the prices that Deutsche Telekom charged subscribers of its own T-Online service. The interconnection fee is a metered fee- this is important because it effectively prevents companies providing

introduce a package of combined local access and T-Online fees. The new fee structure resembled internet-by-call fees.[63] Although April 1, 1999 heralded the arrival of a new era in internet pricing, it still did not amount to a revolution. Both the call-by-call internet services as well as the T-Online service were still metered offerings, meaning that the user was penalised for the time he remained online. As has been pointed out previously, this discouraged intensive use of the internet. Yet, metered interconnection prices reflected the switched network infrastructure of Deutsche Telekom's local phone service. Deutsche Telekom initially wanted to retain metered pricing also for its broadband xDSL offering, although xDSL is pure packet-based network, "because our clients would not understand volume-based pricing plans" (Lux, interview, 10.07.99).[64] In Fall of 2000, T-Online actually introduced flat rate pricing for T-DSL, after it had already started offering flat rate fees for its conventional internet access half a year earlier.

The option to bypass Deutsche Telekom's metered pricing regime by "renting" a direct subscriber line from the incumbent has theoretically was possible since liberalisation in Germany. This possibility, introduced by the national regulator, was initially unique in Europe. Allowing so-called "unbundled access to Deutsche Telekom's subscriber lines" was the most radical step RegTP embarked upon, much more so than low interconnection rates, because it paved the way for unmetered internet service. Indeed, the pressure of the increasing number of flat rate offers through the competition finally led to T-Online's own flat rate service in Spring of 2000.

But progress was slow. There were not many carriers in Germany in the first year of liberalisation renting a direct subscriber line. Two reasons can be cited. The first were

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internet-by-call services from offering other fee structures. This fee represents an effective "bottom line," below which prices cannot sink unless the service company is to face constant losses. For interconnection pricing policy, see Gerpott, 1998, pages 84, 85.

[63] The German regulator, which has to sanction all new pricing schemes of the incumbent, allowed the new offering, provided Deutsche Telekom announce it as "3 plus 3 Pfennige" representing the local call and T-Online use. Although this seems to represent a step backwards by returning to a separate local call fee structure, this is not the case, because 3 Pfennige as a constant rate vastly undercuts a local call price made during business hours. This move by RegTPs was intended as a transparency obligation on the incumbent. It was combined with the obligation that Deutsche Telekom hand the same rebate it offers T-Online for the use of it internet backbone to internet service providers renting the backbone from DTAG.

strong uncertainties caused by political lobbying and pricing negotiations with RegTP by both Deutsche Telekom and her competitors.[65] Most importantly, firms intending to offer this service had to have costly billing systems in place. The start-up costs were, therefore, much higher and were only faced by a small number of local "city carriers." Other competitors focused first on the lucrative long-distance market, until tumbling prices erased their margins. Had the competition been financed through capital markets, this situation might very well have been very different, as will be discussed in a subsequent section.

Upon liberalisation, only two companies rented direct access, these were the so-called "city carriers" NetCologne and ISIS in Düsseldorf. Of these two, only NetCologne launched a flat-fee ("capped") internet service on liberalisation. Cologne immediately became known as "Surfer's paradise."[66] In offering the service upon liberalisation, the "city carriers" had actually gone ahead with establishing direct connections to consumers before the pricing and political framework was certain. Other competitors followed their lead only late 1999; by then, however, a number of firms invested in this type of service offering. This development, which was crucial for the future development of internet access in Germany, will be examined in detail in the last section of this chapter in conjunction with infrastructure investments. Up to late 1999, the reality faced by consumers and small firms was metered pricing.

Deutsche Telekom: "A bad loser?"[67]

The main immediate worries of Deutsche Telekom in the first year of the liberalised market were its shareholders and the regulator. The shareholder's view was especially important because DTAG intended to raise fresh funds through a second public offering, realised in

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[64] See also the editorial in the *Frankfurter Allgemeine Zeitung*: "Schlagaustausch online," *Frankfurter Allgemeine Zeitung*, 27.08.99, page 22.
[65] "Druck der Politik zeigt Wirkung: Anschlußmiete für Telekom-Mitbewerber auf 25,40 Markt heraufgesetzt," Press Release, VATM, 08.02.99. See also: Deutsche Telekom AG F-20 Form filed with the Securities and Exchange Commission, April 15, 1999. Page 18, 19.
[66] "Köln Traumstadt für Surfer," *c't*, Heft 1, Januar 1998, page 36.

July 1999. The debt situation needed to be improved, the balance sheet needed to look good. The regulator also was crucial because, more than the competing entrants themselves, his moves impacted directly on the ability of DTAG to make money. Low interconnection prices, for example, made it possible that the incumbent lost around a third of total long-distance minutes in the first year. National long-distance telephony prices fell by more than 70% (RegTP, 1999a, 8). It is, therefore, not surprising that Deutsche Telekom's strategy in the first year of the liberalised market was not marked by major initiatives in internet access. This needed to wait for the subsequent year, until April 1999. It is also not surprising that DTAG needed to demonstrate its savvy in two regards: In corporate strategy and in its political manoeuvres. The battle that ensued in 1998 between the regulator and Deutsche Telekom was an intense conflict in which the incumbent carrier pulled all possible levers, including its good connections with the newly elected Social Democratic Party.

Through its lobbying efforts, Deutsche Telekom was able to create uncertainty over the crucial issue of "unbundled access" to its subscriber lines.[68] In May 1997, the Postal Ministry had decided that Deutsche Telekom had to offer this powerful service option, a decision that DTAG pleaded against. Full certainty in this decision was delayed as described in the previous section. Court proceedings were still underway throughout 1999.[69] Some of the public manoeuvres of Deutsche Telekom were criticised by the press as "bad loser behaviour." Deutsche Telekom executives did not shy away from publicly attacking the regulator's decisions by appealing to the share value of DTAG. Indeed, the DTAG share was owned by "an army of 2m ordinary Germans, the vanguard of popular capitalism in the

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[67] The trade publication *Global Telecoms Business* states that Deutsche Telekom is increasingly being perceived as a "bad loser" due to the "alacrity with which it has turned to litigation." *Global Telecoms Business*, "Yearbook 1998/ 1999," page 49.

[68] Gerpott, 1998, 78-80, for issue location of interconnection nodes see 86-87, overview chart page 66.

[69] In January and February 1999, RegTP accepted some of DTAGs arguments and stipulated a rental price of DM 25.40 a month, which represented a rise from a provisional price of DM 20.65 set in March 1998. Deutsche Telekom demanded DM 37.30 a month, whereas competitors desired a price between DM 15 and 16. In addition, Deutsche Telekom charged one-time switching costs of between DM 200 to 340 per client. Germany is the first European country that allows entrants the right to unbundled access. Deutsche Telekom AG F-20 Form filed with the Securities and Exchange Commission, April 15, 1999. Page 18, 19. See also pages 32 to 34, containing summaries of legal proceedings. Compare to Gerpott, 1998, 78, 79, 86; and "Druck der Politik zeigt Wirkung: Anschlußmiete für Telekom-Mitbewerber auf 25,40 Markt heraufgesetzt," Press Release, VATM, 08.02.99.

country" (*The Economist*).[70] Political lobbying is to be expected in any competitive situation. However, due to the fact that the government still was a majority shareholder, this strategy carried particular weight with the German financial ministry and not only the German shareholding population.

Deutsche Telekom has also tried to "sabotage" the competition's efforts by other means. The "city carrier" NetCologne, for example, was dependent upon the goodwill of Deutsche Telekom to switch new clients over from its own to the NetCologne network. Initially, this goodwill was lacking and DTAG only switched "a handful" of customers over each day, stating this was their capacity limit. Only by appealing to the regulator was this policy amended (VATM, interview, 14.07.99). Similar complaints were filed with the regulator by new entrants, ranging from technological issues such as placing resistances into xDSL line connections to billing problems. It is important not to exaggerate these issues, however. They were not universal. In one example, Deutsche Telekom's service for its competitors proved remarkably reliable, namely, in enabling call-by-call and preselection telephone punctually on 01.01.1998 (Gerpott, 1998, 89). The most important result these local "sabotage" efforts had, however, was to make it painfully obvious to new entrants how dependent they were on the network of the Deutsche Telekom.

Telecommunications infrastructure investment and capital markets

The German regulator enabled local subscriber line services even while alternative routes to offer direct internet access to consumers such as the cable TV network and wireless still were blocked. As was discussed in previous sections, RegTP allowed the "rental" of "unbundled subscriber lines" from Deutsche Telekom for a monthly flat fee. The long political delays associated with this option also delayed the impact this option could have on the German telecommunications landscape until early 1999. But here, as elsewhere, government policy and the actions of the national regulator do not tell the whole story.

[70] "A Bad Telecoms Merger," *The Economist*, April 24th, 1999, page 19. See also: "Launching Deutsche Telekom," *The Economist*, October 26th, 1996, page 105-106.

Despite uncertainty, a limited number of "city carriers," majority owned by municipal utility companies, offered unmetered "capped" internet access already early 1998 via this route. They did not wait for full regulatory certainty before launching their service. Yet, the surprising fact that municipal utility companies were the pioneers of access infrastructure and unmetered fees in Germany came with strings attached: The "city carriers" financed their growth through earnings derived from other businesses and did not tap the potential of capital markets. Despite their early start, the progress of the "city carriers" was slower than it could have been.

Two different types of utility players are involved in offering telecommunications services in Germany. On the one hand, large utility conglomerates, mostly private, control the national supply and therefore own backbone routes throughout the country which they are using to build up national trunk telecommunications networks. On the other hand, local utility firms, usually owned by the city or region, own rights of way to the home which they can potentially use to install new access lines. Unlike the cable TV network, however, no significant mass of subscriber lines along the rights-of-way of the utility suppliers existed in the mid-1990s; they had to be built from scratch. Municipal utility players founded the "city carriers" for the explicit reason to take advantage of these rights. Yet, the actual infrastructure investments – which were costly and risky – proceeded slowly. To some degree, investment was trapped in these companies. Since they were municipally owned, they were unable or unwilling to tap capital markets, for example through a spin-off, in order to embark upon an aggressive investment strategy. Instead, they financed growth through returns from their monopoly businesses. In contrast, a further type of competitor, the younger telecommunications start-ups (which were listed on the alternative stock market Neuer Markt), did not inherit the privilege of their own rights-of-way. These were the companies that could potentially have financed a high risk and high cost investment strategy focused on local access. The result of this paradoxical situation was that, although local access infrastructure investment proceeded, it moved at a slower pace and is more risk-adverse than would potentially have been possible if it were capital markets financed.

Here, three types of competitors to Deutsche Telekom in the period immediately following liberalisation will be discussed and their investment behaviour described. In part, the classification relies on that used by Gerpott in his book on telecommunications competition in Germany (1998, 261-275). The first competitor to be discussed here were the so-called "national carriers," the second the "city carriers" and the third the telecommunications start-ups. The first group could be described succinctly with the phrase: "National energy conglomerates plus two." The national energy conglomerates included RWE, Veba and VIAG. The "plus two" were the German railway, which owned extensive rights-of-way throughout Germany along its rail tracks, as well as Mannesmann AG, an industry conglomerate which initially entered the telecommunications business without any sizeable rights-of-way. Mannesmann earned its reputation in Germany as the first challenger to Deutsche Telekom by running an alternative mobile phone network. From January 1997, Mannesmann engaged in a partnership with the German railways telecommunication arm, the DBKom, forming Mannesmann Arcor. Through DBKom, Mannesmann achieved rights-of-way and became a fixed line telephony competitor in addition to being a mobile phones operator.[71] Between the "national carriers," a consolidation battle raged long before liberalisation in 1998. One national player has emerged more powerful than the rest: Mannesmann.[72]

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[71] Other investors in Mannesmann Arcor were AT&T, Unisource, Deutsche Bank and AirTouch. The Mannesmann group held the majority stake of this national carrier, however (Gerpott, 1998, 269). It is important to note that the Postal Ministry granted the national energy conglomerates and the Bundesbahn the right to begin to market their trunk capacities already from July 1996, a privilege which provided these companies with a competitive head-start (Gerpott, 1998, 64, 65).

[72] Between the national carriers, consolidation set in early. In fact, it began as soon as market liberalisation was expected in Germany, around 1995, before the actual passing of the Telecommunications Law. The reasons for early consolidation were numerous (see also Gerpott, 1998, 286). Essentially, all of the energy conglomerates "plus two" vied for the same asset: A national backbone network which could offer fixed-line telephony initially to large businesses and then to homes and small businesses. The second step was originally viewed as being dependent upon the promise of the "wireless local loop," a technology that took longer to develop for commercial use than expected. When the promise of the "wireless local loop" moved further and further into the future, the market possibilities shrunk. In addition, all national players financed their investments from earnings derived from other sectors and not through spin-offs onto capital markets. This reinforced risk-averse behaviour. Ambitious returns on investments were expected at an early stage (in the case of Mannesmann, the return on assets is expected to be 15% in the year 2000. Ralph Atkins, "Muscular Manager of Tubes and Telecoms," *Financial Times*, 26.07.99, page 10.) In the beginning, RWE Telliance and Veba Telecom got together to form o.tel.o Communications, a telecommunications joint venture. Mannesmann managed to form a partnership with DBKom, the railways subsidiary, launching Mannesmann Arcor. VIAG Interkom remained solo and focused on developing the wireless local loop and mobile communications; but not after a series of unsuccessful partnerships with international and domestic players. In the first year of liberalisation, o.tel.o encountered problems (aggravated by a late start) and was bought by Mannesmann in

Like its large competitors from the utilities industry, Mannesmann financed the growth of its fixed-line telecommunications services through earnings generated from other businesses, in this case, to a large degree through its lucrative mobile phone business. The rest of the industrial conglomerate Mannesmann was quite distinct from telecommunications and carried a different risk and rewards potential. Why didn't Mannesmann spin off its telecommunications holdings to tap capital markets and embark upon a more aggressive expansion strategy? In this way, Mannesmann could have matched the speed of US-listed new entrants such as WorldCom and Qwest. But, whereas Anglo-American entrants financed their expansion world-wide through capital markets, European firms were slow to do so.[73] The key to understanding this discrepancy is that a spin-off was risky since the spun-off company could be easily swallowed by a competitor, especially an Anglo-American competitor enjoying high valuations. How risky this was proven by the later acquisition of Mannesmann through Vodafone.

In terms of market capitalisation compared to revenue and in terms of market capitalisation growth, European telecommunications companies actually compared favourably to traditional US telecommunications companies (see Appendix C). In fact, the largest European telecommunications companies were doing better than their other European blue-chip counterparts which may have experienced comparable growth over the past months but still have lower valuations compared to their US-counterparts.[74] It is only when selected

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April 1999 for US$ 1.24 billion. On late start: Gabriele Kalt, "Bisher funktionieren meist nur die Servicenummern," *Frankfurter Allgemeine Zeitung*, 17.01.98, page 13. On o.tel.o acquisition: Ralph Atkins, "Mannesmann to keep o.tel.o Brand Separate," *Financial Times*, 07.04.99, page 28.

[73] In 1999, this already started to change, however. A listing of KPNQwest, a joint venture between Royal KPN and Qwest was announced in August 1999. Proceeds from the issue are to finance an expansion of its internet-based fibre-optic network across 39 European cities. Gordon Cramb, "KPN Plans Mobile Phone and Data IPOs," *Financial Times*, 31.08.99, page 19.

[74] Since the share price low point in Fall 1998 up to the Fall of 1999, continental European and German industrial blue chips have matched the growth of US blue chips. The Dow has risen about 45% from its low point and the Dow Jones Euro Stoxx 50 Index has risen about 58% (from 2986 on 08.10.98 to 4714 on 31.08.98). Euro Stoxx 50 tracks 50 major shares in the European Union. The rise of the German DAX has approximately matched that of the Dow. Out of synch has been the UK FTSE 100, which has risen only 26% in the period under examination. Yet, all European markets started on overall lower price level compared to the USA. The price/ earnings multiple of the Dow was 34 times, compared to 28 times of the FTSE and 25 times of Euro Stoxx 50 (in August 1999). See Peter John, "Internet Explosion Leaves Footsie Out of Step With Surging Dow," *Financial Times*, 24.08.99, page 8 and Jörg Schreiweis, "Noch Stehen die Börsenampeln

new Anglo-American entrants at the time were compared to European telecommunications operators, that multiples were very different.[75] The gap increased in 1999- this was the effect of the so-called "internet bubble." If one considers that in October 1997, the entrant WorldCom (1996 revenues $ 4.5 billion) successfully bid for MCI (1996 revenues $ 18.5 billion), European telecommunications players indeed looked very vulnerable and could have been threatened through a number of new entrants, not just Vodafone. Only in the year 2000 did this discrepancy in valuations begin to collapse with the downturn of the capital markets. A large number of US telecommunications upstarts subsequently went bankrupt as easy access to capital disappeared.[76]

Like Mannesmann, the second group of telecommunications competitors to be discussed here financed their growth through earnings obtained from other businesses. Unlike Mannesman, they were small and regionally oriented. Furthermore, they owned one asset upon liberalisation that for the others was out of reach: Rights-of-way to the home. These were the "city carriers," telecommunications carriers founded by municipal utilities companies (Gerpott, 1998, 270-275). It is difficult to generalise upon their strategies, because these were very heterogeneous. The differences could be accounted for by the distinctions inherent in the local markets themselves as well as the particular know-how of their management teams.

Upon liberalisation in January 1998, only two city carriers had significant services in place, based on "renting" of "unbundled" subscriber lines: NetCologne and ISIS in Düsseldorf (Gerpott, 1998, 305). Of these two, only NetCologne offered an innovative service package

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auf Grün," *Frankfurter Allgemeine Zeitung*, 27.08.99, page 24. Euro Stoxx 50 historical data was obtained from the Stoxx web site: http://www.stoxx.com/ on 01.09.99.

[75] The reason cannot be examined in detail here. Part of the overall trend has been to approach valuation of companies using future earnings estimates. Since current earnings and revenue of most "new economy" companies have been negative and negligible, future earnings and revenue estimates have been calculated-based in large part on the number of users of the service ("customer ownership"). A debate has ensued between "new economy" advocates embracing future-oriented valuations and those who point out the dangers of doing so. In most of 1990s Germany, this debate was much less pronounced, with many firms being valued according to current revenues and earnings and not according to "customer ownership." This has changed with the boom of the Neue Markt from 1998/ 1999 (Nacamar, interview, 12.07.99; Lux, interview, 10.07.99; DeTeCSM, interview, 09.07.99).

[76] "Wrong Numbers," *The Wall Street Journal*, 11.05.01, pages 1, A6.

which included internet access.[77] Later, throughout 1998 and 1999, other "city carriers" began to offer similar services. As has been pointed out already in previous sections, these services were introduced before regulatory certainty. The risk, however, of starting early was low because this group of telecommunications competitors intended to run their own subscriber lines into the home and small office over the longer term, taking advantage of their own rights-of-way. The investments in expensive billing systems and service teams, which had to be put in place for offering local service, could therefore be justified. Nevertheless, the municipal players were not quick enough to seriously compete with Deutsche Telekom in their respective regions until late 1999, perhaps even beyond. The speed of NetCologne was exceptional and did not represent the majority of its "city carrier" peers.

It was argued that "city carriers" could have represented powerful local competitors to Deutsche Telekom because they knew their region very well, had a recognised brand name and a well-established customer base (thanks to their parent companies). There was another aspect to the story, however. Werhard Möschel, one of the few vocal advocates of rigorous market liberalisation in Germany, criticised the fact that funds generated by local monopolies were being invested in the recently liberalised market (with the notable exception of City of Frankfurt which early on chose not to involve itself directly but instead allowed private firms such as MFS and COLT to compete).[78] Möschel warned that the municipal owners of "city carriers" made life for other, independent new entrants in those cities difficult. Pointing to the public ownership of "city carriers" competing in a liberalised market, Möschel warned that privatisation should not only be "formal" but also "material." He concluded: "The future cannot be won in this way."[79] A further important perspective could be added to Möschel's argument, however, which he did not explicitly state. The municipal players were unable or unwilling to tap public capital markets for funding their

[77] NetCologne, founded already in October 1994, was owned by the municipal utility company, but local savings banks (Sparkassen) had minority stakes.
[78] For a background article on Frankfurt and its efforts to compete as a financial centre against London see: "Telekommunikation, ein wichtiger Standortfaktor für die Finanzplätze," *Frankfurter Allgemeine Zeitung*, 22.02.96, page 15.
[79] Wernhard Möschel, "Der Staat auf dem Rückzug," *Frankfurter Allgemeine Zeitung*, 30.05.98, page 15.

high-cost, high-risk undertaking. As a result, their initiatives did not exhibit the rapid pace they could potentially have acquired.

The third and final group of telecommunications competitors to be discussed here were genuine telecommunications start-ups listed on the Neuer Markt. MobilCom, Debitel, TelDaFax and Drillisch have achieved valuations ranging from about DM 400 million (Drillisch) to DM 7,000 million (MobilCom) in 1999.[80] Investors expected them to be major players in the future telecommunications landscape in Germany. They were in a difficult fix, however. As of 1999, all local rights-of-way were blocked by a former monopolist, Deutsche Telekom, or by the municipal carriers. In light of this fact, early local access investments based on the option of "renting" subscriber lines would have been risky before regulatory certainty. Instead, the telco start-ups focused initially on long-distance telephony and on securing access to national trunk lines.[81] Thus the stars of the Neue Markt which have benefited from stock market euphoria and "the internet bubble" (Perkins) had a difficult time to enter the market of local internet access – despite the unique possibility offered by the national regulator in "renting" subscriber lines.

MobilCom began to offer direct subscriber lines in 26 cities at the end of 1999, entering this market two years after the municipal "city carriers" (interview, 13.09.99). This timing was similar to that of the "national carrier" Mannesmann Arcor , which launched its subscriber line service in ten densely populated German cities from September 1, 1999.[82] Like the telecommunication start-ups, Mannesmann Arcor waited for regulatory certainty before considering starting an innovative local internet access service. Therefore, up to 1999,

[80] "Telefon-Markt: Preisbrecher in Panik," *Focus*, 26/99, pages 200-204.
[81] Competition is raging over national trunk lines, with MobilCom bidding for the o.tel.o network early in 1999 but loosing out to Mannesmann. MobilCom was prepared to spend about DM 300 million to DM 500 million on a fixed fibre optical backbone network. Ralph Atkins and Alan Cane, "MobilCom Plans to Add Fibre to Low-Cost Diet," *Financial Times*, 28.04.99, page 40. In July 1999, MobilCom was able to secure a long-term exclusive lease of the national trunk network of GasLINE, a telco subsidiary of a gas supplier based in Essen. This put MobilCom in a much better position to offer innovative internet services in Germany. "Huge Cost Savings Via Optic-Fibre Network/ Significant Capacity Increases/ Large Reduction in Interconnection Costs," MobilCom Press Release, 15. July 1999 (from the web site http://www.mobilcom.de/).
[82] "Arcor steigt in das Geschäft mit ISDN-Anschlüssen ein," *Frankfurter Allgemeine Zeitung*, 27.08.99, page 16.

Deutsche Telekom controlled almost all local access to the internet by homes and small firms and could impose its metered pricing scheme.

Conclusion

The critical question that ran through this chapter, therefore, was why the "national champion" did not act as a force for innovation in Germany, which policy-makers, especially those close to the SPD, believed it to be. This chapter explored the possibility that the Deutsche Telekom was in part unable and in part unwilling to follow an innovative strategy pursuing the young internet access market in Germany in the years from 1996 to 1998. A closer look was therefore necessary. The material permitted three explanations why DTAG was unable to pursue a future-oriented course. Firstly, the management of Deutsche Telekom may simply have underestimated the "disruptive techology" of the internet (see Christensen, 1997). Secondly, Deutsche Telekom was under steep cost pressure in the whole period under examination. It also had to reduce its large debt. Thirdly, its network infrastructure was unprepared to meet steep demand for internet access and the company lacked know-how in the internet field. Most traditional telecommunications firms were facing similar problems in that period. The two latter problems were strongly aggravated by DTAG's history as a monopoly carrier before privatisation and its public listing in 1995/ 1996. The management of Deutsche Telekom emphasises this correctly. Yet, an argument could also be made that DTAG could in some cases have acted less defensively in the years between 1996, 1998 and beyond, especially given the capital market's exuberant enthusiasm for a bold, "network economy" strategy in this period.

It is ironic given the politician's trust in Deutsche Telekom that while the carrier potentially was in the best position to act as a "main force for innovation in Germany" it actually hindered the uptake of mass internet use by imposing high metered fees. Throughout 1999, there were only three main modes by which private individuals and small firms could access the internet in Germany.[83] In all three cases, Deutsche Telekom was able to control the underlying fee structure. Despite significant price reductions in 1999, private users and small businesses were confronted in Germany by metered fees and not flat fees – a result of Deutsche Telekom's policy.[84] The US internet evangelist Nicholas Negroponte stated: "Make local calls a flat fee and you would change Germany's economy more than any president could" (quoted in Zerdick et al, 1999, 77).

In a farsighted move, the national regulator provided a possibility through which unmetered fees could be offered in Germany and which side-stepped Deutsche Telekom's cost regime. This was the possibility of renting a so-called "unbundled subscriber line" to the home and small firms – a possibility that was unique in Europe and has since been adopted by other countries. Initially, however, only a very limited number of competitors used this access mode. The reasons for the slow uptake of this powerful option were linked to the ownership structures in the German telecommunications industry and the firms' ability to draw upon capital market funding. A full and rapid embrace of the opportunities of the local loop required risky, up-front investments. As a result, flat rate offers started becoming widely available in Germany only in 2000. The number of providers making flat-rate offerings increased from one in October 1999 to ten in June 2000 and the lowest monthly all-inclusive rental price fell from DM 249 to DM 77 (RegTP, 2000, 32). And, in Spring of 2000, Deutsche Telekom itself distanced itself from its metered regime and also offered flat-rate access to T-Online. As a consequence, 200,000 new subscribers joined the service.[85]

In fact, Deutsche Telekom has not stood still. Many of the future-oriented strategies that were missing before 1999 were embarked upon in that and the subsequent year. Local call pricing was differentiated and internet access costs were reduced in Spring of 1999. In April 2000, Deutsche Telekom's internet provider T-Online was spun off and listed. The mobile

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[83] (1) Over Deutsche Telekom's own internet service provider T-Online, (2) over internet-by-call offers based on interconnection agreements with Deutsche Telekom or (3) through a phone call to a local dial-in point.
[84] The ability for Deutsche Telekom to impose metered access in Germany and the detrimental effect this had on the development of the economy was the theme of a short editorial in a German business daily: "Schlagaustausch online," *Frankfurter Allgemeine Zeitung*, 27.08.99, page 22.
[85] "T-Online jetzt mit mehr als 6 Millionen Kunden," Press Release, T-Online, 27.07.00.

unit was to follow. Cash for new initiatives could be released in the listings. DTAG started selling its cable TV network in regional units in early 2000, retaining a minority stake in each unit. In March 2000, DTAG announced that it would acquire a majority stake of the systems integrator debis Systemhaus from DaimlerChrysler in order to build up its data networking expertise. It was not a coincidence that 1999 was the year in which a new, future-oriented Deutsche Telekom was born, however. It was only in 1999 that DTAG's competitors began to focus on internet access, a year after liberalisation. In June 1999, Deutsche Telekom completed its secondary offering (raising US$ 10.2 billion), and further placements were barred by the German government for the near future. Therefore, public listings of spin-offs were attractive alternatives for Dr. Ron Sommer to access capital markets to finance his internationalisation strategies. And the sale of cable TV networks was embarked upon unwillingly to pre-empt action by the European Commission competition authorities.

The role of capital markets was central not only to understanding the strategy of Deutsche Telekom, but also the moves of competing new entrants. Several competitors of DTAG did not draw on funds obtained from capital markets and instead financed the construction of a new communications infrastructure through earnings derived from other business areas. This stood in contrast to the United States, where infrastructure investments were financed at a rapid pace through capital markets starting at massive scale in 1995. This difference in company strategy regarding capital markets financing was perhaps, apart from telecommunications liberalisation policy itself, the single most significant factor explaining differences in the development of network infrastructures in Germany and the United States.

The initiatives of two types of domestic actors, national government and the incumbent telecommunications operator, have been discussed thus far in Part II. Attention in the next chapter will be turned to the third type of actor under examination, the new ventures themselves. The activities of this third type of actor are especially important for this study. The ability of German internet ventures to participate in a global innovation opportunity essentially is a measurement of the strength of the refraction effect discussed in Chapter

One. Can the development of the new ventures be regarded as largely independent of the influence of powerful domestic actors such national government and the incumbent operator or not?

Chapter Six

Survey of Internet Entrepreneurship in Germany

When this research project was initiated in late 1997, very little was known about internet entrepreneurship in countries other than in the United States. There, entrepreneurs already had been pursuing internet opportunities for around two years.[1] In other countries, however, including in Germany, remarkably little information existed on internet start-up companies, indeed, one was justified in wondering whether there were entrepreneurs pursuing internet opportunities at all. Only a handful of internet start-ups had entered media awareness, and most of these were not begun as internet firms and refocused on the internet only later.[2] Only a single German company had carried out a public offering at the time of the survey which could be labelled an internet company.[3] Yet, practitioners in touch with the computer and software communities nevertheless suggested that an entrepreneurial wave was brewing in Germany. Some emphasised that German entrepreneurs were addressing the internet opportunity as actively as their US counterparts. This was apparently confirmed in the last two years of the 1990s, at this time the new German alternative stock exchange, the Neuer Markt, listed significant numbers of German internet ventures. A revolution in entrepreneurship seemed underway in Germany.

[1] When referring to a date for the start of the internet boom, US commentators usually agree on the NASDAQ listing of the internet software company Netscape which occurred in August 1995. In the subsequent months after this listing dozens of companies were listed in the United States. Some of the highest profile internet companies were founded prior or shortly after the Netscape listing: Amazon.com was started in July 1995, eBay was founded in September 1995 and Yahoo! was transformed into a professional service during the course of 1994.

[2] These were software security and encryption firms ESD Information Technology Entwicklungs GmbH (Dölzig, Leipzig), started in 1994, Utimaco Software AG (Oberursel, Frankfurt), founded 1983, and Brokat Systeme GmbH (Stuttgart), started in 1994. Two companies focused on internet software, Intershop Communications (Burlingame and Jena), founded in 1992, and Blaxxun Interactive Group Munich, started in 1995 and supported by US venture capital. Two electronic commerce firms need also be mentioned, 1&1 Aktiengesellschaft, founded in 1988 as an online marketing service and ABC Bücherdienst GmbH "Telebuch," founded in 1991. "Telebuch" was later acquired by Amazon.com.

[3] The alternative stock exchange for high-growth firms, 'Neue Markt,' Frankfurt, was only launched in 1997 and listed (as of 04.98) seven firms belonging to one of the following industry groups: Telecommunications, software, information technology and computer services. Only one of these, 1&1 Aktiengesellschaft & Co., had direct internet relevance. 1&1 was an on-line direct marketing specialist and an internet outsourcer. Intershop Communications AG, which developed internet software for electronic commerce, listed in June 1998.

Yet, still in 2001, the lack of consistent and thorough information readily available about internet entrepreneurship in Germany is a barrier to serious scholarship about the phenomenon. An important part of this project, therefore, was the collection of empirical data about internet start-up activity in Germany. A survey was carried out in Spring of 1998. This early date was useful in two respects: Firstly, it pre-dates the most extreme manifestation of the stock market bubble, which was especially severe in Germany. Secondly, it allows a direct comparison of German ventures with the first generation of US internet start-ups. Insight into the state of internet entrepreneurship in Germany in 1998 directly addresses the issue of the refraction effect, described in Chapter One.

The rationale for an empirical survey was twofold. The first reason was to help locate entrepreneurs, who could be interviewed. It was apparent that, in order to gain an understanding of the specific challenges faced by internet entrepreneurs in Germany at the time, conversations with decision-makers in a few high-profile companies would not suffice. In the course of the survey, 18 founders of German internet firms were interviewed in person. Venture capitalists and persons from the academic and research community also were interviewed. This material proved invaluable in identifying the main challenges internet entrepreneurs faced in Germany at the time. It also was a crucial guide for formulating guiding concepts, which were later addressed in further interviews with internet founders in different European countries.

The second reason for this survey of internet ventures, however, was to provide an empirical foundation to the project. One of the specific challenges faced here was the fact that no representative list of internet firms existed which could be used as a starting point. The categories "computer," "software" or "telecommunications" were at once too broad, because they included companies not involved in internet opportunities and also too narrow, because they ignored internet firms focused on a diverse range of industries.[4] This

[4] One extremely valuable source of information would have been the list of companies co-financed by the Technologie-Beteiligungs-Gesellschaft (tbg), a federal program promoting venture capital investment. To protect entrepreneurs, however, this data could only be accessed by researchers from a specific research institute. Such a list would have included almost all of the highest growth internet start-ups at the time, due to the selection process of the tbg and the popularity of the program among venture capitalists. Recently,

forced the author to find alternative means to locate internet entrepreneurs; the path chosen was widely marketed start-up "contest." This "contest" was conduced at a time when the internet was just beginning to gain visibility as a US phenomenon and sufficient public interest existed. For this reason, the timing was good. The survey was carried out in co-operation with a leading business publication and one of the most frequently visited web sites in Germany. It attracted significant interest. 140 firms signed up on the survey's dedicated internet site; of these, 123 met the criteria for an internet start-up. For more information about the procedure please refer to Appendix A at the back of this paper. Due to the publicity and positive response, it can be assumed, therefore, that a broad segment of internet entrepreneurs was aware of the survey and participated. A valuable pool of data was produced which is discussed in this chapter. Venture capitalists and other experts were asked to confirm whether the data matched their current perceptions. It did. Nevertheless, due to the lack of a representative list, it is impossible to carry out the usual statistical tests for bias in the sample. The data presented here should, therefore, be viewed as complementary to the qualitative information gathered in the interviews and should not be used in isolation.

