Edgar Einemann
The Internet in Germany

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Facts on Digital Differentiations?

Cities, Divides and Differences

English by Johanna Ellsworth

SCHÜREN

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Contents

Preface

First contemplations about the regional dimension of the internet go back to an exchange of ideas with representatives of the initiative for a better electronic networking of Silicon Valley (Smart Valley Initiative) in Palo Alto, which was made possible to me due to the personal support of Werner Kanthak from Hewlett Packard in 1995. Since my participation in the first worldwide conference on local electronic networking at Stanford University in 1996 ("Connect 96") the continuous communication, particularly with William Miller (Stanford University) and Kenneth Corey (Michigan State University) has sharpened my view on the topic of "the internet and regions". Especially the international e*Space conferences with their focus on 'Electronic Communities', organized by Kenneth Corey and Mark Wilson, repeatedly offered the opportunity for a very fertile scientific discussion in recent years and gave important indications for the further development of my own approaches. In addition to that the cooperation with Maria Paradiso of the Università del Sannio in Benevento/Italy was of great importance for the further development of the frame for the contents of the analysis of internet structures on a decentralized level.

Almost 10 years ago an impulse for intensive empirical work came from the Secretary of State for the Senator responsible for seaports and foreign trade in Bremen at the time, Gerd Markus, who was responsible for the development of a regional internet strategy. Multiple discussions with the former member of the Executive Board of swb AG, Jörg Willipinski, and the news technician and manager of Nordcom GmbH, Dirk Roedler, who unfortunately passed away much too soon, about regional development and company strategies were helpful as well. The practical experience in the field of 'eGovernment' is based on the collaboration in projects carried out by the State of Lower Saxony, supervised by Henning Binnewies, who also was in charge of state modernization at the State Office at that time.

The cooparation with Hans-Peter Canibol, economist and former business editor of *Focus* Magazine, who promoted and accompanied the corresponding projects, was essential for the realization of a city ranking for Germany. I also owe many contacts to companies and institutions to him. Without their willingness to cooperate and active participation (supply with data) the empirical research would have been impossible – the Companies 1&1, GMX, allesklar.com, mobile.de and DiBa as well as the German Registry for Internet Domains (DENIC), the Federal Census Bureau and the German Association of University Presidents (HRK) must be mentioned in particular. The great personal commitment of Michael Frenzel and Nicole Braun of Corporate Communication of 1&1 Internet AG was especially helpful.

Furthermore I am grateful to the healthy "compulsive productivity" of periodical publications of newspaper articles on the internet economy, trends and the different regions, as well as the participation in multiple extremely informative talks with interesting personalities to many years of collaboration with Wolf Gunter Brügmann, Editor of the enclosure of the *Frankfurter Rundschau* on the "Cebit" Computer Trade Fair.

In the past years the continuous communication process with Heinz Thörmer, now member of the Senate of the Audit Office for the State of Lower Saxony, was very pleasant and productive; I also wish to sincerely thank him for his critical reading of my manuscript and for many pieces of advice that greatly contributed to the improved quality of this book.

I especially thank my wife, Beate, and my son, Lennart, for taking on many helpful tasks and for giving me their undivided support during the whole project.

My collaboration with the Publisher Schüren Verlag has again paid off well for this book – in particular I want to thank Annette Schüren for her positive, flexible and intense support.

Bremen, on the 11th of January 2006 Edgar Einemann

Introduction

Today it is an undisputed fact that the internet offers innovation within society at a worldwide speed of expansion that presents a historical record. This was only possible because millions of people in various roles actively promoted that development. The internet is neither the product of a few corporations nor an act of God, but rather a structural change of society in which masses of people have been participating. There is as little reason to exclusively claim its advantages and blessings as there is to solely conjure its dangers of globalization and electronic networking. Instead the effects of the internet development show ambivalences that open up a multitude of (however limited) options. Thus the individual not only risks isolation and dependence on technology but also benefits from prospects of new contacts, new educational opportunities, new creative activities and new self-esteem. Worldwide communication promotes a unification of language and the expansion of American mass culture on one hand; on the other hand however, there are totally new local and worldwide communication opportunities for the languages and cultures of minorities. The centralization of power for those with quick access to collected knowledge is confronted with the access of knowledge to all of society (free or cheap offers on the net, a quick exchange of critical information) and therefore a boosted democracy and power on the other side. The new demands made on people lead to a cultural change which includes new opportunities as well as new risks.

The integration into networks and the quality of the (also but not only electronic) networking of companies, citizens and government is more and more turning into an essential local success factor – only those who are optimally integrated into the global capitalistic network society stand a chance. "Internet power" is a criterium for future survival.

Today there are differentiations and digital divides between those regions and individuals that profit from the advantages of the new possibilities of digital networking and those that stay behind because access to electronic networking is mainly denied to them. As a matter of fact there is a digital divide of the world municipality on a global level (Kellerman, 2002). A current review of Africa shows, for example, that the whole continent has less telephone connections than the City of Tokio, while the costs for an internet line in Mafikeng, South Africa – where people are not exactly pampered with high incomes – is six times as high as in Miami (*Die Zeit*, 2005, p. 46).

The corresponding results of past analyses of the internet development worldwide show that single countries (in particular the U.S.) and individual large cities within the nations in question dominate. At the very top you will find global finance centers, high-tech regions, internationally renowned locations boasting perfect electronic networking, large innovative and economically powerful cities, and within these cities those areas populated by modern enterprises and well-off residents. Based on Zook's data (2005b), Manuel Castells comes to the conclusion that for instance in the year of 2000 "the top five cities, accounting for 1 percent of world population, accounted for 20.4% of internet domains." (Castells, 2003, p. 220). The internet is therefore far from expanding evenly.

A discourse with William Miller from Stanford University, former Vice President of the Smart Valley Initiative, on a more intense electronic networking in Silicon Valley over ten years ago (Einemann, 1997; Sinclair, 1999) served as an impulse to take a close look at the internet in Germany. The side question on the situation in Germany, which appeared to be simple at first, took on a

much deeper meaning: What about the internet development in Germany and in German cities? How actively do companies, the government and private households participate? Can powers that promote the organization of the electronic networking be identified – is it rather the government such as in Singapore, or the industry such as in Silicon Valley?

Any well-founded answer to these questions – if it is not merely based on rough ideas and assumptions – requires the most precise knowledge possible on the changing of social reality, of which a scientific analysis is very difficult theoretically as well as empirically. The two core problems are the operationalization of the term 'internet position' respectively 'internet power' as well as the determination of the empirical approach. The study by TNS Emnid (TNS Emnid & Initiative D 21, 2003) with its title "Nonliner-Atlas" and the subtitle "A Topography of the Digital Gap That Runs Through Germany", which is of German interest, concentrated on such issues as access lines to the internet and is based on interviews with users, intended users and non-users, resulting in the fact that on a state and district level there are very small regional differences (TNS Emnid & Initiative D 21, 2003, p. 18-19, 21). It is obvious that the existence of an access line to the internet says something about the opportunities of participation, but only very little about the internet position in the sense of the production and use of the net – the basis of indicators must be much broader. (Telephonic) interviews with selected groups representing users surely offer certain insights – they can, however, cover only limited aspects (reliable data relating to regions can hardly be compiled) and are subject to the risk of the continuation of subjective erroneous assumptions (such as one's own internet activities). More precise findings can only be gained if a multitude of actually measured internet-related data (versus data compiled in surveys) is available and if it is possible to put said data in a context with the real socioeconomical structures.

A productive approach to the solution of the described problems and the answering of the questions rendered lies in the development of a research design that can be applied to the level of small and even the smallest spatial units. Local units (city districts, cities, regions) can serve as a fixed point for the approach towards the analysis of internet power (the use of measured data on the basis of a complex model with a variety of indicators), to which economical structural data (such as wealth, work) as well as indicators related to persons (i.e. percentage of residents with junior college, unemployed, employers/freelancers) can be allocated. Such an approach on the level of the 'smallest unit', for instance, enables a new illumination of the conditions in larger regions that can be distinctively researched or newly defined regardless of traditional geographical or political borders (such as German states or city districts). When interpreting the findings, this can also clarify the question whether, besides digital differentiations and digital divides, there is a correlation in the sense that the internet situation in Germany is closely related to geographical, economical and/or social factors.

The selection of the cities as starting points for deeper analyses has, apart from the strategical benefit regarding research, the additional benefit that exciting, future-related information can be presented (to players on the regional respectively local level). Even though, according to current knowledge, the road to an electronically networked world society will lead through changed regional and national state structures and relevancies (if not organizations), it will not be accompanied by the dissolution or disappearance of cities. The cities will remain the locations of innovative networks that are electronically networked on a global as well as a national and a local level. The internet power is a central factor in the actual and future role of the cities (as well as of the regions and nations in which they are located) within the global capitalistic network society.

Manuel Castells (2003), too, has assumed an exception on city level regarding Germany from the observed international development of internet centralization in the metropolis of the country (such as London, Paris...) due to the decentralized urban structure, and claimed: "Only Germany has a decentralized system of Internet content provision, with Berlin, Munich, and Hamburg sharing relatively low percentages of concentration, ahead of other areas. This reflects the flat hierarchy of the German urban system, suggesting that Internet content provision adapts to the pre-existing metropolitan structure, rather than reversing it." (p. 22).

That hypothesis deserves a detailed examination: On the contrary – isn't it a fact that there are regional and local digital differentiations, perhaps even digital divides, even in a leading industrial country such as Germany? Our starting point is the term of "digital differentiation" – it is preferred to that of "digital divide" since it suggests the analysis of differences and does not automatically allege the digital divide as an extremely strong form of differentiation within Germany on the regional level, but merely considers it (for certain areas and groups of individuals) as being a possible result of empirical findings.