Introducing the typical German internet start-up

The survey is comprised of data collected from 123 internet start-ups based in Germany. Of these, 23 firms were internet software companies. Examples of internet software were systems enabling electronic commerce, online publishing, knowledge management and financial transactions. The clients of these software start-ups were mostly firms offering services on the internet or building internal corporate services. An example of a software start-up was the COIN Corporate Interactive AG, a firm with at the time 23 employees founded the previous year in Hannover. It developed internet-based corporate business process software for insurance companies and other firms involved in repetitious data processing tasks.

however, a private data source, a credit information service, has been opened for academic research (Harhoff and Steil, 1997).

The most popular firm type were web development agencies. 57 firms fit this classification. These start-ups had deep knowledge of internet business, but worked primarily on a project-by-project basis for corporate clients. Companies in this group were new media agencies, which offered services such as web site design, consulting and development and systems consultants, which worked on systems integration. Founders of web development agencies could be understood as 'evangelists' because much of their activity consisted in convincing others of the benefits of an involvement in internet and new media. Only a few adopted a high-growth path and were able to access venture capital financing.[5]

The third category was comprised of portal sites, electronic commerce start-ups and business-to-business (B2B) internet exchanges. 29 firms offered these types of internet services. They included companies involved in online retail services, content, services for the hotel and travel industry, information brokers and business-to-business platforms. They were the types of companies attracting media attention and very successfully raising venture capital in the United States. An example among the German survey participants was BPS, started in 1997 in Karlsruhe and at the time with 12 employees. The B2B purchasing platform connected SME fashion manufacturers to their clients, the boutiques.

The last group were 14 companies which did not fit into the previous three groups. Some of these were internet service providers (ISPs). They offered internet access for firms and individuals in a local area.

The data collected in the survey can be used to present the "typical" internet start-up at the time.

[5] For more information regarding the role of the so-called evangelists in Germany and their motivations, see Waesche, 1999a.

Chart 1. The typical German internet start-up in Spring 1998.

- The typical firm was 1.8 years old.
- It had 20 employees, of which six were free-lance.
- It was highly likely (79%) to have been re-investing profits to finance its growth.
- Yet, the managing founders also estimated that would require DM 2.2 million of initial investment to jump-start high growth.
- The typical firm had a 11% chance to find a venture capital equity investor which would have provided this capital.
- It had a 5% chance of being funded through the federal Technologie-Beteiligungs-Gesellschaft (tbg).
- Had generated a turnover of DM 1 million in 1997.
- Expected a turnover of DM 3 million in 1998.
- Expected employee growth of 77% per annum.
- 52% of costs were employee costs, 15% were spent on hardware and software, 11% on telecommunications and internet access and 17% on marketing and PR.
- In the typical firm, a team of two company founders were active managing partners.

Start-up funding and the "balancing act"

One immediate surprise in the survey was the apparently large proportion of venture capital-financed firms in Germany, 11%. Although this may partially be accounted for due to the bias of the survey, the figure still stood out as an unlikely result.[6] It did not, for example, match the estimate by a German private equity research firm, Mackewicz & Partner. One of their publications at the time stated that only 5% of technology start-ups in Germany were successful in their search for a venture capitalist (VC). Nor does the 11% figure correspond to anecdotal evidence about the difficulties of locating and convincing German VC financiers to invest in a start-up, especially in the case of internet electronic commerce start-ups or web developers. At the time, German VCs had to act in a more risk-adverse way than their US counterparts, because the long-term success of the alternative stock market in Frankfurt, the Neuer Markt, was not yet apparent.

[6] The survey explicitly called for leading companies in the internet arena. Venture capital firms were contacted and asked to notify their companies about the survey, therefore, it is very probable that more venture-capital firms participated than would have been representative of the start-up landscape as a whole.

In fact, the 11% figure represents, more than anything else, the lack of understanding about VC financing in Germany at the time among entrepreneurs. Entrepreneurs may have thought they had venture capital financing when, in fact, they were referring to other, less supportive types of private equity finance. Some private equity firms in Germany ("Beteiligungskapitalgesellschaften") were unable to offer the range of services, the depth of specialist know-how and breath of contacts which were associated with US-style venture capitalists.[7] For this reason, it was crucial to separate "real" VCs from other investor types in Germany which were mistakenly labelled VCs. The MBGs ("Mittelständische Beteiligungskapitalgesellschaften"), for example, were generally not active investors and not profit-oriented; they receive only an interest rate payment return on their investment. These private equity investment funds were started in the 1970s and 80s by business initiatives and local chambers of industry and commerce with state-level public support. The performance of the MBGs was confirmed to be under that of standard, profit-oriented venture capital firms. One research effort, furthermore, ascertained that the portfolio firms of MBGs further indicated that they were dissatisfied with their investor (Kulicke and Wupperfeld, 1996, 220, 221; see also Kulicke, 1997c, 140-142). According to two different sources, there were only very few experienced and US- oriented venture capitalists in Germany at the time, and they formed a small subset of the total population of private equity investors (Wupperfeld, 1996, 248; Wupperfeld, 1997, 168; Freeman, 1998).

Indeed, from the data provided in the survey itself, there were indications that the 11% figure was too high. We knew, for example, that 5% of all firms received financing through the Technologie-Beteiligungs-Gesellschaft (tbg). This percentage probably more accurately reflected the proportion of "real" VC-financed, high-growth firms in the sample (See Table 1, below). The tbg provided entrepreneurs with the possibility of raising public money only in combination with an investment by a recognised venture capitalist or a high profile

[7] Thomas Hellmann and Manju Puri evaluated the financial strategies of a sample of around 100 Silicon Valley start-up companies. The panel data was originally collected from 1994 onwards as part of the Stanford Project on Emerging Companies (SPEC). On the basis on this and other data, Hellmann and Puri conclude that venture capital-backed firms tend to receive more funding and are more liable to change their CEO in an effort to professionalize (Hellmann and Puri, 1997). In another paper, they show that firms following an innovator strategy are more likely to pursue venture capital financing in order to speed up their time to market. The securing of venture capital therefore seems to be an important strategy among Silicon Valley firms racing to secure first mover advantages (Hellmann and Puri, 1998).

individual investor ("angel"). Like the similar Kreditanstalt für Wiederaufbau (KfW) program, the tbg co-venturing scheme actually lowered the risks for venture capital investors. Both the tbg and the KfW only worked together with venture capital firms they recognised as high-quality, profit-oriented investors.

Table 1. Forms of financing.

	All firms	Firms with VC financing	Firms with bank loans	Firms with tbg support
Reinvesting profits	79%	43%	88%	33%
Individuals	33%	14%	33%	33%
Bank loan	20%	21%	100%	17%
VC financing	11%	100%	13%	83%
State ("Land") program	8%	21%	17%	17%
Parent company	8%	0%	4%	0%
tbg support	5%	36%	4%	100%
Other	5%	7%	8%	0%
Federal program	4%	21%	8%	17%

(This table can also be found in Appendix A; there it is Table 3)

The most common form of growth financing for an internet start-up was by reinvesting profits. 79% of the companies included in the survey indicated that they financed their activities through what was often referred to as 'bootstrapping.' Indeed, self-financing of growth was the most common means of finance for all types of start-ups surveyed, including internet software firms and portal sites and electronic commerce start-ups and not just for web developers (see Appendix A, Table 4). The need to generate the positive cash flow required for self-financing, however, represented a significant constraint to growth. Software companies had to carry out more project-by-project work for their clients and could not dedicate themselves to the same extent to scalable products. Web development companies were dependent upon organic growth and could not acquire other firms in their field to capture valuable know-how. Electronic commerce players, portals and other innovative internet start-ups were handicapped because they had to carry out cash-flow positive activities "on the side" such as systems integration or web development.[8]

Moreover, a few German entrepreneurs preferred bootstrapping to giving up an equity stake to a venture capitalist.[9] Many software and consulting firms have in the past grown to be successful with this means of financing. The most successful German software firm, SAP, was also bootstrapped, and combined this with an early stock market listing. This pattern, bootstrapping and an early public offering without involvement by an early-stage venture capital fund, could be observed in several computer and internet companies listed on the Neuer Markt in 1998 and 1999. It reflected suspicion to "outside control" in the company; a suspicion associated with the German "Mittelstand" tradition.[10] However, the survey indicated that most of the internet founders questioned did not subscribe to this view. In fact, an astounding proportion (73%) of founders who embraced rapid growth also believed in the advantages of venture capital investment (Appendix A, Table 27).

But, intentions diverged from reality in many cases. And the constraints of bootstrapping were obvious. One founder described these in the following way:

> "We had to wait for one and a half years for our first pay cheques as partners. We paid our rents by working part-time for Novell. Our employees were, of course, always our first priority and we were very tight on liquidity."[11]

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[8] A well-known example was the German internet portal web.de, which was built up in parallel to a cash-flow generating systems integration business. For more examples of German companies financing their internet start-up businesses on the side through other cash-flow generating activities, see: Niko Waesche, "Tough Balancing Act for German Internet Start-ups," *Tornado-Insider.com Magazine*, No. 2, May 1999, pages 24, 25.

[9] Interview with Netlife.

[10] The traditional German "Mittelstand" start-up model has been identified with the lone engineer intent on keeping exclusive, patriarchal control of his company until he could bequeath it to his siblings. This attitude still existed in the late 1990s and was called 'Herr im Hause' ('Master in his own house') thinking or 'Blut, Scholle, Erbhof-Denken' ('Blood, earth, homestead mentality') (see, for example, Breuer, 1997, 326, "Mentalitätsphänomen;" Kulicke, 1997c, 130; Huhn, 1997, 86).

[11] USWeb InnoMate interview.

The survey results reflected this "balancing act" of German internet start-ups trying to combine cash-flow positive project-by-project work with their high-growth, scalable offerings. Only about 40% of all selected firms generated most of their revenue (defined as 75% or more) from products or scalable offerings. About one fourth of all selected firms were complete hybrids, generating substantial income from both product as well as project work. As expected, tbg financed start-ups most closely matched the revenue streams one would expect from high-growth firms (see Table 2, below). One needs to keep in mind that the group of 30 selected firms represented the most promising high-growth category among the survey participants. The task of web development was by nature project oriented. One clear result of the "balancing act" was that undercapitalised German internet start-ups could not address their specific area in the same vigour as a "pure-play" internet start-up could. Established media and telecommunications firms were not challenged by start-ups in the same way as they would have if they had faced more "pure-play" firms.

Table 2. Proportion of start-ups generating most of their sales from project work or product sales.

	All firms	% of total	tbg financed
Mostly project-by-project*	10	35%	0
Mostly product, scalable offerings ("pure play")	12	41%	3
"Hybrids"	7	24%	1
	29	100%	4

(The categories are defined in Appendix A, where the table is listed as Table 18.)

Slow internationalisation

A further result of the "balancing act" was the slow pace of internationalisation of German internet start-ups in the second half of the 1990s. One of the original theses of the practitioner network thinkers, described in the introductory chapter, was that the global internet would enable small start-ups to acquire and serve clients in other countries, whether businesses or consumers. Any small firm could use the network to become instantly global, ran the argument. Reality seems to have been a little different, with only a few exceptions.[12]

Among all firms surveyed, only 2% of business customers were international clients and 0% of consumers came on the average from outside Germany (Appendix A, Table 2). In a more detailed, second questionnaire handed only to internet software and internet electronic commerce firms, sales figures from countries outside of Germany were established. Two firms had a significant proportion of foreign sales, they derived over 90% of revenues from abroad (see Table 3, below). However, most start-ups had only a small share of international revenues. The average of foreign sales was 21%, the median was 10%. It is important to remember here that the survey explicitly asked the most internationally active German internet firms to apply. Furthermore, the low internet penetration in the German market should have motivated firms to enter other countries more rapidly than, for example, in the United States, where the domestic internet market was already at that time relatively large. One company that successfully targeted international markets from a early stage was the German internet software firm Intershop. But Intershop had the benefits of venture capital financing by a high profile, internationally oriented investor; bootstrapped firms had to prepare their internationalisation more carefully and had to move at a more gradual pace.

[12] One German firm did correspond in a picture book-way to the network thinker's ideal. This company was an electronic commerce start-up selling airline tickets, TISS. The internet service compared up to 80 million airfares which were put to the disposal of its registered users. Travel Information Software Systems GmbH (TISS) was a global internet start-up company with a staff of two people based in Heilbronn, Germany. Astoundingly, only about one in ten of the bookings it referred originated in Germany, the majority were from the United States. Without a US sales office or any other physical presence on the other side of the Atlantic, TISS was responsible for referring flights with a total value of over five million Euro alone in the month of October 1998. But this start-up was unique in the German internet landscape. Rudi Weissmann and Dirk Trostmann started the TISS service in 1995. The founder's slogan was: "Look big, keep small." Figures have been provided on the TISS homepage: http://www.tiss.com/. A succinct, yet detailed article on TISS: Indra Büttner, "Internethandel," *Econy, Business in Bewegung*, December/ January, 04/98, pages 42, 43.

Table 3. Number of firms with given percentage of foreign sales.

% foreign sales	Frequency	%
90-100%	2	7%
80-89%	0	0%
70-79%	0	0%
60-69%	1	3%
50-59%	1	3%
40-49%	3	10%
30-39%	4	13%
20-29%	2	7%
10-19%	5	17%
0-9%	12	40%
	30	100%

(This table can also be found in Appendix A; there it is Table 15)

Unbalanced demand for internet services

The two previous chapters focused on telecommunications deregulation in Germany and the laggard uptake of internet use among consumers. Business uptake was faster in Germany. As indicated in the previous chapters, some larger businesses received preferential treatment by the monopolist telecommunications operator, Deutsche Telekom. Leased line prices, which affected large business use of the internet, for example, were below those of many other countries. Evidence from management research shows that leading German firms were upgrading their computer networks as part of an effort to "modernise" their operations (Ruigrok et al,1999, 52, 53). These were large German firms as well as advanced "Mittelstand" (SME) companies. In general, internet adoption by these companies, was much more rapid than among small businesses and consumers.[13] The massive costs of

[13] Early reports seemed to indicate that uptake among advanced small- and medium sized enterprises in Germany (the "Mittelstand") were above the European average (European Commission DGXIII.A3, 1997, p. 26). Another source confirms that SME uptake of information and communication technologies was higher in Germany than in other countries. The study credits trade associations, which provide information on information and communication technologies to 55% of German firms (DTI, 1998, Executive Summary). These types of informational services were supplemented in 1997 by a one-time federal subsidy for SMEs for setting up an internet presence, a support scheme that was, incidentally, heavily oversubscribed. 1,000 SMEs were provided with up to DM 4,600 each for setting up their internet presence. Around 3,000 companies

internet access among small firms and consumers resulted in an unbalanced uptake pattern in Germany which was highly unfavourable for internet start-ups.

As described in Chapter Two, the most advanced applications for the internet consisted in linking small businesses and consumers to each other and to larger firms in seamless "business webs." It was this breakthrough which transformed the internet into a "disruptive technology," to use a concept developed by Clayton M. Christensen (1997). In the 1980s and early 90s, large firms had already begun to use the advantages of computer networks to exchange data among themselves. Yet, electronic data interchange (EDI) was expensive, and could not be used to link small businesses and consumers. With rapidly rising internet penetration among small firms and consumers in the United States, however, the benefits of lower transaction costs over networks could be extended, thereby creating wholly new opportunities. Start-up companies could exploit these opportunities first, because, in contrast to EDI efforts, large firms were not in control. Furthermore, the internet as a "disruptive technology" linking small firms and consumers was not given full attention by large companies.

In those countries, however, where internet uptake lagged among small firms and consumers, such as Germany, the range of possible internet applications was much more limited and in many cases reduced to "showcase" projects. Demand for internet services was, therefore, clearly unbalanced in Germany; consumer demand was low while business demand was higher. In fact, one web development and systems integrator company founder advised internet entrepreneurs in Germany to examine advanced internet demand structures in the United States before developing their own ideas:

> "To start an internet company, one should first secure DM 250.000 to have a year's worth of breathing space. Then one should head straight for the airport and catch a flight to San Francisco to collect ideas."[14]

applied for the subsidy administered by the "Bundesamt für Wirtschaft," Eschborn ("Gewerbestraßen statt Gemischtwaren-Shopping," *Computerwoche*, 39/97, p. 67).

[14] GFT interview.

Also for this reason, some firms such as Intershop maintained advanced technology groups in the USA while others insured cross-Atlantic information flow through partnerships with other small firms.[15]

Unbalanced internet uptake in Germany and primitive internet demand structures were reflected in the survey results as well. The client base of internet start-ups in Germany in early 1998 consisted largely of business customers. Most of these business customers actually were technologically advanced Mittelstand companies. Over 70% of sales to businesses were derived from the Mittelstand. Only a minority, 15%, of internet start-ups targeted consumers (Appendix A, Table 2 and 28). It is not wrong, therefore, to characterise the typical internet start-up in Germany in early 1998 as a firm carrying out project-by-project work for business customers while in parallel trying to experiment with new internet applications. This was very different from the United States, where 604 so-called pure-play internet firms were financed in 1998 by venture capital to focus on specific high-growth opportunities.[16] The highest profile early start-ups such as Amazon.com, eBay and Yahoo! focused on where the internet was most "disruptive:" On extending the powers of the network to small firms and consumers.

Technology enthusiasts and management know-how

The most common problem of New Technology Based Firms (NTBFs) emphasised by German-language literature was that technology know-how was not matched with management know-how (Koschatzky, 1997, 1, 6; Pleschak, 1997a, 14, 15). The reason for this was that many founders started companies right out of university. In order for a NTBF to succeed, however, management know-how was considered crucial.

[15] The COIN Corporate Interactive partnership with Liquid Edge, New York City, for example (COIN interview).
[16] In 1999, this figure grew to 1,798 companies. "Moneytree US Report Full Year & Q4 1999 Results," PricewaterhouseCoopers.

This observation cannot be directly confirmed with this survey of internet start-ups in Germany.[17] Barely any were founded right out of a science university. In fact, only one such start-up initiative was identified.[18] Several start-up initiatives, however, took shape while the founders were taking business courses at a German university. In fact, business courses were the most popular type of course founders had taken at university, followed by computer programming courses.[19] This evidence indicates that the typical internet entrepreneur in Germany was very different from the NTBF founder. NTBFs seemed to follow the traditional industrial strengths of Germany, areas such as precision tools and electronics. These were areas where the university system had its strengths.[20]

Nevertheless, the most accurate characterisation of internet founders in Germany in early 1998 was a multi-skilled person with a university, but non-science, background but with an enthusiasm for technology. The founders of the companies surveyed here count among the very early adopters in Germany of consumer networks. A significant proportion of founders, over 20%, already encountered consumer network services before 1990, in this case the system of the German telecommunications operator, BTX (Appendix A, Table 20).

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[17] Nor could it be confirmed by examining the results of the first pilot programme for NTBFs, TOU. Marianne Kulicke et al found that some entrepreneurs already had management know-how on founding and most could compensate for their deficits by learning on the job (Kulicke et al, 1993, 255).

[18] They were not included in the survey because they had not founded their company by the time the data collection was completed. An interview was carried out, nevertheless (Verteilte Systeme).

[19] Very important for internet start-ups seems to have been the combination of different fields of know-how, especially the fusion of technological and management know-how. Often, this was achieved by creating teams. Partners in both iXOS and Brokat emphasised the managing founder team. The teams approach was an important element in a speed management strategy (Interview with Netlife, iXOS, Brokat). In Silicon Valley, the teams approach was widespread. One survey from 1996, which examined human resource strategies, revealed that most firms were started with two founders, although there also were companies with three, four, five, six, seven, nine or even with twelve founders. Among the German internet start-ups surveyed here, most firms had two founders as well, but there were fewer companies with three or four founders. The interview data on German start-ups, however, indicates the process of composing founder teams may have differed to that in Silicon Valley. The research just quoted from 1996 examined different models of employment relations. One of these models was the 'commitment model,' a long-term attachment in which peer control, cultural fit and loyalty mattered. Family and friends are usually listed as key partners in the creation of the company. Among German internet start-ups, almost all founders interviewed had teamed up with friends, whereas less than 30% of the Silicon Valley firms had chosen the 'commitment model.' For a short explanation of the different employment models see Hannan, Burton and Baron, 1996a, 513. For family and friends among founding partners Hannan, Burton and Baron, 1996b, 271.

[20] This is confirmed by comparative emperical data on NTBFs in Germany, Sweden and the UK. In Germany, over half of all NTBFs are in the machine tools and precision instruments business, followed by electronics and chemicals/ pharmaceuticals. Only about 3% of all NTBFs are involved in computer technology. This is in strong contrast to Sweden and the UK, where electronics dominate, but where over 10% of NTBFs are in computer technology (Licht and Nerlinger, 1997, p. 193-195).

Very few of these early German internet entrepreneurs, however, had a strong international management background.[21] This differentiated them from the internet founders which appeared in Germany in 1999 and 2000, which, in general, seemingly had more pronounced international management skills but were less firm on technology.

The early founders, which could be most accurately be labelled technology enthusiasts with universal skills, need to be viewed as distinct from the programmers and engineers they hired. While the surveyed start-up companies are working at 81% of their potential capacity due to problems in finding personnel (Appendix A, Table 18), this was a situation very much comparable to that in other countries, including the United States. However, loyalty among key technical personnel was better in Germany.[22] In fact, some founders clearly indicated that availability of technical know-how was a locational advantage:

> "There is no question that technical know-how is better in Germany than in the USA. The applicants are better, the quality is better. In the USA or the UK I require five engineers for the same task three carry out in Germany."[23]

Another relevant question was the existence of specialist know-how among German internet start-ups. In the late 1990s, two areas of specialist scientific knowledge found application and further development through the commercialisation of the internet: software agents (classified here under "knowledge management") and encryption systems. The first was a requirement for advanced search features across vast amounts of unstructured information and for such applications as intelligent brokers. The scientific origins of this technology lay in research in artificial intelligence, artificial life, neural networks and

[21] Foreign founders and managers in Germany added international management experience to German teams. One example was the constellation of managers surrounding Fidelio, a Munich-based hotel software firm which later helped spawn at least two internet firms, Serenata and NxN as well as a developer of software and hardware for the optometry industry and a call center software firm. Fidelio was started in 1987 by an American, Keith Gruen, and two Germans, Dietmar Müller-Elmau and Dietrich von Boetticher. Vijay Sondhi, David Lehrer and Galen Bales, all of them Americans, Eric Fischer and Rick Spence, both are British and Rolf Schmiedke (Swiss) joined and left Fidelio at various stages. In 1997, Sondhi became CFO of a high profile document management software company, iXOS. Recent immigrants to Germany have also been among internet firm founders, for example Arvin Arora from COIN Interactive or Xuân Baldauf of Medium.Net. International experience is a very important criterion for VCs. For this reason, an experienced English software manager was placed at the helm of Hyperwave, a company specialising in intranet publishing.
[22] Interviews with Netlife and Lars Heiden Jörg Füllenbach Realisationen.
[23] GFT interview.

human/ computer interaction. The best-known research programmes in this field were the Software Agents Group at MIT's Media Laboratory, the Artificial Intelligence Laboratory at the Free University of Brussels (VUB) and work carried out in Cambridge University. Among German internet start-ups, in this area of specialised technological know-how was underrepresented when compared to a US sample (Appendix A, Table 8, compare "Knowledge Management Software"). In fact, most well-known agent-technology firms were American and one, Autonomy Systems Ltd., was from the UK

The second area of specialist knowledge, encryption systems, was necessary for confidentiality and authenticity of internet transactions, which were major requirements for conducting business and especially banking over the internet. Using these techniques, a sales contract sent over the internet could be 'signed,' insuring its authenticity. Asymmetric encryption techniques, used on the internet, was pioneered in the United States in the 1970s, but research was embarked upon in numerous countries due to its affiliation with military research.

In this area, German internet firms were very well represented and seemed internationally competitive. They had ambitious strategies for international expansion. The origin of this strength could be traced to the national teletext service, BTX, which found its most popular expression in on-line banking applications. Most German banks offered on-line banking over BTX and several in the late 1990s began to transfer these services to the internet. Three of the companies interviewed in the course of this research, Brokat, ESD and Netlife, developed software for banks intending to offer on-line banking services over the internet. The issue of encryption, especially as an international standard, was a main issue of concern among founders of German internet start-ups (Appendix A, Table 25).

Much effort was put into securing and extending this competitive advantage in Germany. A consensualist alliance between the banking industry and associations formed to develop the open on-line banking standard HBCI ("Home Banking Computer Interface").[24] In order to

[24] Positive uptake of HBCI by financial service-oriented internet start-ups was confirmed in the Brokat and ESD interviews.

promote both the use of encryption techniques as well as their development by German firms, the Federal Ministry of Education, Science, Research and Technology was instrumental in framing a multimedia and communications law in Germany, the "Informations- und Kommunikationsdienste Gesetz" (IuKDG). This law and its appendix relating to electronic signatures represent a framework for conducting legally binding electronic commerce. It also covered several other important areas such as responsibility over on-line content. It did not, however, address its own enforcement issues, which was a severe weakness.[25]

The comparison of the development of these two areas by German internet start-ups illustrated the concept of path dependence found within technological innovation and diffusion theory. The enthusiasm with which application of encryption technology was developed by internet start-ups could be contrasted to the difficulty in competing in an area where little research and development has existed in the past, in agents technology and knowledge management systems. Apart from the specialist knowledge issues, general computer engineer know-how and management experience seemed readily available in Germany in the late 1990s. And the strong desire to embark upon a high-growth entrepreneurial experience was there.

Wrong country, wrong time

At the beginning of this chapter, the typical German internet start-up was introduced: A 1.8 year-old company with 20 employees. The founders were seeking DM 2.2 million in venture capital. These technologically well-versed founders saw the opportunities of the internet and embraced rapid growth. DM 2.2 million was not a substantial amount compared to the money raised in the United States at that time.[26] Yet, it represented a lofty sum of money in a country and at a time when venture capital was just a trickle. Although

[25] Due to this weakness, the law could be "ignored" in one high profile content responsibility case- in the case against Felix Somm carried out in Bavaria.

the government sponsored venture capital programs mentioned in Chapter Five were laudable and allowed a minimum level of activity to persist, they were not extensive enough to initiate rapid growth. The venture capital boom, which would occur in Germany later in that year fuelled by the Neuer Markt had not reached the entrepreneurs yet. As a result, most entrepreneurs financed growth through positive cash flow.

It was also difficult for company founders to foresee that demand for internet access by consumers would shift into high gear in subsequent months. In early 1998, Germany was known for its laggard uptake among consumers, which was behind even the European average. The reasons for this have been described extensively in the two previous chapters. Those founders who expected rapid uptake in the future were nevertheless dependent upon generating income in the current market. For this reason, there were few alternatives to carrying out project work for business customers. This was highly problematic, because sophisticated internet applications at that time consisted in integrating consumers into new types of business transactions. Due to these constraints, the typical German internet start-up carried out project-by-project work to subsidise its more innovative ideas, often consumer-oriented, on the side. The game to play was a tough balancing act focused on generating cash which could be re-invested in growth. In order to realise their own ambitions, the internet founders were in the wrong country at the wrong time. They required better access to innovative financing as well as more advanced domestic demand structures than were available in Germany in early 1998. In contrast, therefore, to the idealistic visions of network thinkers, domestic determinants did play a crucial role also for internet ventures addressing global opportunity. The most interesting finding, perhaps, of this empirical survey, was that the resource allocation and strategy of German new internet ventures was considerably different from that of their US counterparts.

This survey of internet entrepreneurship in Germany was a single-country snap shot. It served to highlight the specific challenges faced by entrepreneurs. It is important now to extend the results of the data and place it in a comparative setting. The argument offered

[26] Venture capital financed internet companies in Silicon Valley, received on average US$ 6 million each in the fourth quarter of 1997 ("A telling statistic: Average investment up 50% since '92," *San Jose Mercury*

here needs to be strengthened by relating the findings back again to government policy and national institutional determinants. The conclusions arrived at in this chapter are contrasted with the experiences of other countries. In the next chapter, material from the whole period between 1995 and 2000 will be taken into consideration for three further European countries.

News, 14.02.1998, from the web page http://www.sjmercury.com/).

Chapter Seven

Internationalisation of Internet Start-ups from Four European Countries

Several contemporary business press articles have made the point that country-level institutional factors, such as internet access and the availability of venture capital were important determinants in internet-based entrepreneurship and the internationalisation of new ventures. While an important contribution to practitioner understanding, these articles failed to explore *how* these institutional factors impacted on the internet start-ups. Furthermore, they often discussed either internet access or venture capital, not the combined impact of the two factors. This combined view of two important county-level institutional factors is missing also in academic literature relevant to this topic; most work thus far concentrates either on venture capital and new firm formation or on telecommunications liberalisation. It is the objective of this thesis to discuss the combined impact of two country-level institutional factors within a rapidly developing global entrepreneurial environment. Of course, the institutional factors were changing as well. One could view this effort as a comparison of speeds of change of institutions vis-à-vis new ventures.

To come to terms with the level of detail required to explore linkages between changing institutional factors and market actors, this research focused on a single country, Germany, to present an initial, yet detailed, set of hypotheses. The laggard pace of consumer internet adoption in Germany and the initial lack of venture capital in Germany for internet start-ups had a deep impact upon firm strategy and resources. As a consequence, German internet start-ups were slow to internationalise, focused mostly on enterprise clients instead of consumers and adopted "mixed" resource allocation- including a significant amount of project work. They responded not to global opportunities, but to a 'refracted' version of these opportunities. Only when the institutional framework began to change conclusively from 1999, did strategy and resource allocation among start-ups also change and 'pure play' start-ups began to appear. The timing of institutional change thus insured institutional distinctiveness and path dependence- despite the fact that institutions eventually reacted to competitive pressures for global convergence. By the time the two institutional factors-internet access and venture capital availability- began to adapt conclusively, the 'first generation' of German internet entrepreneurs had already made their mark, established players had firmly entrenched themselves in the internet business and US start-ups had acquired prime internet assets. As a result, the local landscape for information technology entrepreneurs still remains distinct in Germany.

In this chapter, learning from the German case will be extended to three further European countries, to explore the "refraction" effect in other local environments. Unfortunately, it was not possible to delve into the level of detail presented for Germany. It was also not possible to extend the quantitative survey into other countries. Nevertheless, the information available about the development of internet ventures in other countries permits a testing of the concepts derived from the German case in different environments. This comparative section is also useful to gain further understanding about the German case itself. For example, the boom of venture capital in Germany from 1998 and the significance of the Neuer Markt can only be fully understood when compared to growth rates of venture capital in other countries.

Yet, a disclaimer needs to be extended to the reader. With the exception of Germany, continental Europe at the time populated mostly by privately-held internet start-ups. Public information on quoted companies obviously is much more easily accessed, more reliable and better to compare than what was available on private firms. Much of this discussion was based on news items, analyst reports prepared by investment banks and interviews with experts and journalists.[1] Very little of this information is directly comparative. For this

[1] Due to the initial success of the Neuer Markt and the popularity of the growth exchange among internet entrepreneurs, Germany was home to the most transparent internet industry in Europe. 22 internet companies were quoted on the Neue Markt as of October 1999. With a combined market capitalisation of EUR 6.3 Billion, internet stocks comprised 12% of the total market capitalisation of the Neuer Markt. Please refer to the analyst report DG Bank Deutsche Genossenschaftsbank AG Research, "Neuer Markt," October 1999. Many internet software companies were listed, including Brokat and Intershop. The three best-known web development companies, were listed on the Neuer Markt as well: Pixelpark, Kabel New Media and I-D Gruppe. In addition, there were several portal sites and electronic commerce start-ups; some of the better-known on the Neuer Markt included Endemann!! (a holding owning three different, previously undercapitalised portal sites), iFAO (an electronic commerce travel service as well as software specialist), buecher.de (book retail) as well as Ricardo (an electronic commerce auction site). ConSors (an online brokerage) was classified as financial services, not internet stocks. Although the Neue Markt provided a researcher with unparalleled insight in Germany, more information on Germany and the rest of Europe was

reason, these findings should be considered tentative but should nevertheless provide a starting point for further investigation.

While the purpose of this Chapter is to discuss the development of institutional factors and internet start-ups in three new countries, the German case will be included in the narrative for comparative purposes. Thus, this Chapter represents a four-country survey, which includes two "large" economies as well as two "small" ones. Older management studies literature argued that internationally operating firms benefit from a large home market.[2] Porter, by pointing to more subtle, qualitative criteria contained in home demand, has been able to elegantly side-step this issue (1990). In fact, some of the largest multinational companies operate from small countries, leading to the argument that small countries foster internationalisation because their own markets are too constricted. The effect of economic size therefore needs to be taken into account. Lastly, this is a good moment to note that the local tongue of all countries studied here is not English. Much has been written about the supposedly English-centric internet, although, in reality, local languages dominate the internet in Europe.[3] None of the countries here had an advantage over the others by being English-native, although English as a second language was stronger in the "small" countries compared to the "large" ones.

Originally, the intended comparison was between Germany and Sweden. In contrast to Germany, Sweden was a European country with a high internet penetration already in 1998. In that year, 27% of Swedes were internet users; this figure was roughly comparable to the proportion of internet users in the United States. Finland, although it had the highest internet penetration in the world at the time, has a very small population of 5 million and

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still required, especially regarding the first generation of internet start-up companies. Some of which, such as OSM Online Software Marketing und Vertriebs Aktiengesellschaft (Neuried), have long disappeared due to financial constraints despite an innovative service. Only a few of these "first generation" private internet start-ups were listed on the Neuer Markt. They were rapidly being superseded by a new generation of entrepreneurs equipped with venture capital financing and responding to a much improved demand structure. When I carried out a survey of internet start-up companies in Germany in the beginning of 1998, I captured some of this "first generation" activity.