Central issues are:

- How can the regional, respectively local internet position be appreciated at all; how can the internet power of cities be characterized?
- Which qualities do regional and local digital differentiations in Germany have; are their any digital divides? Are these enhanced by the internet development (Centralization Thesis), as for instance Saskia Sassen has described it regarding the "Cities in a World Economy" (1994) and cities connected with global networks (2002), and as Graham and Marvin portrayed it under the aspect of the development of telecommunication (1996)?
- What causes explain the findings; which factors determine the development of the internet within the cities and regions? Which correlations can be found between the economical and social situation and the internet development?
- How does the government itself fulfil its key role in the internet development within cities and regions? Which qualities does the internet presence of the municipal governments and eGovernment have?

This work shall contribute to the empirical research of internet development and internet economy by taking cities into special consideration. Thus it fundamentally differs from a multitude of excellent but rather qualitative analyses of structural change in correlation with the internet. William Mitchell (2003), for example, expressly points out that he does not consider the developments outlined by him with the fixed point of "city" from the perspective of the empirical social scientist (p. 6).

Manuel Castells has justly emphasized that an analysis of the correlation between the internet development and, for instance, the development of a city requires new theoretical and methodical developments with an interdisciplinary approach, for the purpose of which the internet itself must become a research instrument; well-founded empirical analyses are of great importance (Castells, 2002, p. 404-405). Aharon Kellermann has pointed out a complication (if not even the central complication) regarding successful empirical research: the seriously difficult data situation (Kellermann, 2002, p. 188) concerning city-related internet data, which has proven to be a great hurdle for research. The works by Aharon Kellerman ("The Internet on Earth", 2002) and Matthew Zook ("The Geography of the Internet Industry", 2005a) are among the few well-founded empirical contributions on the internet development on a local level. Kellerman's

analyses of differentiations between continents and nations, focusing on the global level, are important contributions towards the development of the research approach and the compilation of data. Zook very early started to collect local internet data and a database with data on the locations of internet domains (Zook, 2005b), on which, among others, Castells relies for his analyses of city development in the network society (Castells, 2003, p. 220). The well-founded empirical analysis of the geography of the U.S. internet industry (Zook, 2005a) presents another milestone for research.

The work presented here is to be considered an empirical study of a country and exclusively focuses on Germany. The following questions shall be closely analyzed on different levels in regards to the Federal Republic of Germany and its large cities.

(1) Differentiations between urban centers and areas of the country that are of rural or small-town character are made out through comparisons between the larger cities and the rest of the German Republic.
(2) A closer look on the internet development in the 50 largest German cities and a ranking of same serves the analysis of differentiations.
(3) The differentiations within a city are determined by means of a case study on the City of Bremen and its 89 city quarters.
(4) The evaluation of the quality of the internet presences of the municipal governments serves the analysis of differentiations.

It will be differentiated as much as possible between the side of offers (production) and that of demand (consumption) as well as frame conditions, and between companies, private individuals and the government. Based on the findings the correlations between the 'real' situation of the society (to be precise: the internet situation naturally is part of that reality) and the position on the internet, between internet power and economic, respectively social power is investigated and the issue of correlation is clarified. The examination of explanatory factors for the findings on city level concentrates on profile data (size, political function, dominance of branches, innovative strength, location of corporation centers) as well as on the geographical location and the economical and social position of the city. The case study on the City of Bremen aims at private users and mainly examines factors relating to the individual (education, professional status, citizenship) as causes of digital differentiations, digital divides and correlations. The analysis of the quality of internet presences of cities deals with the issue of the quality of e-Government offers and the interactive offers to its citizens: What is the situation; are there differentiations between the cities and how can these be explained?

The in-depth methodical considerations necessary for the analysis simultaneously mean a contribution to method innovation. How can the 'internet development' or the 'internet position' of cities be operationalized, and which indicator permits a statement on what? The development of complex analysis models concerning the internet city position (ICP) and the city website position (CWP) allows for summarized evaluations and comparisons with other research findings, such as on the overall economical position of the cities. The second singularity of this work lies in the fact that the empirical use of a multitude of indicators is possible: A lot of research but particularly the cooperation with market-leading internet companies have made the compilation of data treasures on the level of cities possible to a degree that dramatically surpasses former availability of data for research.

17 indicators are available for the description of the 'traditional' position of the 50 largest German cities, and a total of over 30 indicators may be used for 75 of 89 quarters of the City of

Bremen; 30 main indicators with additional differentiations (i.e. according to companies and private individuals) are available for the analysis of the internet position. The EXCEL, respectively the SPSS tables on the internet city position (ICP) contain approx. 3,000 basic numbers, on which further calculations (such as download per user, domains per resident, score evaluations, ranking) are based. The examination of the internet position of the city sections, city districts and quarters of the City of Bremen is based on approx. 3,000 additional basic numbers. 139 indicators were employed for the analysis of the quality of city websites, and the data (approximately 7,000 basic numbers) was assessed and evaluated with the help of a selfmade software tool (ACCESS-database 'Website-City-Position', WCP). Altogether about 13,000 basic numbers, on the basis of which weightings and calculations were made, form the wide empirical background of this work.

The foundation of this book is not based on surveys and computer-based predictions but on facts: my own compilations as well as solid data measured by internet companies and independent institutions. The results of research with a quantity approach are interpreted and presented without completely relying on statistical procedures: "In almost all cases a direct measurement of the power of an effect is more suitable for the evaluation of the power of the effect than a significance test." (Schnell, Hill & Esser, 2005, p. 454).

The first part of the Book (I.) commences with an illumination of the relevance of electronic networking and the internet power as local success factor. This deals with the analysis of core elements of the network society of digital capitalism by taking developmental dynamics and differentiations, respectively digital divides into special consideration. At the beginning there is a characterization of 'digital capitalism' (1.) and the 'network society' (2.); subsequently the change of the demands on people's behavior (3.) is discussed. A closer analysis of the situation of the cities and regions in the age of the internet is conducted with the help of a description of local electronic networking as well as the local success factor (4.) and the processing of recent discussions on the development of the cities in the age of digital electronic networking (5.). Thereafter one's own active participation in the net demanded by the government (initiation of citizen information systems, integration of the administration into the electronic processes, eGovernment) is outlined(6).

In Part Two (II.) the findings on the internet position of the largest German cities are presented and interpreted. After the elucidation of the empirical approach, the measuring of data and the evaluation model (1.), this part first deals with the analysis of the relation between the large cities and the 'rest of the country' (2.) and subsequently with differentiations and digital divides of the internet power of the large cities regarding production, consumption and frame conditions as well as companies, private individuals and government (3.). As a conclusion an explanation of the findings is attempted (4.) and the results are summarized (5.).

In the third part (III.) the research findings on the differentiations within a city are presented, taking the City of Bremen as an example. According to the elucidation of the empirical approach (1.) first results (2.) are relativized on the basis of detail research (3.). Then the digital differentiations are analyzed more closely on the basis of a district ranking for the private internet users (4.), explanatory approaches on the findings are introduced (5.) and finally the central results are presented (6.).

The presentation of the empirically determined quality differences of city websites are the central focus of the next chapter (IV.). The depiction of the empirical approach and the evaluation model (1.) is followed by the evaluation of the quality and the analysis of differences regar-

ding the web presences of cities (2.) and thereafter by the search for explanatory factors for the differentiation (3.). This is followed by a short summary of the results (4.).

In the final chapter (V.) the overall research results (digital differentiations, digital divides and correlations) are summarized and points of approach for further research are discussed.

I. Internet power and electronic networking as success factors

1. Digital capitalism

At first globalization is often being understood simply as activities of corporations outside the national frame and the development of an exchange of goods and services beyond the borders of nation states. In that sense globalization began a very long time ago and was criticized sharply already over 100 years ago – consider for instance Hilferding's (1968) "Analysis of Financial Capital" and Lenin's (1972) "Description of Imperialism as the Highest Stage of Capitalism" (compare Fetscher, 1967). Karl Marx already (1968, 1969, 1971) worked out globalization as being the necessary result of capitalistic activities and viewed it as a quality of civilization. In his main work "Das Kapital" (The Capital), written in the middle of the 19th Century, Marx recognized "three main facts of capitalist production", namely "1st the concentration of means of production in the hands of few...; 2nd the organization of the work itself as a collective act: through collaboration, division of work and relating the work to the natural sciences; 3rd the production of a world market." (1968b, p. 276-277). In the years 1857/58 Marx stated: "The tendency to create a world market is directly implied in the term capital itself. Any border seems to be a hurdle that can be overcome" (Marx, 1939, p. 311). Mid-2005 the political German weekly *Der Spiegel* cited in its leading story titled "Ein Gespenst kehrt zurück" (A Ghost Returns) Marx's and Engel's early forebodings as a potential basis for current criticism of globalization: "The need for a continuously expanded demand of its products is chasing bourgeoisie around the globe. It is forced to settle everywhere, expand everywhere, make connections everywhere. Through its exploitation of the world market bourgeoisie has made the production and consumption of all countries cosmopolitan. (...) Ancient national industries have been destroyed and are still being destroyed daily. (...) Due to the speedy improvement of all production instruments and infinitely easier means of communication bourgeoisie is dragging all nations, even the most barbaric, into civilization. The cheap prices of its goods are the heavy artillery with which it blasts all Chinese walls into the ground." (Marx & Engels 1972, p. 466; *Spiegel*, 2005).

Almost one hundred and fifty years later the Stanford Professor, former CEO of the Consulting Company SRI and of the Software Company Borland, William Miller, rendered a sober description of the (final?) development of the world market as a process of the opening of economies (1996). For the time after World War II Miller considers as essential the fact that Asian countries (in particular South Korea, Hongkong, Taiwan, Singapore and later Japan) turned away from politics of import substitution (1), the modernization of the Chinese industry since 1978 with the goal of promoting new enterprises and trade expansion (2), the opening of the Mexican economy since the Mid-Eighties (3) as well as the collapse and change of the East European countries (4).