[2] This argument has found its way into the discussion surrounding economic change and technology, the idea being that small countries have problems maintaining contact with global technological shifts (compare with Freeman, 1988, 2).

therefore was not selected. In further research, it would be rewarding to delve into the Finnish case. Finland has a very different history of telecommunications regulation from most other countries; in fact, it never had a monopoly. In order to adjust for the effect of country size, a European country roughly comparable to Germany and another roughly comparable to Sweden were selected. The United Kingdom was excluded because it is an English-speaking country. Although smaller than Germany in terms of population, France is useful for comparative purposes. Much is known about the development of online services in France, through the prevalence of Minitel. The French Minitel experience has already been referred to several times in this study. As a counterpart to Sweden, Holland was selected, although slightly larger in terms of population (see Table 2).

Special emphasis in this survey is placed on the period from 1996 to 1998. These years were a crucial time for internet entrepreneurship because, during this time span, the "first generation" of US ventures were beginning their vigorous expansion. For Europe, it was also an important time period. During these three years, domestic conditions in the Nordic countries including Sweden enabled a lead in internet uptake and the first Swedish internet companies such as Icon Medialab began their European expansion.[4] Most start-ups in continental European countries, however, in this period focused on their home market and only begun internationalising in 1999. But the temporary success stories of 1999 and beyond only emphasised how troubled the previous years were.[5] And several promising ventures, such as the German firms Lava, InnoMate, ABC Bücherdienst "Telebuch," Alando.de and Ricardo were acquired by the U.S. players iXL, USWeb, Amazon.com, eBay and the British start-up QXL. The fact that the years from 1996 to 1998 represented a

[3] In 1997, the largest proportion of all websites (42%) in the EU were in the native tongue only and originated in non English speaking countries (European Commission, 1997, 28, 29).

[4] Icon Medialab was founded in March 1996 and opened its first international office in Madrid in August the same year, as well as in San Francisco in December. In 1997, Icon Medialab opened offices in London, Kuala Lumpur, Copenhagen and Tampere (Finland). In May 1997, Icon Medialab hired its 100th employee. From: "Four friends founded Icon Medialab in March 1996," on the website of Icon Medialab, http://www.iconmedialab.se/default/about_us/history/1997.html, accessed on 27.11.99.

[5] ConSors was extremely successful among German internet brokerage companies, in a market space hotly contested by spin-offs from established players such as Deutsche Bank, Commerzbank and Hypo Vereinsbank (Direkt Anlage Bank). ConSors embarked on an aggressive internationalising strategy. It is important to point out, that ConSors was not a new venture; it was a spin-off from a smaller German private banking house.

unique window of opportunity for internet entrepreneurs world-wide is a key assumption of this research.

The first section of this chapter will discuss the general institutional environment in the four countries analysed here. The key observation is that all systems began to change significantly in the 1980s and 1990s. In Germany and Sweden, changes were more recent and thus had a stronger effect on current entrepreneurship. In the second part of the Chapter, internet access will be examined in all four countries in the relevant period. Sweden had the most advanced demand structures. The regulatory environment in telecommunications will be studied in the next section; here, explanations are provided for differences in internet access conditions. Then, venture capital development in the late 1990s is described; the growth of venture capital funding was strongest in Germany. In the fifth section, further relevant policy areas are briefly compared. The next part, which focuses on the actual development of internet start-ups in the four countries. This section concentrates on web development firms, because most know-how about firms and internationalisation is available in this business area. The final section concludes the Chapter with a review of Swedish development; it represented in several ways the strongest contrast to Germany and showed an early lead in internet start-up internationalisation under optimal home demand conditions.

Europe in trouble

The 1990s were a difficult decade for Europe, economically as well as socially. Of course, this was, to a degree, a perception caused by the success of the United States economy, especially in the second half of the 1990s, when low unemployment was combined in America with low consumer price inflation and high growth rates. The troubles in Europe were nevertheless real, and included high unemployment rates, government deficits in some countries as well as an overburdened health and social security system. Add to these difficulties those factors which "Eurosceptics" have grouped together under the term "Eurosclerosis," manifested in inflexible labour regulations and outdated tax laws. Although all the European countries examined in this paper shared these problems to a certain extent, they encountered the full weight of these burdens at different times, and the timing difference is crucial for this discussion.

Table 1. Macroeconomic indicators, End 1997.[6]

	GDP (US$ Bn)	Inflation (1998)	Populati on (M)	Average annual growth in real GDP 1990-97	Unempl oyment rate
USA	7,783	1.6%	272	3.0%	5%
Germany	2,321	1.0%	82	1.4%	10%
France	1,542	0.7%	59	1.3%	12%
Nether-lands	403	2.0%	16	2.4%	6%
Sweden	232	-0.1%	9	0.9%	8%

All four European countries discussed here did very well in the 1950s and 1960s. In each case, credit was given to a country-specific social and economic "model." Whether these "models" were indeed the reason for each country's growth is subject to intense debate; for a complete analysis, one would have to also examine external factors such as world trade. In addition, some scholars argue that growth was caused by domestic factors very different to or even contradicting the supposed "model" of the country in question. This point was made for Germany (see Giersch, 1992).

And these "models" were quite different from one another, the closest two being the corporatist approaches of Germany and the Netherlands. Sweden also shares some corporatist traits (see Katzenstein, 1985, 31, 34). Under the corporatist model, three so-called "stakeholders" (government, employers and the unions) together negotiate a partial redistribution of wealth in combination with private ownership of capital. This approach was complemented by a "diffusion oriented" stance in technology policy, which emphasised small and medium sized enterprises (SMEs) and the spread of information and new technologies to these companies (Ergas, 1987). Public resources were thus made available in smaller amounts and were tied to co-operation among firms and research organisations

[6] Source: The Economist, *Pocket World in Figures 2000*, London, 1999 (in Association with Profile Books).

(Ziegler, 1997, 198). This approach complemented the "skill-conscious" nature of the SME "Mittelstand" (see Wengenroth, 1999, 131).

Like Germany and the Netherlands, France also had to rebuild its economy after the Second World War, but, unlike those two countries, France was immediately re-immersed in further wars of independence in the colonies and a political crisis (see Wright, 1989, 6, 7). When the Fourth Republic was toppled and the Fifth was declared in 1958, French policy-makers believed they had to catch up. This process of catching up was carried out with high degree of state intervention and public ownership. This state-led, dirigiste approach was coupled with a "mission oriented" (Ergas, 1987) technology policy which oversaw the concentrated investment of significant sums in large-scale defence, aeronautics and electrotechnical projects. Government interacted with "national champions," while SME relations were underemphasised (Sally, 1995, 77). Government also dominated the financial system in what John Zysman has labelled a "credit-based system with administered prices" (1983, 104, 168, 169, 285). Despite the appearance of a "strong state," however, the system was not resilient and policy-making was splintered among several institutions, which one scholar has compared to a "Byzantine court" (Wright, 1989, 348, 349; see also Sally, 1995, 75).

Finally, Sweden shares some traits of the corporatist countries, but also has characteristics in common with France. Government acted in a strongly redistributive manner by directly providing certain services such as health and social security. Swedish authorities sought, even more than the other countries described here, to reduce economic risk carried by the individual. Corporatist agreements existed between economic stakeholders. Its technology policy was 'diffusion oriented' (Ergas, 1987). Yet, like France, Sweden's technology policy was also marked by high defence expenditures. In addition, economic activity was concentrated among large firms, which Hans Sjörgen calls a "Schnapps Glass" structure. Sjörgen's glass has a wide top, thin neck and small base (Sjörgen, 1998, 159; see also Kurzer, 1993, 32). This was related to the fact that privately held wealth by the richest industrial families was relatively untouched in World War Two due to the Nordic country's neutrality. This was reinforced by weak anti-trust legislation, specific aspects of shareholder laws as well as tax policy (Andersson et al., 1996, 32, 33; Sjörgen, 1998, 167). In the early 1960s, for example, the Wallenberg family holdings employed around 13% of all workers in the private sector.[7]

In all four countries, the effectiveness of the respective "models" deteriorated gradually from the late 1960s, leading to a crisis of the "models" from the 1980s. The French "model," although instituted the latest, was challenged the earliest- together with that of the Netherlands. French governments under François Mitterrand in 1981 and 1982 embarked upon a further dirigiste initiative, taking control of companies, infusing public capital and restructuring industries such as chemicals and electronics.[8] From 1983 onwards, however, a significant shift occurred towards what Peter Hall has called "politics of austerity" while France was still under Socialist leadership, marked by the arrival of a new Minister of Industry. The additional weight of subsidies of loss-making operations could not be supported. But the Mitterrand government also had to wrestle with inherited structural problems and a delayed recovery of the international economy (see Hall, 1986, 195-202). In 1986, a conservative coalition under Jacques Chirac was elected which continued these policies and strove to privatise nationalised industries; these initiatives had to be temporarily halted by the stock exchange crash of October 1987 (Hall, 1994, 177, 178; see also Wright, 1989, 344). In contrast to the tumultuous 1980s, France in the 1990s was marked by more evolutionary change.

The crisis of the Dutch corporatist "model" also arrived with vigour in the early 1980s. The crisis occurred for different reasons than in France, however. Here, the regulation of the labour market developed into what was perceived as an unbearable situation. But by the late 1980s, the Netherlands economy seemed on track again. Unemployment stood at 14% in 1983. In 1997, it was 6% (Visser and Hemerijck, 1997, 7). The "Dutch Miracle" of the 1980s, a steady reduction in unemployment and increased growth rates, is credited to a

[7] Wealthy families and the institutional investment vehicles controlled by them were closely interwoven into the financial and industrial world. These families are the Wallenbergs, Söderbergs, Bonniers and others. Petersson calls them "owners" and discusses their "inherited network" (Petersson, 1994, 179, 181, 183). The Wallenberg figure stems from Kurzer, 1993, 128.

[8] Vivien A. Schmidt has a particularly positive view of the need for government-mandated industrial restructuring during the Mitterrand years (1996, 114-131).

corporatist pact, the famed "Accord of Wassenaar" of November 1982. Unions "accepted without agreeing" to wage moderation in response to a reduction in working hours. Visser and Hemerijck have elegantly called this an example of "corporatism without consensus" (1997, 96-105). A period ensued marked by slow growth in real wages, growth of the part-time temporary worker industry and tax cuts (Solar and de Jong, 1998, 119). *The Economist* put it this way: "The Dutch welfare state has become increasingly unDutch."[9] Because of its adjustment during the 1980s, like France, the Dutch system could make it through the 1990s without major further shifts, although some observers are still quick to point out that labour markets are still relatively inflexible and unemployment rates higher than they should be. For them, recovery merely is "a reversal of past underachievements" (OECD, 1998c, 4).

In the remaining two countries examined here, however, crisis of the local economic and social model and adjustment was delayed until the late 1980s. In Sweden, the delay of crisis was aggravated by the late entry of the country into the EU in 1995 and a correspondingly late dedication to tight monetary policy. In Germany, policy "re-engineering" was delayed due to the unforeseen unification project. During the 1990s, however, it became increasingly clear to many Germans that the government health and social security system had become dangerously overburdened. The lack of change evident in the Kohl and the beginning of the Schröder Eras led to further loss of confidence in the system and unleashed a private financial revolution. Large sums were shifted into stocks, a phenomenon previously unseen in Germany. This began with the successful public listing of Deutsche Telekom in 1996 and continued with a boom of growth stocks on the newly launched Neuer Markt from 1997. According to the *Financial Times*: "The popularity of the Neuer Markt among retail investors in Germany, indeed, is similar to the internet fever that has gripped the US."[10] The success of the Neuer Markt can, therefore, be attributed to great extent to a domestic revolution in personal investment behaviour, sparked by economic uncertainty

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[9] Frits Bolkestein, "The Dutch Model. The High Road that Leads out of the Low Countries," *The Economist*, 22.05.99.
[10] Vincent Boland, "Survey – Private Equity Finance, Exchanges Broaden Their Global Appeal, Junior Markets," *Financial Times*, 11.01.99.

and a perceived crisis of the social and economic system. A boom in online brokerage accounts accompanies this development.[11]

Sweden also moved into crisis during the 1980s, but a particularly severe period began in the early 1990s.[12] During the previous decades, the Swedish system of direct state provision of health and other services had grown disproportionally. In the 1970s and 1980s, unemployment was kept low, but government employment rose massively. High inflation was coupled with low growth (Petersson, 1994, 7). From 1991 to 1993, this system started to crack under its own weight; the government sector could not grow any further and unemployment shot up over 9% - a rate that was previously inconceivable under the Swedish "model" (Sjögren, 1998, 173). Government severely curtailed its expenditures, forcing the economy into a recession. Equity values fell, and the bankruptcy rate increased dramatically (Andersson et al., 1996, 28, 29). But government "re-engineering" was accompanied by private sector changes as well. For example, several top staff of the best-known Swedish multinationals had to give up their jobs. Their severance pay, or 'golden parachutes,' were invested in start-up companies. In addition and more importantly, the managers dedicated part of their time and their network to helping the young firms.

Therefore, in both Sweden and Germany, crisis in the 1990s helped the entrepreneurial process along in very different ways. Both the personal stockholding boom which occurred in Germany as well as through the re-orientation of top managers towards start-up companies in Sweden can be linked to economic and social crisis in these two countries.

Domestic internet demand structures in Europe

In Chapter Two, following Porter, it was shown that all types of internet ventures discussed here were dependent less on high absolute numbers of users than on the sophistication of user demand. It was also argued that demand sophistication was linked to internet penetration rates and time spent online. In this section, the high demand sophistication in

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[11] "Prost, Germany's Online Stockbrokers," *The Economist*, 31.07.99.

Sweden in the period under consideration is evident, as well as the fact that other countries began to catch up rapidly towards the end of the period.

Table 2. Internet penetration in 1998.[13]

	Est. internet users 1998 (M)	**Population (M)**	**Penetration**
Finland	1.8	5.1	35%
USA	79	271.8	29%
Sweden	2.4	8.9	27%
Netherlands	1.4	15.6	9%
Germany	6.9	82.1	8%
United Kingdom	4.3	58.5	7%
Italy	2.6	57.4	5%
France	2.5	58.5	4%
France (regular Minitel users)	15	58.5	26%

The difference between absolute user base and internet penetration is most striking when comparing Germany to Sweden. In 1998, Germany's internet user base was less than three times as large as that of Sweden while Germany's total population was about ten times as large. Sweden's internet market therefore was smaller, but more advanced than Germany's. This relationship also showed up in two further relevant statistics. The next table shows the number of internet servers prepared for secure electronic commerce transactions (Table 3). Again, Sweden had a clear lead. Its needs to be noted, however, that growth in Germany and France was just as impressive as Swedish growth.

[12] Paulette Kurzer emphasises this delay in her book on political and economic change in Europe (1993, viii).
[13] For sources of internet user estimates please refer to Appendix D. The Finnish figure: Gallup Media (May 1998); Italy: Osservatorio Internet Italia (May 1998); United Kingdom: NOP Research Group (March 1998), all countries courtesy of Nua Internet Surveys (http://www.nua.net/). Population estimates were obtained from The Economist, *Pocket World in Figures 2000 Edition*, London, 1999 (in Association with Profile Books).

Table 3. Estimated absolute number of secure web servers for electronic commerce.[14]

	Sept. 1997	Aug. 1998	Per 100.000 Inhabitants Aug. 1998	Growth rate 1997 - 1998
Finland	20	81	1.6	305%
France	65	250	0.4	285%
Germany	147	558	0.7	280%
Sweden	53	184	2.1	247%
United Kingdom	353	821	1.4	133%
USA	7,513	16,663	6.1	122%
Italy	88	193	0.3	119%
Netherlands	75	148	1.0	97%
OECD average			2.0	128 %
EU average			0.8	177 %

A further statistic (see Table 4) depicts internet advertising expenditures per internet user. In 1998, companies spent EUR 10 on internet advertising per user in Sweden, compared to only EUR 4 in Germany. The advertising figure is especially instructive for the purposes of this research; it reflects the vibrancy of the consumer internet in the countries under examination at the time. The results for all countries with the exception of Sweden were disconcerting in the period up to 1999; only in that year were U.S. levels from 1997 reached.

Table 4. Estimated internet advertising spending per internet user in EUR (calculated from figures in Appendix D)[15]

	1996	1997	1998	1999 (Est.)
USA	5 – 6	9 – 13	22	25
Sweden		4	10	15
Germany	1	2	4	8
Netherlands	1	3	6	6
France		3 - 5	5 – 7	4 - 6

[14] Source: OECD, *Communications Outlook 1999*, page 90. OECD obtained these figures from Netcraft. French Minitel user figure was obtained from OECD DSTI/ICCP/IE(97)10/FINAL, 1998, page 31.
[15] Constant exchange rates were used for all four years: 1 EUR was equal to 1.1 USD, 2.0 DM, 6.6 FF, 2.2 Dfl and 8.8 SEK.

Advanced demand conditions in Sweden did not go unnoticed. Rapid internet uptake was especially attractive in combination with mobile phone usage, which was also very advanced in the Nordic countries. To exploit these conditions, U.S. internet companies moved to Sweden. Among these were research companies, hoping to pick up on emerging consumer trends, such as Jupiter Communications (strategic research) and Media Metrix (internet user statistics), as well as the advertising network Doubleclick.[16]

Telecommunications liberalisation across Europe and internet access prices

The laggard development of sophisticated internet demand may come as a surprise when one considers that consumers in all European countries discussed here have been long exposed to the concept of online services through their national teletex systems. Due to the existence of national teletex services, which were generally more successful in Europe than in the United States, the history of the consumer online experience and usage of electronic commerce dates back into the late 1980s and early 1990s. The online book retail company that Amazon.com acquired in Germany was much older than Amazon.com itself. Amazon.com was launched in July 1995. The German acquisition object, ABC Bücherdienst GmbH 'Telebuch,' was founded in 1991. Degriftour, a successful French internet travel site, was founded as a Minitel service.[17] It was acquired by UK internet start-

[16] Jupiter Communications, press release, "Jupiter Communications Acquires Swedish-based Intelligence AB, a Leading Scandinavian Research Company," New York, 05.08.99. In 1999, Jupiter's research network included offices in London, San Francisco, Stockholm, and Sydney. Media Metrix, press release, "Swedish Web User Habits Similar to US Users, Media Metrix Releases The Top 50 Swedish Web Sites at Home and at Work, First Available Internet Audience Ratings Outside the U.S. Provided by Media Metrix and its Partner SIFO Interactive in Sweden," New York, 01.06.99. Through a partnership, Doubleclick extended its advertising network's reach into Sweden before its IPO in February 1998, at that time, it had offices in Australia, Canada and the United Kingdom and partnerships in other countries as well. In Europe, Doubleclick was present only in Sweden, the United Kingdom and Spain. After the IPO, the international presence was expanded aggressively into many further countries. Filing of Doubleclick Inc. with US Securities and Exchange Commission (http://www.sec.gov/), S-1, 16.12.97, as well as Doublieclick web site.

[17] In 1998, growth of Degiftour's sales was attributable to the internet and not any more to Minitel. In December 1998, 400 000 clients visited Degriftour's Minitel site and already 300 000 visited the internet web site. English abstract of French article, "Degriftour's Web Site is Successful, Chez Degriftour, le Web Supplante le Minitel," *Globalbase*, *Informatique*, 22.01.99.

August 2000. Online retail banking also had a much longer history in Germany than in the USA.

This did not mean, however, that, early electronic commerce demand in Europe was very sophisticated. Online banking over the teletex service Btx in Germany basically offered the same account management functions for several years; they were not extended into brokerage or insurance services, for example. Even the most advanced teletex country in Europe, France, did not see its services evolve into more than basic travel, financial, retail and sex offerings. The long teletex history in Europe shows that electronic commerce can stay on a humble level of sophistication- if depressed through high metered access rates.

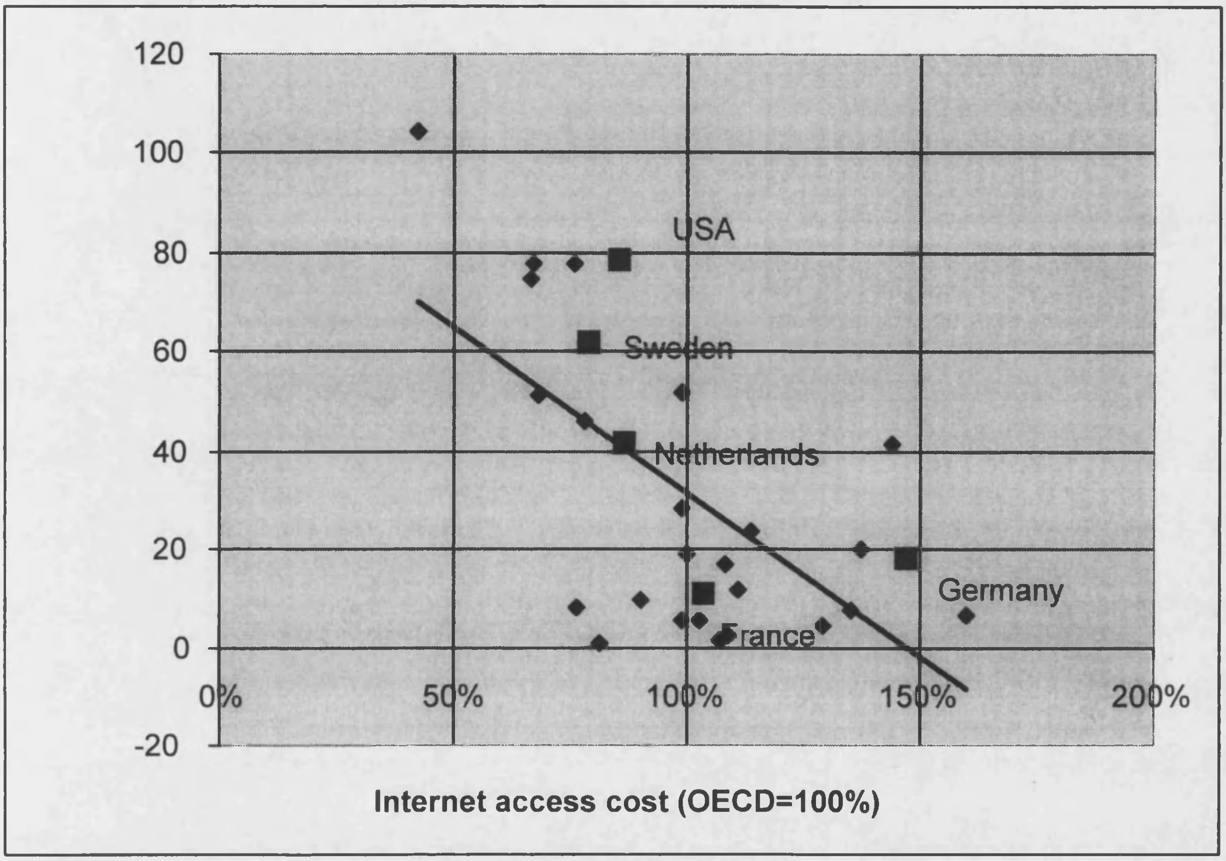
Table 5. The most and least expensive countries for consumer internet access. OECD Internet access basket 1998, in US$ PPP. Charges for 20 hours internet use per month including telecommunications fees at discounted off-peak rate.[18]

Czech Republic	75	New Zealand	46
Germany	68	United Kingdom	46
Switzerland	67	Portugal	46
Austria	64	Spain	42
Hungary	63	Netherlands	40
Greece	60	United States	40
Luxembourg	53	Turkey	38
Japan	52	Sweden	37
Poland	51	Australia	36
Ireland	51	Italy	36
Mexico	50	Norway	35
France	48	Denmark	32
Korea	48	Iceland	31
OECD	47	Canada	31
Belgium	47	Finland	20

The highest access rates by far in 1998 of the countries examined here could be found in Germany and the lowest in Sweden. Yet, before embarking upon a discussion of telecommunications policy it is important to note that internet access prices did not explain laggard internet uptake in Europe alone; they were merely one significant contributing factor. There was not always a correlation between access costs and internet penetration. Countries existed where access costs were pricey in an international comparison, yet where penetration rates were quite good. This point was emphasised in an early study commissioned by the EU (European Commission, 1997, 23). In a recent OECD survey, penetration rates and access costs have been mapped (see Chart A. below). Some countries fit nicely on a downward sloping line, confirming a relationship between penetration and access costs. Other countries diverged strongly from the expected relationship, however. One of the best examples of divergence can be drawn from the relative positions of two of the countries in our survey, the Netherlands and Sweden. Access costs in those two countries were roughly similar. In fact, they were about on the same level as the USA. Yet internet penetration in these three countries varied considerably, the two leaders being USA and Sweden.

[18] Source: OECD, *Communications Outlook 1999*, page 186. This included discount rates offered by the telecommunications operators, in France "Primaliste" and in Germany "City Plus." For calculation details, please refer to pages 175 to 186 of the original document.

Chart A. Internet cost and host density (a measure of internet penetration) in various countries, 1998.[19]



One of the best ways to better understand the relationship between penetration and internet access costs may be through the insight that pure price is not the relevant issue. Instead, consumer-friendly pricing is crucial. The quoted OECD study noted that while some telecommunications operators offered low access rates, they did so in the middle of the night when children or employed people often did not access the internet (OECD *Communications Outlook*, 1999, 183, 184). Pricing innovations and user-friendly pricing

[19] Figures for 29 countries obtained from OECD *Communications Outlook*, 1999, page 86 (Internet hosts in OECD countries, including gTLDs by domain registrations per 1.000 inhabitants, July 1998) and page 186 (Total basket of off-peak internet access rates for 20 hours online per month, 1998). A similar chart based on similar data sources can be found in OECD *Science, Technology and Industry Scoreboard*, 1999, page 23.

were crucial for technology uptake. This was demonstrated by the massive boost given to mobile telephony services in the late 1990s in the United Kingdom, when pre-paid phone packages were introduced.[20] The relationship between pricing innovations and internet were also confirmed with the introduction of unmetered access in Europe from 2000.

The Minitel experience also is instructive here. In the mid-1990s, Minitel reached an astounding penetration of about 26%, which made the Minitel the most successful Teletex service, with numbers able to match those of internet penetration in the most advanced countries (see Table 2). But Minitel reached a peak in 1994 and subsequently usage call volume started to decline. The main reason cited was high costs- especially the fact that usage of services was charged by the time spent online. According to OECD, this metered charging system discouraged use and proved to be a disincentive stunting further development (OECD, 1998a, 19-23).

The most consumer-friendly internet pricing innovation beyond doubt was unmetered access - as offered in most of the United States and only from 2000 onwards introduced broadly to consumers in Europe. The OECD-Table above (Table 5), which compares costs for 20 hours of internet access, provides an abstract measurement which did not reflect the discouraging effect of metered pricing. In fact, due to the artificial yardstick of 20 hours of internet use, the United States did not even appear as the cheapest country in the OECD list. Yet, the more the internet is used in the United States, the cheaper it became relative to European countries. While an average user perhaps did not use the internet for more than 20 hours, the psychological impact of the "ticking clock" was discouraging. Metered access pricing, practised in almost all European countries, penalised internet use.[21] As a result, time spent on the internet remained low (see Table 5.).

[20] "Im britischen Mobilfunk sind Vorauszahler der Wachstumsmotor," *Frankfurter Allgemeine Zeitung*, 03.11.99, page 28.
[21] Several newspaper articles pointed to the adverse effects of metered pricing. For example: Paul Taylor, "Telephone tariffs put net take-off on hold," *Financial Times*, 27.10.99, page 16; "Schlagaustausch online," *Frankfurter Allgemeine Zeitung*, 27.08.99, page 22.

Table 6. Hours spent online per month in 1999 (according to Jupiter Communications).[22]

USA (AOL)	30
France (Wanadoo)	10
Spain (Telefonica)	10
UK (AOL)	8
Finland	8
Germany (AOL)	7

There was a certain irony here. On the one hand, in the United States, unmetered access was established as the primary mode to charge for local calls when AT&T was split up into regional companies and a long-distance carrier. On the other hand, the price for a local metered phone call went up significantly in Europe in the 1990s due to telecommunications liberalisation. On the two sides of the Atlantic, therefore, telecommunications liberalisation had divergent effects: In the USA, an unmetered internet access model was established while in Europe a pricey, high-cost access structure appeared. Previous to liberalisation, governments on both sides of the Atlantic insured that call prices, especially local calls, were kept at "acceptable levels," in the USA by capping AT&T's prices, in Europe, by government ownership of the telecommunications operator. The overarching policy objectives were different, however. In the United States, policy addressed monopoly profits, in Europe the social concept of telephony as a universal communications device was appealed to. In hindsight, US policy objectives proved to be more robust while policy goals were easily re-interpreted in Europe.[23]

[22] Numbers from Noah Yasskin, Phil Dwyer, "Free-to-Air Internet: Creating a Consumer Medium Out of a Metered Network," Jupiter Communications, March 1999, page 5. Another instructive figure available stated that Americans spent 55 minutes per day online compared to 17 minutes online per day in Europe. This figure came from AOL. AOL, a popular internet and online service, was present in the US and several European markets and could therefore directly compare the effect of metered pricing on time spent online. Ralph Atkins, "Interview, Andreas Schmidt, Preaching the Internet Gospel Across Europe," *Financial Times*, 27.05.99, page 13.

[23] Although competition was introduced to US long-distance telephony, local calls were still constrained in a tightly monitored monopoly structure, with regional "Baby Bells" having to offer affordable local call pricing packages. Even after 1996, with the passing of a new Telecommunications Act, local carriers needed to demonstrate the existence of local competition before they can begin to act as fully independent companies. In essence, US policy did not budge, even when the local carriers applied significant pressure on the federal telecommunications authority, loudly objecting to the fact that that they were "subsidising" the growth of the internet.

European policy makers allowed local call rates to rise, pointing to falling long-distance rates. National telecommunications operators argued that they had offered local calls below cost in the past. The term used was "rate rebalancing" and it was, in effect, a cosmetic measure meant to mimic competitive tariffs based on supposed cost structures. Yet, there was no competition in the local loop, which could have generated real competitive rates. In fact, "rate rebalancing" was a highly profitable exercise for the incumbent operators. The telecommunications operators were split off from the postal service. Then, the operators were partially privatised and publicly listed. All this occurred before fixed-line competition was introduced. In France, for example, the incumbent operator was privatised in 1997 and was exposed to fixed-line competition only in 1998. This allowed for an attractive "window" in which the returns on monopoly could be maximised without the responsibility previously linked to government ownership. This process was especially severe in Germany, where the incumbent telecommunications operator was burdened with debt incurred during and before the unification.

Several European countries diverged from this pattern, however. The country which diverged most strongly was Finland, which never had a telecommunications monopoly and featured one of the lowest metered internet access rates in the world. Although Sweden never had a real monopoly, its telecommunications environment was "monopoly-like." In fact, Noam classified it as a "de facto" monopoly. Different government institutions could run their own telecommunication services internally, but there was no market competition. One competitor was allowed to launch its services in 1991; a formal law allowed further competition in 1993. In contrast to other countries, however, partial privatisation was carried out late in Sweden; Telia was only publicly listed in June 2000.

Therefore, the Swedish pattern of liberalisation was the mirror opposite of that in France, Germany and the Netherlands; in the Nordic country, competition was introduced first, then privatisation was contemplated (please refer to Table 7). "Rate balancing" occurred in Sweden as well, and local call prices were certainly raised; here also, the national operator Telia was using its local call advantage to counter long-distance competition. But, because

Telia was exposed to fixed-line competition early, local call prices could not be raised quite as much as the incumbent might have wanted.[24] Here, the Swedish "social democratic" inclination to allow competition between government-owned and private enterprises seems to have shown positive results. This interesting case, however, cannot be examined further here.

Table 7. Key dates of telecommunications privatisation and fixed-line competition.[25]

	Privatisation/ public listing	**Government share after privatisation**	**Fixed line competition start**
Germany	1996	61%	1998
France	1997	62%	1998
Netherlands	1994§	44%	1997+
Sweden	2000	71%	1991/1993*

* In 1991, the first competing fixed-line network was launched in Sweden, Tele2 AB, owned by Cable & Wireless and Kinnevik. This broke the "de-facto" monopoly of Televerket (today's Telia) in fixed-line telephony (Noam, 1992, 211). In 1993, the Swedish telecom act was passed, enabling further fixed-line competition.

+ Local telephony was liberalised on 01.07.97 in the Netherlands. Royal KPN (then Royal PTT Nederland) faces competition in fixed-line services by Telfort (joint venture between British Telecom and Dutch railways) as well as Enertel (Dutch power companies and cable network operators consortium). Royal PTT Nederland demerged its mail, express and logistics activities in 1998, becoming a pure telecom player, Royal KPN. The "new" KPN share was traded for the first time on 29.06.99.

§ Royal KPN was listed in Amsterdam in June, 1994. New York (October 1995), London (June 1996) and Frankfurt (July 1996) followed.

In this section, the diverse experiences of Germany, France, the Netherlands and Sweden have been described. Yet, despite the complexity, lessons can be drawn from this material. Pricing and, especially, user-friendly pricing mattered and there were clear reasons why the pricing structure was prohibitive in some countries and not in others. In all countries, however, pricing was influenced by telecommunications policy inadvertently, i.e. policies

[24] Telia owns over 90% of the local loop in Sweden. To compensate, the telecommunications regulator mandated an interconnection fee transfer when access calls were placed from local lines owned by the incumbent operator to the dial-in nodes of competitors. The success of competitive internet access offerings, especially that of Tele2, created a situation in the years 1997 and 1998 in which Telia was a net payer for internet access calls. As a result, Telia was forced to lower its local call rates (Interview, Billinger, 21.12.99).
[25] OECD *Communications Outlook*, 1999, For government shares, pages 32-33.

were originally devised for completely different reasons completely unrelated to internet uptake.[26] Policy makers were not aware of the importance of local call rates for internet uptake in the mid-1990s; in fact, many were not aware of the importance of the internet at all. They had underestimated the effect of the internet as a "disruptive technology" (Christensen, 1997). However, low local call rates were a top policy priority in most countries historically in Europe, because of social objectives. After privatisation of the telcos, the social objectives were to be met by market mechanisms. In Sweden, competition arrived early and the incumbent could not raise local call rates as much as it would have liked. In other countries, and here Germany is an extreme example, the window to competition was an opportunity and low local call rates were abandoned to maximise profits for the incumbent operator.

The European venture capital bottleneck

Historically in Europe, start-ups in knowledge-intensive service industries such as the types of internet ventures described here have had severe problems in securing adequate growth financing. In contrast to the United States, so-called "true" venture capital focused on early-stage technology start-ups was underdeveloped in all European countries - including the United Kingdom, which boasted a sizeable venture capital industry but which emphasised later-stage, less risky investments. Europe financed its growth mostly through bank loans, an instrument suitable only for "old" industries with significant capital stock and slow depreciation. The venture capital bottleneck influenced the entrepreneur's ability to succeed at home and abroad.

Due to the lack of venture capital, internet start-up models were favoured which did not require extensive up-front investment and could generate an early positive cash flow from which further growth could be financed. Europe, therefore, was home to the "bootstrapped" internet start-up. Web development companies were easier to finance out of earnings than portal sites. Start-ups operating portal sites often cross-subsidised their activities through

[26] Thanks to Sam Paltridge, OECD Secretariat, for clearly making this point to me in a thought-provoking

income from other areas. Prominent examples were the origins of Spray's portal and content services in the Swedish web development company of the same name, and the well-known German portal Web.de which was launched and for a long time run by Cinetic Medientechnik GmbH, a German systems integrator. The portals Spray and Web.de were spun off and are respectively financed by an industrial group and public capital markets, but throngs of smaller portals were in the 1990s still run "on the side."[27] Still others, such as another popular German portal, DINO-Online, were run on an extremely tight budget and were later acquired. Instead of developing internet services, some players remained software companies concentrating on developing back-end solutions for electronic commerce clients and portal sites run by established media players and telcos.[28]

The venture capital bottleneck was the main reason why established telecommunications, media and retail companies were able to secure top positions among the most frequented sites in Europe (see Table 14.). If their competition from the ranks of start-up companies would have been more aggressively financed, the established firms would have encountered far more resistance in getting to the top.

Europe tried hard to establish a 'true' venture capital industry. In the 1970s and 1980s, an indigenous venture capital industry appeared in Europe but disappeared again at the end of the decade. An early ill portent was the problems encountered by the most innovative VC firm pioneering pan-European investments in the late 1970s, European Enterprises Development S.A. (EED) (Coutarelli, 1977, vi). EED was founded in France as early as 1964 (Lorenz, 1985, 156). The main reason for the decline of the industry was the lack of what venture capitalists call an attractive 'exit option,' a strong, growth-oriented alternative stock market. A risk-embracing venture capital industry can only be sustained with such a public capital market- this exit opportunity allows high returns to offset losses in a VC's portfolio.

email exchange.

[27] For more examples of German companies which financed their internet start-up businesses through other cash-flow generating activities on the side, see: Niko Waesche, "Tough Balancing Act for German Internet Start-ups," *Tornado-Insider.com Magazine*, No. 2, May 1999, pages 24, 25.

Witnessing the decline of the industry, private as well as public initiatives attempted to break up the venture capital bottleneck in Europe. A private initiative was launched by the European Venture Capital Association (EVCA), which was founded with the objective of promoting venture capital in Europe. EVCA sought to tackle the problem head-on, in conjunction with venture capital groups Capricorn Venture Partners and Apax, and started an alternative, growth-oriented stock market modelled on NASDAQ in the USA. EASDAQ was opened in Brussels in 1996. EASDAQ has had some success and has provided venture capitalists with a new exit opportunity. Yet its progress as a pan-European growth exchange is hampered by the lack of an EU-wide regulatory framework for securities.[29]

Since 1997, EASDAQ has been overshadowed by a newcomer, the Neuer Markt, based in Frankfurt. Whereas Brussels had a small impact, the Neuer Markt considerably improved the situation for venture capitalists, mostly in Germany but also in other European countries. The liquidity of the Neuer Markt was much higher than that of EASDAQ or any other growth exchange in Europe, such as Nouveau Marché, and the valuations companies listed there achieved, were significant and comparable to those at NASDAQ. In fact, Neuer Markt had the largest market capitalisation of all the exchanges in the confederation of European growth markets, Euro.NM. Before the peak, in 1999, the Frankfurt-based exchange made up 81% of Euro.NM, while Nouveau Marché only contributed 13% and Amsterdam's Nieuwe Markt NMAX only 5%.[30]

[28] Such as messaging software by the Media Service Group Aktiengesellschaft (Oldenburg, Germany), the business-to-business extranet catalogue software developed by BPS Online Bestellsysteme GmbH (Karlsruhe, Germany) and the internet casino software by Boss Media AB (Växjö, Sweden).

[29] See an excellent article about the advantages of an EU-wide framework, which, however, could benefit EASDAQ as much as it could boost the cross-border activities of Frankfurt's booming Neuer Markt. "No SECs Please, we're European, European Financial Regulation, Regulatory Muddle is Impeding Europe's Progress Towards its Goal of a Single Market in Financial Services," *The Economist*, 21.08.99.

[30] One French VC exclaimed: "The Nouveau Marché is terrible. There is no liquidity, only a few really good companies are listed there. EASDAQ also is in bad shape. Top French companies go for NASDAQ." The Euro.NM market capitalisation percentages from: "Europe's New Markets Flourish Despite Turbulence and Euro," *European Venture Capital Journal, Source Express*, 01.01.99.

Table 8. Number of new listings on Europe's growth exchanges, January to October 1999.[31]

Neuer Markt, Frankfurt	86
AIM, London	35
Nouveau Marché, Paris	20
EASDAQ	10
Nieuwe Markt, Amsterdam	1

Salvation came late, however. The impact of the Neuer Markt on the investment behaviour of venture capitalists in Germany was only felt from 1998 onwards, because it took time before the Frankfurt-based exchange could prove its robustness and build liquidity. The impact of the market beyond Germany was delayed even further as European VCs not based in Germany learned how they could approach a placement there. Because of the delayed effect of the Neuer Markt on venture capital investments, the first generation of internet start-ups in Germany have generally not profited from the new inflow of venture capital. The second generation, launched in late 1998 and throughout 1999, initially did, but experienced the effects of the subsequent downturn very soon afterwards. In effect, private funding for internet ventures dried up before most of these companies could list on public markets. German venture capitalists had a dangerous proportion of their funds tied up in internet ventures when the downturn came.[32]

The success of the Neuer Markt and the struggle of EASDAQ demonstrated the crucial role of a tightly integrated, domestic capital market. To some, EASDAQ represented an idealistic European dream whose time had not yet come. The story of the two markets also represents a problem to those who expound the rise of global "unfettered," "casino" capitalism. While top US investment banks backed EASDAQ and channelled funds into it, companies listed there were arguably regarded as "orphan stocks" because they were not

[31] "Flaute an den Wachstumsmärkten, Seit Juli kein Börsengang bei Euro.NM-Partnern des Neuen Marktes," *Süddeutsche Zeitung*, 07.10.99.

[32] "Teueres Abenteuer. Wagniskapital: Der Absturz vieler Internet-Unternehmen verdirbt den Fonds die Renditen," *Manager Magazin*, May 2001, pages 27, 30.

backed by any domestic financial community.[33] Instead, local funds were poured into the Neuer Markt, coming in large part from the domestic retail sector- composed of private shareholders. The rise of the Neuer Markt has actually been accompanied by a powerful, new, popular movement embracing private shareholding in Germany.[34] From 1997 to 2000, the number of Germans who invested in stocks directly or through funds had almost doubled to more than eleven Million.[35] One of the executives at the German exchange joked: "Entire families that used to watch the soaps on TV in the evening are tuning to Bloomberg TV or the German equivalent."[36] The next section will discuss this important shift in investment behaviour, which occurred in Germany in the second half of the 1990s. To relate this back to the large country/ small economy discussion it is, of course, important in this instance that the German economy is large and could also for this reason generate a high level of market activity domestically.

Other reasons frequently mentioned for the initial success of the Neuer Markt seem less crucial than the shift in investment behaviour, yet were significant as well: A strict focus on technology and media companies, a high degree of transparency including tight company disclosure rules, an advanced computer-based trading platform available in several countries as well as an innovative "adoption" policy specifying that at least two investment banks need to pledge market-making responsibility to each listed company.[37] According to *Institutional Investor*: "The Neuer Markt... was part of a single-minded and highly organised initiative aimed at building up the German financial services industry, which

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[33] Paul Lerbinger, Managing Director of Investment Banking Division, Deutsche Bank, stated in a roundtable discussion: "EASDAQ will find it very hard to expand to become the hi-tech stock exchange of Europe. Most of the stocks listed there are in danger of becoming orphan stocks because they do not have a natural home market." From: "The New World of German Equity," *ABI-Inform, Euroweek International Equity Review Supplement*, May 1999.

[34] Hans Peter Roemer, Managing Director at Dekia Kapitalanlage, one of the largest German mutual fund companies stated in Early 1999: "At the end of last year we had 1.7 Million accounts held by private investors. In the first four months of this year that figure rose by half a million, or by almost 30%. This is not just happening at Dekia. You see the same trend in every large German mutual fund company." He also declared: "Since the Deutsche Telekom flotation, German investors have become more aware of the need to save for their retirement through equities." From: "The New World of German Equity," *ABI-Inform, Euroweek International Equity Review Supplement*, May 1999.

[35] "Aktienfonds ziehen Millionen neuer Anleger an," *Handelsblatt*, 02.08.00, page 1.

[36] "The Neuer Markt's Wild Ride," *Predicasts PROMT, Institutional Investor International Edition*, 01.04.99.

[37] "A German Coup: European Stockmarkets," *The Economist*, 09.01.99.

included far-reaching changes in security and bankruptcy laws."[38] Surely, the Neuer Markt would not have had such a convincing start without strictly implemented rules and an overarching strategy, yet, to a certain extent, similar rules and changes were instituted in conjunction with other European growth exchanges as well. One exception seemed to be the Amsterdam Stock Exchange, NMAX, which was less transparent and rigorous than the German, French and Swedish alternative stock exchanges. It was also less focused. "Our top company is a manufacturer of milking robots," remarked a Dutch venture capitalist dryly.[39]

Table 9. Early stage venture capital investments by amount of investment compared to total venture capital investments.[40]

	1996	1997	1998	1999
USA	N/A	32%	36%	42%
Germany	13%	15%	24%	32%
Netherlands	16%	20%	16%	20%
France	11%	7%	15%	19%
Sweden	1%	1%	12%	19%
United Kingdom	2%	3%	2%	2%

Venture capitalists in Germany and other European countries operating before 1998 had no way of knowing that new exchanges, led by the Neuer Markt, would soon enter a boom period. As a result, European venture capitalists made investment decisions that were far more risk-adverse than their colleagues in the USA. The best indication of this is the proportion of early-stage investments (Table 9). The only country with consistently significant early-stage investments was the Netherlands. Also, the absolute amounts invested in technology-oriented companies were much lower in European countries compared to the United States (Table 10). Only a few investments in internet start-ups were made, mostly in the software segment, which was considered "safer." And even the limited amount of investment that was made would not have existed without government programs specifically designed to promote venture capital and technology investments.

[38] "The Neuer Markt's Wild Ride," *Predicasts PROMT, Institutional Investor International Edition*, 01.04.99.
[39] See also: Jeremy Gray, "Survey – Financial Times Guide to Investing in Europe, Take Dutch Courage, Investing in the Netherlands," *Financial Times*, 20.03.99.

Table 10. Venture capital investments in technology. EUR Million.[41]

	1996	1997	1998	1999	Growth 1996-99
Sweden	22	69	110	320	1,355%
Germany	182	331	664	1,317	624%
USA	5,000	7,545	9,818	29,454	489%
France	232	242	485	804	247%
United Kingdom	636	1,165	1,820	2,128	235%
Netherlands	147	172	243	394	168%

In all countries where government venture capital promotion schemes existed for several years, the quality of the programs improved over time. The main innovation by government authorities consisted of integrating the know-how of the private venture capital industry into the funding process. All three countries with a history of venture capital promotion linked public support to private investment decisions in so-called 'co-venturing' schemes. Thus, government invested side-by-side with a venture capitalist (VC). In many countries, refinancing programs also existed. Here, VCs were provided with unsecured loans or guarantees.

In France, the existing research and development support body, ANVAR (National Research Agency), invested side-by-side with a venture capitalist.[42] There also existed a refinancing scheme, SOFARIS (subsidiary of BDPME, Development Bank for Small- and Medium-Sized Enterprises), which guaranteed a percentage of the venture capitalist's

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[40] Source for the US figures: PricewaterhouseCoopers, "MoneyTree Current Quarter Highlights / Q4 '98" and "MoneyTree US Report Full Year & Q4 1999 Results" as well as "National Venture Capital Survey, Results for Fourth Quarter 1997." European data from: EVCA, *Yearbook 1998*, *Yearbook 1999* and *Yearbook 2000*.
[41] Source for the US figures: PricewaterhouseCoopers, "MoneyTree Current Quarter Highlights / Q4 '98" and "MoneyTree US Report Full Year & Q4 1999 Results." In USD: 1996, 5.5 Billion; 1997, 8.3 Billion; 1998, 10.8 Billion; 1999, 32.4 Billion. These figures are slightly, but not substantially, different from the U.S. figures listed in the PricewaterhouseCoopers, "Money for Growth, The European Technology Investment Report 1998," 1999, as well as other, earlier PricewaterhouseCoopers sources. Please refer to the internet site http://www.pwcmoneytree.com/. European data from: EVCA, *Yearbook 1998*, *Yearbook 1999* and *Yearbook 2000*. Technology investments in Europe were defined as the sum of investments in the following sectors: "Communications," "Computer related," "Other electronics related," "Biotechnology" and "Medical/ health related." Constant exchange rates were used for all three years: 1 EUR equals 1.1 USD, 2.0 DM, 6.6 FF, 2.2 Dfl, 0.7 UK Pounds and 8.8 SEK.

investment, allowing him lower his risk. SOFARIS was launched in 1982.[43] In France, these two programs could be combined, allowing a considerable degree of public leverage (Interview, Grossmann, 08.10.99). By the late 1990s, however, these were old programs. They targeted 'technology' investments in a narrow way; early innovations associated with the internet such as direct consumer-to-consumer trading (eBay) would not have been eligible for public support in France (Interview, Simoncini, 06.11.99).

In Germany, existing support schemes were upgraded considerably at the beginning of the 1990s, and began to incorporate a public/ private approach. Older programs, in which the government funded start-ups directly without an accompanying private investment, were abandoned. Although the Ministry responsible for Research and Development initiated the re-orientation, two public/ private institutions that were originally founded to finance the reconstruction of Germany after the Second World War were charged with carrying out the schemes. Both institutions were close to the "Mittelstand" SME sector in Germany. The tbg Technologie-Beteiligungs-Gesellschaft, a subsidiary of the Deutsche Ausgleichsbank (DtA) implemented the 'co-venturing' program, while the Kreditanstalt für Wiederaufbau (KfW) was responsible for the refinancing scheme. Both focused on 'technology' investments and traditionally supported start-ups in fields such as biotechnology, software and advanced materials.[44] The definition of 'technology' was fairly open, however, and internet start-ups of the types discussed here have also been financed.

The most recent innovation in government support programs was carried out in the Netherlands, which also had a long tradition of public support for venture capital, dating

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[42] ANVAR has a particularly rocky history; it was launched in the late 1960s and abolished temporarily in the late 1980s by the conservative government coalition, only to be resuscitated again. Venture capital was supported by ANVAR from 1979 onwards (Lorenz, 1985, 157).

[43] In 1998, BDPME, together with the venture capital industry, raised FF 47 Billion (EUR 7.2 Billion) for 40.000 companies. English abstract of French article, "40 000 Companies Benefited From the Support of BDPME in 1998, 40 000 Entreprises Ont Bénéficie du Soutien de la BDPME en 1998," *World Reporter, La Tribune*, 03.02.99. See also mention in Adam and Farber (1994, 131). ANVAR invested FF 1.38 Billion (EUR 209 M) in 1,300 projects in 1998. English abstract of French article, "ANVAR Invested FF 1.4 Bn in 1998, L'Anvar a injecte l'an passe 1,4 milliard de francs," *Globalbase, Les Echos*, 12.03.99. See also OECD (1999b, 19, 20).

[44] In contrast to France, the programs cannot be combined and the guarantees are a little lower- this makes the German schemes more compatible with EU regulations. French officials are now evaluating in what ways the SOFARIS fund can be adapted to regulations (OECD, 1999b, 124).

back to April 1981.[45] In October 1998, under the names Twinning Seed Fund and Twinning Growth Fund, a new pair of start-up funds which combined government with private capital were launched. Prominent entrepreneurs and venture capitalists ran the program, which was advised by US internet celebrities Esther Dyson and Vint Cerf.

Government programs in Germany, France and the Netherlands made an important contribution to the venture capital industry in each country. The programs saved the venture capital industry from extinction in the 1990s, until the effect of the alternative stock exchanges kicked in, which occurred in parallel to an increasing public market appetite for internet stocks. This is apparent when examining German data. While both the proportion of early stage investments (Table 9) and amounts invested (Table 10) improved somewhat between 1996 and 1997, the real boom came only with the impact of the Neuer Markt from 1998. But the boom would have been impossible if a base of a precious few VCs would not have been present in Germany to react to the new opportunity.[46]

In Sweden, similar government support programs oriented towards high-growth companies were only recently initiated; older government programs were too slow and unfocused in their execution and high potential internet entrepreneurs did not take advantage of them.[47] As a consequence, the technology-focused and early-stage venture capital industry had a much harder time surviving. This occurred despite the fact that Sweden was one of the earliest adopters of the venture capital concept in Europe in the 1970s. Yet, the venture capital industry did not really disappear; it moved abroad and changed its approach. Funds were invested privately instead of in venture capital funds. We will delve into this issue later. It suffices at this moment to point out that fund investments by the Swedish venture capital industry were considerably lower than in the rest of Europe- although subject to impressive growth from a very low starting point in 1997 and 1998. The situation in

[45] Particuliere Participatie Maatschappijen (PPM) was a guarantee scheme compensating venture capital companies for 50% of loss on investments. It ran from 1981 to 1995 and was responsible for a massive rise in the supply of venture capital (mentioned in Cowie, 1999, 24; Adam and Farber, 1994, 131).
[46] See Professor John Freeman's study of venture capital in Germany, John Freeman, "Venture Capital and Growth Businesses in Germany," 03.11.98, University of California, Berkeley, Manuscript.
[47] Interviews with venture capitalists confirmed this: Pärson (02.12.99) and Spangberg (17.11.99). For an overview of Swedish programs see OECD (1998b, 148, 149).

Sweden will further improve considerably when government initiatives channel pension money (API fund) into venture capital investments (Interview, Spangberg, 17.11.99).

Further relevant policy areas

Obviously, there were many other policy areas which were crucial for entrepreneurs in the internet field. One such policy area was electronic commerce legislation. Yet, here, even the country that by the late 1990s moved ahead the most rapidly in enacting new legislation, Germany, only began to provide some very basic pointers. Then, there were creative and useful government initiatives, such as Sweden's tax regulation change that allowed employers to provide computers for employees at home. Diverse activities such as the Swedish one were found in all countries. In 1998, France set aside FF 6 Billion for a broad set of measures, from education to "paperless government."[48] Yet, these were not part of a concerted, aggressive effort focused directly on the needs of internet entrepreneurs.[49] A crucial policy area, for example, included taxation issues and regulatory measures affecting entrepreneurs; they were not typical 'cyberissues,' but were more important. Here, however, all European countries had their share of problems (see especially Cowie, 1999, 31-38). Even the business climate in the Netherlands, a country which prided itself in coming the furthest in increasing flexibility and reducing regulatory obstacles, was, according to one entrepreneur: "Absolutely start-up unfriendly" (Interview, de Hoop, 26.10.99).

In none of the countries reviewed here, entrepreneurs felt that taxation and labour regulation was favourable. Of course, it would be astounding to find any country on earth where entrepreneurs are content with taxation and regulation issues. In Europe, however, the taxation of options (a crucial issue for internet entrepreneurs) was especially unclear and muddled; policy makers did not seem to understand why entrepreneurs grant options to

[48] "Address by Prime Minister Lionel Jospin at the 20th Summer Forum on Communication," Service d'information du gouvernement (SIG), 26.08.99, Hourtin (can be found on http://www.internet.gouv.fr/, accessed on 19.09.99).
[49] On Sweden's regulatory initiative, see the mention in: Nicholas George, "Chilly Regions of North Warm to the Net," *Financial Times*, 13.10.99, page 16.

their employees. In the Netherlands, for example, options were taxed when they were granted, based on an estimate of the future ("phantom") value a company may have. This may have been fine for established firms, which could more or less accurately predict future earnings, but for start-ups it presented headaches. Some companies had to provide their employees with loans to pay the taxes (Interview, de Boer, 14.10.99). In Sweden, companies granting options had to move in a legal grey area in order to insure that the options were not taxed as income. "In Sweden, we live by the Eleventh Commandment: Don't get caught," commented one internet entrepreneur. In fact, many of the Swedish electronic commerce start-ups moved their official headquarters out of Sweden or were not set up there in the first place- citing the difficulty with taxation rules as applied to share options.[50] In France and Germany, options taxation seemed to be a little clearer, although uncertainty remained in this key area also in these countries. Entrepreneurs in Germany and the Netherlands were in the recent past blessed with a removal of capital gains taxation (with holdings below 25% in the case of Germany and 5% in the case of the Netherlands), yet here also, statements by policy-makers were creating new uncertainty. From an entrepreneur's perspective, capital gains tax reduces his power to invest as a private 'angel' investor in new ventures or to start new businesses. Capital gains tax, therefore, can be regarded as a tax on future start-up activity, as United States experience in the 1980s shows.[51]

Labour regulation was the object of severe criticism by entrepreneurs, who were running risky start-up businesses and were, therefore, uncertain of their long-term ability to retain employees. Yet, all countries made it difficult to lay off employees once fully hired.[52]

[50] English abstract of Swedish article (World Reporter). "Linne and Spray Remain in Sweden, Linne och Spray stannar i Sverige," *Dagens Industri*, 20.09.99.

[51] Cowie describes succinctly the US experience. Capital gains tax was raised in 1969 and lowered again in 1979. Private equity commitments rose substantially as a result of the reduction (1999, 32, 33).

[52] It is useful to recall that entrepreneur's perception of policy in these areas was based on the situation in the United States. Although US tax policy is much clearer and labour regulation in many aspects more flexible, Europe as a whole enjoyed an advantage to the US - which many entrepreneurs pointed out as well. Employee loyalty seemed to have been stronger in Europe, this was especially important given the dearth of 'knowledge workers' with IT skills. In a way, this compensated for some of the problems entrepreneurs encountered in Europe - one of the reasons for extensive options programs in the USA was to improve employee loyalty.

Public statements encouraging entrepreneurship in Europe were common but they were generally underscored with policy in those areas where entrepreneurs would feel real benefits, such as in options taxation and capital gains taxation. No country examined here moved much beyond public statements.[53]

The internet start-up experience in four European countries

In this project, different types of internet start-ups were classified. Three of these categories were examined in detail in the survey of German start-ups: Web developers, internet software firms and portal players. The portal category was broadly defined and included portal sites, business-to-business exchanges as well as electronic commerce start-ups. Due to the lack of data available on a comparative basis in most of these categories, this section will focus on web development firms – which incidentally also have a long history throughout Europe because they did not require large up-front investment and could finance growth through earnings. Yet, the most ambitious internationalisers among the web developers also required aggressive financing. They were also, and this has been stated already in Chapter Two, dependent upon advanced demand structures just like other internet start-ups. The most interesting projects were realised in high-penetration areas. This applied to all types of internet start-ups, not just web developers. At the end of this section, a brief glimpse will be cast on the situation among portal players in each country under examination, keeping in mind the dearth of comparative data.

Obviously, options programs also motivated employees and European entrepreneurs were eager to make use of them.

[53] For France, see OECD, 1999b, 18, 19.

Table 11. The largest independent web development companies in four European countries plus USA. End 1999.[54]

Country	Firm	Employees	Financing	International Presence
USA	USWeb/ CKS	4.000	IPO (NASDAQ, December 1997)	USA (37), Canada, France, Belgium, Germany (2), Luxembourg (2), The Netherlands, Norway, Sweden, Switzerland (2), United Kingdom
	iXL	1.700	IPO (NASDAQ, June 1999)	USA (15), UK, Germany (2), Spain
Germany	I-D Media AG	240	IPO (Neuer Markt, June 1999)	USA, Germany (5), UK
	Kabel New Media	230	IPO (Neuer Markt, June 1999)	Germany (3)
France	Cythere	75	Private	France, USA
	Pictoris	55	Minority investment by US-based company Agency.com (July 1999)	France
Nether-lands	NetlinQ	100	Private	The Netherlands (4), USA, Germany (January 2000)
	Lost Boys	200	Private	The Netherlands, Spain
Sweden	Icon Medialab	850	IPO (Stockholm Stock Exchange O-List; SBI listing on June 1998)	USA (2), Sweden, Finland, Denmark, Norway, Germany, France, UK, The Netherlands, Belgium, Spain (2), Italy, Malaysia
	Cell Network	480	Cell Network AB resulted out of a merger between the listed company Linné Group AB, the Cell Consulting Group and Norway's New Media Science ASA. The merger was announced in May 1999. Linné IPO (Stockholm Stock Exchange O-List)	Sweden (2), Norway, Denmark, France

[54] Information from company sources published on their web sites (http://www.usweb.com/, http://www.ixl.com/, http://www.idmedia.de/, http://www.kabel.de/, http://www.cythere.com/, http://www.pictoris.com/, http://www.cellnetwork.se/, http://www.lostboys.nl/), accessed in December 1999. Icon Medialab, Press release, "Icon Medialab Acquires Nicholson NY, A Leading US Internet Services Firm," 22.11.99 (from http://www.iconmedialab.se/). Cell Network AB Press release, "General meeting of the Linné Group approves merger between Cell and NMS," 26.08.99 (from the investor information site http://www.huginonline.se/). Thanks also to Marc Simoncini (France), Roel de Hoop (Netherlands), Adriaan Meij (Netherlands) and Niels Valkering (Netherlands) for very helpful advice. Source on Cythere: Email from Christophe Tricaud, Cythere, 03.12.99. Source on NetlinQ: Jacob van Duijn, 03.12.99 (email). It is important to note that the leading German web development firm by employees (390) and international locations (USA, Germany (4), France, UK, Switzerland (2), Austria) was Pixelpark. Pixelpark, however, was majority-owned by Bertelsmann. Negotiations to acquire the first 50% took place at the end of 1995. For an early history of web development companies in Germany, see Waesche, 1999a. In October of 1999, Pixelpark carried out an IPO on the Neuer Markt, with 60% of the public entity still owned by Bertelsmann Multimedia GmbH and 20% by the co-founder Paulus Neef. Pixelpark, Press release (from the web site http://www.pixelpark.de/), "Pixelpark-Aktien erstmals am Neuen Markt notiert; Emissionspreis bei 15 EURO pro Aktie," 04.10.99. The Swedish web development firm Spray Network is not on the list because it was acquired by New York-based Razorfish. As a result, Spray Ventures had a 33% stake in Razorfish. "Spray to Compete Online With Yahoo, AOL in Europe," *Reuter Economic News*, 09.09.99. Compare this table to an earlier version including only US and Sweden-based firms as well as Pixelpark from late 1998 in Waesche, 1999b.

The top German web development companies were all publicly quoted. Nevertheless, although they grew rapidly, their progress in terms of internationalisation was disappointing compared to the top players in the USA and Sweden. Also, their employee count did not match that of their US and Swedish competitors. In the home market, German web developers seemed to have been established firmly and initially proved themselves next to tough competition from the advertising and consulting industries. Although French web development companies boasted very strong technical skills, their growth and pace of internationalisation were not strong compared to US and Swedish competition. In contrast to Germany, where most top tier web development firms were listed on the growth exchange, some of the best-known French web developers remained private or were acquired. As in Germany and France, the top Dutch web development agencies built an excellent pool of technical know-how, but essentially remained national players. Two of the top web developers, Twinspark Interactive People and CyberConsult were acquired by international web development firms in Autumn of 1999.[55] The contrast between the Netherlands and Sweden was instructive.[56] Both were small countries, yet the consumer demand structure for internet services was much more sophisticated in Sweden than in the Netherlands. A strong lead in internationalisation was taken in Sweden by the largest web development companies, Icon Medialab, Spray Network, Linné Group (later Cell Network) and Framtidsfabriken. Icon Medialab and Cell Network were listed on the Stockholm Stock Exchange. Icon Medialab and Spray Network established a strong presence in most major European internet markets as well as in Asia. The lead of the Swedish web developers vis-à-vis the European competition is clear from Table 11 above. The table shows the level of development at the end of 1999, some months before the market downturn. From 2000 onwards, Swedish players encountered problems because, despite their mostly organic growth strategies, they had overextended themselves and their revenues could not cover the

[55] Agency.com, Press release, "Agency.com Announces Acquisition of Leading Dutch Interactive Firm," 02.08.99 (from the corporate web site http://www.agency.com/); CyberConsult, Press release, "Icon Medialab International neemt CyberConsult over 'E-vikings landen in Nederland'," 27.09.99 (from http://www.iconmedialab.nl/). Thanks goes to Roel de Hoop of Hot-orange.com for the pointers.

[56] My understanding of the Swedish internet space was boosted considerably through numerous interesting discussions with Johan Jörgensen, former editor of an IT-magazine and now COO of the internet start-up Municel.

significant costs they were incurring. Swedish web developers were not alone, their US and German counterparts had to reduce staff significantly.[57]

Swedish electronic commerce companies such as Boo.com, Boxman, Dressmart and Letsbuyit.com (see Table 12, below) attempted to emulate the internationalisation success of the Swedish web development firms. Initially, they also seemed successful. In 2000, however, two of the firms mentioned here already had gone bankrupt, Boo.com in May and Dressmart in July/ August. Letsbuyit.com, after a delayed listing on the Neuer Markt, had to lay off about a fifth of its employees in August 2000 and subsequently hovered near bankruptcy for months.[58] The most successful and earliest internationaliser, Boxman, went bankrupt in 2001.[59]

[57] For the web developers, the most threatening development after the year 2000 next to the disappearance of easy funding was the reduction of IT expenditures by large corporations. For a review of the fate of web developers in Germany, see: "Internetberater werden Übernahmeziele. International Großkonzerne bemühen sich um Unternehmen wie Kabel New Media oder GFT Technologies," *Financial Times Deutschland*, 16.05.01, page 4.

[58] "Letsbuyit.com," *Financial Times Deutschland*, 31.08.00, page 15.

[59] The Swedish internet music retailer Boxman managed to start internationalisation early enough in the internet adoption cycle to profit from internet uptake in Europe. In fact, it started as early as its U.S. competition. Founded in December 1997, Boxman employed 120 people by December 1999. By that time, it managed to establish a recognised consumer brand in the Scandinavian countries as well as in France, United Kingdom, Germany and the Netherlands. In September 1999, Boxman signed a major cross-promotion deal with the music television channel MTV. Boxman developed innovative international business models; it built a centralised warehouse in the Netherlands linked to its internet ordering system. In Scandinavia, Boxman secured 4-5% of total compact disc retail sales, including sales via traditional retail outlets. In 1999, between 3.000 and 5.000 orders were placed each day over the international Boxman web sites. Interview with Tony Salter, CEO, Boxman AB, 03.12.99. Please refer also to the analyst report by Morgan Stanley Dean Witter, Equity Research Europe, "The European Internet Report," June 1999, page 189. Further: Interview with Ola Ahlvarsson, CEO, Result Ventures Knowledge, 18.10.99. And: Kimberley A. Strassel, "Using an Old-Fashioned Approach, Boxman Becomes Big Hit in Europe," *The Wall Street Journal*, 08.07.99. See also: English abstract of Swedish article (World Reporter). "Boxman Records Huge Losses, Boxman gor brakforlust," *Finanstidningen*, 18.09.99. In the article, the sales of the company were cited to be SEK 77 M (approximately EUR 9 M) in the first half of 1999 with losses of SEK 188 M (EUR 21 M). The article continued to state that Boxman raised a total of SEK 400 Million (EUR 45 M) in venture capital.

Table 12. Internationalisation of Swedish electronic commerce start-ups. End 1999.[60]

Name	Focus	Head-quarters	Founded	International presence
Boxman	Music retail	London	1997	Sweden, Norway, Denmark, Finland, France, UK, Germany, The Netherlands
Letsbuyit.com	Group buying	Amsterdam	1999	Sweden, Norway, Denmark, Finland, Germany, UK, Switzerland, Austria
EPO.com	Financial services	Stockholm	1998	Sweden, UK
Dressmart AB	Fashion	Stockholm	1999	Sweden, UK, Netherlands, Finland, Norway, Denmark
Boo.com	Fashion, sports retail	London	1999	Sweden, UK, France, Germany, Finland, Denmark

While the Swedish web development and electronic commerce firms initially impressed European observers with their spectacular internationalisation strategies, Swedish portal start-ups could not be boastful. Like their counterparts from other European countries except France,[61] Swedish portal start-ups met considerable resistance by a number of

[60] Information from the web sites of the companies, accessed in December 1999. Also: "Ghost in the Machine; Will Boo.com Be Able to Meld What's Hot in Athletic Footwear Across Continents?" *Footwear News*, 02.08.99.