Dan Schiller (2001) showed in his analysis of "digital capitalism" (2000) that a strengthening of the role and power of transnational conglomerates is related to the use of the late technical possibilities within the frame conditions of a neo-liberal political basic tendency, and that social differences are not only increased globally but also and particularly in the U.S. (p. 206-207).

The term "digital capitalism" as a description for the latest phase of globalization under capitalistic conditions has been introduced into the German debate by Peter Glotz (2001), who has pointed out the problem of "jobless growth" and the "intensified social separation", a digital divide into "core and fringe jobs, into core and fringe personnel, into value-added work and routine work, into an elite of skilled workers (including their co-op helpers) and a new 'underclass'." (p. 119).

In their work on the Empire (2003) Antonio Negri and Michael Hardt view the formation of global world capitalism as a consequent advanced development in history from the Marxist point of view. They see the positive perspective of the passage of relevance of (historically redundant) nation states in the initially economical formation of a world society: "The United States do not form the center of an imperialistic project, and as a matter of fact no nation state has that ability today. Imperialism is over. No nation can claim world leadership the way the modern European nations did." (p. 12). In the unavoidable development caused by the economy the political opportunity means less "to oppose those processes but rather to alter and steer them towards other goals." (p. 13).

After a thorough analysis even those in the top positions of German science critical of capitalism find themselves forced to accept the new frame conditions of society as a given fact: "Currently there are no convincing quality alternatives to the forms of market economy, plural society and political democracy", and: "To try and put globalization into reverse would not be a project focussing on the future." (Altvater & Mahnkopf, 1997, p. 70, 589).

The cities and regions are part of open economies and therefore elements of the world market – willingly or unwillingly, they are subjected to the competition of different locations with all its risks and chances. Moss Kanter (1997) describes the formation of a new 'caste' of cosmopolitans within the global networked international management, that depends on the openness of the regions (economically as well as mentally). The formation of a 'world class' regarding the production and distribution of goods and services is a process already well under way (also because the people demand world class products), and regional isolationalism does not stand a chance. The problem of the regions is to assert themselves in the world market structures: making the global economy work locally.

The thesis of a global centralization of money and power and the simultaneous deepening of the gap between 'on top' and 'at the bottom' was extensively supported by Saskia Sassen during the 'pre-internet era' – at least for the financial metropolises of capital (1997, 2001, 2002). Cities extend their functions related historically to the region or nation by the global dimension; some cities even obtain such a distinct global function that they show tendencies of separation from their region (which, for instance, becomes obvious in completely different price levels). An empirical analysis of "world cityness" using many indicators by the "Globalization and World Cities (GaWC) Research Group" (Taylor, Walker & Beaverstock, 2002, p. 100) has discovered 12 different levels of integration into the world economy for 122 cities. London, Paris, New York and Tokio dominate (Level 12); on top of the German city charts are Frankfurt (Level 10), Düsseldorf (Level 6), Hamburg, Munich and Berlin (each on Level 4), Cologne and Stuttgart (both on Level 2) as well as Dresden (Level 1). From a (possibly nationally limited) German view, any analysis of the economic power of the cities based on very in-depth research by utilizing 60 indicators draws a completely different picture, however: Here Munich by far tops the list; while Berlin (ranking 47) and Dresden (ranking 36) can be found at the bottom of the list of the 50 largest German cities (Lichtblau, 2004, p. 7).

Figure 1: Ranking of World Cities

THE GAWC INVENTORY OF WORLD CITIES*

A. ALPHA WORLD CITIES

12: London, Paris, New York, Tokyo
10: Chicago, Frankfurt, Hong Kong, Los Angeles, Milan, Singapore

B. BETA WORLD CITIES

9: San Francisco, Sydney, Toronto, Zurich
8: Brussels, Madrid, Mexico City, São Paulo
7: Moscow, Seoul

C. GAMMA WORLD CITIES

6: Amsterdam, Boston, Caracas, Dallas, Dusseldorf, Geneva, Houston, Jakarta, Johannesburg, Melbourne, Osaka, Prague, Santiago, Taipei, Washington
5: Bangkok, Beijing, Rome, Stockholm, Warsaw
4: Atlanta, Barcelona, Berlin, Buenos Aires, Budapest, Copenhagen, Hamburg, Istanbul, Kuala Lumpur, Manila, Miami, Minneapolis, Montreal, Munich, Shanghai

D. EVIDENCE OF WORLD CITY FORMATION

Di Relatively strong evidence
3: Auckland, Dublin, Helsinki, Luxembourg, Lyon, Mumbai, New Delhi, Philadelphia, Rio de Janeiro, Tel Aviv, Vienna

Dii Some evidence
2: Abu Dhabi, Almaty, Athens, Birmingham, Bogota, Bratislava, Brisbane, Bucharest, Cairo, Cleveland, Cologne, Detroit, Dubai, Ho Chi Minh City, Kiev, Lima, Lisbon, Manchester, Montevideo, Oslo, Rotterdam, Riyadh, Seattle, Stuttgart, The Hague, Vancouver

Diii Minimal evidence
1: Adelaide, Antwerp, Arhus, Baltimore, Bangalore, Bologna, Brazilia, Calgary, Cape Town, Colombo, Columbus, Dresden, Edinburgh, Genoa, Glasgow, Gothenburg, Guangzhou, Hanoi, Kansas City, Leeds, Lille, Marseille, Richmond, St. Petersburg, Tashkent, Teheran, Tijuana, Turin, Utrecht, Wellington

* Cities are ordered in terms of world city-ness with values ranging from 1 to 12.

(Source: Taylor, Walker & Beaverstock, 2002, p. 100)

2. Network society

Max Weber has studied the developmental conditions and structural problems of modern capitalistic industrial societies in depth (1964, 1979). His theoretical considerations aim at making a connection between individual orientation and the development of society; he relates the manifestation of capitalism to the establishment of rationality: "What has created capitalism in the end is the rational permanent enterprise, the rational process, rational technology, rational law, but not only that; supplementing those there had to be *the rational mind, the* rationalization of living, the rational economical ethos." (Weber, 1979, p. 360). As opposed to Karl Marx, Weber emphasized the significance of non-economical factors for the development of capitalism: "Webers wrtings, in fact, have been desribed as involving a lifelong struggle with 'the ghost of Marx'(...) According to him, non-economic factors have played a key role in modern social development. Weber's celebrated and much discussed work *The Protestant Ethic and the Spirit of Capitalism* argues that religious values – espacially those associated with puritanism - were of fundamental importance in creating a capitalistic outlook. This outlook does not emerge, as Marx supposed, from economic changes as such." (Giddens, 1997, p. 573). Traditionalism, which aimed at meeting demand and short-term satisfaction of needs, had to be overcome in order for the capitalistic spirit to take shape. The "professional obligation" (Weber, 1979, P. 45) plays a decisive role in that: The "ideal type" of capitalistic entrepreneur does not care about his own wealth, but rather about his sense of proper "professional fulfillment" (p. 60), and it is important for the worker "to perform his work as if it was a complete goal in itself." (p. 52). Weber sees the "most consequential foundation of the *idea of profession*" in ascetic Protestantism and particularly in Calvinistic puritanism (p. 166).

According to Weber (1964) the development of modern as well as efficient and stable organizations of industrial companies and the government goes hand in hand with the establishment of bureaucracies that are clearly superior to the dominating organizational forms of past eras: "The decisive factor for the advancement of bureaucratic organizations has always been its purely *technical* superiority to any other forms. The relativity between them and a fully developed bureaucratic mechanism is exactly the same as that of a machine to non-mechanical production methods. Precision, speed, unambiguity, written records, continuity, discretion, conformity, strict subordination, a decrease in conflicts, objective and personal costs (...) are optimized (...) in a strictly bureaucratic (...) administration carried out by trained officials." (p. 716).

Weber drafts an ideal type of bureaucratic organization which marks modern capitalism. Among other factors it is defined by the "exact separation of duties and competencies, a regulated system of superiority and subordination in authorities (office hierarchy and instances), written recordings, separation from one's private life, specific training and knowledge (examinations, principle of promotion), full time work instead of part-time job and finally office management according to strict regulations (compliance with rules, official knowledge)." (Bernsdorf, 1969, p. 149).

To Weber (1964) bureaucratic organization meant optimal efficiency for large corporations (coining the modern era): "The really large capitalistic enterprises are examples of a strict bureaucratic organization usually not even achieved." (p. 717). The change of society primarily coined by the large industry ("Fordism"), the growing importance of the service industry, the implementation of new information and communication technologies as well as new efficiency models of the economy (i. e. "The Virtual Corporation", Davidoff & Malone, 1993) have brought up the question of organizational principles of "Post-Fordism" (Amin, 1994). The following summarizing chart based on Hubert Knoblauch's work (1996, p. 348-352) illuminates the differences:

Figure 2: Stylized comparison between 'fordist' and 'post-fordist' organizations

Some features of 'fordist' organizations	**Some features of 'post-fordist'organizations**
Prototype: large companies	Prototype: flexible, innovative small enterprises
Mass production of standardized goods (economies of scale)	Production of small series, product variety and adjustment of production to customers' individual needs, fast modifications to production processes (economies of scope)
Concentration of tasks in a large company ('vertical integration')	Decentralization and delegation of work tasks (outsourcing), vertical disintegration
Functional differentiation	Flexible specialization
Hierarchical coordination	Flattening of hierarchies
Highly specialized separation of work tasks	Introduction of teamwork
Clear definition of exterior borders	Softening/diffusion of external borders by network-like connections between companies
Clear definition of work fields and competences	The increased complexity of new products requires interdisciplinary and constantly updated knowledge
The principle of instrumental rationality	The principle of contextual rationality

(Source: Raab, 2004)

The fundamental work by Manuel Castells (1996, 2000a, 2000b, 2002, 2003) on the network society, which was published in three volumes containing a total of approx. 1,500 pages, must be considered to be a historical milestone – after all there is an argument under way whether Castells' work is "to be named in comparison with Weber's *Economy and Society* as Giddens has done in the *Times Higher Education Supplement*" (Nollmann, 2003, p. 372). Castells seems to consider himself eye to eye with Weber when claiming in his essay *'Theory of the Network Society'* (2000b) to describe "the emerging of society structure at the turn of the Millenium" (p. 423) and to supply material regarding the development of a sociological theory that is "able to grasp emerging forms of social organization and social conflict" (p. 6) "thus providing theoretical meaning to the ideal type of the network society." (p. 6). His choice of the term "ideal type" and his expression of the new "spirit of informationalism" as well as an explicit reference to "the voice of the master" (Castells, 2001a, p. 211) imply that Castells himself claims to present an epochal work.