[61] Surprisingly, French portal start-ups did very well, by combining search services with public forums ("communities"). There were a significant number of independent portal players among the top 15 web sites, including the VC-backed firms MultiMania and iFrance. One reason for the significant number of independent start-ups in the top ranks of portal and community sites could have been the slow response to the internet by established French media companies - presenting start-ups with a unique window of opportunity not available in other European countries. The internet only full came into French public consciousness in Summer of 1999, according to the founder and chief executive of iFrance, Marc Simoncini (Interview, 06.11.99). Again, however, like most European portals, French portal ventures did not internationalise much. Only one of the leaders mentioned here, iFrance, was a fast internationaliser and by 1999 had expanded into French-speaking Canada, the Benelux countries and Switzerland. The competing portal service MultiMania in 1999 did not yet have an international business. "MultiMania concludes capital increase, preparing for bourse listing," *Reuter Textline, Les Echos*, 07.10.99. Electronic commerce firms also were slow internationalisers. While a few electronic commerce players such as Chateauonline moved into neighbouring markets UK and Germany, most French firms focused on France, or, when they internationalised, they started with French-speaking countries or Italy and Spain. The Goldman Sachs-financed iBazar Group, which included the iBazar auction site as well as the online hosting site Chez.com and was later acquired by eBay, was present in France, Italy and Spain in 1999. "Goldman Sachs funds invests in iBazar e-commerce site," *Reuter Textline, Les Echos*, 06.10.99. On Chateauonline see Morgan Stanley Dean Witter, Equity Research Europe, "The European Internet Report," June 1999, page 190. German internet start-ups in the portal business were not successful, here, the space was dominated by telecommunications and media companies. DINO-Online (AIS Axon Internet Services GmbH)

powerful, established telecommunications and media companies.[62] As shown clearly in Table 13, below, established players have had an easy time in Europe building consumer internet brands with strategies which were very similar to those of their U.S. counterparts. The supply of entrepreneurs attempting to build internet brands was not lacking; the issue was supportive financing schemes through venture capital.

was an independent start-up but was acquired in January 1999 by the telecommunications operator MobilCom AG. The electronic commerce arena looked more promising in Germany. The appearance of internet broker ConSors Discount-Broker AG on the top 15 web sites list was symbolic of the domestic strength of electronic commerce start-ups in Germany as well as the rise of popular shareholder culture in Germany- although, as a spin-off from an established German private banking house, it was not exactly an independent new venture. Yet, as with the other stellar domestic start-up stories, the internationalisation pace of ConSors during the high points on the markets still was disappointing. ConSors only in July 1999 acquired an online stockbroker in France and in October 1999 established itself in Switzerland, but did not in 1999 move into other national markets. And ConSors was one of the fastest internationalisers in the industry. Other electronic commerce players, even among listed companies, were even slower to internationalise or focused on German-speaking neighbours. ConSors Discout-Broker AG, Press release, "ConSors erwirbt Mehrheitsbeteiligung an Axfin, Paris," 05.07.99; ConSors Schweiz AG, Press release, "Der günstigste Discount-Broker der Schweiz heißt ConSors Schweiz," 01.10.99. As in Germany, the top 15 portal sites in Holland in 1999 were dominated by telecommunications and media companies which quickly moved into the portal space. The most ambitious Dutch electronic commerce start-ups, such as Hot-Orange.com, had internationalisation plans did not execute them in 1999 (Roel de Hoop, Interview, 26.10.99). But as of yet, the strongest internet players in Holland were not the types of ventures examined here. Instead, alternative, new breed data telecommunications specialist Equant and the Vianen-based ISP World Online (WOI) grew fast and internationalised very rapidly. WOI later encountered problems due to an insider trading scandal. These new telecommunications companies expanded rapidly across the Dutch border and benefited from advanced business-to-business demand for data communication services. Holland is home to some of the world's largest multinational companies such as Royal Shell, AKZO, Philips and Unilever, and the country is the logistics and communication hub of Europe. Amsterdam and Atlanta-based Equant owned a world-wide data network and, since July 1998, was listed on NYSE and Paris Bourse. World Online acquired one of the oldest independent ISP pioneers in Germany, Nacamar. Morgan Stanley Dean Witter, Equity Research Europe, "The European Internet Report," June 1999, page 68. World Online International and Nacamar, Press release, "World Online erwirbt Mehrheitsbeteiligung an Nacamar. Zwei europäische Key Player im Bereich Internet Services bündeln ihre Energien," 05.08.99, Vianen, London, Dreieich.

[62] Next to the telcos Telia, Tele2 (owns the ISP Swipnet) and Telenordia (Algonet), the Norwegian publishing group Schibsted was particularly strong in the Swedish internet through its stakes in Aftonbladet. Passagen was the Swedish portal of Scandinavia Online (SOL), an internet company co-owned by Telia, Norwegian telco Telenor and Schibsted. Swedish Post's PostNet owned the portal site Torget.

Table 13. Most popular 15 local web properties in August/ September 1999. Independent local internet start-ups marked in grey (excluding ISPs and online services).[63]

USA	**Germany**	**France**	**Netherlands**	**Sweden**
AOL Network	FOCUS Online	Voila – Wanadoo (France Telecom)	World Online (WOI)	MSN/ Hotmail
Yahoo!	DINO-Online	Yahoo France	Lycos	Passagen Natverk
Microsoft Sites	Infoseek	MultiMania	Ilse	Tele2
Lycos	ConSors BrokersWorld	Caramail	World Access / Planet Internet	Microsoft
Go Network	RTL Online	AOL France (Cegetel)	Royal KPN	AOL
Excite@Home	ProSieben Online	AltaVista	Publieke Omroepen	Yahoo!
Amazon	AOL Homepage	Chez.com	Startpagina.NL	Telenordia
Time Warner Online	Spiegel Online	Les Echos	IDG	Altavista
RealSite Portfolio	Coupe	iFrance	VNU	Telia
Altavista Sites	RZ-Online	Club Internet (Lagadere)	De Telegraaf	Aftonbladet
eBay	DSF SportsWorld	Excite	Microsoft Nederland	Torget
Go2Net Network	DM-Online	MSN	Veronica	Spray
LookSmart	Süddeutsche Zeitung Online	Nomade	Nederlandse Spoorwegen	Lycos Network
Bluemountainarts.com	Fun Online	Lycos	PCM Uitgevers	Modern Times Group
ZDNet Sites	Com! Online	Infonie	Versatel Telecom	TV4

Therefore, if there was a single initial success story among indigenous European internet start-ups in terms of rapid internationalisation, it was the Swedish web development and

[63] Most sources measured the popularity of consolidated marketing "internet properties," not individual sites. Focus Online in Germany, for example, included different web sites such as the *Focus* magazine's web page as well as the GMX site, which was an internet start-up offering email and messaging services. Sources: USA: Media Metrix (can be found on http://www.mediametrix.com/), data from the month of September. Germany: IVW Online Medien Reichweiten (can be found on http://www.pz-online.de/), data from the month of September, France: Le Journal du Net quoting figures by Benchmark Group (http://www.journaldunet.com/), data from the month of August, accessed on 25.09.99, Netherlands: Multiscope (Email Stefan Pauls to author, 05.10.99), data from the month of August, Sweden: Sifo Interactive Media / Media Metrix (Email Mikael Ohlsson, Research Manager, to author, 18.10.99), data from the month of September. These sources all used different measurement techniques. It can be assumed that the German IVW figures were both inaccurate as well as not representative. Instead of measuring unique visitors to a site using user tracking techniques (such as Media Metrix in USA and in Sweden), IVW measured 'visits' based on server-side software measurements. There was no way to distinguish unique visitors, this caused distortions between transaction-oriented sites that were frequently visited to check email or make auction bids. Furthermore, many top sites refused to participate by not installing the required software. These included the independent internet start-up Web.de as well as the American players Yahoo! and Excite as well as Deutsche Telekom's T-Online, the top portal in Germany. Special thanks goes out to Frederic Madre for guiding me through the French internet scene.

electronic commerce firms. In fact, only the Swedish start-ups as a whole could keep up the with the international ambitions of US ventures.[64] Yet, the Swedish players were not able to sustain their internationalisation effort and growth when the capital markets contracted after the year 2000. Coming out of a home market without a powerful domestic alternative technology stock exchange, their funding base was so weak that even the strongest new ventures could not survive. This fate was shared by most internet start-ups in other countries. What was remarkable, however, was how the Swedish players got so far with relatively little capital compared to their US counterparts. American web developers combined strong venture-capital backing and 'cheap capital' from NASDAQ to acquire European start-up companies. Swedish web developers, by contrast, initially moved abroad through organic growth and complemented this with minor acquisitions. Icon Medialab's shopping spree was an exception and it began to intensify only during 1999.[65]

Although Swedish entrepreneurs liked to praise the advantages of organic growth and frequently pointed out the dangers of acquisition-only growth,[66] organic growth was not a choice, but rather a necessity. Although Icon Medialab and Cell Network were listed on the Stockholm Stock Exchange, the capital they had managed to raise through this insignificant exchange was not comparable to what they would have generated through an IPO on the German Neuer Markt. For this reason, many Swedish players had considered listing on the rival German exchange.[67] Funds provided by the venture capital industry for technology-

[64] Other than Swedish web development firms, the only independent internet start-ups active in more than one European country in 1998 were US-headquartered companies. The search service and portal site Yahoo!, for example, launched in Germany, France, and the United Kingdom during 1996, in Sweden, Australia, Singapore, Korea, Denmark, and Norway during 1997, and Italy, Hong Kong, and Spain in 1998. See Filing of Yahoo Inc. with US Securities and Exchange Commission (http://www.sec.gov/), 8-K/A, 12.11.99. Yahoo! could have remained content with focusing exclusively on the largest internet marketplace, the US- especially since competition in the United States is vigorous and encompasses established players from media, telecommunications and retail industries as well as well-funded start-up companies. Yet, US internet ventures developed innovative services for their advanced home market, which they launched abroad as demand improved elsewhere. US start-ups also profited from funding opportunities handed to them by angel investors, venture capitalists and growth-focused public capital markets.

[65] These include the small Cologne-based shop killakanu (September 1998), Dutch agency CyberConsult (September 1999) and the New York interactive consultant Nicholson NY (November 1999).

[66] A Swedish entrepreneur, Ola Ahlvarsson, celebrated the organic growth strategy, referring to Boxman and Dressmart: "In the music industry, it has been clear for a long time that you can't just create hits by throwing millions of marketing dollars at a certain band. You need to create a convincing story that consumers and journalists just can't pass by. Once you manage to do this, roll it out in as many countries as possible" (Interview, 18.10.99).

[67] See: "Sweden's Icon Medialab prepares for foreign IPO," *Reuter News Service*, 22.09.99.

oriented start-ups were been almost non-existent in Sweden in the years 1996 and 1997. Instead, private investors have placed their own money into start-ups. But their funding capacity was limited. Government support schemes for promoting venture capital were only in development in the late 1990s, most notable was the re-orientation of Swedish pension funds into venture capital.[68]

An informal network of angel investors with a high-calibre background was nevertheless very supportive of the Swedish internet start-up scene. The former top executive of Scandinavian Airlines, Jan Carlzon, was one of the initial backers of many start-ups including Boxman. It was characteristic of the Swedish start-up scene that the best-known Swedish venture capitalist at the time, Kjell Spangberg, invested his own private money out of San Francisco without being associated with a fund (Interview, Spangberg, 17.11.99). What was furthermore unique about Sweden was the survival of powerful, wealthy families, such as the Wallenbergs and its Investor Group. Investor AB backed Spray's pan-European portal initiative with a substantial amount of funding, approximately USD 62 Million.[69] An important characteristic of all of these backers was the strong personal support they offered, opening doors and adding instant legitimacy to an entrepreneur. Although the backing of Investor Group in Spray's portal project was large even by US standards, the sums invested by informal investors, mostly private persons, often was paltry. The initial investment in Icon Medialab by a former media executive was reputed to have been SEK 250,000 (EUR 28,000) for 10% of the company. Swedish ventures, therefore, benefited from some of the immaterial advantages US venture capitalists provide without being exposed to the luxury of lavish funding. As a result, Swedish web development entrepreneurs developed a unique internationalisation strategy funding organic growth partially out of earnings generated by the advanced Swedish internet marketplace. The Swedish venture capitalist Pär-Jörgen Pärson of Cell Ventures put it succinctly:

> "Swedish start-ups have less cash than their US counterparts because they are funded by angel investors. But what they do receive is smart capital in terms of network and access of people. This investment network has allowed Swedish

[68] "Sweden Allows Pension Funds More Freedom," *Financial Times*, 25.06.99.
[69] "Spray to Compete Online With Yahoo, AOL in Europe," *Reuter Economic News*, 09.09.99.

> firms to move much further, much faster, with less cash than others" (Interview, 02.12.99).

But the advanced internet demand structure in Sweden was also crucial. Web developers and electronic commerce firms perfected services in their home country which were in many ways more advanced than competing services in other European countries. The internationalisation effort they carried out was impressive, although most companies eventually disappeared because they ran out of cash before they had managed to achieve break-even.

Why Sweden?

We compared two large and two small European countries. Although several different variables were discussed here, size did not seem to matter much. Part of the reason for this is that all countries under examination here were "small" internet market places: Germany had almost 7 Million internet users in 1998, but this figure was less than three times as large as the number of Swedish users (see Table 2). Compared to 79 million internet users in the USA, all country markets discussed here were small. Yet, one central argument of this paper has been that absolute market sizes and absolute investment figures may not have been as important as qualitative aspects relating to the domestic market and the financing of new ventures. If internet demand was sophisticated such as in Sweden, perhaps, as a home base, "small is beautiful." The advantage of his domestic market was described by Ola Ahlvarsson in the following way:

> "Sweden is an ideal starting place for internet entrepreneurs. Here, we develop internet services before moving out to other countries. We have a small population of very advanced internet users. We have to convince a network of only about 30 critical, but opinion-leading journalists of our service. We have to persuade a small, tightly integrated network of private investors. Once we succeed at this, all doors are open. A well-oiled start-up engine is in operation here" (Interview, 18.10.99).

In some ways, it seems that Swedish entrepreneurs were able to benefit from many of the same factors that insured Silicon Valley's ascent and leadership in one technology wave after another. Only one crucial element was missing: In comparison to US internet start-ups, Swedish ventures, like their other European brethren, were undercapitalised. The fact that official venture capital funding was even lower in Sweden than in other European countries and that targeted government support schemes were lacking did not initially hinder the internationalisation of Swedish web development and electronic commerce start-ups, however. Informal private networks compensated to a degree for a lack of institutional venture capital. Swedish entrepreneurs had to develop a low-cost internationalisation strategy based on organic growth. Only later, when their extensive international networks required further funding, did they fail. Swedish web development and electronic commerce firms, therefore, also reacted to a "refracted" set of opportunities; in this case, however, these opportunities enabled early internationalisation through the path of organic growth. Web development and electronic commerce firms in other countries did not manage to internationalise as successfully as their Swedish counterparts. The exclusively domestic focus of many German, French and Dutch players, however, made them attractive acquisition candidates for US internationalisers.

The initial Swedish success in internationalisation relative to other countries in Europe showed how important sophisticated domestic demand structures are - even in the age of the global internet. The attractiveness of a home base cannot be discussed without analysing the role of government. The greatest contribution of government policy was in telecommunications liberalisation. The course of telecommunications liberalisation was supportive of internet development in Sweden because the national carrier was first exposed to competition, with privatisation being planned only from the year 2000. In other European countries, in the crucial period from 1996 to 1998, prices for internet access moved upwards as privatised telecommunications operators "rebalanced" their rates. Former monopolists used their dominance over the local "last mile" to extract maximum earnings from their internet users. Government ownership in the Swedish case to a certain extent prevented the dominant carrier from using is control of local phone lines to the detriment of the internet user. Although rate rebalancing also occurred, access price as well as pricing packages were more attractive in Sweden. Simply put, due to government ownership, Swedish policy makers were not placed into a situation of extreme conflicts of interests as their colleagues in other countries were: In Germany and other countries, the newly privatised entity was to be a "national champion," a star of the local stock market and a source of windfall income. In contrast, the internet user would have benefited from a tough stance towards the former monopolist- as occurred in the USA. In all countries as well as in Sweden, however, telecommunications policy was embarked upon independently of the development of the internet and its effects were inadvertent. Not inadvertent, however, was the emphasis on competition and the avoidance of pre-competition privatisation and excessive profit making.

Yet, towards the end of the period under discussion, significant changes in both institutional factors examined here were underway. Telecommunications liberalisation was leading to lower access prices and the venture capital bottleneck was disappearing. In Germany, development was more rapid than in many other countries because it was initially the only country in which the national regulator allowed the direct rental of a consumer local phone line from the Deutsche Telekom for a fixed monthly fee. Usage friendly internet fee structures were introduced by the incumbent and its competitors from 2000. The Neuer Markt contributed to a venture capital boom in Germany. An unprecedented boom in entrepreneurship occurred. But change occurred in other countries as well. In France, the Minister of Industry and Finance requested the Telecommunication Regulatory Authority (ART) to examine ways in which internet access rates could be lowered- with impressive results. In the Netherlands, widespread cable TV access was the basis for new unmetered internet services liberated from the local phone line.[70] These developments, in addition to the massive rise of mobile phone use, engulfed many European countries and made the Swedish home market with its advanced demand structures appear a little less unique.

As a result, a host of new internet start-ups in the broadly defined portal, electronic commerce category appeared after 1998 all across Europe. A 'Top 100' table of European internet start-ups from August 2000 listed several start-ups from different European

[70] Gordom Cramb reported on television cable in the Netherlands: "A 24 – hour online service without per minute charges... is functioning in all main Dutch cities and will soon extend to all of the country." He continued: "Evidence from other consumer electronics areas, like mobile phones, suggest that the Dutch do

countries, with a significant number headquartered in Germany, but also several from France and Sweden (see Table 14 below). Although the relevant founding dates were not available, most firms except for Tiss.com and degriftour.fr were founded in 1999. In contrast to their predecessors, this 'second generation' of European internet start-ups were to a significant proportion venture capital financed. Furthermore, a surprising percentage of these firms were focused on consumers; Sweden was not the only European country any more with internationally ambitious consumer-oriented internet start-ups. Lastly, they were much more fervent and rapid internationalisers than their predecessors.

Table 14. Company headquarter locations in Bathwick Group e-League of "Top 100" European internet start-ups in August 2000[71]

	Start-ups in "Top 100"	**Company names**
Germany	14	Tiss.com, goindustry.com, dooyoo.de, ciao.com, 12snap.com, elabseurope.com, surplex.com, webmiles.com, efoodmanager.com, vitago.com, glomedix.com, censio.de, webvertising.de, beautynet.de
France	9	degriftour.fr, kelkoo.com, omniticket.com, finance-net.com, allocine.fr , proXchange.com, doubletrade.com, wineandco.com, femmeonline.fr
Sweden	5	epo.com, boxman.com, funplanet.com, citikey.com, wapshealth.com
Nether-lands	0	

In mid 2000, these 'second generation' ventures were all very young, private companies, however. Most of them were still vulnerable and dependent upon ongoing venture capital financing when the capital markets downturn came. Almost all disappeared in the course of the years 2000 and 2001. If one compares these to the 'first generation,' of at that time already publicly listed internet start-ups from Germany and Sweden, important differences

not rush in first- but that once a technology has proved its usefulness they embrace it wholeheartedly." "Switched on and netting business," *Financial Times*, Survey, The Netherlands, page II.

[71] These were the results of the second e-League table. It incorporated feedback from the first Bathwick Group e-League table published in the Sunday Times on 02.07.00 and was therefore more accurate than the first table. The table still showed strong tendency in favouring UK firms, in fact, in the second table, 62 companies from England were named. However, it was one of the few comparative sources on internet-start-ups across Europe. Published under http://www.bathwick.com/, accessed on 30.08.00. Bathwick Group is a consultant and research firm.

were visible. The German firms on the Neuer Markt still very much came from a different environment. Their origins were in a Germany which was characterised by a lagging demand structure and by underdeveloped private and public capital markets. As a consequence, many of these were 'mixed-play' companies which were originally focused on the domestic market and corporate clients. Their internationalisation was much slower than that of their Swedish counterparts such as Icon Medialab, Cell Networks or Boxman. These companies were beneficiaries of advanced home demand conditions. However, the Swedish players, while rapid internationalisers, were prevented from realising their ambitious strategies by a Swedish domestic capital market which was even less developed than the German capital market. The winners of the so-called 'internet era' at the end of the 1990s seem to have been a very small number of successful 'first generation' American new ventures which managed to establish themselves internationally and secure sufficient funding to reach break-even before the capital markets downturn. In Europe, they occupied leading positions, sharing the market with the established European media and telecommunications companies.

While policy convergence in telecommunications did lead to better internet demand structures after 1998 and the initial success of the Neuer Markt altered the situation on the capital markets considerably, these improved home conditions only benefited the 'second generation' of new internet ventures. By then, however, the unique Schumpeterian window of global opportunity, characterised by rapid technological innovation and a massive wave of financing of new ventures, seems to have shut. Despite policy convergence and a considerable change of home country determinants, German and European information technology did not seem to have managed to 'leapfrog' to a position of global leadership side by side with the United States. It seems to be important, therefore, not only to compare distinct institutional environments statically at a given moment in time, but also to compare speeds of change in dynamically changing institutional landscapes. Timing apparently matters, too. A discussion of the issue of timing and institutional divergence insured by timing will conclude this thesis.

Conclusion

The Power of National Governments

From its founding in 1997, the German alternative technology stock exchange Neuer Markt developed spectacularly, symbolising a rebirth of entrepreneurship in Germany. Following the severe downturn in the Spring of 2000, however, a search for blame began. Investment banks, which had carried out the initial public offerings (IPOs), were faulted for a lack of research and unreasonably high initial enterprise valuations.[1] Several fund analysts, previously the stars of the Neuer Markt, were fired. Lastly, the Neuer Markt exchange itself was criticised. Insider dealings investigation and other reported criminal activities by the management of listed companies were cited as evidence for lax rules on the new exchange. Although this search for blame revealed some weaknesses of the IPO system in Germany and the inexperience of some participants within this system, one aspect of the downturn was not mentioned by public commentary, namely, the fundamental conditions for information technology (IT) entrepreneurship in Germany.

Public commentary did not present the full picture. Although the rules of the Neuer Markt were tightened in the aftermath of the downturn, they already were stricter and more transparent than those of other European exchanges, as discussed in the previous chapter.[2] Most importantly, the downturn in the technology stock market was not limited to Germany alone. Although it was slightly more severe in Germany, the development was global and was led by the US technology exchange NASDAQ.

In the Introduction to this thesis, the question was raised to what extent the wave of entrepreneurship in the late 1990s in Germany was part of a global development and to what extent it was specific to Germany. In order to effectively be able to explore the impact of global shift vis-à-vis country-specific determinants, a novel framework called *refraction* was presented. Refraction 'measures' the extent to which domestic determinants impact upon the economic opportunities presented by global technological

[1] "Aufstieg und Fall des Neuen Marktes: Die Rolle der Emissionsbanken. Auf dem Friedhof der Kuscheltiere," *Financial Times Deutschland*, 15.03.01, page 21.
[2] "New rules aim to clarify Neuer Markt dealings," *Financial Times*, 21.12.00, page 17.

shifts. The method chosen was that of a single country study. An economy was selected in which an especially strong response to global change had apparently occurred. This country was Germany, and here, although it is still too recent to fully judge, entrepreneurial response seems to have ended as dramatically as it had begun. Perhaps the strength of the entrepreneurial revival itself was artificial, a fiction conjured by investors in the local capital market in need of a success story. To understand what happened, a detailed examination of actual developments seemed necessary.

Refraction revisited

Before embarking upon a study of actual developments, a framework for analysis was presented in the Introduction of the thesis called refraction. The refraction framework assumes the parallel existence of two opposing interpretations of technological change. Scholars examining technological change and economic history have closely linked innovation to social shifts in a specific local environment. Often, these changes are incremental and evolutionary in nature. Alternatively, network thinkers have understood recent changes wrought by the proliferation of global IT networks as worldwide, disruptive shifts emerging out of the techno-economic sphere with strong effects on society.

It is helpful to make a brief detour here and mention two writers who have had a great influence on recent theorising, Max Weber and Joseph Schumpeter. Although Weber and the younger Schumpeter co-operated on some projects, and tried to answer some of the same questions, their focus differed. It is a fundamental issue, which will appear in different guises when summarising and drawing conclusions from this project. This difference has also been emphasised by several authors in an issue of the academic journal *Industrial and Corporate Change* dedicated to these two canonical thinkers (Hamilton, 1996; Galambos, 1996). Weber tried to unite economics, history and sociology. He saw change as multicausal, emanating from different parts of the greater, interwoven institutional setting. Thus, different institutions, including firms, changed jointly, moved by broad trends. Technology was not a specific, isolated issue of concern. Schumpeter acknowledged the greater institutional setting as well but narrowed in on economic actors more so than Weber did. He tended to focus on technological change and entrepreneurship. His understanding of change was 'endogenous,' or contained within the economic system (Rosenberg, 1994). Despite his pessimism about a world he viewed as becoming increasingly bureaucratised, Schumpeter believed the primary strength of the capitalist system lay in its encouragement of constant, entrepreneurial change.

One way to view the difference between Weber's and Schumpeter's work is in terms of scale. Whereas Weber discussed profound, deep changes in whole institutional landscapes, Schumpeter seemed to prefer writing about periodic changes limited to the economy and emanating from entrepreneurs. Yet, Schumpeter did not shy away from analysing broad changes such as bureaucratisation. The more important difference between the two seems to be the question who is in the driver's seat. Bureaucratisation for Schumpeter is caused in great part inadvertently by technological progress and the cumulative effect of multiple entrepreneurs' innovations. Shifts described by Weber are not technology-driven in the same way; a host of effects from different institutions and great historical currents are more important. The purpose of this investigation into the network economy was precisely this question: "Who is in the driver's seat?"

Before arriving at possible answers to this question, we need to review the broad similarities common to much of what is called 'institutionalist' work. This work includes that of economic historians, including Nobel Prize laureate Douglass North (1990), and several prominent historians of economic change, such as Nathan Rosenberg (1982) or Joel Mokyr (1990). Evolutionary economics was also mentioned, Richard R. Nelson and Sidney G. Winter have defined this field (1982). Their primary concern has been to renew the economics discipline by basing it on change instead of equilibrium. The thesis also drew upon the writings on institutional change by Geoffrey M. Hodgson, who condenses thinking on institutions into a general-purpose theoretical framework for the social sciences (1994). The book on Italian economy and society by the political economist Robert D. Putnam has raised controversy by touting the benefits of what he calls *social capital* (1993). Putnam believes the economic prosperity of a region is linked to long-standing structures of trust. In this range of work, the spirit of Max Weber seems to be emphasised just slightly more than that of Joseph Schumpeter, with the exception of Nelson and Winter's contributions (see Stolper, 1994, 74 - 85).

Three essential aspects of change can be found in the work of some of the recent writers mentioned here. They are, firstly, the incremental pace of institutional change, secondly, its so-called *path dependency*, and lastly, the continuity of local variety. Much of the Introduction was dedicated to explaining these three concepts. Actors are viewed as embedded in structures defined by different types of institutions. Change is a tedious process promoted by numerous agents with uncertain outcome. This, in turn, ensures that there exists a great variety of political economic 'approaches' world-wide, including within capitalist systems. This variety is not reduced by change. Change is not convergent, it is path-dependent and thus reinforces local variety. This institutionalist understanding can be contrasted to a very different, quite contemporary body of work, namely, thinking about the network economy at the end of the 1990s.

Network thinking is a sibling of 'globalisation thinking,' which has declared the disappearance of geographic boundaries and highlights convergence over divergence. Network thinkers also emphasise the potential of new players to challenge established enterprises, even the ability of new regions to 'leapfrog' economic development and assume a new role in the global economy. The international economy is a discontinuous, dynamic environment with reduced certainty. While so much of this modern mythmaking is easy to disprove, it would be unwise to completely ignore it. It has emerged from some of the most intelligent and best-informed observers of Silicon Valley. Here, we will briefly recap some of these practitioner's arguments described in the introduction.

Kevin Kelly's approach is to summarise network thinking, thus the three basic trends he highlights in the beginning of his book *New Rules for the New Economy* are a good starting point (1998). According to Kelly, the three most important aspects of the so-called 'new economy' are that it is global, intangible and interlinked. These factors together are responsible for a decentralised force of upheaval which breaks up the 'old economy.' What is happening is that, for the first time, "we are connecting everything to everything" (page 12). This is why the internet is significantly different from the world-wide corporate electronic networks which have existed for three decades. It is precisely because small firms and individuals are being integrated into the global network that real, lasting changes are occurring. The heroes of this networked vision are the people and also the small firms whose success is enabled by the global network. Accordingly, most old-style organisations, including governments, will not be able to cope with these changes and they will see their influence decline. In their place, the network will bring about new institutions, which are not dependent upon centralised, geographically founded means of control. New types of firms and new types of government will appear which operate according to principles of performance and voluntarism. In fact, the network behaves very much like a free market, with an ongoing selection process in operation. The economic sphere is privileged. Among the network thinkers, a belief in market selection has merged with 1960s anti-establishment thinking. In this context it is worthwhile to re-read Esther Dyson's explanation: "How I got the story and learned to love markets" in her book *Release 2.1.* Several of these writers recall Schumpeter, who in his early writings (1934) also emphasised technological change and privileged the economic sphere and the market over other social institutions.

Although the two different sets of ideas concerning technological change described above, institutionalist analysis and network thinking, really do seem to come from different worlds, both provide answers to our central question: "Who is in the driver's seat?" It is not that one set of thinkers point to one actor and the other to another; the very basis of their analysis is different- as is the difference between Weber's and Schumpeter's approaches to change. Whereas the historically guided institutionalist work described first has as its essential unit institutions in a geographically definable entity, sometimes a nation, sometimes an economic region, this is not the case with the network thinkers. In fact, the very purpose of institutionalist analysis is to ask why some regions do very well and others don't. Since they see firms as part of a larger political, social and economic institutional landscape, these authors look for combinations of factors encouraging or stifling growth. While the possibility for agent-driven change exists, much institutionalist writing emphasises institutional constraints. Furthermore, institutionalist work has difficulties explaining rapid and sustained global shifts. This is the strength of network thinking, which moves away from geographically defined entities. Network thinkers look for types of actors which will be successful in a networked, global environment, such as small, fast ventures, self-employed knowledge workers and new, nongovernmental global movements and organisations. They juxtapose these to geographically based, old entities which will not be able to keep up the fast pace, such as domestic governments. In most cases, network thinking does not reach the depth of Schumpeter's analysis which explores the causes of change, questions them and arrives at an endogenous change model based on longer-term waves. Most network thinkers simply think of technological change as a deterministic and external. While the weaknesses of network thinking are recognised here, the aim of the thesis is to see what can be learned from juxtaposing institutionalist insight and network thinking.

Readers knowledgeable of the institutionally guided literature from Max Weber to Douglass North and David S. Landes can easily downplay the once fashionable topic of writing about the network economy and its lack of rigor. This is not the issue here. These same writers acknowledge the importance of profound technological change occurring occasionally in history in combination with a strong social shift. Apparent contemporary changes in technology may signal a global social shift in progress and this possibility needs to be taken seriously by scholarship. Some sociologists, especially urban sociologists, critics of post modernity as well as of globalisation, have analysed current technological developments in depth to uncover possible parallel social currents. The sociologists discussed in this thesis included Manuel Castells (1996), Saskia Sassen (1996) and David Harvey (1990). These sociologists also understand that, despite a digital network and marketplace accessible all over the world, those firms which manage to innovate, create the most value and manage to grow faster are located only in a few, specific countries. Innovation does not seem to be equally pronounced everywhere.

To answer the guiding question pitting older, institutional structures against global technology, the thesis was divided into two parts. The first, comprising Chapters One and Two, focused on global change. It asked what could have caused the current perceptions of networked change by drawing upon writing from different academic fields such as sociology and economics as well as from network thinkers. The impact of international policy-making is considered and the development of international data networks cannot be explained without it. In effect, Part I tried to show what is real about the global virtual economy. The second part focused on domestic institutions and turned the question around: What is fake about the network economy? This study focused on one 'old style' entity, a single domestic economy, Germany, with its government and its firms, as well as a 'new style' player, the internet start-up. In doing so, it contrasted two supposedly very different paces of change: The rapid, global network disruption initiated by start-up companies, and the continuous, steady, multicausal evolution of domestic institutions.

Summary of Part I- Global Opportunity

No single, early event symbolised the entrepreneurial wave which would be unleashed by the internet more than the initial public offering of the internet software company Netscape on NASDAQ on the 9th of August 1995. The start-up was financed by aggressive venture capital partners. Its vision combined idealism and self-serving business sense: Transform the internet into an ubiquitous and global consumer network. These two concepts are crucial to understanding the nature of the internet opportunity.

Electronic networks have been put to use in corporate environments for a long time. Since the 1970s, multinational manufacturers as well as financial services used global electronic networks to co-ordinate their business processes. But installing and maintaining these networks was very expensive and, most importantly, the investment was borne exclusively by the participating parties. The internet turned the top-down cost structure on its head; numerous parties shared the costs of the decentralised network. Furthermore, the internet was a 'stupid network,' meaning that intelligence was located at the periphery and not in the centre. This was important because the decentralised technology of the internet provided a point of easy entry for a vast range of new enterprises which challenged established players. These structural and technological factors associated with the internet were crucial preconditions for ubiquity.

Ubiquity inspired and enabled a broad range of new, sophisticated services. By integrating the consumer into seamless *business webs* (Tapscott, et al, 2000), whole business processes from manufacturing to warehousing, distribution and finally consumption could be carried out digitally. 'Company-only' networks were opened up and extended. One of the first types of start-ups to target the opportunities described here were indeed software companies such as Netscape. But others thrived initially as well: Internet service providers (ISPs) were a threat to telcos; web development firms competed against consultants and portals challenged media conglomerates. Then there were the throngs of different electronic commerce service companies in diverse business areas from retail to financial services. From 1995 onwards, a first wave of start-ups in the USA strove to become 'first movers' in this vast array of different service segments. It is important to keep in mind that these entrepreneurial firms had an important stake in the sophistication of the internet marketplace; they helped 'create' the ubiquitous marketplace by 'inventing' and perfecting new types of services. Yet, US government was involved in the sophistication of the internet marketplace as well; telecommunications liberalisation allowed a low price regime for internet access to emerge. Internet technologies were developed in a subsidised research environment.

Next to ubiquity, internationality was a crucial aspect of the internet opportunity. The fastest growing among the US internet start-ups also began to internationalise and set up a presence in different country markets, mostly in Europe. In Europe, they confronted indigenous start-ups as well as established firms. Most indigenous start-ups had not internationalised in a similar manner as their US brethren; they were domestic in orientation and some represented attractive acquisition candidates. The supply side represented by these internet ventures needs to be viewed jointly with the demand side, however. Due to the increasingly global nature of specific service businesses such as banking and consulting as well as multinational industrial enterprises, a small, elite segment of the world-wide population demanded personal access to an international data network. The emergence of this 'international society' needs to be seen in conjunction with the emergence of transnational enterprises and international government policy preparing the grounds for this emergence.

Not all shifts in the global economy associated with the internet were breathtaking and new, however. Parts of our understanding are plainly wrong. The global network economy itself is not new; in fact, corporate networks have been around since the 1970s. And governments have not lost as much control over the world network flows as was claimed in the late 1990s. Even global financial flows can be controlled. The problem seems to be instead that subtle policy instruments have not been sufficiently explored. Abruptly killing off financial flows is easier than fine-tuning them. What was real and novel, however, was certain aspects associated with the internet. Here, we are not referring to internet technologies or the academic network, which have been around since the late 1960s. The internet meant the end of 'company-only' and 'country-only' networks. These unique aspects were also the reasons for the popularity of the internet among commentators and investors. The internet had the potential to massively influence how we live our lives.

Summary of Part II- National Political Economy

In the second part, the study departed from the so-called global network revolution to examine the development of the internet in a specific, domestic environment. The reason for this downshift in scale was the following: A detailed examination of internet firms in their home environment would reveal to what extent these firms are linked to domestic institutions. Strong linkages would suggest that location has not lost its crucial importance, that firms cannot simply set up shop elsewhere- at least not new ventures engaging in innovative market shifts. Differences among innovation activity would furthermore point to the perseverance of variety and challenges the view that the world is converging- at least in the important area of innovation activity. Lastly, it would show that firms cannot speedily 'overtake' the structures they are embedded in and that 'old' domestic structures themselves may be more sustainable than assumed by network thinkers.

In order to allow the inclusion of sufficient amounts of detail, the approach of a focused, one-country study of Germany was selected which was complemented by ancillary research from other countries. Why Germany? One reason is that Germany is not the USA. Much of our understanding of the network economy is derived from the experience of the USA. Specifically, Germany was attractive for this investigation was because it was host to a surprising shift in entrepreneurial activity in the late 1990s. Known throughout the 1990s as the 'sick man of Europe,' Germany was perceived as a country with strong, established technologies but with a lack of entrepreneurial dynamism which would secure it leadership in information technologies and telecommunications. After 1997, entrepreneurship seemed to have reappeared, judging by the temporary success of public listings of dozens of local internet ventures on the new German alternative stock exchange, the Neuer Markt.

To understand the seeming revival of entrepreneurship in Germany, the activities of three types of agents crucial to the development of internet ventures were examined in detail: National government, the former monopoly telecommunications carrier and the entrepreneurial companies themselves. In addition to identifying three types of agents, two arenas of interaction were selected as being especially important for the development of internet ventures in Germany. These two arenas were telecommunications policy and technology policy, especially the promotion of venture capital. From the example of the United States, we know that sophistication in the internet marketplace was closely linked to telecommunications policy. The aspect of the internet that most encouraged innovation was its ubiquity, by linking consumers directly to firms providing products and services via one network. And ubiquity, in turn, was encouraged by low local call fees, consumer-friendly pricing structures and low cost of leased lines- a result of the particular course of telecommunications liberalisation in the United States which combined tight government control over local access with strong competition in distance telephony and data trunk lines.

Throughout most of the 1990s, the German telecommunications landscape was static, despite valiant attempts at change. In the early 1990s, for example, policy-makers in Germany had a unique opportunity to inject a dose of competition into the mostly monopolistic landscape. This opportunity was created by the unification of Germany and the necessity to rapidly upgrade the antiquated phone system of the East German states. Innovative solutions, such as the bundling of telecommunications with other services such as cable TV or energy could have emerged in this environment. The business and social climate as well demanded new ideas addressing the telecommunications bottleneck in Eastern Germany; businesses small and large and also parts of the population were ready for innovative policy. Although the fixed-line monopoly of the incumbent operator was institutionally protected by the German Basic Law, the historic moment could have been used to grant the states of the former German Democratic Republic an exceptional status. While the moment was unprecedented and numerous reasons can be cited why change would have been possible, the status quo was preferred. The opportunity was not grasped.

After this lost chance, telecommunications liberalisation in Germany slowly moved along its consensus-driven path. The monopolist, renamed Deutsche Telekom, was privatised and publicly listed in 1996. As a political compromise to the employees and the Social Democrats, the company retained its ownership over several key assets, including its online service T-Online as well as its cable TV network. The main reason for keeping control of cable TV could not have been earnings. Since the network was reduced to carrying only TV programs and was not charged with transporting telecom services, it was a loss-maker. The main reason to retain cable TV was to delay the arrival of telecommunications competition. A further political compromise was the granting of a two-year 'window' from 1996 to 1998 in which the former monopolist could prepare for competition. The interests of the employees of the Deutsche Telekom matched those of the German Finance Ministry, which wanted to keep its privatisation income as high as possible. Strong competition was equated with a lower share price and less money in the coffers of the state. This is also why the new independent regulator, the RegTP, which began its work upon the arrival of competition in 1998, was arguably not very popular among some Social Democrats and also the Finance Ministry. The arrival of RegTP marked a new era, however, and finally resulted in profound institutional change, a decade after liberalisation was first seriously discussed in Germany and about 16 years after first steps towards liberalisation in the United States. The incremental, slow, multicausal shifts, which took place here, fit snugly into the framework of institutionalist analysis.

The point is that, given the institutional environment in Germany, it would have been improbable for liberalisation to have arrived sooner (unless the external shock had been greater). It is not surprising that the historic opportunity during the aftermath of unification was not taken. Yet, introducing fixed-line competition at that time would have put Germany on an equal footing with Sweden. Sweden allowed a first private fixed-line competitor in 1991 and established legislation allowing further competition in 1993. Instead, the German opportunity of 1989 was transformed into a burden- the costs of modernising east Germany's telecommunication infrastructure was paid for by the

German telephone user, especially also the private internet user. Until 1999, Germany had one of the highest internet access prices in the whole of the OECD. Lower prices would have meant higher penetration early on, and more sophisticated and ubiquitous demand structures. Germany had consistently low internet advertising expenditures, for example; this had had a negative impact on those internet start-ups that intended to derive part of their income from advertising. The effect of lower access prices was demonstrated convincingly by the growth of internet usage from 1999, when the first, significantly cheaper internet access packages were introduced country-wide.

The 'tale of three countries,' Germany, the US and Sweden, described above shows that the development of sophisticated internet services was closely linked to institutional change. In the United States, profound institutional changes took place 16 years before Germany. At first glance, it seems as if there is a strong random element here in this story. There was no way that German policy makers debating the future of the national telecommunications landscape in the early 1990s could have foreseen the importance of the internet. Certainly, there were a few farsighted individuals within German academic institutions, such as University of Karlsruhe's Werner Zorn, who fought for the use of internet standards on the German academic network. But these grassroots conflicts were contained to the mostly academic internet community. The immense commercial potential of the internet and especially its potential for entrepreneurs was only apparent from August 1995. After this date, however, it became increasingly apparent that the internet provided an innovative space for new ventures. The delays in opening up the telecommunications landscape from 1996 to 1999 after change and a new institutional structure was politically agreed upon cannot be attributed to a lack of knowledge. They were due to particularist policy-making, favouring groups which had profited immensely from the status quo in the monopoly era and did not want to give up their comfortable position.

But to emphasise inadvertent effects of policy-making would be a mistake. We should not lose sight of the broader historical context these changes occurred in. Although policy-makers could not have been aware of the importance of the internet before 1995, they were already from the 1980s onwards observing the shifts taking place in telecommunications such as the rise of data networking and the growing importance of global corporate networks. Although only the internet allowed these changes to come to full fruition, the internet itself can also be seen to be a result of these changes. One of the objectives of the first part of this paper was to show how the internet was both unique as well as part of a longer technological development consisting of decades of innovation activity. In other countries, such as the USA, UK and Sweden, the institutional framework already in the 1980s and early 1990s encouraged the arrival of alternative networks. In Germany, however, institutional structures in telecommunications resisted change much longer.

Comparing innovative activity

There is no such thing as a global internet start-up. Instead, there are American as well as German, Swedish and other start-up firms. The strategy and resources of internet ventures are different from one country to the next; this is one of the most important findings of the project and it is presented in Chapters Six and Seven.

In order to investigate geographic particularity in the so-called network age, this paper explored the influence of two vital determinants of start-up activity: Internet demand as well as the availability of venture capital (VC). In the United States, a highly sophisticated, ubiquitous demand structure as well as a venture capital boom can both be associated with the wave of entrepreneurial activity on the internet. On the one hand, demand sophistication in the United States allowed start-ups to specialise, focus their resources and competitively address one facet among a wide array of industries. New services were developed at an astounding rate. On the other hand, venture capital helped finance the extremely rapid international growth of the ventures, allowing them, among other things, to temporarily disregard cash flow constraints and to acquire competing and ancillary firms.

Both factors together helped bring about the 'model' internet start-up. It had the following three characteristics. First, the company was a 'pure-play' start-up focusing all of its resources on a very specific area and catering to sophisticated demand for internet services. Second, the firm could run negative cash flow over a number of years; private and public investors supported its vigorous growth strategy. Third, its growth was international and was in part achieved through acquisition. Obviously, there existed US internet start-ups which did not match the above 'pure-play' 'model' and were not VC-financed. They were, in fact, the majority of firms. But the commercialisation of the internet was strongly influenced by those firms which did correspond to this 'model.'

The German internet start-up was a 'mixed-play' company. First, the German start-up was more of a general service firm, combining project-specific consulting, web development or systems integration services for clients with 'pure' offerings on the internet. Project-specific services therefore supported the 'pure' work; for this reason, the companies had a positive cash flow. Second, very few companies were venture capital-financed from 1996 to 1998. Those firms that enjoyed the advantages of venture capital financing in the internet arena were firms which were more traditional software companies, such as Blaxxun, Intershop or Brokat. The traditional means of industrial financing in Germany, bank credits, were not extended liberally to knowledge-intensive industries lacking securities, such as the internet entrepreneurs. 'Bootstrapped' growth mostly was organic. Acquisitions were few in number. Venture capital in Germany only really took off from 1998, when public market appetite for internet investments grew and the success of the Neuer Markt became evident. Third, international expansion was cautious; only after 1998 did it become more vigorous. German internet ventures were preoccupied with their domestic market.

Yet, despite these traits which can be found not only in Germany but also across other countries in Europe, national distinctions existed. Particularly interesting is a small subset of Swedish internet start-ups, which shared some of the above European characteristics, but which already in the period from 1996 to 1998 started to internationalise and grow rapidly. These Swedish start-ups, such as Icon Medialab or Boxman, initially compensated for the lack of a thriving, technology and early-stage oriented venture capital industry by drawing upon active, private 'angel' investors and by embracing a lower-cost organic growth strategy. Most importantly, they profited from advanced home demand, a result of early telecommunications liberalisation. This transformed Sweden into a hotbed for internet innovation. The start-ups rapidly developed advanced consumer-oriented services, which were then 'exported' to other countries. The small size of the Swedish economy was not a barrier to development.

Yet, it was also not a lone facilitator, as often argued; the Netherlands also is a small economy, but its internet demand was less sophisticated. Internet start-ups in Holland were more domestic in orientation. However, after an initial phase of European expansion, the capital-constrained Swedish start-ups encountered strong obstacles in securing their position and creating sustainable companies.

The contrast between Germany and Sweden is instructive. Germany was fairly well-endowed with venture capital in a European comparison; Sweden has extremely advanced internet demand, matching that of the United States. Although both components, venture capital and demand structures, are crucial to explain the US story, home demand sophistication served Swedish start-ups well in the early days. It gave them a boost to internationalise early on and assume a position as rivals second only to US start-ups expanding across Europe. Especially web development firms, those types of internet start-ups which could generate profits to invest in growth, fared well in their internationalisation effort. While capital constraints eventually contributed to their demise, the development of Swedish companies proved the crucial importance of sophisticated, ubiquitous local demand structures. The sophistication of the venture itself reflects the sophistication of the home market.

In this study, we have carried out a broad sweep from telecommunications policy and institutional path dependency to demand structures and have arrived at innovation, firm structure and resource allocation. In trying to find out how essential national institutional structures are for global competition in the network age we arrived at the following conclusion: They are crucial. In fact, the detailed investigations of Germany in this study revealed that entrepreneurial firms did not induce change. They responded not to global opportunities, but instead to a domestically refracted version of these opportunities. Refraction was influenced by the country-specific institutional environment. During the course of 1999, institutional change had made itself felt in factors influencing internet entrepreneurship, including significantly lower access prices and a growing volume of venture capital. This came late. A second generation of German internet start-ups which profited from these improved home conditions appeared from 1999; they were born into an environment already clustered with first generation internet start-ups, established players and U.S. entrants. They also had to face the consequences of stock market downturn in 2000 while they were still very young. As a consequence, they did not have favourable growth opportunities either, despite changes in fundamental conditions for entrepreneurship in Germany.

While the German case probably is not surprising to students of institutional change, the history of internet start-ups in Silicon Valley seems to indicate the opposite. Here, entrepreneurs, not Washington, are viewed as inducing change. But the geographic distance between Washington and Mountain View obscured the fact that US 'pure play' internet start-ups are focused on a national market for internet services created by national telecommunications policy. Up to and including 1999, even the most internationally oriented US internet start-ups, such as Yahoo!, generated only a fraction of their of their sales outside of the USA.

One of the main advantages of Silicon Valley is the existing cluster of venture capital firms. It is an industry which has thrived due to local cluster effects as well as national policies, such as a reduction in capital gains taxes. It is important to emphasise, however, that the services venture capitalists provide are not unique, neither geographically nor historically. The example of Sweden shows how Swedish private financiers have actively helped internet start-ups to grow and expand internationally. The main advantages of venture capital financing can thus also be provided by experienced and active private investors. Venture capital in its current form was perfected in Silicon Valley, but famous VCs include the Rothschilds, Oppenheims, Bethmanns and other European private banking families which were active during the industrial revolution by financing railroad and steamboat investment. The point here is not to downplay the tremendous cluster advantage of Silicon Valley or to underemphasise the vital role of the financiers of innovation, but to show active investment know-how may be internationally mobile in contrast to local demand conditions, which are fixed. Yet, the demise of the Swedish start-ups also shows that long-term success also requires sustained investor support which most private families will not be able to provide. The longer term support which was available through the public US capital markets for a window of several years up to 2000 was missing in Sweden.

The comparison of German and Swedish ventures showed that local demand conditions are just as important for innovation direction and success as financing. They have a direct impact on resource allocation in the start-up. The 'pure-play' internet firm was instrumental in pioneering new services in a way that a 'mixed-play' could not. It would not come as a surprise to specialists of technological change that 'innovation' includes changes in market and firm structures. In fact, Schumpeter argued that entrepreneurs create demand for their innovations. Without sophisticated demand in the USA, 'pure-play' start-ups could not have existed, and vice-versa. The point here is that, despite the growth of global networks, national government power remains massive, among other things, through its decisive influence on internet uptake through telecommunications policy.

To a certain extent, the rapid rise of entrepreneurship in Germany and its similarly quick demise was 'constructed' by the investors on the alternative stock market Neuer Markt. The German internet ventures were, due to weak local demand structures and the initial difficulties in raising capital, not able to assume positions of international leadership in their category. They were from the very beginning not companies which were focusing their resources on the high-growth requirements of the international stock markets. The demise of these companies was already contained in the 'mixed-play' code of the firms, as discussed at length in Chapters Six and Seven.

Future directions of research

In examining the interdependence of small, innovative firms and national institutions, this study focused on a relatively narrow area. It honed in on two 'external' factors, demand and financing. The experiences in Germany and the United States during the 1990s pointed to the critical importance of these two country-specific determinants. Nevertheless, research could also have focused on more inclusive 'external' factors such as macroeconomic variables or specific determinants such as the educational system. These factors relate to an important issue which has not stood at the centre of this effort, know-how and human capital. Chapter Six only briefly touched upon this issue. Know-how is deeply influenced by institutional factors. In studying know-how formation it is possible to draw even tighter linkages between national institutions and firm innovation.

In a recent book, Nicholas Ziegler has highlighted some of the ways in which policy-makers, the research and the business community interact as part of a know-how producing system (1999). The experiences in Germany during the late 1990s with entrepreneurship also indicate a lack of experience among decision-makers in capital markets and among entrepreneurs. More work can be carried out in this area.

One of the main challenges encountered when examining know-how formation and utilisation, however, is the separation of different structures working on national, regional and local levels. Economic historians have debated what the most relevant level may be for the study of economic activity. Indeed, studies of Silicon Valley such as the seminal work by AnnaLee Saxenian emphasise local institutional characteristics (1994). It is argued that Silicon Valley structures are particularly performance-focused and open. They seem superior for the formation of new ventures to those closed, community-focused structures which Putnam described in Europe (see the excellent article by Cohen and Fields, 1999).

Yet, know-how formation in the so-called network economy is a difficult object of study at this point in time because effects are subtle and difficult to interpret. Alone the question of the relevant level of study is challenging. Does one emphasise local, regional, national or supra-national institutions? The determinants chosen for this project, telecommunications policy and the availability of venture capital, are clearly national, keeping in mind important supra-national influences such as the European integration process or effects of international trade negotiations. Other determinants, especially know-how formation, are not so easy to delineate. Again, an investigation into know-how formation will involve not only 'new' knowledge fields such as web development resources and database programming skills, but also 'old' factors, such as international management experience and an understanding of capital markets and venture capital investment procedures. Furthermore, as Ziegler has shown in his study about know-how formation, modes of interaction among expert groups are crucial. It may be necessary for time to pass before embarking upon a potentially very rewarding examination of know-how formation in the network economy.

The power of national governments

In the Introduction, the research question guiding the thesis was presented. After years of apparent lack of dynamism in the German economy, a wave of entrepreneurship associated with the internet seemed to have appeared in the final years of the 1990s. The question asked was what the underlying drivers of this apparent turnaround were.

In the first part of the thesis, practitioner network thinking as well as research from sociology and other academic disciplines was drawn on to explain how the internet assumed global proportions. Furthermore, it was shown how internet ubiquity and internationality stimulated technological and business process innovation. Yet, technological innovation stimulated by the internet opportunity did not occur in an isolated, economic sphere. Parallel social developments were crucial, especially the emergence of an elite, so-called 'international society' working for multinational service and industrial enterprises. Next to the international research community, this group was among the first groups to demand internet access. Ironically, network thinking itself played a crucial role in the development of the internet by providing an idealised self-interpretation which activated further demand. Government played a crucial role, both in the internationalisation of the internet as well as in encouraging domestic adoption. The role of government policy cannot be characterised as 'hands off' even in the United States, where telecommunications liberalisation, the promotion of venture capital and subsidy of the national research data network were crucial determinants. These findings are not surprising for institutionalist scholars, who emphasise that important innovations involve joint changes in the economic, social and political spheres.

Yet, how important were international developments vis-à-vis national factors in causing the apparent turnaround? Indeed, in the second part of this thesis, which was dedicated to the German case study, it was shown that German entrepreneurs did respond to the internet opportunity at roughly the same time as in other countries, including the US and Sweden. While the internet did have this discontinuous, cross-border effect, the 'first generation' German internet start-up was unlike its US or Swedish counterparts. It was a 'mixed-play' company, which focused largely as a services firm on the IT needs of established, domestic corporations in the internet era.

The first generation German internet start-up was not able to directly focus on the two innovative, unique aspects of the internet opportunity: Its ubiquity among small companies and consumers as well as its internationality. Nevertheless, the entrepreneurial response in Germany was amplified through the successful and rapid launch of the Neuer Markt, the alternative technology stock exchange. Due to the Neuer Markt, Germany appeared the most entrepreneurial country in Europe during the internet 'stock bubble,' while the underlying reality of the entrepreneurial response was lacking vigour. With the downturn of the market, this became apparent. The entrepreneurial response in Germany therefore can be seen to exhibit continuities with the weak path of IT development in Germany.

A series of factors can be listed to explain why Germany missed this 'leapfrogging' opportunity. As discussed in Chapter Six, one important factor surely was know-how and the structure of expert networks which included entrepreneurs, the research community, venture capitalists and investment bankers. These experts attempted to emulate the Silicon Valley 'model' of innovation but were challenged by their own inexperience. They also had to face persevering traditional German innovation models in which the entrepreneur carries more personal risk as well as retains more control. Yet, this began to change in Germany in the final years of the 1990s, as expert networks evolved and lessons were learned. To an extent, these human capital issues existed but they were certainly not alone in accounting for the weakness in the entrepreneurial response in Germany in the late 1990s.

It was shown in the thesis that two policy arenas had a significant impact on internet entrepreneurship in Germany. These policy arenas affected the way that entrepreneurs could respond to the novel aspects of the internet opportunity. They refracted global opportunity and can be used to explain the fundamental weaknesses of first generation German internet start-up companies. The first was the restriction of internet demand in Germany among small firms and consumers and the second was the initial lack of venture capital. The first factor was a direct result of the course of fixed-line telecommunications liberalisation in Germany and the second factor can be linked to high taxation of private wealth, other tax issues as well as the initial lack of a liquid public capital market for young technology companies. In the United States, policy in both arenas differed considerably. Telecommunications liberalisation- a process which was largely disadvantageous to established, dominant telecommunications players- led to lower, subsidised internet access pricing. Tax adjustments stimulated the venture capital industry and the investing of private seed money.

After 1998, fixed-line liberalisation in Germany led to improved internet demand structures. In parallel, innovation in the capital markets made itself felt in Germany. Yet, shifts in these two specific determinants had only limited impact on first generation internet ventures. Their resources and strategies were to a large degree aligned with the older conditions. Therefore, despite the fact that convergence with US conditions had occurred, the timing of changes was crucial. As a result, when one looks at the development of the internet, Germany remained distinct from the United States. Established media and telecommunications companies had a better position in Germany vis-à-vis internet newcomers than their counterparts in the United States.

The thinking forwarded here thus far could lead one to think that rapidly adjusting one's home market to 'American' conditions is the key to creating global business advantage. American conditions have been regarded largely (and wrongly) as 'hands off' government. Yet, critics who want to bring government 'back in' identify the widely embraced trend to emulate presumably 'hands off' US conditions with a 'race to the bottom.' Both camps in the debate, those who seek to emulate US conditions and those who are warning of a possible 'race to the bottom,' are making two fundamental mistakes. First, both the emulators and the critics of 'hands off' government seem to be overlooking one crucial aspect of technological innovation. Innovation activity is indeed intimately linked to home demand structures, which, in the case of the internet were associated with fixed-line telecommunications liberalisation. It is difficult to predict, however, what aspects of home demand will turn out to be crucial in the future. Technology waves, especially major disruptions, are difficult to forecast, as we have seen. If one seeks to orient one's economy to current American conditions one implicitly assumes that technology is static. Second, both camps in the debate are wrong in seeing regulation and technological innovation as opposites. Less regulation is not always the solution for encouraging technological innovation; sometimes stricter regulation is- this has been demonstrated powerfully in the so-called deregulation of financial services and the growth of alternative, technology-focused capital markets, such as the Neuer Markt. In these instances, deregulation actually meant more regulation. A further crucial area where 'hands on' government has been beneficial for innovation activity is active competition policy; in this study the profound consequences of the break-up of AT&T as well as the commercialisation of the internet research network in the United States have been discussed. The simplification resulting out of a bipolar classification of policy into 'hands off' and 'hands on' is not very useful.

The dilemma for policy makers is apparent. By examining innovation carried out by internet firms, it was shown that there were different types of cars on the so-called 'information highway.' Ferraris were racing against Fiats. And national governments were to a great extent responsible for this. They refracted the opportunities presented by the global economy and recast them; small firms oriented themselves very much according to this refracted, domestic reality. Despite the opportunities presented by global networks, entrepreneurs could not 'overtake' national institutional conditions or ignore refraction. Government policy has led to vibrant innovation activity among new ventures in certain cases, but has had the opposite effect in others. Unfortunately for policy-makers, it is not clear how their powers are best put to use; how can one transform Fiats into Ferraris? The solution certainly is not simply to try to mirror perceived US conditions at a given point in time. Maybe Fiats will even prove to be on the road longer while the Ferraris overheat and roll onto the side. As Hayek pointed out, government does not have a sufficient basis of knowledge to be able to rationally intervene on behalf of a specific technology. The market mechanism alone distinguishes effectively between rival technologies.

After examining the 'new' network economy both globally and in Germany, some commonplace, classic liberal conclusions can be returned to. It is precisely because of its tremendous power and not despite of it that government should focus instead on the 'lesser' tasks: On setting the rules of the road, reducing particularist policies and emphasising vibrant competition. This is a reiteration of key aspects of the classic liberal approach, emphasised by German *Ordoliberal* writers. 'Lesser' means here not less government intervention, but instead less ambitious policy objectives. Framework rules are preferred; 'experimental' process intervention is shunned (Sally, 1998, 108, 109; see also Eucken, 1990).

But although Ordoliberalism had its home in Germany, the country was exposed to "the reality of daily mercantilism" (Starbatty, 1999, 170, 171). Some German policy-makers were, in part, sincere in their confidence that their particularist sponsorship of a single, dominant firm, a 'national champion,' would foster innovation in their country. The underlying idea was that only a powerful, large entity can compete and innovate in a global environment. In fact, the impulse for telecommunications liberalisation in Germany seems to have sprung in part out of the desire of some policy-makers to 'free' the national champion to compete globally. Viewing telecommunications as an infrastructure good seems to have been regarded by these politicians as an 'old fashioned' perspective. National champion priorities were in alignment with institutional relationships. For example, despite the fact that the former monopolist is publicly quoted, German government was and still is a significant shareholder.

Active government technology policy has often been praised when discussing GSM, the European telecommunications standard. Indeed, the scale benefits of European GSM were apparent to large, pan-European operators and especially for the equipment manufacturers. Yet, the GSM standard was introduced in parallel with successful, early liberalisation and pro-competitive policy in the mobile telephony segment. By mentioning GSM as an example, we are being sympathetic to European technology policy. Large-scale standard setting in Europe has also failed by missing the needs of the market; this is not surprising, since market needs are notoriously difficult to forecast. When referring to GSM, one should also mention the example of ISO/ OSI, the networking standard advocated by European governments in place of internet standards. Policy support for this favourite standard of the large telecommunications monopolists delayed internet adoption in Europe. The effect of another telecommunications standard, UMTS, on the innovative activity of smaller ventures is as of yet not apparent.

It seems clear from this research that determined, early competition policy in the fixed-line telecommunications arena would have had a profound effect on the development of first generation internet ventures in Germany. Some liberal political economists regard active competition policy with suspicion due to the danger of abuse. Nevertheless, Ordoliberal writers, for example, explicitly included active competition policy as a necessary component of 'framework' policy. This is because Ordoliberals were just as concerned about the issue of power misuse by market players in the economy as they were concerned about power misuse by government (Sally, 1998, 106-117). In fact, arguments for proactive competition intervention adopted to the so-called 'network economy' have become popular recently. Active competition policy was promoted by some US economists during the Microsoft trials. These economists argued that the lock-in effect occurring as a result of network externalities in the information economy gave established players an unfair advantage over newcomers, thus inhibiting innovation. To use another example, the German federal cartel authority has recently expressed concern that internet-based exchanges of bulk commodities such as cement can lead to illicit trust agreements between large buyers.[3]

Given this very relevant current debate about the role of competition policy vis-à-vis global data networks, perhaps it is important to remind oneself here of the institutionalist premise that the market itself is an institution formed deliberately by actors in the economic, political and social spheres. What appears as proactive government intervention prone to abuse can also be interpreted as framework policy to insure a functioning market mechanism which can serve to select among rival technologies. The best example of a functioning market is the actively regulated stock market.[4] It is interesting that even when studying a global wave of entrepreneurship, the aftertaste that seems to linger around longer feels a little more like Weber than Schumpeter.

[3] "Kartellkonferenz in Berlin. Müller: Freie Bahn fürs Internet. EU-Kommissar Monti fordert weltweite Kooperation der Wettbewerbsbehörden" and „Thema des Tages. Wettbewerb durch Tempo," *Süddeutsche Zeitung*, 22.05.01, page 21.

[4] In *Emancipation, the Media and Modernity*, a masterful book on media and technologies which also is a critique of the so-called 'new economy,' the sociologist Nicholas Garnham includes a section on path dependency, lock-in and competition (2000, 75-78). In this section, Garnham describes how economists have shown that the Hayekian market mechanism for the selection of technologies is suspended through the forces of path dependency and lock-in. Garnham seems to suggest that in a network economy the market mechanism as a whole has limitations. If we view the market as a deliberately constructed institution, however, Garnham's critique seems self-evident.

Appendix A: Procedure and Results of the globalstartup Survey

As stated in Chapter Six, in early 1998, a representative list of internet start-ups in Germany was not available. Nor had the press identified internet companies beyond a small handful of high profile firms. For this reason, firms had to identify themselves by responding to a publicity campaign. The response rate was boosted by the participation of the monthly business publication *manager magazin.* They announced that they would to publish an article on a selection of start-up case studies in Fall 1998 drawn from the pool of survey participants.[1] The editors of *manager magazin* as well as "Spiegel Online," the web publication of *Der Spiegel,* are thanked here for their indispensable and very kind co-operation.

An important factor which had to be taken into consideration was that entrepreneurs in the first months of their start-up phase have very limited spare time. In order to speed up the registration process, a web site was set up which allowed on-line registration (under http://www.globalstartup.com/ and http://www.smallfirm.org/). The initial questionnaire was comprised of a brief set of basic questions. These were specifically devised to be filled out by entrepreneurs, questions on possibly confidential data such as sales figures were avoided. A selection of these internet start-ups were identified as potential high-growth companies. These entrepreneurs were asked to spend additional time on a second questionnaire. They were personally contacted by the author who assured them that he would respect their confidentiality concerns. The second questionnaire was designed to generate numerical data not contained in the first, such as sales figures. In addition, many of the founding managers of these selected companies were interviewed in person by the author to generate qualitative data for the project. Sample web site pages from the original survey can be found in the exhibit at the end of this section.

For the reasons just outlined, the design of the study had to address issues usually not present in other empirical surveys. The lack of a representative list of internet start-ups was the most important issue. The results must, on the one hand, be viewed as tentative and useful mainly for the generation of leads and key concepts, for an initial taxonomy and to identify interview partners. On the other hand, the good timing of the survey at the beginning of increasing public interest in Germany for the internet start-up phenomenon resulted in a good awareness and a high number of responses. Contemporary experts, such as German venture capitalists, believed that the pool of responding firms was indeed representative. The numbers generated reflected their own observations at the time.

Procedure

1. Publicity campaign.

Publicity efforts began in mid January 1998. Firms could sign up on the globalstartup.com and smallfirm.org web sites until 15.03.98.

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[1] Helene Laube, Jochen Rieker, "Neue deutsche Welle" and "Shooting Stars," *Manager Magazin*, October 1998, pages 208 – 231.

Several internet start-ups as well as venture capital (VC) firms were contacted directly via email. VC investment managers were asked to identify the internet companies they had invested in.

Posts were placed in two internet newsletters. One was in the official mailing list of dmmv, the German multimedia association. The "dmmv E-Flash," was subscribed to by 360 member firms. The post appeared on 06.02.98. The other was a marketing mailing list, which was promoted by the multimedia marketing trade journal "Horizont.net." The "Netmarketing-Digest" had 1,800 subscribers when the post appeared on 29.01.98.

An announcement of the study was made on "Spiegel Online" (http://www.spiegel.de/). The announcement ran from 15.02. until 15.03.98 under the business section of the home page. According to the "Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V." (IVW, http://www.ivw.de/) the site had 688,015 'visits' in January 1998 and was among the most frequently visited German-language content sites. This announcement on "Spiegel Online" can also be found in the exhibit at the end of this section.

An announcement was made on page 36 in the March 1998 print issue of *manager magazin*, which was released on 20.02. At the time, *manager magazin* had a readership exceeding 500.000 according to IVW.

2. Signing up.

The following restrictions were announced:

- The firm has to have its headquarters in Germany.
- The firm should not be older than two years or must have redefined the its business strategy in the last two years.
- The firm needs to have an international focus.
- Products or services of the firm should have a direct connection with the internet or other online services.

The firms were free to interpret these criteria themselves and fill out a questionnaire of 28 questions.

3. First sample (n=123) of internet start-ups.

140 entries were collected. 11 entries were excluded from further analysis because the firms were in their sixth year of existence or older (founded before 1994). They could not be considered firms in a start-up or seed phase. Two entries were excluded because they were not firms. Both were projects at universities. One New York-based LLC and one Delaware corporation were removed. There were two double entries. 123 firms remained.

The ventures were then classified according to a taxonomy. 22 business areas and four groups ("Web developers," "Software," "Portals sites, electronic commerce start-ups and business-to-business exchanges" and "Others") were defined. The classification was carried out on the basis of an evaluation of the returned survey as well as information found on the web sites of the firms.

4. Second sample (n=30) of internationally active or potentially internationally active internet start-ups.

Of the firms that has signed up, 52 firms belonged to business groups that seemed especially promising for international expansion ("Software" and "Portal sites, electronic commerce start-ups and business-to-business exchanges"). These were further analysed according to the level of their international activity or potential international activity. This was again based on the survey answers as well as the firm's web sites. 28 start-ups were selected for an informal interview and a second questionnaire. 3 firms from other business groups that nonetheless were potentially high growth were added to this sample.