Castells' core thesis (2001b) states: "A fundamental feature of social structure in the Information Age is its reliance on networks as the key feature of social morphology. While networks are old forms of social organization, they are now empowered by new information and communication technologies, so that they become able to cope at the same time with flexible decentralization and with focussed decision-making." (p. 5). Just as Weber's bureaucratic organizations asserted themselves due to their superior efficiency and coined the modern age, they are now being superseded by an even more efficient new form of organization which determines the future epoch: "Once introduced and powered by information technology, information networks,

through competition, gradually eliminate other organizational form, rooted in a different social logic." (p. 16).

Castells considers the social structure as being determined by the "interplay of production and consumption conditions, the conditions of social experiences and existing power conditions." (p. 424). He characterizes the network society (primarily coined by information networks), described by him as a new type of social structure, on 7 levels:

(1) A technological revolution based on the new information and communication technologies as well as on gene technology starts, which will result in a greater change than the one caused by the Industrial Revolution or the invention of book printing (p. 10).
(2) The new economy is informational, global and electronically networked. The characteristics of this new economy may well survive the capitalistic production methods in which they came into being: "... it may well outlast the mode of production where it was born ..." (p. 11).
(3) The organization of work and employment will lead to a "dramatic surge of inequality" (p. 12) based on digital divides between the excluded unemployed and those employed as well as between the working population ("self-programmable labour, and generic labour", p. 12) itself. An individualization of work comes into being. "The most important transformation in employment patterns concerns the development of flexible work as the predominant form of working arrangements." (p. 11).
(4) In the cultural sphere an "oligopolistic concentration of multimedia groups" occurs on one hand, and a segmentation of the market on the other hand, which also makes the formation of an interactive public possible ("superseding the uniformity of the mass audience", p. 12).
(5) Politics are more and more turning into politics of the media and therefore become an expensive business where political marketing, simple messages and stagings, such as scandals, matter (p. 13).
(6) A re-definition of life's material basics, time and space, comes into being. Especially the internet makes a "timeless time" versus the "clock-time characterizing the Industrial Age" (p. 13) possible. The "space of flows" allows for "the simultaneity of society practices without geographical vicinity", however, at the same time the technical infrastructure is still dependent on certain locations.
(7) On the one hand the nation state loses competences to supranational units and is forced to permit decentralizations of power, while on the other hand it is more and more turning into a "network state" (p. 14).

Since the functioning of networks is marked by an ability to change quickly (non-compatible nodes are dismissed, new ones are created), Castells assumes that change of society in the sense of a transformation of the network program only stands a small chance: "There is little chance of social change within a given network, or network of networks." (p. 22). Changes could be effected by those who reject the network logic (religious, national, territorial and ethnic groups) as well as powers that construct alternate networks (such as ecological, feminist and human rights organizations). "The fundamental dilemma in the network society is that political institutions are not the site of power any longer." (p. 23).

3. New challenges, opportunities and problems

The global capitalistic network society has its material foundation not only in concrete locations but also functions only with and for real people. They are faced with a series of new challenges in

their professional as well as their private lives – challenges that may offer opportunities as well as risks.

The technologically feasible structural changes in companies which are created by the demands of the knowledge-based society and realized because of economical aspects strengthen the demand for a new type of employee. Structures, technology, products and turnover must be carried out by concrete human beings, whose behavior and qualifications become key issues in an era beyond industrial mass production.

There is plenty of evidence that the human image (Packard, 1995) at the High Tech Corporation Hewlett Packard (HP), which received the status of corporate culture by the company founders almost from the beginning, has contributed a lot to the company's success story. Key terms concerning their employees are: respecting the individual's personality, opening of opportunities for self-realization and the supporting of creativity through personal space, mutual trust and help, allowing for mistakes, acknowledgment of performance and a share in the company's success, responsibility through collective rights and duties, clearly structured sections due to decentralization, informal work atmosphere and open communication, supporting and advancing the further development of the employees, job security, social benefits and the willingness of the employees to give their best due to enjoying their work. Certainly those goals set by the management cannot be equated with a complete description of the reality, and a company will surely be able to support their employees easier in times of the highest economical growth rates possible than in times of crisis. However, the profits of HP and the results of surveys taken among their co-workers hint at the true secret of their success: The motivated employee with self-esteem who works in small teams with a lot of personal space and who carries responsibility does not only produce the great economical success but also profits from it – and only offers one serious point of criticism: That the demands on his or her performance are extremely high. HP's former Manager for Germany, Jörg Menno Harms, therefore kept emphasizing the real rationalization reserve of our time: the mobilization of the people's personal motivation and the overcoming of 'mental quitting', which can only be achieved by a decrease in bureaucracy and by real participation.

The former boss of the former company Siemens-Nixdorf, Gerhard Schulmeyer, summarized his explanation for the corporate culture change program of SNI very precisely: "High technology leads us away from the economy based on industrial manufacturing to an economy founded on knowledge. This follows different rules which require not only new structures but also new behavior from people. We don't need specialized knowledge learned and accumulated over a period of time as much as we need knowledge relevant to correlations, to the controlling of extremely complex processes and to constantly new linkages of knowledge. For that we need people who are highly flexible and never delinquish their curiosity - people who are willing to start and try out something quickly, but who are just as able to stop quickly and turn to something else if that which they started turns out to be inefficient or obsolete. [For that we need] people who know where to obtain something they don't have themselves. This is what I perceive cultural change to be. We need a new corporate way of thinking. That means to have an overview of all available resources and to be able to utilize them combined and real fast. We need a lot of entrepreneurs in the company who also have enough personal space: Be it that they can make decisions on prices without having to lead lengthy discussions with the central office when negotiating with a customer, or that they as engineers can simply try out something new in the development section." (*Frankfurter Rundschau*, 1997, p. 5).

Dynamics and independent decision-making in decentralized structures instead of duties according to regulations are what is required today. Participation, the deployment of hierar-

chies, a decrease in bureaucracy, self-determination, a humane company climate, holistic tasks and flexible working arrangements are requests often made by modern management – 35 years ago those were the issues demanded mainly by a youthful opposition. Interdisciplinarity, the correlation of learning and practical experiences, teamwork, focussing on projects, autonomy are all demanded by today's industry – 35 years ago being the fundamental principles of the newly founded University of Bremen, which was abusively called a "red cadre training center", those were considered a political scandal. The claim "Small is Beautiful" by Schumacher (1977) and the demand for 'network thinking' were considered to be thoughts from the 'poison kitchen' of the environmentalist opposition – whereas today large corporations consider decentralization to be a strategic pillar. Today the cultural revolution of the Sixties and the expansion of the educational system would probably have to be staged for the benefit of the industry and would be much too late because the people needed for this unavoidable change would have to be educated and trained first.

The company of the future as a learning organization needs the employee who considers a lifelong learning process as a natural part of the development of his or her personality. Job security more and more depends on qualifications constantly adapted to current requirements, which from the individual's point of view ensure his or her "employability". (Moss Kanter, 1997, p. 156). This also includes a greatly increased amount of flexibility for growing numbers of workers, which by all means presents problems.

Richard Sennett (1998) made an important contribution to the critical analysis of the cultural dimension of flexible post-industrial capitalism – on the darker side of the "mind of informationalism", so to speak – with his studies about the "Corrosion of Character", which mainly refer to "its impact on personal character" (p. 10).

Sennett uses a detailed presentation of case examples for the decoding of changes in human behavior, awareness and character; his definition of character is "the long-term aspect of our emotional experience" which expresses itself in the "pursuit of long-term goals" (p. 10). Sennett shows central changes on the example

(1) of workers trained short-term in a highly technical bakery: They lose the control over the working process and their professional identity, can be replaced quickly and feel personally degraded: "Operationally, everything is so clear; emotionally, so illegible." (p. 87).
(2) of a gastronomer who temporarily abandoned the work in her restaurant to take a job at an advertising agency: The high turnover of staff and the constant ideal of being young reduce the meaning of experience and biographical continuity, one has to start over at zero again and again and is forced to prove oneself anew each day: "Taking risks has become a test of character." (p. 90).
(3) of fired programmers who, trusting the permanent stability of their job contracts with IBM, only in the third stage of processing their crisis identified their unwillingness of a (risky) early job change as being a problem (p. 129): "Failure is the great modern taboo." (p. 118).
(4) of a consultant who achieved a very high position as a very young man and who was forced to frequently move to other cities for work and family reasons. The short-term professional ties and the "fugitive quality of friendship and local municipality" (p. 21) clash with long-term family values (such as dependability and loyalty): "Short-term capitalism threatens to corrode his character, particularly those qualities of character which bind human beings to one another and furnishes each with a sense of sustainable self." (p. 27).