The founding managers of 18 firms were informally interviewed in person. Two founding managers were interviewed in their offices and the rest during the computer trade fair CeBIT '98 in Hannover. 13 were contacted over the phone. The founding managers of the selected firms were asked to fill out a second survey, which required more detailed and sensitive information than the first questionnaire. All agreed to fill out this second questionnaire on an anonymous basis, meaning that the results would only appear in aggregate form. The second survey was sent out by email in April and returned by 30 founding managers. One founding manager failed to return the second survey due to time constraints.

This procedure insured that two separate survey results could be analysed, one with a sample of 123 respondents and a second, more detailed survey, with a sample of 30 respondents (the names of the 30 selected firms are listed at the end of this Appendix). In addition, 18 personal interviews with founding managers were carried out.

Firm taxonomy details

Before analysis, the firms were classified according to their primary business area. Business areas were grouped into potentially international, high growth segments ("Software" and "Portal sites, electronic commerce start-ups and business-to-business exchanges") as well as generally project-oriented start-ups with a national or regional focus, the "Web developers." Firms with a software and a portal focus are related in that, much of the time, internet software enables internet portal sites and electronic commerce companies to conduct their business.

The classification by business area was central to the study. Of course, overlaps were possible. Some firms were placed into one area, although they could conceivably belong to another area as well.

Note: In calculations where absolute numbers of international and domestic clients as well as turnover approximations were used, one electronic commerce start-up had to be excluded because the number of its consumers exceeded the totals of all other firms together. This caused strong distortions especially in comparisons between software and service start-ups.

Here, the different start-up types are explained:

a) **Web developers**, n=57: These firms worked primarily on a project-by-project basis. They were systems consultants or new media agencies. Their revenue came from assisting other firms in realising their internet presence or an internet-supported business model. In the mid-90s, entrepreneurs involved in this process described themselves as 'evangelists' because they saw it as their task to convince their clients and also consumers of the benefits of internet activity (see Waesche, 1999a).

New media agencies: Companies that specialised in the design and development of internet sites and other digital media. They often had marketing know-how and co-operated with systems consultants in realising projects for their clients.

Systems consultants: Companies that developed custom software configurations for clients and carried out systems integration. Usually this involved database technology.

Consultants, training: Companies that trained business users in use of the internet or consulted firms on all aspects of internet business.

TV/ internet studios: Firms that carried out video productions for use as streaming video over the internet.

3D: New media agencies that concentrated on 3D productions for the internet.

b) **Software start-ups**, n=23: Internet software firms with a high product standardisation potential.

Ecommerce software: Standardised or semi-standardised software that facilitated electronic commerce. ECommerce was defined as the sale of digital or non-digital products over the internet. ECommerce software often involved software for database-driven product catalogues and transaction components such as a virtual 'shopping basket.' Firms partnered with financial software firms and financial service institutions. Clients were retailers.

Publishing systems: Standardised or semi-standardised software to control the process of publishing either solely on internets and intranets or also on other platforms such as CD-ROM or print catalogues. The ability to publish on other platforms was referred to as 'cross-media.' Publishing large internet sites or handling intranets with several sites was very complex task. This software tried to solve some of the problems associated with this task. Clients thus could be publishing houses or corporations with intranets.

Knowledge management: Software that attempted to solve the problem frequently referred to as 'information overload.' This type of software could be very simple or very complex, ranging from personal browser-based web-search tools to on-line information analysis systems for sales force databases. Information filters, autonomous agents and one-to-one customer profiling and addressing were all part of this category. A wide variety of different clients were possible including consumers and corporate systems in the service sector.

Financial software/ encryption: Software that managed transactions over the internet and their security. Could be used to insure that data could not be used by third parties or to insure that a given document transferred over the internet was actually from a given party and authentic. Clients could be financial institutions or internet retailers.

EBusiness (Business processes): Internet software that supported business processes, either work-flow processes common to service corporations such as insurance companies and airlines or production or sale processes including warehouse management systems. Software often needed to integrate with SAP or legacy systems and thus had a strong middleware component. Clients could be all types of firms, service or manufacturing.

EBusiness (Communication): Internet software for firms that aimed to improve internal and external communications. Email, fax and internet conference system software all belonged to this genre.

c) **Portal sites, electronic commerce start-ups and business-to-business exchanges** (forthwith: "Portal sites"), n=29: Internet start-ups with a high growth potential offering content, retail or exchange services to consumers or business clients.

Sale of products: This group included both the so-called "e-tailers" which targeted consumers as well as procurement specialists, focusing on businesses. Competition by price, sometimes also by dynamic prices, was combined with branding and community approach.

Content: All types of content developed for publishing on the internet targeting consumers as well as businesses. Revenue could come from different sources: internet advertising through banners, sponsorship by a firm or subscription fees.

Hotel, travel: The consulting group Datamonitor (http://www.datamonitor.com/) identified the travel industry as the internet industry with the highest proportion of total on-line sales (in a release of 28.04.98). In this survey, the travel area included not only the sale of travel services but also the development of online application services for hotels, such as booking systems hosted by the start-up.

Brokers: Internet-based services that provided bidding services or classified ads for their clients.

Extranets: Extranets are networks linking two or more firms. The use of the term has since become unpopular and was replaced by business-to-business exchanges (B2B). Neither of the two terms is very precise and could refer to a wide array of different data network services connecting separate firms, including transfer of pricing information and or warehousing information for supply chain optimisation. It could also just refer to internal company news content being shared among different firms. Extranets were the successors to electronic data interchange (EDI). Relative to EDI, extranets were be cheaper to install and maintain, thus new combinations of businesses could be linked. EDI would have in the past been much too expensive, for example, for electronically linking small retail outlets with a manufacturer.

Community, chats: Chat-based communities were usually consumer communities. Their purpose was entertainment. Revenue from hosting a chat community came from internet-advertising or, again, from sponsorship. The obstacles to building a successful revenue model were similar to those for content services.

Entertainment: As in the case with hotel and travel, firms in this business area catered to both business clients or to consumers. This category included firms specialised on providing application services for businesses which enabled game design. Alternatively, they provided internet entertainment experiences for consumers directly.

Marketing, ad services: This referred to centralised services for internet advertising. Service firms hosted advertising networks, which allowed what usually were small firms to participate in group advertising initiatives.

d) **Others**, n=14: Businesses that could not be placed into one of the above groups.

Provider, internet outsourcer: Firms that specialised in providing access to the internet or in hosting sites. This was a pioneering industry for the internet. By 1998, consolidation had already set in world-wide.

Hardware for internet access: Any equipment that was required for accessing the internet (such as modems).

Telecommunication services, networks: Telecommunication services such as software for locating the cheapest telecom provider. Telecommunications networking and telecommunications infrastructure.

Main survey results

1. The average German internet firm that participated in the survey was 1.8 years old and employed 20 people.

The total number of employees of all firms together: 2,422. Mean total employment was 19.7.

Table 1. Breakdown of employees.

	Mean	% of total	Median
Contract	11	54%	5
Free	6	31%	4
Abroad	3	15%	0

36% of all firms were incorporated as Personengesellschaften, 59% as GmbH and 6% as AG.

2. Discounting international employment, the potential high-growth firms that were selected for the second, detailed questionnaire had more aggressive financial strategies than the general group.

Table 2. Key characteristics of the original sample and the 30 selected firms.

	Original sample	Selected firms
Number of firms	n=123	n=30
Average age (years)	1.8	1.7
Total employees/ firm	19.7	17.6
International employees/ firm	3.0	1.9
% int. employees	15%	11%
% int. partnerships	16%	22%
% int. business clients	2%	13%
% int. consumers	0%	3%
% consumer firms of total	15%	7%
Likelihood of VC financing	11%	30%
Likelihood of tbg support	4%	13%
Likelihood of federal support	4%	7%
Likelihood of state support	8%	7%
Likelihood of bank loan	20%	20%
% are Personen-gesellschaften	36%	27%

3. The most popular form of financing an internet firm was by reinvesting profits. This was followed by investment by individuals (angels or founders), bank loans and venture capital.

At first glance, venture capital seemed a relatively significant form of financing for internet firms in Germany. It was the fourth popular financing option with 11% of all firms being VC-financed. Instead of "VC-financed," a more appropriate term to be used for this group of firms, however, would have been "private equity-financed." In Germany, at the time, the range of services, which should have been available through an active venture capital investor, were not

yet well understood. Entrepreneurs thought they were recipients of venture capital investments, when, in fact, they were not. The two terms "private equity" and "venture capital" were sometimes used interchangeably (instead of understanding venture capital as an early-stage, technology-oriented and active type of private equity investor).

Furthermore, the survey design contained a bias towards venture capital-backed firms. High profile venture capital investors had been contacted and their portfolio firms were asked to participate.

tbg-backed companies automatically required an individual or an active VC firm as a co-investor. Due to the selection process of the tbg, these companies better matched the criteria, which one would have associated with high-growth, VC-financed firms. For example, the proportion of firms, which generated profits available for reinvesting, was low. Furthermore, the proportion of "pure play" companies was higher and project-by-project work lower (see Tables 17, 18). However, only 5% of all companies in the sample were tbg-financed and the majority of these were software start-ups.

Table 3. Forms of financing.

	All firms	Firms with VC	Firms with bank loans	Firms with tbg support	Selected firms for second survey
Reinvesting profits	79%	43%	88%	33%	70%
Individuals	33%	14%	33%	33%	23%
Bank loan	20%	21%	100%	17%	20%
VC	11%	100%	13%	83%	30%
State ("Land") program	8%	21%	17%	17%	17%
Parent company	8%	0%	4%	0%	3%
tbg	5%	36%	4%	100%	13%
Other	5%	7%	8%	0%	3%
Federal program	4%	21%	8%	17%	7%

Table 4. Financial strategies of different business areas.

	All firms	Web developers	Software	Portal
Individuals	33%	33%	30%	31%
Reinvesting profits	79%	86%	70%	79%
VC	11%	4%	17%	21%
Bank	20%	23%	22%	14%
tbg	5%	0%	17%	7%
Federal program	4%	2%	9%	0%
State program	8%	7%	4%	7%

Parent company	8%	7%	4%	7%
Other	5%	7%	0%	3%

Most firms used more than one different type of financing.

4. The largest employers were internet service providers and software start-ups. Portal sites, electronic commerce start-ups start-ups and business-to-business exchanges were among the smallest employers.

Table 5. Business areas and employment.

	Number of firms in sample	Number of employees	Employees/ firm (rounded)
New media agencies	33	555	17
Systems consultants	15	267	18
Sale of products	6	57	10
Ecommerce software	8	356	45
Publishing systems	7	113	16
Content	6	40	7
Hotel, travel	3	15	5
Brokers	4	68	17
Consultants, training	5	40	8
Provider, outsourcer	9	458	51
Knowledge management	2	40	20
Hardware for access	1	20	20
Telecom. services, networks	4	35	9
TV/ Internet	2	31	16
Extranets, EDI	4	52	13
3D	2	14	7
Community, chat	2	38	19
Financial software/ encryption	1	41	41
EBusiness (Business processes)	4	125	31
Entertainment, games	3	33	11

Marketing, ad service	1	18	18
EBusiness (Communication)	1	6	6
	123	2.422	20

Table 6. The largest average employers. Numbers are mean total employment/ firm.

Provider, outsourcer	51
Ecommerce software	45
Financial services/ encryption	41
EBusiness (Business processes)	31

Table 7. The smallest average employers. Numbers are mean total employment/ firm.

Hotel, travel	5
EBusiness (Communication)	6
3D	7
Content	7

5. The most popular business areas for German internet software start-ups were electronic commerce software, publishing systems and business processes. Internet portal start-ups focused on the sale of products ("e-tailers" and procurement specialists), content, information brokerage and extranets ("B2B").

In the United States, firms emphasised roughly the same areas with the exception that knowledge management software was a much more frequent and electronic commerce software a less frequent business focus than in Germany.

Table 8. Frequencies of software and service start-ups by business area.

	Frequency	% of start-ups	Frequency (US sample*)	% of start-ups (US sample*)
Software start-ups				
Ecommerce software	8	15%	5	7%
Publishing systems	7	13%	11	16%
Knowledge management	2	4%	18	26%

Financial software/ encryption	1	2%	0	0%
EBusiness (Business processes)	4	8%	16	23%
EBusiness (Communication)	1	2%	4	6%
Portal sites and electronic commerce start-ups				
Sale of products	6	12%	0	0%
Content	6	12%	7	10%
Hotel, travel	3	6%	1	1%
Brokers	4	8%	1	1%
Extranets, EDI	4	8%	1	1%
Community, chat	2	4%	5	7%
Entertainment, games	3	6%	0	0%
Marketing, ad service	1	2%	1	1%
Total	52	100%	70	100%

(* US data was obtained from Upside Media Inc.'s "Upside's 1998 Hot 100 Private Companies" which can be found on http://www.upside.com/. The report is dated 30.03.98. Since the companies were categorised differently, the profile of each US firm was evaluated and the company placed into one of the business area groupings above. Firms from areas, which were not relevant to this survey, such as semiconductor equipment, were not included. Included were firms from the following: Ecommerce, Online Content, Net Infrastructure, Enterprise Software and Business Automation. The Upside survey was similar to globalstartup in that the companies nominated themselves. One difference in the table above is important, however: The Upside list included only selected firms, this particular globalstartup list included all software and service start-ups that participated. The Upside list therefore already reflected the selection process of the editors and industry experts.)

6. Business area alone did not seem to influence the level of international activity of a firm. Software start-ups were internationally active to a greater degree when measured by the numbers of employees abroad. Web developers and portal sites cultivated international partnerships to compensate for their lack of offices in countries outside of Germany.

Table 9. Business areas and proportion of international activity.

	All firms (n=123)	Web developers (n=57)	Software (n=23)	Portal (n=29)
% int. employment	15%	7%	22%	16%

% int. partnerships	16%	19%	19%	12%
% int. business clients	2%	13%	4%	23%
% int. consumers	0%	12%	N/A	5%

7. Overall, growth expectations were good among those internet firms selected for the second survey. The firms expected to grow in sales by over 200% and in employees by over 60% in 1998. Software start-ups expected to generate DM 5.2 million in sales, portal sites, electronic commerce start-ups and business-to-business exchanges around DM 1.2 million. The growth expectations of portal sites, however, lagged those of software firms considerably.

Table 10. Expected turnover and current employee growth in DM millions.

	All selected firms*	Software	Portal
1997 turnover	1.00	1.26	0.74
1998 expected turnover	*3.00*	*5.17*	*1.24*
Sales growth	*200%*	*310%*	*68%*
Current employees (rounded)	17	24	11
Growth in employees/ year	77%	103%	61%

(* Due to the fact that many firms were founded in 1997 or 1998, only 18 respondents gave turnover figures for 1997. For 1998 expected turnover, 28 firms responded.)

8. Estimated total start-up capital required by the selected internet firms to reach break-even ranged between DM 14,000 and DM 12,500,000. The average start-up capital required by a software firm was DM 2.8 million and for a portal site DM 1.3 million. These requirements seemed low compared to those of US internet firms and reflected the greater reliance in Germany on business models with early profit expectations.

Table 11. Start-up capital required by selected internet firms in DM.*

Mean	2.171.172
Median	1.000.000
Maximum	12.500.000
Minimum	14.000
Standard deviation (sample)	2.826.348

(* n=29, one firm did not respond to this question.)

On average, the selected firms estimated months to break-even as 21 months. The median was quite close to this figure, 19. Minimum was 6 months, maximum 42 months.

Table 12. Mean start-up capital required in DM millions and months to break-even by internet firm type.

	Start-up capital	Months to break-even
Software	2.8	24
Portal	1.3	19

9. Because portal sites, electronic commerce start-ups and business-to-business exchanges offered their services over the internet, their hardware and software as well as telecommunication and provider costs were substantial. Telecommunication and provider costs of internet software start-ups were much lower because they still sold software as a shrink-wrapped product and generally only conducted market research and software support over the internet.

Table 13. Mean distribution of costs.

	All selected firms	Software	Portal
Employees	52%	57%	47%
Hard- and software	15%	12%	19%
Telecommunication and provider	11%	7%	15%
Marketing, PR and advertising	17%	19%	15%
Other	5%	6%	3%
	100%	100%	100%

10. tbg financed companies were internationally more active than the average selected software company but about equally active to portal sites. However, these figures have been influenced by the fact that high international sales were achieved by a small number of very active companies. Most start-ups in Germany were not internationally active.

Table 14. Geographic distribution of sales in %.

	All selected firms	Software	Portal	tbg financed companies
Germany	79%	90%	66%	67%

Rest of Europe	12%	5%	20%	24%
Rest of world	9%	5%	15%	9%
	100%	100%	100%	100%

The median for all selected firms was 90% sales in Germany, 10% total foreign sales. 11 of the selected firms, however, had a significant proportion of total foreign sales, between 30% and 90%.

Table 15. Number of firms with given percentage of foreign sales.

% foreign sales	Frequency	%
90-100%	2	7%
80-89%	0	0%
70-79%	0	0%
60-69%	1	3%
50-59%	1	3%
40-49%	3	10%
30-39%	4	13%
20-29%	2	7%
10-19%	5	17%
0-9%	12	40%
	30	100%

11. Software as well as portal sites, electronic commerce start-ups and business-to-business exchanges all concentrated mainly on the US market for future expansion. Aside from this US focus, however, portal firms were geographically more diversified and were interested also in the Asian market.

Table 16. Importance of different international markets. Percentage of firms in group that answered affirmatively.

	Software	Portal
"The USA is an important market."	85%	79%
"An office in the USA is necessary."	54%	50%
"Eastern Europe is an important market."	38%	50%
"Asia is an important market."	54%	71%

12. On average, a large proportion of sales by both software as well as portal sites was derived from project-by-project work. Software start-ups were especially dependent on project-by-project income. About one fourth of all selected firms were "hybrid" companies generating revenue through both

significant project sales as well as significant product work. Only about 40% of the selected firms were "pure play" firms focused on generating sales mostly from products or scalable offerings.

Table 17. Break-up of revenue sources from project work or products by internet firm type.

	Software	Portal	tbg financed
Project-by-project	62%	43%	30%
Product, scalable offerings	38%	57%	70%

Table 18. Proportion of start-ups generating most of their sales from project work or product sales.

	All firms	% of total	tbg financed
Mostly project-by-project*	10	35%	0
Mostly product, scalable offerings ("pure play")	12	41%	3
"Hybrids"	7	24%	1
	29	100%	4

(* "Mostly project-by-project" was defined as project revenues of 75% or above, "Mostly product, scalable offerings" as product or scalable service sales of 75% or above. The two consumer start-ups were included in this latter category. One firm did not respond to this question.)

13. The thirty selected firms together had 134 job openings. Especially German software start-ups were working significantly under capacity.

Table 19. Firms are currently at % working capacity.

	All selected firms	Software	Portal
Mean	81%	78%	86%

14. Most German internet firms had two active managing directors who were also the founders of the firm. There still were a significant number of start-ups with a single founding manager.

Table 20. Number of active founding managers.

Number of active managers	Frequency in sample	% of total
1	10	33%
2	14	47%
3	5	17%

4	1	3%
5	0	0%
	30	100%

The average number of active founding managers was 1.90 over all firms, 2.00 for software start-ups and 1.86 for portal start-ups.

These results can be compared to those of the Stanford Project on Emerging Companies (SPEC). In 1996, 160 start-ups of the Bay Area were examined. The most common number of founders also was two, but there were firms with three, four, five, six, seven, nine and twelve founders. The mean was therefore higher: 2.81 (http://www-gsb.stanford.edu/research/programs/SPEC/).

15. Founding managers of internet portal sites and electronic commerce start-ups generally had encountered commercial online networks earlier than their counterparts at software start-ups. One reason may have been the slightly higher average age of service founding managers.

Table 21. When did managing directors first encounter commercial value-added networks? Number of affirmative indications. Multiple answers possible.

	All selected firms	Software	Portal
1977-90 BTX	8	2	6
1991-94 On-line services	19	9	9
1995- Internet	9	5	2

The mean age of all managing founders was 33 at the founding of their firm. The founding managers of software start-ups were on the average 31 at the founding of their firm, portal entrepreneurs were 34.

16. Most founding managers of the selected internet firms completed a university program. The number of founding managers who studied in a computer science related program was matched by those who elected a business related program.

Table 22. Types of university or vocational college courses completed by founding managers.

	All firms	Software	Portal
Business courses	19	11	7
Computer courses	15	10	5
Other courses	12	2	7

Table 23. Other career experiences listed by managing founders.

	All firms	Software	Portal
Uncompleted university/ vocational college	4	4	0
Programming experience	15	8	6
Started a company before	12	6	4
Employee at SME	15	7	7
Employee at MNE	14	5	9
Self-employment	19	8	10

17. Those founding managers who recommend a public funding program were matched almost exactly by those who advise against all programs. DtA, KfW and state (Land) programs were in equally high regard by those who recommended public funding.

Table 24. Number of entries from selected firms, which recommended public funding in Germany.

	All selected firms
Can recommend	13
Cannot recommend	12
No comment	5

Table 25. Recommended public funding programs.

	All selected firms*
DtA tbg	5
DtA Existenzgründer	1
KfW	5
State#	5

(* Multiple selections of different programs possible.)
(# Named were: Land Baden-Württemberg, MFG Medien- und Filmges. Baden Württemberg, Sächsische Entwicklungsges. für Telematik mbH, Mittelstandsförderung Sachsen and Bayern Kapital.)

18. The German multimedia law (IuKDG) of 1997 did not seem very relevant to German internet firms at the time, but the deregulation of the telecommunications market did.

Table 26. Number of affirmative responses to the question whether the given issue affects the firm today.

	All selected firms
"Is the IuKDG relevant to your business today?"	53%
"Is the deregulation of telecommunications relevant to your business today?"	70%
"Are German provisions regarding data security relevant to your business today?"	60%

19. The managing founders of 77% of all selected firms believed the internet required international laws and controls, especially laws relating to digital signatures and encryption.

Table 27. Demand for international laws and controls regulating the internet. Percentage of all selected firms.*

	All firms	Software	Portal
Value added tax	20%	15%	29%
Copyrights	57%	46%	64%
Trust centers for digital signatures and encryption	63%	62%	71%
Political or social undesirable content	0%	0%	0%

(* Multiple selections possible, this is why the percentages did not add up to 77%. 77% was the proportion of all firms that believed international laws were necessary. The percentages should be read in the following way: 20% of all firms in the selected group indicated that value added tax regulation was necessary. NOT: 20% of the 77% who believed laws were necessary.)

20. The objective of most selected German internet firms was rapid growth and most of these firms believed this objective could only be achieved with venture capital and a later IPO. Portal sites, electronic commerce start-ups and business-to-business exchanges were, however, less inclined towards venture capital than software start-ups.

Table 28. Percentage of affirmative answers on questions regarding growth objective and financing.

	All selected firms	Software	Portal
Is rapid growth your objective?	87%	92%	86%
If so, do you believe rapid growth can only be achieved with venture capital and a possible later IPO?*	73%	83%	67%
Do you think your financing options have improved through the launch of the Neue Markt at	79%	85%	79%

the German Stock Exchange and the better access of venture capital in Germany?			

(*Only firms that answered the previous question affirmatively.)

21. German internet start-ups were generally involved in strategic partnerships with other small- and medium-sized enterprises (SMEs) and those with business clients generated most of their income from SMEs as well.

Table 29. Break-up of revenue sources by client firm type (consumer firms did not answer this question).

	All selected firms	Software	Portal
Multinational enterprise (MNE) clients	29%	29%	24%
Small- and medium-sized (SME) clients	71%	71%	76%
Total	100%	100%	100%

Whereas the mean break-up between MNE and SME clients was 29%/71%, the median break-up was 20%/80%.

Of the 30 selected firms , there were five with no MNE sales and one with no SME sales. 18 firms were relatively independent of MNE sales, with a proportion of MNE sales from 0% to 30%. Only three generated substantial sales proportions from MNEs, between 70%-100%. Seven firms generated significant sales to MNEs, between 31% to 69%.

Table 30. Percentage of affirmative answers on questions regarding partnerships.

	All selected firms	Software	Portal
Are you in a strategic partnership with a large firm/ MNE?	50%	69%	43%
Are you in a strategic partnership with SMEs?	83%	85%	79%

22. American software companies involved in the internet business were the most popular MNE partners of German internet start-ups, followed by Deutsche Telekom and Siemens Nixdorf.

Table 31. Existing strategic alliances with major corporations.

	All selected firms
Deutsche Telekom	3
Siemens Nixdorf Informationssysteme	3
SAP	1
A German universal bank (Bayerische Hypo- und Vereinsbank,	2

Commerzbank, Deutsche Bank, Dresdner Bank)	
German public TV station (ARD, ZDF)	1
German private TV station (RTL, SAT1, PRO7)	1
Java/ NC alliance (SUN, Netscape, Oracle)	4
Microsoft	5
Others	7

23. Distribution partnerships were the most frequent type of partnership for software start-ups. Portal sites, electronic commerce start-ups and business-to-business exchanges were not as active in partnering, some engaged in distribution, marketing and technology partnerships.

Table 32. Likelihood of selecting a given partnership

	All firms	Web developers	All selected firms	Software	Portals
Distribution	46%	42%	46%	61%	34%
Marketing	46%	49%	40%	43%	38%
Consulting	25%	32%	13%	17%	10%
Technology	54%	63%	42%	48%	38%
Outsourcing	13%	14%	8%	9%	7%
Financial	12%	9%	12%	22%	3%
Product development	28%	30%	23%	26%	21%
Other	22%	26%	17%	13%	21%

24. Among the sample of 123 firms, the greatest likelihood for an internet firm's location was southern Bavaria (postal codes 80000-89999). The most important cluster for international activity was the greater Munich area (postal codes 80000-83999 and 85000 to 85999). When firms with above average international activity were isolated, one fifth of these were located in the greater Munich area.

Table 33. Frequency of firms with given postal code.

Postal code	Sample cities in area	All selected firms	All firms (% of total)	Above average international activity index*	Above average int. activity index (%)
0-9999	Halle, Leipzig, Dresden	3	2%	1	4%
10000-19999	Berlin, Schwerin, Rostock	7	6%	1	4%
20000-29999	Hamburg, Bremen, Lübeck	17	14%	3	11%
30000-39999	Hannover, Kassel, Fulda	11	9%	4	14%
40000-49999	Düsseldorf, Essen, Osnabrück	14	11%	1	4%

50000-59999	Mainz, Bonn, Köln	11	9%	3	11%
60000-69999	Frankfurt am Main, Wiesbaden, Heidelberg	18	15%	0	0%
70000-79999	Stuttgart, Karlsruhe, Konstanz	14	11%	5	18%
80000-89999#	Munich, Ingolstadt, Ulm	21	17%	7	25%
90000-99999	Passau, Würzburg, Erfurt	7	6%	3	11%

(* The mean of a firm's percentage international partnerships and clients/ consumers. If this mean was above 13% the firm was considered an internationally active firm. 13% was the mean of all firms where n=123.)

(# 17 firms were located in the greater Munich area, carrying the postal coses 80000-83999 and 85000-85999. The area formed a triangle with the vertices at Garmisch-Patenkirchen, Rosenheim and Ingolstadt. 17 companies corresponded to 14% of the total. 6 scored above average on the international activity index. This meant that 21% of the firms with above avererage international activity were located in the greater Munich area.)

(The 14 venture capital-supported firms were found in 12 different cities. The only city that occured more than once was Munich. Four VC-supported firms were located in greater Munich area. Thus, about one fourth of all VC-supported firms were located in the Munich area.).

30 selected German internet start-ups

Table 34. Software start-ups

#	Name	Year	Employees	City	Product/ service description	Partners/ clients
ECommerce systems						
1.	Shopmaker GmbH Deutschland Electronic Commerce Solutions http://www.shopmaker.de	97	23	Limburg	Software for internet-shops. Interfaced with SAP, Sage KAK, Oracle. SQL database system.	GEN (US Telecom.), GEFM (Deutsche Bank subsidiary), Schöpflin (fashion direct retailer), Sage KAK, SAP
2.	USWeb InnoMate http://www.in	94	25	Düsseldorf	Internet integrator with modular solutions for internet shopping and product databases.	Deutsche Telekom, Oracle, IBM,

	nomate.de					Compuserve
Publishing solutions						
3.	Hyperwave http://www.hyperwave.com	97	39	Munich	Web-based knowledge management/ intranet development platform which combined web document and web content managment into an integrated and scalable system.	Motorola, Siemens, Lufthansa, Deutsche Bank
4.	Systembureau GmbH http://www.systemfabrik.de	96	14	Düsseldorf	Publishing system for internet and intranets.	Bauboden Bank
5.	HFR Heiden Fuellenbach Realisationen http://www.hfr.de	94	12	Düsseldorf	Project management and software solutions for cross-media-publishing and marketing needs. Combined internet, CD-Rom and print product catalogues. Close developmental partnership with Munich-based software company.	AIWA Deutschland GmbH, 3M/ Imation, various German publishers
6.	2CK http://www.2ck.com	94	35	Munich	Publishing system for use in intranets.	
7.	SAC ProMedia http://sac.promedia.de	96	7	Regensburg	Cross-media publishing system. CD-ROMs in internet-standard which could be updated.	
EBusiness software (Business processes)						
8.	Coin Corporate Interactive AG http://www.coin.de	97	23	Hannover	Internet-based system for workflow. Software solutions avaliable for publishers, insurance firms and other service corporations.	Hannoverische Lebensversicherung
9.	Eway http://www.eway.de	96	5	Melle	Web-based applications for the sales force. Web-based calendar.	
10.	ONEstone http://www.onestone.de	95	70	Paderborn	Workflow systems integrated with the groupware platforms LotusNotes and MS-Exchange.	CSC Ploenzke, GIS Langhagen, Dialog Switzerland
11.	i-net software http://www.inetsoftware.de	96	13	Berlin	Software for running a computer help desk over an intranet.	Microsoft, GSW Berlin (Gemeinnützige

						Wohnungs bauges.)
Financial software/ encryption						
12.	NetLife http://www.netlife.de	96	51	Hamburg	On-line banking and ECommerce solutions (SET). Subsidiary in Singapore, sales offices in New York and Vienna.	Drei-Banken-EDV Austria, Postbank AG, dvg Hannover (large German IT supplier)
EBusiness (Communication)						
13.	MSG Media Service http://www.media-service.group.com	97	10	Oldenburg	Developed a virtual web-based office for 'mobile professionals' called www.smartmessage.de. Another product was IntraSoft, an email workflow system for corporate feedback management. In addition, carried out project-based implementation services.	EWE (local electricity provider), Milagros USA, Hong Kong (Textiles and glasses), mezzo.net, Spain

Table 35. Portal sites and electronic commerce start-ups

#	Name	Year	Employees	City	Product/ service description	Partners/ clients
Sale of products ("e-tailers" and business-to-business procurement specialists)						
1.	Friedrich Ingredients http://gewuerz.de and http://www.ingredients.de	98	4	Konstanz	Sale of food ingredients over the web. Managing founder had long export experience. Targeted Asia, South America and Eastern Europe.	
Content						
2.	Localglobal http://localglobal.de	97	17	Stuttgart	Web-based content for SME exporters. Vitual trade fairs, calendar, articles. Editors based in Milano, Beijing and Poznan.	Deutsche Messe AG
3.	PropackExpo GmbH http://www.propackexpo.de	97	3	Karlsruhe	A virtual trade fair including products, manufacturers, news and developments in the fields of processing and packaging technologies. Target group were the pharmaceutical, chemical, food and cosmetics industries.	Tellux GmbH
4.	OSM GmbH	97	4	Gleichen	Compiled consumer information which	Horizont,

	http://www.onlinetest.de				could be sold to portal sites. Database technology centrally held information separate from the layout, which could be adjusted to the hosting site. Content on computer products and software was sold to 51 German language sites.	Chip, T-Online, Hoppenstedt, Wer liefert Was?, Weka Verlag, Bertelsmann
Hotel, travel						
5.	Serenata http://www.serenata.de	96	10	Munich	Online reservation service for hotels that included software 'middleware' to link different front desk systems.	Hilton, Hyatt, Sheraton, Steigenberger, Intercontinental and others.
6.	Tiss http://www.tiss.com	95	3	Heilbronn	Internet-based flight ticket service run through an international network of independent travel agencies.	Travelocity, unnamed German media corporation
Extranet services/ EDI/ B2B Exchanges						
7.	BPS http://www.bps.de	97	12	Karlsruhe	Ran a business-to-business (B2B) procurement platform for the fashion industry that linked producers with retailers in Germany and Europe.	Lee Cooper (UK jeans manufacturer), 14 German SMEs in the textile industry
8.	Virtualheaven http://undercover.virtualheaven.de:8080	97	9	Cologne	Extranet for SME publishers. On the system, international licensing offers could be announced to members.	
9.	n:media http://www.nmedia.de	98	15	Düsseldorf	B2B exchange linking manufacturers of PR articles and retailers using hybrid CD-ROM technologies. European focus with more than 50% foreign customers and a planned office in London.	
Entertainment, games						
10.	NxN http://www.nxn.net	97	9	Munich	Tools software to design computer games. The software allowed the design process to take place in a distributed environment by using the internet. The firm also hosted tool environments for game developers.	Unnamed major games and multimedia companies

11.	Entertaining Interactive Productions (EIP) http://www.eip.de	97	18	Altenholz	Produced on-line and off-line entertainment applications. Launched a popular German lottery service on the internet (http.//www.jaxx.de/).	SAT.1 TV
Community/ Chat						
12.	Medium.net http://www.medium.net	98	2	Leipzig	Modular software for communities on the internet. Chat software was already being sold and a popular chat site was being hosted. Managing founders were 16 and 17 years old.	UNICUM (Internet-service for students), AIESEC, Wirtschaftsmesse Wien, Radio Bremen
13.	21TORR http://21torr.com	94	36	Reutlingen	Ran a German-language internet community with more than 140.000 participants. Users averaged 60 minutes per session. Banner advertising was avoided as a revenue stream, instead, companies could host events, promotions and chat channels. Managing founders called this approach "soft sponsoring." Expansion into Austria and Switzerland was planned. Partnership in France.	Levi's, ZDF, Havas, Hewlett-Packard
Brokers						
14.	Up2Day Telekommunikation http://www.kostenlos.de	96	14	Duisburg	Hosted one of the most popular German-language classifieds service offers. Currently was developing a pay-for-view and search system for a major German publisher.	Unnamed major German publisher

Table 36. Others

#	Name	Year	Employees	City	Product/ service description	Partners/ clients
New media agencies						
1.	FORK Unstable Media http://www.fork.de	96	12	Hamburg	New media agency with two American and one German managing founders. Planned expansion to New York.	Beiersdorf, B&D Verlag, Kabel New Media
Consultants, training						
2.	InnoVatio Verlags AG/ Netz-	97	8	Leipzig	Carried out on-line research for clients. Included regular reports as well as programmed alert mechanisms. Co-	Hoechst, Mercedes-Benz,

	Informations-Analyse http://www.netz-analysen.de				operations being formed with Ostavia, Berne, Dover and Vancouver.	Nestlé
Hardware for access						
3.	Tixi.com http://Tixi.com	96	20	Berlin	Development of the Tixi-box, which was an autonomous modem-device that was able to receive emails from the provider and store them without the computer being on. Targets were SMEs that needed to answer email requests but did not want to invest in an expensive router infrastructure.	