(5) of industrial executives during their annual meeting in Davos: "The capacity to let go one's past, the confidence to accept fragmentation: These are the two character traits which appear at Davos among people truly at home in the new capitalism." (p. 63).

Sennett sees a diametral contrast between the assertion of teamwork and the past epoch: "Modern forms of teamwork are in many ways the opposites of the work ethic as Max Weber conceived it." (p. 106). He finds fault with the "domain of demeaning superficiality" (P. 106) and reaches the conclusion: "A regime which provides human beings no deep reasons to care about one another cannot long preserve its legitimacy." (p. 148).

However, the culture moulded by technology and electronic networking is not only determined by the working atmosphere, but also by life outside work. More and more people are continually integrated into the network society through stationary and mobile communication appliances (computers/telephones) in their homes, on the road or in other places.

The multitude of research on the areas of application, the new possibilities and the effects of this development (such as Negroponte, 1995; Tapscott, 1997; Kellerman, 2002; Ling, 2002; Rheingold, 2002; Wellmann, 2002; Mitchell, 2003) show two essential results:

(1) Many people as active users of this technology first and foremost are not victims of its negative effects but rather 'perpetrators' with many personal benefits including the increased opportunity of political information and participation. They are cost-conscious individuals, who contribute to the rationalization of society, for instance by making inexpensive purchases and bookings via the internet (and job reductions, for example through the elimination of retail business).
(2) There is a difference, if not even a divide, between those with access to the new opportunities and the 'informational have-nots'.

Today there is a group of knowlegeable workers, who are gaining in importance and self-esteem, who promote technical and scientific progress, and who are becoming increasingly politically empowered. Humans are the makers of progress – not only within the lines of capitalistic mechanisms. The visions expressed in Brecht's radio theory of 1927-32 (Brecht, 1967) have become reality. The "structural change of the public" (Habermas, 1962) has reached a dimension which has surpassed the first considerations on the use of upload opportunities for the citizens' own channel and communication among citizens (Müller et al., 1980) by far. The internet presents a chance for many to personally participate as producer, sender and player. The internet economy allows for creating values without capital-intense production, and voluntary electronically networked activities of productive individuals can combine considerable resources of computer capacity and work power. The "secret media revolution" (Möller, 2005), which is not all that secret any longer, reaching from free associations of producers (such as Linux and Open Source Software, Wikipedia, Weblogs) to an as yet hardly suppressible evasion of copyright laws when swapping music and movies, is already being seen as the beginning of the new era of "Cybercommunism" (Barbrook, 2001).

Richard Florida found out in a multitude of empirical research on the role of the "creative class" (2004a, 2004b, 2005) that the percentage of well (preferably academically) educated individuals is decisive for the economical success of a region. Yet there are indications for an exclusion of people from the new digital world that can be justified neither from a social nor from an economical point of view. Under the term of 'digital divide' this problem of a digital gap is discussed on

a multitude of different levels and is pinpointed using a series of indicators (Castells, 2003, p. 248; Kellerman, 2002, p. 176):

- sex (male/female)
- age (younger/older)
- income (higher/lower)
- education (high school, resp. university/other)
- professional status (employers/freelancers, government agents/employees, workers)
- position within the company (management/non-supervisory)
- ethnical group (Caucasian, 'black'/Hispanic)
- residential area (high incomes/low incomes)
- residence (city/country)
- region (services, traditional industry, rural region)
- climate zone (Mediterranean/northern)
- continent ('First World'/ 'Third World').

Regarding Germany there is a study exclusively related to internet access lines and based on a telephone survey of private persons done by TNS Emnid (TNS Emnid & Initiative D 21, 2003), which confirmed already known internet data concerning the differentiation according to age and sex (81 % of all individuals between 14 and 19 years old have internet access, while only 21.5 % of all persons between 60 and 69 years old have access to the internet; 58.8 % of all man and 42.1 % of all women are online). A closer look at the survey revealed that the nationality has no impact but a slight advantage based on the method of measurement for non-German residents who are not entitled to vote (p. 13).

Furthermore no relevant regional differences were found for Germany (p. 9, 19), but considerable social differentiations were registered. These can mainly be determined in three areas: (certified) level of education, professional status as well as personal wealth (income). Regarding "internet access according to education" 19.4 % of those surveyed without higher education and without a learned profession (apprenticeship) are online (36.1 % of those with a completed apprenticeship, i.e. a skilled profession), while 79.3 % of individuals with one year college or a high school diploma have access to the internet (p. 12). Concerning the "internet access according to type of profession", employees in leading positions and employers/freelancers show a very high percentage (84.3 % resp. 74.6 %); 49.9 % of unskilled and skilled workers combined are represented on the internet, while homeworkers (30.0 %) as well as retirees (14.6 %) were at the bottom of the scale (p. 16). For school pupils (81.9%) and college/university students (94.8%) the access to the internet is part of their basic studying tools. 50.4 % of surveyed unemployed indicated having access to the internet. In regards to "internet use according to net income per household" the group with a monthly income of Euros 1,000 to 1,500 (most likely including very few students) shows an access rate of 33.3 % versus 74.0 % of those earning over Euros 3,000 (p. 14).

4. Networking as local success factor

Development, production, distribution and consumption of goods and services, whether limited to an area or organized globally, will only function with real people. These real people are at real locations. Even if people today live on different continents and, contrary to the past, can yet collaborate without hardly any limitations, development, production, distribution, consumption

and human life still take place in real and concrete places, in cities, communities and regions. Even global business, no matter how mobile and virtual humans may act, is realized in concrete places after all. The essential difference to past times lies in the fact that the technologically supported mobility of capital as well as the growing penetration of formerly protected local niches promote the tendency towards a global competition of location which can mean the downfall of sites. Altvater/Mahnkopf, probably leaning on Marx, express the same insight: "However, obviously standards are set by the world market that cannot be fulfilled at every 'location'. Thus it really can happen that the products of work are devaluated and therefore work itself becomes superfluous. Hence people will lose their jobs." (Altvater & Mahnkopf, 1996, p. 77). Since globalization cannot take place without localization, they talk of "glocalization" (p. 28).

Already in pre-internet times extensive empirical studies on the local success factors for survival within a global economy, conducted on U.S. cities and regions, came to the conclusion that networking is an essential success factor on the road to world-class performances (Moss Kanter, 1997; Saxenian, 1996)

"To succeed in the global economy, places must nurture the core capability that gives them international distinction ..." (Moss Kanter, 1977, p. 361). Moss Kanter defines the decisive local power in the global economy with the terms "Concepts, Competence and Connections". She "identified three archetypal ways how global economy can work locally, built around the golden triumvirate of world class resources: concepts, competence, and connections." (p. 30).

"Cities specialize in using those assets to link their local population to the global economy. Thus they develop preeminence in one of the generic ways: as thinkers, makers or traders... Thinkers specialize in concepts ... Makers specialize in executional competence ... Traders specialize in connections." (p. 30-31). The attractiveness of a city or a region and its power to attract are what counts: "Thus, communities need both magnets and glue. They must have magnets that attract a flow of external resources – new people or new companies – (...) Communities also need a social glue – a means for social cohesion, a way to bring people together ..."(p. 32). The so-called 'soft' success factors of local quality of life are of great importance here: "In addition to the physical infrastructure that supports daily life and work – roads, subways, sewers, electricity, communication systems – communities need a social infrastructure, an infrastructure for collaboration to solve problems and create the future." (p. 32).

Moss Kanter (1997) provides a detailed description of regional success factors of American world-class regions, using three clusters: the Boston area ("thinkers"), a region in South Carolina ("makers" for external companies) and Miami ("traders"). The decisive factor is that there is a regional structure of collaboration that can make things happen, that realizes changes for the benefit of the region ("getting things done"). The regional cooperative culture, the 'social infrastructure', the functioning of networks is a central factor of local success that must be developed by the participants: "Therefore communities must offer more than their connective physical infrastructure of roads, bridges, buses, subways, airports, seaports, electric power lines, and telecommunication networks. They must also have a social infrastructure that helps forge linkages relevant to global success: networks among small and large companies in related industries, between suppliers and customers, between ethnic groups and neighborhoods, or among institutions in a municipality that contributes to quality of life. I call this the infrastructure for collaboration." (Moss Kanter, 1997, p. 362-363).

Annalee Saxenian (1996) concentrates on Silicon Valley as a perfect example of a high-tech region that combines several world-class qualities and, on top of that, has special network qualities (network society) as well as considerable venture capital.

Saxenian presented a comparative study of the development of Silicon Valley and the "Route 128" region (Boston area) based on the evaluation of extensive data as well as 160 intense interviews conducted in companies. The results of the competitive analysis, which refutes many forecasts of 1990, revealed that despite higher incomes Silicon Valley has defended and expanded its top position in the field of technology. Some of the assumed essential advantages of Silicon Valley are:

(1) The high rate of adjustment to new developments. Companies are faster being restructured and newly founded than anywhere else.
(2) In the end everyone benefits from a quick exchange of information between competitors. The widely spread coopetition secures an advantage concerning time to market, which has become more and more central to economical success.
(3) The cooperation between universities and the industry has traditionally been very close and uncomplicated. This ensures a quick transfer of knowledge.
(4) The climate for the new foundation of a company is extremely positive. Venture Capital is seen as adventure and play capital that has proven to pay off often enough – and is not considered as a risk to be shunned the way it is shunned in Germany.