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globalstartup: Auf der Suche nach den 100 innovativsten Internet-Unternehmen in Deutschland

Einleitung

globalstartup ist der Name einer Studie, die in Zusammenarbeit mit der London School of Economics (LSE) und dem manager magazin durchgeführt wird. Ziel ist es, junge Unternehmen in Deutschland zu identifizieren, die Produkte und Dienstleistungen rund um das Internet entwickeln und deren Geschäftsmodell und Strategie nicht an nationalen Grenzen halt macht.

Wer sind diese Startups? Worauf spezialisieren sie sich? Wieviele Mitarbeiter beschäftigen sie? Wie sind sie organisiert? Welche Wachstumsperspektiven haben sie? Wie international ist ihr Geschäft? Wie finanzieren sie sich? Woher kommen die Gründer? Wohin wollen sie? Und welche Hürden müssen sie im Unternehmensalltag überwinden?

Um diese und andere Fragen, vor allem in qualitativer Hinsicht, geht es in der Untersuchung, die für das Frühjahr 1998 geplant ist. Um die noch junge Branche möglichst exakt beschreiben zu können, sind Besuche bei den Unternehmen und Interviews mit den Gründern und Geschäftsführern vorgesehen.

Veröffentlichung im manager magazin

Nach Abschluß der Erhebung stehen die Untersuchungsergebnisse dem manager magazin zur Verfügung, das als Medienpartner einen Bericht über Fallbeispiele erfolgreicher Geschäftsmodelle veröffentlicht. Voraussichtlicher Erscheinungstermin ist Sommer 1998.

Auf Wunsch werden die Angaben selbstverständlich auch anonym behandelt.

Teilnahmebedingungen und Formblatt

Teilnehmen können alle Unternehmen, die...

- ihren Hauptsitz in Deutschland haben,
- in den vergangenen zwei Jahren gegründet wurden (bzw. in den letzten zwei Jahren ihre Geschäftsaktivitäten neu ausgerichtet haben) oder unter 50 Mitarbeiter haben,

- international ausgerichtet sind und global denken,
- Produkte oder Dienstleistungen mit direktem Bezug zum Internet oder anderen netzwerkbasierten Mehrwertdiensten anbieten (z.B. Internetsoftware, Inhalte- und Informationsanbieter, Online-Handel).

Falls Ihr Unternehmen diese Bedingungen erfüllt, nehmen Sie sich bitte ein paar Minuten Zeit, um dieses www-Formblatt auszufüllen. Nur so können wir Sie in die Auswahl der 100 deutschen Global Startups aufnehmen. Die Anmeldefrist endet am 15.03.1998.

Vorgehensweise

Nach Absenden des www-Formblattes sind Sie bei uns als Teilnehmer registiert. Ende März rufen wir Sie ggf. an, um einen kurzen Gesprächstermin zu vereinbaren. Es entstehen keine Verpflichtungen; das Interview findet selbstverständlich nur statt, falls Sie Zeit und Lust haben. Das Gespräch dient dazu, mehr über Ihr Unternehmen und Ihre Internet-Strategie zu erfahren.

Die Ergebnisse der Gespräche werden in Zusammenarbeit mit dem zuständigen Redaktuer von manager magazin ausgewertet. Voraussichtlicher Erscheinungstermin vom mm-Report zum Thema ist Sommer 1998.

Bei Fragen können Sie sich an den Projektleiter der Studie wenden:

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Hintergrund

Die Studie ist Teil des globalstartup-Projektes an der London School of Economics. Dieses langjährige Forschungsprojekt untersucht die wirtschaftlichen, technologischen und politischen Rahmenbedingungen für Unternehmensgründungen in verschiedenen europäischen Ländern. Kleine Unternehmen stehen im Zentrum des Vorhabens, weil sie heute durch das Internet schneller und leichter global präsent sein können als je zuvor.

Niko Waesche ist Research Scholar (Doktorand) an der London School of Economics im Fachgebiet International Political Economy/ International Relations. Vor dieser Tätigkeit arbeitete der Werbekaufmann an Internet, Intranet und Extranet Projekten bei Hoechst International Services GmbH (HiServ), Frankfurt am Main, sowie der Privatbank Sal. Oppenheim jr. & Cie., Köln. Er berät außerdem die Frankfurter Design-Agentur surface Weisbeck Glauninger Vitt GmbH.

Rechtliche Aspekte

- Bei der Studie handelt es sich um ein wissenschaftliches Forschungsprojekt im Rahmen einer Dissertation an der London School of Economics and Political Science (International Relations Department- International Political Economy).
- Aus der Teilnahme leiten sich keinerlei Ansprüche gegen den Leiter (Niko Waesche) oder den Medienpartner (manager magazin) ab.
- Die Studienergebnisse werden nach Auswertung exklusiv dem manager magazin zur Verfügung gestellt.

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Global Startup: Teilnahmeformular

Falls Ihr Unternehmen an der Studie teilnehmen soll, füllen Sie bitte dieses Formular aus und senden Sie es ab. Sie werden dann vom Projektleiter innerhalb von drei Arbeitstagen per Email kontaktiert. Vielen Dank für Ihren Zeitaufwand!

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Gründungsjahr	1998 ▼
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Anzahl freie Mitarbeiter (Inland)	
Anzahl Mitarbeiter im Ausland	
Produkttypen/ Software (Keine, eine oder mehrere Optionen möglich.)	☐ connectivity - Internet/ Mobiltelefon
	☐ connectivity - Internet/ sonstige Telekommunikation
	☐ connectivity - Internet/ TV
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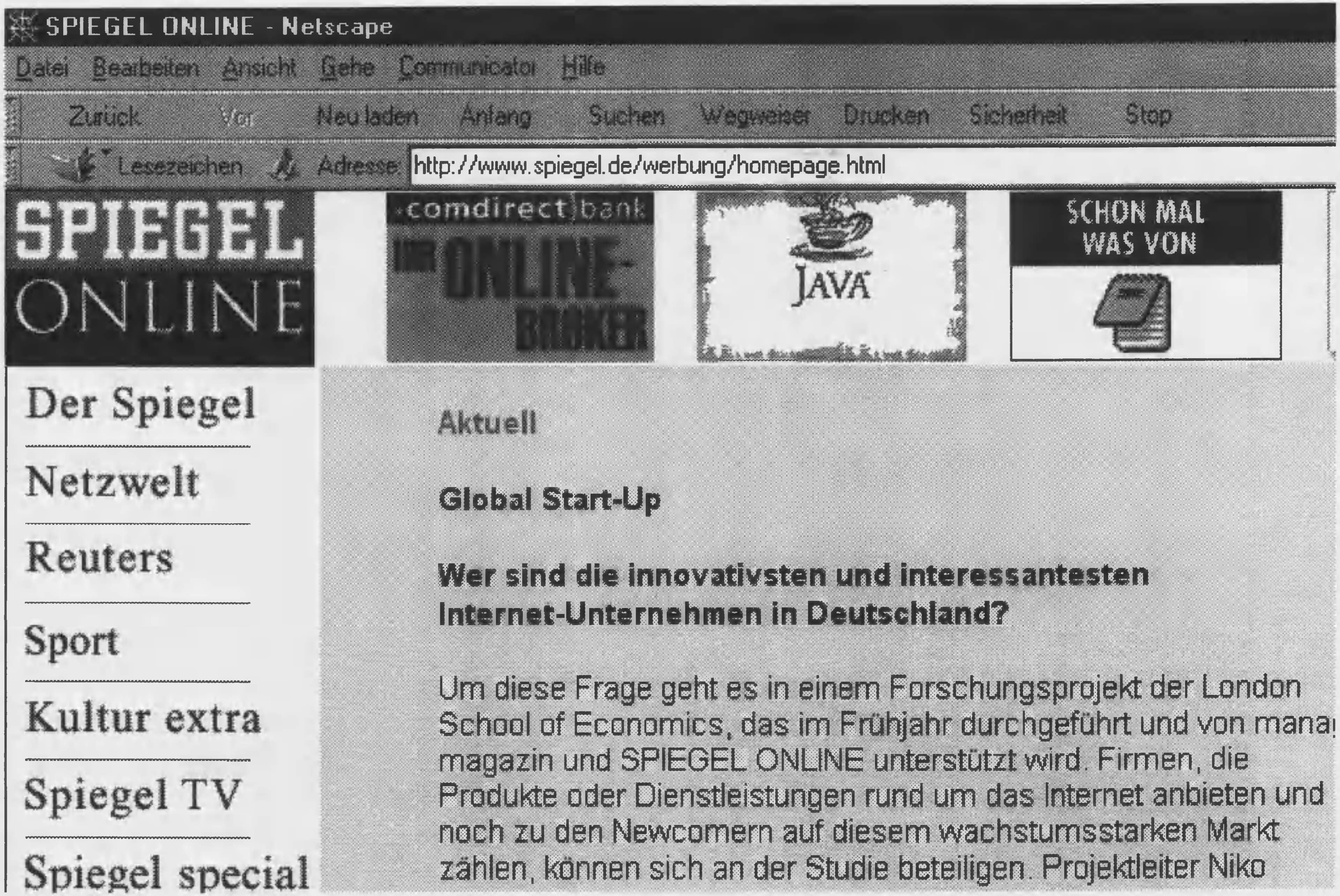
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Wer sind die innovativsten und interessantesten Internet-Unternehmen in Deutschland?
Um diese Frage geht es in einem Forschungsprojekt der London School of Economics, das im Frühjahr durchgeführt und von mana
magazin und SPIEGEL ONLINE unterstützt wird. Firmen, die Produkte oder Dienstleistungen rund um das Internet anbieten und noch zu den Newcomern auf diesem wachstumsstarken Markt zählen, können sich an der Studie beteiligen. Projektleiter Niko

Appendix B: Interviews

Interviews with representatives of private enterprises

1&1 Internet GmbH (Eigendorfer Straße 57, 56410 Montabaur)
20.03.98, 11:00-12:00
CeBIT, Hannover, Halle 6
With Anastasia Antoniadou, Dipl.-Betriebswirt (FH).

1&1 Multimedia Service GmbH (Multimedia-Internet-Park, Gebäude 71, 66482 Zweibrücken)
20.03.98, 12:00-12:30
CeBIT, Hannover, Halle 6
With Frank Ufer, Consultant.

2CK Gesellschaft für DV-Dienstleistungen mbH (Kirchtruderinger Straße 22, 81829 München)
21.03.98, 13:00-14:00
CeBIT, Hannover, Tagungscentrum Messe (TCM)
With Christian Koch, Dipl.-Infom. (FH), Managing Director, and Christoph Köberle, Dipl.-Infom. (FH), Managing Director.

21Torr (Christophstraße 31, 72760 Reutlingen)
19.03.98, 16:00-17:00
Halle 1, CeBIT, Hannover
With Martin Cserba, Managing Director, Marketing and Sales.

Atlas Venture
16.07.97, 09:00-10:30
Office of Atlas Venture, Steinstraße 70, 81667 München
With Ingo Johannsen, Partner.

Blome + Partner Managementberatung für Vertrieb + EDV (Werner-von-Siemens-Straße 19, 49124 Georgsmarienhütte)
20.03.98, 14:00-15:00
Tagungscentrum Messe (TCM), CeBIT, Hannover
With Frank F. Blome, Managing Director.

BPS Online-Bestellsysteme GmbH (Greschbachstraße 3B, 76229 Karlsruhe)
23.03.98, 13:00-14:00
CeBIT, Hannover, Halle 1
With Diana Schulirsch, Dipl.-Wi.-Ingenieur, Project Head, Member of Management.

Brokat Informationssysteme GmbH (Industriestraße 3, 70565 Stuttgart)
22.03.98, 17:00-18:00
CeBIT, Halle 18, Hannover
With Dr. Boris Anderer, Managing Partner.

Callisto Germany.net GmbH (Stresemannallee 30, 60586 Frankfurt am Main)
13.07.99, 11:00-12:00
Interview in company offices
With Stefan Kühler, Presse- und Öffentlichkeitsarbeit

COIN Corporate Interactive AG (Göttinger Chaussee 115, 30459 Hannover)
23.03.98, 12:00-13:00
CeBIT, Hannover, Halle 1
With Arvin Arora, Executive Board and Hartmut Poppinga, Head of Marketing.

DeTeCSM (Pfnorstraße 1, 64293 Darmstadt)
09.07.99, 12:00-14:30
Interview in company offices
With Dr. Hartmut Wittig, Dir. Corp. Strategy

ESD Information Technology Entwicklungs GmbH (Ringstraße 33, 04430 Dölzig/ Leipzig)
12.04.98, 10:00-11:15
At London Office, 35A Smith Street, London SW3 4EP
With Rembert von Meysenbug, Head Multimedia Division (based in Leipzig), and Nicolas J. Ziegler, Representative UK.

GFT Informationssysteme Gmbh & Co. KG (Leopoldstraße 1, 78112 St. Georgen)
19.03.98, 13:00-14:00
CeBIT, Hannover, Halle 3
Gespräch mit Ulrich Dietz, Dipl.-Ing. (FH) Managing Partner.

Hyperwave Information Management GmbH (Stefan-George-Ring 19, 81929 München)
21.03.98, 10:00-11:00
CeBIT, Hannover, Halle 6
With Georg Thamer, Head of Sales and Marketing.

i-net Software GmbH (Friedrichstraße 231, 10969 Berlin)
24.03.98, 11:00-12:00
CeBIT, Hannover, Halle 2
With Torsten Klose, Dipl.-Ing., Managing Director.

iNETiative Venture Capital Neue Medien GmbH & Co. KG
16.03.98, 12:00-13.30
Office of iNETiative, Kaistraße 14, 40221 Düsseldorf
With Mirko Jovanovski, Investment Manager, iNETiative, Niklas Mahrdt, iNETiative and Oliver Gardey, Smedvig Capital, London.

iNETiative Venture Capital Neue Medien GmbH & Co. KG
16.04.98, 17:15-19.30
Office of iNETiative, Kaistraße 14, 40221 Düsseldorf
With Mirko Jovanovski, Investment Manager, and Niklas Mahrdt.

Intershop Communications
20.02.98, 18:30- 19:50
Office of Intershop Communications (UK) Ltd., Hygeia Building, 66 College Road, Harrow, Middlesex, HA1 1FD
With Wilfried Beeck, Managing Director Europe and Nicole Fischer, Director of Strategic Alliances, Europe (both based in Hamburg).

iXOS Software AG (Technopark Neukeferloh, Bretonischer Ring 12, 85630 Grasbrun/ München)
19.03.98, 11:00-12:00
CeBIT, Hannover, Halle 2
With Eberhard Färber, Dipl.-Kfm., Speaker of the Executive Board.

Lars Heiden Jörg Füllenbach Realisationen (HFR)
04.03.98, 18:00-19:30
Office of HFR, Gerresheimer Straße 22-24, 40211 Düsseldorf
With Lars Heiden and Jörg Füllenbach, Founding Managers.

living systems AG (Roggenbachstrasse 1, 78050 VS-Villingen)
18.04.99, 20:00-20:30
Interview in Queen's Arms pub, Queen's Gate Mews, London SW7
With Kurt Kammerer, Vorstand Consulting

local global, Magazin für Außenwirtschaft (Rotebühlstraße 154, 70197 Stuttgart)
19.03.98, 14:00 -15:00
TCM (Tagungszentrum Messe), CeBIT, Hannover
With Hans Gäng, Publisher.

Lucent Technologies Business Communications Systems & Microelectronics GmbH (Bramfelder Straße 121, 22305 Hamburg)
Lucent Technologies Network Systems GmbH (In der Raste 26, 53129 Bonn)
24.03.98, 14:00-15:00
CeBIT, Hannover, Halle 16
With Michael Grün, Manager Business Management, Business Communications Systems (based in Hamburg) and Harald Kettenbach, Public Relations Manager, Corporate Communications (based in Bonn).

Medium.net (Dinterstraße 13, 04157 Leipzig)
22.03.98, 13:00-14:00
CeBIT, Hannover, Halle 22
With Xuân Baldauf und David Uhlmann, Founders.

Microsoft GmbH (Edisonstraße 1, 85716 Unterschleißheim)
24.03.98, 10:00-11:00
CeBIT, Hannover, Halle 2
With Thomas Baumgärtner, Press Liason Internet& Tools.

MobilCom Aktiengesellschaft (Postfach 520, 24753 Rendsburg – Büdelsdorf)
13.09.99, 09:00-09:20
Telephone interview
With Stefan Arlt, Press Speaker

Nacamar Data Communications GmbH (Robert-Bosch-Straße 32, 63303 Dreieich)
12.07.99, 10:00-11:00
Interview in company offices
With Michael Wirsik, Marketing Manager

Netlife Internet Consulting und Software GmbH (Elbberg 1, 22767 Hamburg)
23.03.98, 14:30-15:00
CeBIT, Hannover, Halle 18
With Claus Müller, Managing Partner.

Netlife Internet Consulting und Software GmbH (Elbberg 1, 22767 Hamburg)
23.03.98, 14:00-14:30
CeBIT, Hannover, Halle 18
With Andreas Schlichtmann, Head of Marketing.

NETCOLOGNE Gesellschaft für Telekommunikation mbH (Maarwegcenter, Maarweg 163, 50825 Köln Braunsfeld)
30.04.99, 09:00-09:30
Telephone interview London – Cologne
With Werner Hanf, Managing Director

NetPartners Venture Capital, Milano
14.04.98, 17:45-18:15
Telephone London/ Milano
With Michelle Appendino, Managing Partner.

ONEstone Information Technologies GmbH (Riemekestraße 160, 33106 Paderborn)
24.03.98, 12:00-13:00
CeBIT, Hannover, Halle 2
With Oliver Heinz, Managing Director.

Online Marketing und Vertriebs GmbH (Im Dörmke 8, 37130 Gleichen/ Klein Lengden)
20.03.98, 15:00-16:00
CeBIT, Hannover, Halle 6
With Hartmut Stöpler, Managing Director.

ShopMaker GmbH Landesvertretung Deutschland (Justus-Staudt-Straße 2, D 65555 Limburg)
19.03.98, 09:30-10:30
CeBIT, Hannover, Halle 6
With Dr. rer. oec. Luigi Carlo De Micco, Founding Manager.

Tixi.Com GmbH (Karmeliter Weg 114, 13465 Berlin Frohnau)
23.03.98, 9:15-10:00
CeBIT, Hannover, Halle 6
With Simon Verdenhalven, Sales & Marketing.

TPS Labs AG (Balanstraße 49, 81541 München)
27.02.98, 09:00- 10:30
Regents Park Marriot, 128 King Henry's Road, NW3 3ST
With Michael Wenglein, Sales & Marketing Analyst and Marc Philipp Gösswein, Sales & Marketing Analyst (both based in Munich).

TVM Techno Venture Management GmbH & Co. KG
16.07.97, 15:00-16:00
Office of TVM Techno Venture Management, Tölzer Straße 12A, 82031 Grünwald
With Peter Kaleschke, Managing Partner.

USWeb InnoMate
16.06.98, 10:00-12:00
Office of USWeb InnoMate, Hallbergstraße 28, 40239 Düsseldorf
With Oliver Höck, Managing Director, Birgit Merz, Marketing, and Jochen Rieker, Redakteur, Manager Magazin.

USWeb InnoMate (Hallbergstraße 28, 40239 Düsseldorf)
24.03.98, 13:00-14:00
CeBIT, Hannover, Halle 18
With Kai Petersen, Dipl.-Informatiker, Managing Director.

Verteilte Systeme, Universität Stuttgart, Institut für Parallele und Verteilte Hochleistungsrechner (IPVR) (Breitwiesenstraße 20-22, 750565 Stuttgart)
20.03.98, 13:00-14:00
CeBIT Hannover, Halle 22
With Dipl.-Inform. Hartmut Benz.

Webplanet Corporation (Ostring 7e, 85630 Grasbrun)
23.03.98, 18:00-19:00
CeBIT, Hannover, Tagungscentrum Messe (TCM)
With Dieter E. Hesse, CEO & President.

Interviews with parliamentarians, their staff, government officials and representatives of private/ public institutions

Georg M. Bröhl, Ministerialrat, Medienrecht
Dr. Alexander Tettenborn, Oberregierungsrat, Medienrecht
Anton-Josef Cremer, Referent, Medienrecht
10.05.99, 15:00-15:50
Bundesministerium für Wirtschaft und Technologie, Haus VI, Villemombler Straße 76, 53123 Bonn

Dr. Manuel Kiper, former MdB (Bündnis 90/ Die Grünen)
31.05.99, 9:30-9:45
Via telephone London – Oldenburg

Dr. Marianne Kulicke, Deputy Head, Department Innovation Services and Regional Development, Gerhard Samulat, Public Relations (with) Jochen Rieker, Editor, *Manager Magazin*
Fraunhofer-Institut für Systemtechnik und Innovationsforschung (ISI) (Institute Systems and Innovation Research)
24.06.98, 10:30-12:00
Fraunhofer-Institut für Systemtechnik und Innovationsforschung (ISI), Breslauer Straße 48, 76139 Karlsruhe

Kilian Lenard, Speaker
European Net Economy Forum (ENEF), Kurfürstendamm 132a, 10711 Berlin
15.08.99, 9:00 – 9:15
Via telephone Munich - Berlin

Dr. Hans-Peter Lorenzen, Ministerialrat, Unterabteilungsleiter 6A
Kathrin Meyer, Referat 6A 5
11.05.99, 10:30-11:30 Uhr
Bundesministerium für Wirtschaft und Technologie, Haus VI, Villemombler Straße 76, 53123 Bonn

Harald Lux, Consultant and freelance journalist
Nettraffic.de ISP Watch, Heinen & Lux GbR (Sandkaule 5-7, 53111 Bonn)
10.07.99, 11:30-14:30
Summer lunch in a restaurant on the Rhine

Dr. Martin Mayer (Siegertsbrunn) MdB (CSU)
23.04.99, 13:00-13:30
Via telephone London - Bonn

Dr. Michael Meister, MdB (CDU)
22.03.99, 15:00-16:00
Bundeshaus, 53113 Bonn

Siegmar Mosdorf, Parlamentarischer Staatssekretär, MdB (SPD)
Andreas Schaal, Persönlicher Referent des Parlamentarischen Staatssekretärs
Kathrin Meyer, Referat 6A 5
10.05.99, 13:00-13:45
Bundesministerium für Wirtschaft und Technologie, Villemombler Straße 76, 53123 Bonn

Lutz Reulecke, Medienpolitischer Mitarbeiter, (FDP)
25.03.99, 17:15-18:15
Bundeshaus, 53113 Bonn

Jörg Tauss, MdB (SPD)
25.03.99, 16:15-17:00
Bundeshaus, 53113 Bonn

VATM, Verband der Anbieter von Telekommunikations- und Mehrwertdiensten e.V. (Oberländer Ufer 180-182, 50968 Köln)
15:00-16:00, 14.07.99
Interview in offices of the association
With Jürgen Grützner, Stellvertretender Geschäftsführer, and Eva-Maria Schreiter, Referentin für Presse- und Öffentlichkeitsarbeit

International interview partners

Ola Ahlvarsson, CEO
Result Ventures Knowledge (Peter Myndes Backe 12, 118 46 Stockholm, Sweden)
18.10.99, 12:00 - 12:45
Telephone interview

Nils Gunnar Billinger, Head
Post and Telecommunications Authority (P.O. 5398, 10249 Stockholm, Sweden)
21.12.99, 11:00 – 11:30
Telephone interview

Klaas de Boer, Former Investment Director
Vannenberg Group in Putten, The Netherlands (now independent start-up consultant living in London, W8)
14.10.99, 11:15 – 11:45
Telephone interview

Benoist Grossmann, Partner
Viventures Partners SA, (Tour Séquïa 1, Place Carpeaux, 92915 Paris La Défense, France)
08.10.99, 18:00 – 18:30
Telephone interview

Roel de Hoop, Founder
Hot-Orange.com, (Stephensonstraat 19, 1097, Amsterdam, The Netherlands)
26.10.99
Email interview

Johan Jörgensen, COO
Municel (c/o Result Venture Knowledge, Peter Myndes Backe 12, 118 46 Stockholm, Sweden)
11.10.99, 11:00 - 11:30
Telephone interview

Pär-Jörgen Pärson, CEO
Cell Ventures AB (Hightechbuilding 111, 101 52 Stockholm, Sweden)
02.12.99, 15:45 – 16:15
Telephone interview

Tony Salter, CEO
Boxman AB (Innovation Centre, 68 Milton Park, Abingdon, Oxon OX14 4RX, UK)
03.12.99, 11:00 – 11:15
Telephone interview

Marc Simoncini, PDG
Opsion Innovacion/ iFrance (Boulogne Billancourt 92100, France)
06.11.99
Email interview

Kjell Spangberg
Swedish private investor living in San Francisco
17.11.99, 17:00 – 17:30
Telephone interview

Appendix C: Selected financial figures for international telecommunications operators

Table 1. Selected financial figures for international telecommunications companies in the year 1998*

	Net revenue US$ million	Net income (loss) US$ million	Net income as percentage of net revenue	Shareholder equity US$ million	Return on equity (on the basis of net income)	Year-end share price US$	Number of shares issued (million)	Basic earnings (loss) per share	Market capitalisation US$ million
European Telecommunications Operators									
Deutsche Telekom (DT)	39,126	2,493	6.3%	27,853	9.0%	31	2,743	0.91	85,582
France Télécom (FTE)	27,359	2,553	9.3%	18,860	13.5%	70	1,025	2.49	71,750
Mannesmann	21,142	699	3.3%	7,060	9.9%	109	390	1.79	42,666
Royal KPN N.V.	8,926	763	8.5%	6,565	11,6%	47	473	1.61	22,373
Telia Group	6,381	559	8.8%	3,438	16.3%				
US Telecommunications Operators									
AT&T (T)	53,223	6,398	12%	25,522	25.0%	76	1,784	3.59	135,227
Sprint Corporation +	17,134	# 853	5.0%	12,448	6.9%	95	431	1.98	40,945
US Telecommunications/ Cable Entrants									
MCI WorldCom (WCOM)	17,678	# -2,571	-	45,003	-	72	1,274	-2.02	91,728

* Based on Annual Reports. Share prices were not always contained in the Annual Reports. In these cases, year-end share prices were estimated. Exchange rates used were 1.76 DM per US$ (Deutsche Telekom), 1.11 US$ per 1 Euro (Mannesmann, Royal KPN and France Télécom) and 8.03 SEK (Swedish Krona) per 1 US$ (Telia).

+ Sprint Corporation acquired 100% ownership of the wireless operator PCS and split its stock into Sprint FON and Sprint PCS. These figures represent the combined group.

Qwest Communications (QWST)	2,243	-844	-	4,238	-	25	278	-3.02	6,975
IXC Comminications (IIXC)	668	# -221	-	-	-	35	36	-6.15	1,260
Level 3 Communications (LVLT)	392	§ -128	-	2,165	-	42	302	-0.43	12,684
@Home Network (ATHM)	48	-144.18	-	494	-	40	114.24	-1.26	4,560

NOTE: These figures are recalculated to be applicable to common shareholders.
§ NOTE: This income figure is based on operating income.

Table 2. Market capitalisation of selected firms as of 25.08.99[1]

Ticker	Share price in US$	Number of shares (million)	Market capitalisation US$ million
DT	43	2,994	128,742
FTE	78	1,025	79,950
T	48	3,196	153,408
WCOM	80	1,861	148,880
FON	45	868	39,060
QWST	29	746	21,634
IIXC	36	37	1,332
LVLT	63	340	21,420
ATHM	42	368	15,456

In addition: Mannesmann had a capitalisation of US$ 63,836 million and Royal KPN of US$ 22,933 million. As with the original table, a uniform exchange rate of 1.11 US$ = 1 Euro was used.

[1] For ticker symbols, please refer to Table 1 in this Appendix.

Table 3. Market capitalisation as multiples of net revenues 1998 and market capitalisation growth of selected telecommunications and cable companies.[2]

	Market cap multiple 1998	**Growth of market cap 12.98 to 08.99**
European Operators		
Deutsche Telekom	2.19	+50%
France Télécom	2.63	+11%
Mannesmann	2.02	+50%
Royal KPN	2.51	+3%
U.S. Telecommunications Operators		
AT&T	2.54	+13%
Sprint	2.39	-5% #
U.S. Telecom and Cable Entrants		
MCI WorldCom	5.19	+62%
Qwest	3.11	+210%
IXC	1.89	+6%
Level 3	32.36	+69%
@Home	95.00	+239%

Due to a stock split into Sprint FON and Sprint PCS.

[2] Please refer to Table 1 of this Appendix for details on the figures. Market capitalisation multiples are market capitalisation in US$ at year-end 1998 divided by net income for 1998 in US$. Growth in market capitalisation is relative to values as of 25.08.99.

Appendix D: Internet advertising expenditures and the number of internet users by country[1]

		1996	1997	1998	1999 (Estimate)
USA	Spend	USD 267 M (IAB/ Coopers & Lybrand); USD 236 M (Cowles/ Simba)	USD 907 M (IAB/ Coopers & Lybrand); USD 597 M (Cowles/ Simba)	USD 1,920 M (IAB/ PWC)	USD 3,000 M (IAB/ PWC, based on 1st Quarter)
	Users	40 M (FIND/SVP)[2]	62 M (Intelligest)	79 M (CommerceNet/ Nielsen)	109 M (Nielsen// NetRatings)
Germany	Spend	DM 6 M (G+J EMS)	DM 24 M (G+J EMS)	DM 50 M (G+J EMS); USD 27 M (Prognos, ZAW)	DM 150 M (G+J, EMS); USD 82 M (Prognos)
	Users	2.8 M (Computer Industry Almanac)	5.5 M (IDC)	6.9 M (G+J EMS)	9.9 M (G+J EMS, 4th Wave)
France	Spend	-	USD 6.7 M (Havas); FF 30 M (IAB/ PWC)	USD 13.5 M (Havas); FF 80 M (France Pub); FF 113 M (IAB/ PWC)	Between FF 160 M and FF 240 M[3]
	Users[4]	0.8 M (Computer Industry Almanac)	1.3 M (Computer Industry Almanac)	2.5 M (Mediangles)	6.2 M (Mediangels)
Nether-lands	Spend	USD 1 M (Jupiter)	Dfl 6 M (Media Plaza)	Dfl 18 M (Media Plaza)	Dfl 30 M (Media Plaza)
	Users	0.7 M (Computer Industry Almanac)	1.0 M (Computer Industry Almanac)	1.4 M (Computer Industry Almanac)	2.3 M (Pro Active)
Sweden	Spend	-	SEK 61 M (IRM)	SEK 207 (IRM)	SEK 408 M (IRM)
	Users	1.1 M (Computer Industry Almanac)	1.8 M (Computer Industry Almanac)	2.4 M (Sifo Interactive Media)	3.2 M (Sifo Interactive Media)

[1] Advertising expenditure estimates were obtained from the following sources on the internet: Internet Advertising Bureau (http://www.iab.net/), Cowles/ Simba Information (http://www.simbanet.com/), Nielsen// NetRatings (http://www.nielsen-netratings.com/), G+J Electronic Media Service (http://www.ems.guj.de/), Media Plaza (http://www.mediaplaza.nl/), IRM Institutet för Reklam & Mediestatistik (http://www.irm-media.se/). Internet user numbers have been compiled from different sources by Nua Ltd. Online Relationship Management, "How many online?" Dublin and can be accessed on http://www.nua.net/. To complement these figures, Computer Industry Almanac estimates were used, these are quoted in Morgan Stanley Dean Witter, 1999, 248 - 250. The following web sites were also consulted: Nielsen// NetRatings (http://www.nielsen-netratings.com/), Sifo interactive Media (http://www.sifointeractive.com/), For French statistics, see also http://www.journaldunet.com/.

[2] Early internet user figures are generally very inaccurate in all countries, because they were often not based on representative surveys, but on internet host counts (it is impossible to accurately say how many internet users access a given host computer). The added difficulty faced here is that often only one figure in each country is available for a whole year, and the month these numbers were estimated are not uniform. Given the rapid growth of the internet, it can make a great difference whether indicators from the beginning or the end of the year are taken. The early US data actually was released early in the next year instead of the year indicated. To obtain the figures used in this table, several different sources were consulted and the numbers that matched most closely with the different estimates were used.

[3] Unofficial estimate of Thierry Noisette, journalist and Internet Analyst. Email sent to author on 30.09.99. See: http://www.strategie-internet.com/, http://www.journaldunet.com/.

[4] Does not include Minitel users.

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