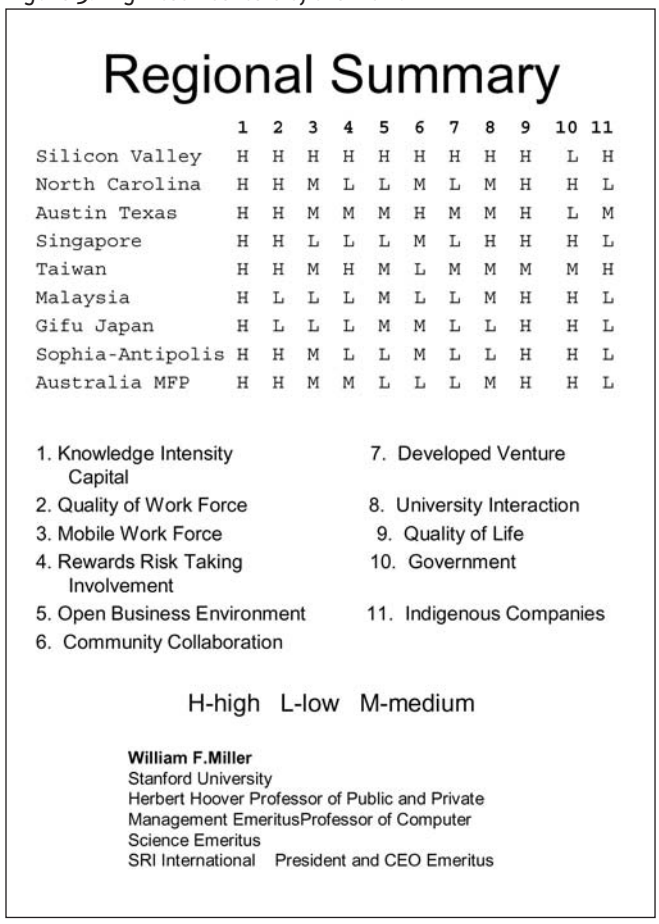
The message of the analysis is that the success of Silicon Valley mainly is the success of a regional culture which promotes the dynamics of fast change within a structure integrated into the network. The meaning of the region and the spatial vicinity is so great that despite the high costs even a lot of companies from outside invest in Silicon Valley in order to profit from the fast exchange of experiences characteristic for that area.

Annalee Saxenian calls the network strategy the stringent result of her research "creating collaborative advantage". She sees great opportunities in a politically fostered regional culture of openness for change on which all participants work together. That factor must be given more weight than the promotion of one particular technological solution:

"Technological advance in Silicon Valley depends on shifting patterns of collaboration and competition among networks of specialist producers. The dynamism of the region's industrial system lies not in any single technology or product but in the competence of each of its constituent parts and their multiple intercorrelations. As a result, efforts to protect an individual sector, such as memory chips, often have perverse and unintended consequences upon linked sectors. Ultimately, regions are best served by policies that help companies to learn and respond quickly to changing conditions - rather than policies that either protect or isolate them from competition or external change. Policies to support network-based industrial systems are most effectively achieved at the regional rather than the national or sectoral level. Regional policy serves best as a catalyst - stimulating and coordinating cooperation among firms and between firms and the public sector. Rather than being orchestrated as top-down intervention or bureaucratic guidance, policy initiatives should evolve as interested local parties exchange information, negotiate, and collaborate.The starting point for a regional industrial strategy is fostering the collective identities and trust to support the formation and elaboration of local networks. By providing public forums for exchange and debate, policymakers can encourage the development of shared understandings and promote collaboration among local producers." (Saxenian, 1996, p. 166-167).

William Miller clearly sees that neither the infrastructure nor the employees of a region can quickly disappear so investing in their development is worthwhile. He suggests a policy of people and places. Politics must promote training and specialized training, support research and

Figure 3: High-tech centers of the world



Regional Summary

	1	2	3	4	5	6	7	8	9	10	11
Silicon Valley	H	H	H	H	H	H	H	H	H	L	H
North Carolina	H	H	M	L	L	M	L	M	H	H	L
Austin Texas	H	H	M	M	M	H	M	M	H	L	M
Singapore	H	H	L	L	L	M	L	H	H	H	L
Taiwan	H	H	M	H	M	L	M	M	M	M	H
Malaysia	H	L	L	L	M	L	L	M	H	H	L
Gifu Japan	H	L	L	L	M	M	L	L	H	H	L
Sophia-Antipolis	H	H	M	L	L	M	L	L	H	H	L
Australia MFP	H	H	M	M	L	L	L	M	H	H	L

1. Knowledge Intensity Capital
2. Quality of Work Force
3. Mobile Work Force
4. Rewards Risk Taking Involvement
5. Open Business Environment
6. Community Collaboration
7. Developed Venture
8. University Interaction
9. Quality of Life
10. Government
11. Indigenous Companies

H-high L-low M-medium

William F.Miller
Stanford University
Herbert Hoover Professor of Public and Private Management EmeritusProfessor of Computer Science Emeritus
SRI International President and CEO Emeritus

(Source: Miller, 1999)

education, further the development of a modern infrastructure and create institutions that organize the collaboration of industry, government and science. "Develop the people and places, i.e., the habitat for living and working." (Miller, 1996, p. 15; Lee, Miller, Hancock & Rowen, 2000).

Apart from the regional network and communication culture the availability of venture capital in a (greater than) sufficient amount is a decisive factor. In this aspect Silicon Valley has been superior to other regions for a long time. Besides the large investors the many small venture capital companies and individual investors ('business angels') play a decisive part in that. Matthew Zook has impressively confirmed the central role of venture capital for the development of new enterprises and therefore for the regional economy in his latest empirical study on the sites of the American internet industry (Zook, 2005a).

1999, William Miller presented the results of a study conducted at Stanford University on the international position of high-tech regions (which, in spite of all problems resulting from the Dotcom crisis, probably have not changed much in the meantime) (Miller, 1999, 2004; Anttiroiko, 2004).

It is imaginable that these centers of innovation with their dynamics of development will more and more separate from the 'rest of the world' and connect with each other electronically – possibly with different legal frame conditions as those that apply within the nation states. William Miller (1996, 2000) even considers the possibility of a beginning of a "New Hanseatic Capitalism" (1996, p. 13). In order to realize the internal exchange, from early on the Hanseatic League developed a series of its own coordination mechanisms apart from the locally strictly limited state instances and anticipated basic economical elements of the later capitalism – but finally had to give in to the dominating military of the old power.

Today the regional electronic networks challenge the classic separation between national, regional and local levels. Economical regions – sometimes by circumventing national borders –

come closer together. Miller, for instance, refers to the close connections between Michigan, Ohio and New York (U.S.) with Ontario (Canada), Texas and Arizona (U.S.) with Mexico as well as the forming of the Cascadia Region by the states in the northwest of the U.S. and the southwest of Canada (Miller, 1994, 1996); Altvater & Mahnkopf (1996, p. 434) and Moss Kanter (1997, p. 368) additionally mentions the Euro Regions, respectively Euro Cities as evidence.

1995, it was recognized in Silicon Valley that the internal electronic networking did not measure up to the individual opportunities and future requirements. Under the supervision of the industry a regional initiative ("Smart Valley", Einemann, 1997; Sinclair, 1999) was founded and the international experiences during the development of regional and local "electronic communities" (Einemann, 1999) were discussed at the Stanford Conference "Connect 96", the first global meeting of local internet initiatives (Einemann, 1996). Central issues were the following activities:

(1) Development of infrastructure (glass fiber lines, broadband nets)
(2) Establishing of foster agencies for the coordination of activities and means
(3) Realization of research projects and pilote projects
(4) Fostering of the economy and of commercial projects
(5) Promoting internet access for everyone under democratic aspects
(6) Improvement of education system (connecting schools with the net)
(7) Establishing electronic access to administration and information systems for citizens
(8) Support of initiatives, such as those for environmental protection
(9) Promoting tourism and culture (municipal information systems)
(10) Improvement of the quality of the health system
(11) Optimization of protective and safety measures in national disaster/emergency cases.

5. Cities in the Internet Age

Manuel Castells (1996, 2002, 2003), William Mitchell (1996, 1999, 2003) and Stephen Graham (1996, 2002, 2004) conducted the most intense studies on the development of the cities in the Internet Age. William Mitchell from MIT mainly analyzed the structural changes connected to the application of the latest technologies that also have an impact on real human life. Manuel Castells, in his urban sociological tradition, closely examined the development of the cities in the network society. Stephen Graham's particular contribution is the publication of a commented text collection ("The Cybercities Reader", 2004) that summarizes the relevant debate on the subject of 'cities and telecommunication/internet'.

As a result of the penetration of new technologies into concrete human life the cities change as well; virtual activities have concrete effects on the concrete reality in concrete places that change structurally (most distinctively worked out by Mitchell, 1996, 1999, 2003), however, without losing their function. Even the "Teleserviced City" (Mitchell, 1999, p. 112f) still *is* a city, and mobile (internet) connections do not effect the removal from real life but rather the opposite: "We will increasingly take advantage of digital telecommunications technology to stay more closely in touch with places that are particularly meaningful to us when we travel. There will be still some place we call 'home'. And when we are far from it, we will continue to call it home." (p. 73). The time when separate virtual and physical worlds were contemplated within the city debate is over: "Networked intelligence is being embedded everywhere, in every kind of physical system – both natural and artificial. Routinely, events in cyberspace are being reflected in physical space, and vice versa." (Mitchell, 2003, p. 3).

Graham and Marvin (1996, p. 78) argue against analytical approaches that view the use of the new information and communication technologies deterministically as a primarily technological 'wave from outside' and against those who predicted the utopia of the 'disappearance of cities' and the transfer of most activities into the virtual world as a realistic possibility. Empirical findings, such as on the development of transportation requirements, strongly contradict those predictions: Even though the growth of internet use can reduce trips in theory (i.e. by working at a home computer), fact is that the mobility of people and presumably of goods, too, has increased permanently (Castells, 2003, p. 231; Graham, 2004, p. 153). Empirically observed there has been no decrease in urban population, either, but rather the opposite: The percentage of world population living in the cities is continually growing (Angel, Sheppard & Civco, 2005; Castells, 1996, p. 424).

Castells sees the cause for that in the central function of the cities as offering an innovative environment and the frame conditions necessary for innovations: "Yet, why does the new production and management system of the Information Age favour metropolitan concentration? Knowledge generation and information-processing are the sources of value and power in the Information Age. Both depend on innovation, and on the capacity to diffuse innovation in networks that induce synergy by sharing this information and knowledge. A twenty-year-old tradition in urban and regional research has shown the importance of territorial complexes of innovation in facilitating synergy. What Philippe Aydalot, Peter Hall, and I named some time ago as 'milieus of innovation' seem to be at the heart of the ability of cities, and particular of large cities, to become the sources of wealth in the Information Age. This is certainly the case for Silicon Valley (and the San Francisco Bay area in general), the acknowledged birth-place of the information-technology revolution (Saxenian, 1994). But, as shown by Peter Hall and myself in our world survey of technopoles, the argument extends to all societies. All major centers of technological innovation have appeared in and from large metropolitan areas ... But the innovative potential of cities is not restricted to information-technology industries. It extends to a whole range of activities dealing with information and communication, thus based on networking and the internet. Innovation is essential in advanced business services, which form the leading money-making sector in our economy. Services such as finance, insurance, consulting, legal services, accounting, advertising, marketing comprise the nerve center of the twenty-first century economy." (Castells, 2003, p. 226-227; Castells, 1996, p. 421; Castells 2002, p. 325; Sassen, 2002, p. 22). Face-to-face contacts continue to play an important part.

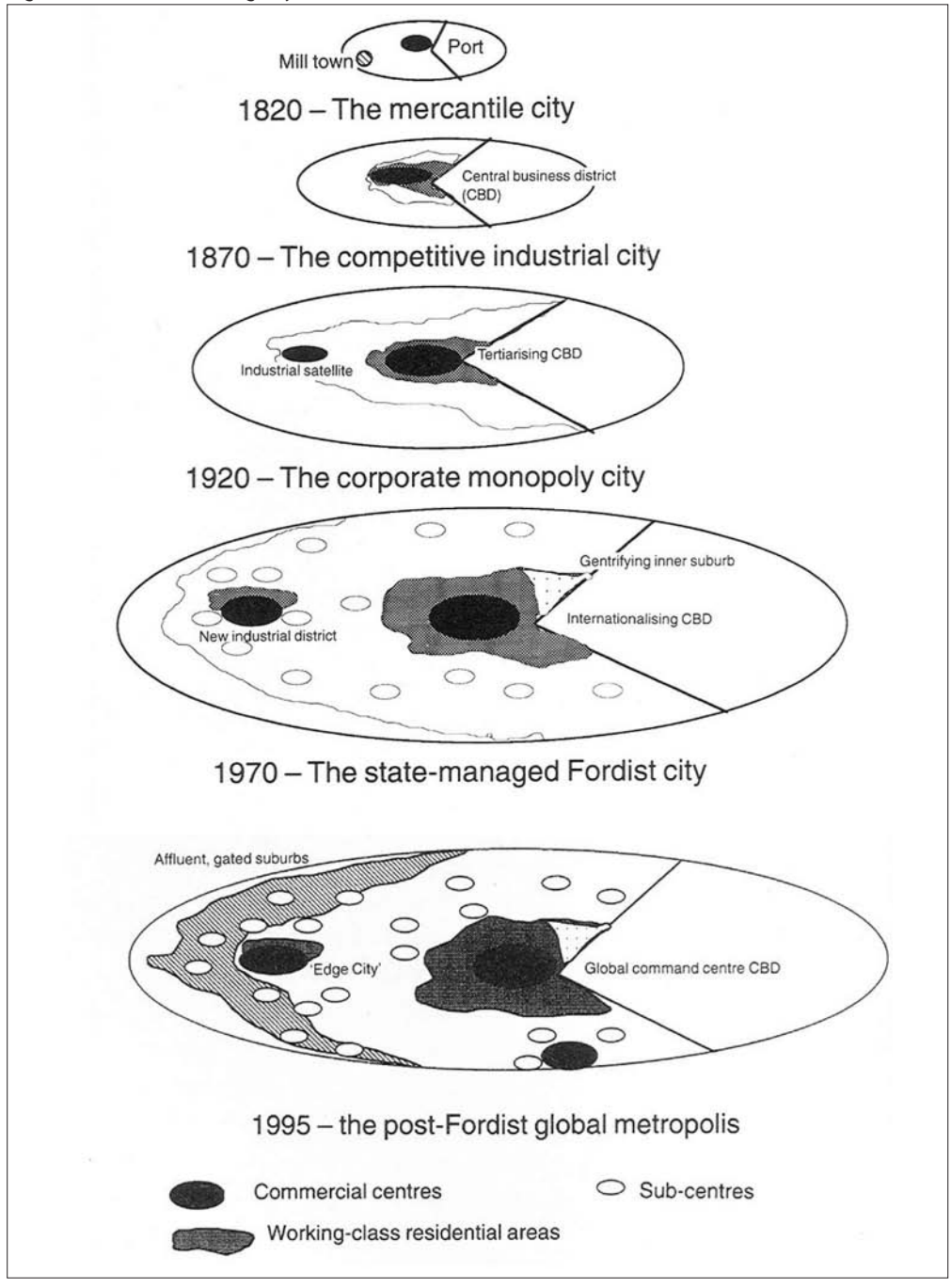
Even if the new technologies make many decentralizations possible for companies, at least the monitoring and control functions remain concentrated in the metropolises.

Castells detects a "network of metropolitan nodes" in his concept of the "space of flows" (as a new form of space) (Castells, 2003, p. 228). "So, metropolitan regions in the Internet Age are characterized, simultaneously, by spatial sprawl and spatial concentration, by the mixing of land-use patterns, by hypermobility, and dependence on communications and transportation, both intra-metropolitan and inter-nodal. What emerges is a hybrid space, made up of places and flows: a space of networked places." (Castells, 2003 p. 235).

Graham and Marvin presented a good visualization of the historical structural change of the cities into metropolitan areas (1996, p. 314, p. 334) (Figure 4).

Saskia Sassen (2002, p. 14-15) sees neither a decrease of hierarchies or imbalances among the cities nor a reduction of imbalances within the cities in the Internet Age. Häußermann and Siebel very soon detected a trend enhancer in the new media for existing polarizations (1984, p. 41). Gra-

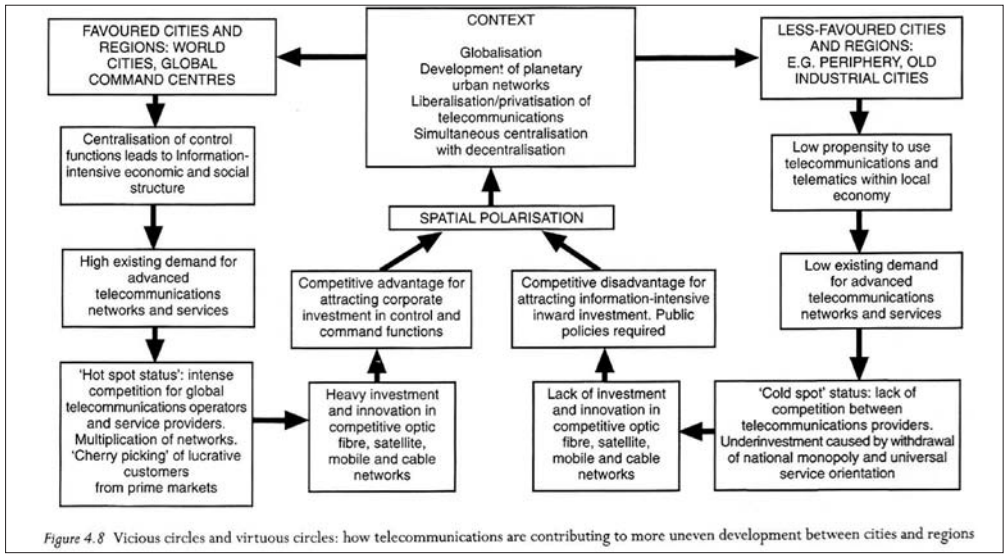
Figure 4: Structural change of the cities



(Source: Graham & Marvin, 1996, p. 314, 334)

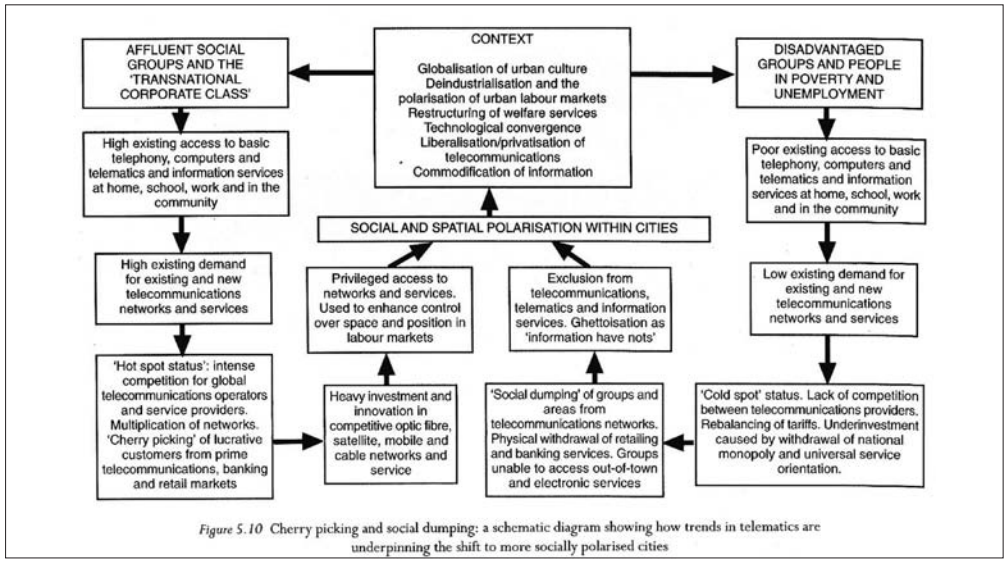
ham and Marvin (1996) analyze in detail how existing imbalances are rather enhanced than balanced among as well as within cities by the ability to expand the use of new technologies.

Figure 5: Imbalances among cities



(Source: Graham & Marvin, 1996, p. 169)

Figure 6: Imbalances within cities



(Source: Graham & Marvin, 1996, p. 236)

Without exception the available empirical studies on the development of the internet on city level come to the conclusion that, at least during the actual first phase, those who were already strong before are getting even stronger. That applies to the level of infrastructure, production of the internet and use. Analyses of the flows of communication show a growing concentration on the metropolises as well. Detail research shows the differentiation between large cities and the

rest of the nation, among individual cities and within the cities. However, frequently the empirical basis is rather narrow.

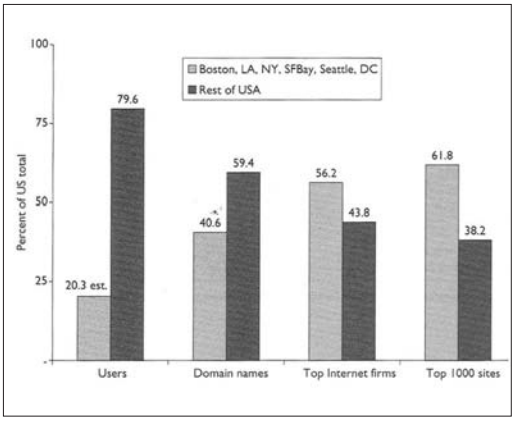
Anthony Townsend shows in his thesis at the MIT (2003) on the development of the internet infrastructure that it "actually reinforced existing geographic differences in connectivity at multiple spatial scales – global, metropolitan, and neighborhood." (p. 15). In contradiction to the claims made by the inventors of the internet "just a handful of cities around the world serve as dominant hubs for the network." (p. 55). He sees a dominance of the United States in the most important nodes of the world's backbone (Kellerman, 2002, p. 140, 161) and notes a "geographic Digital Divide" (p. 117): "This place-based divide was reinforcing existing inequities in opportunity between prosperous and declining cities, and between metropolitan and rural areas." (p. 101).

Castells differentiates between the technical geography of the internet and the user's geography (2003, p. 208-209) and, based on the data available to him (especially that from Zook, 2005b), he comes to the conclusion that the fast spreading of the internet follows a certain spatial pattern: "...this diffusion follows a spatial pattern that fragments its geography according to wealth, technology and power (...) Within countries, there are also major spatial differences in the diffusion of the internet use. Urban areas come first, both in developed and developing countries, and rural areas and small towns considerably lag behind in their access to the new medium." (Castells, 2003, p. 212).

In his latest study on the geography of the American internet industry Matthew Zook, probably the internet researcher with the best empirical tradition and evidence of data, has underlined the dominance of the large cities over other regions of the nation with the aid of the indicators user, domain names, the top internet enterprises and the top 1,000 sites. Boston, Los Angeles, New York, the San Francisco Bay Area, Seattle and Washington, D.C., clearly stand out from the rest of the country. (2005, p. 38).

Aharon Kellerman (2002) endeavored an empirical foundation of the differentiation between nations and cities on a global level, taking a closer look at the production of the new technology and internet contents, data flow and the use, including access lines. Overall Kellerman confirms the thesis of concentration and gives proof of it by indicating the distribution of the international backbone capacities, among other evidence (p. 147).

Figure 7: Internet dominance of U.S. cities



(Source: Zook, 2005a, p. 38)

Table 1: City bandwidths

Table 6.4 Leading cities in intercontinental backbones by Mbps, 2001

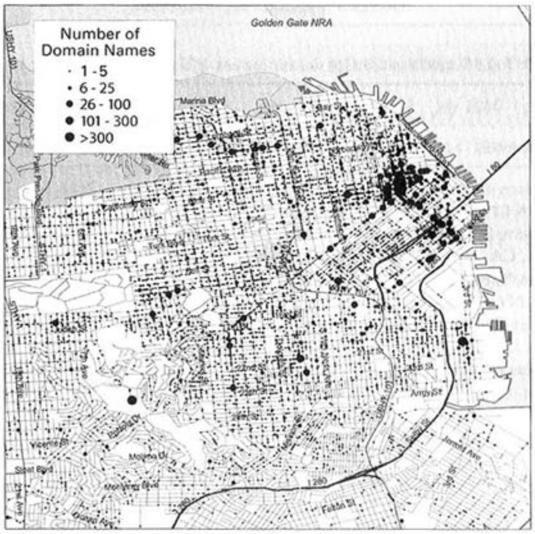
City	Bandwidth
New York	149 989.5
London	85 518.7
Amsterdam	24 479.6
Paris	22 551.8
San Francisco	20 813.6
Tokyo	16 745.5
Washington DC	13 261.2
Miami	11 912.4
Los Angeles	11 227.0
Copenhagen	10 417.0

Source: Adapted from TeleGeography (2001).

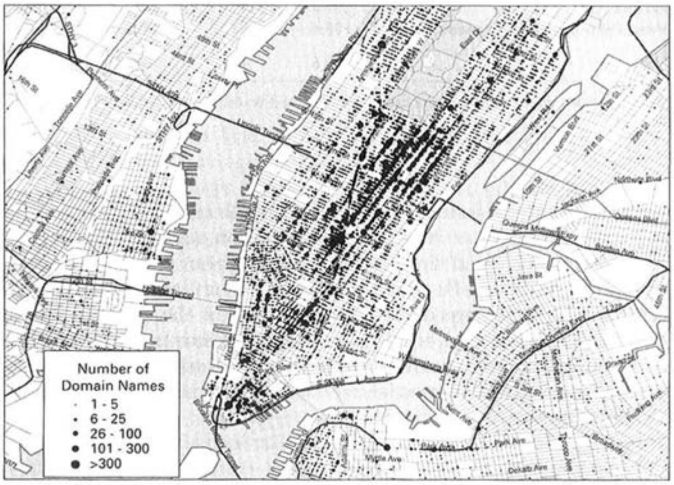
(Source: Kellerman, 2002, p. 147)

A look at San Francisco and New York, where internet domains concentrate to a great extent, illustrates the urban digital differentiation (Zook, 2005a, p. 32).

Figure 8: Internet centralization in San Francisco and New York



Map 3.6 Location of commercial domain names in downtown San Francisco, July 1998.
Source: author survey.



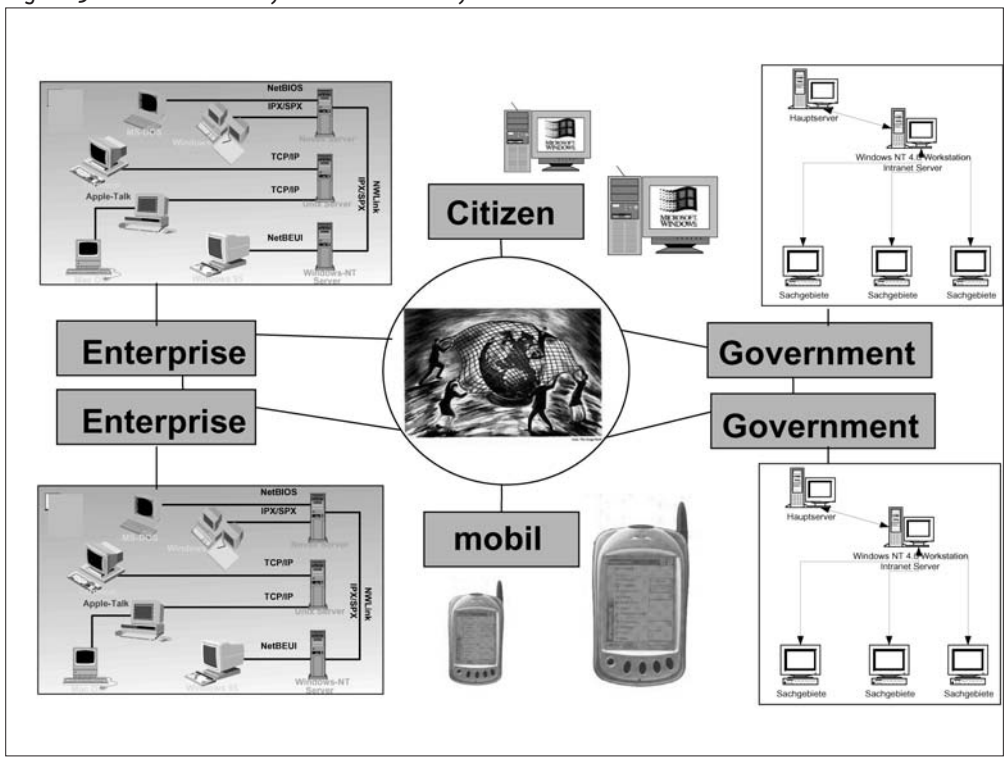
Map 3.7 Location of commercial domain names in downtown New York, July 1998.
Source: author survey.

(Source: Zook, 2005a, p. 32)

6. The government as player in the net

Globally state instances played different roles in the establishment and the development of the digital network society – whereby the differences were not only between continents and nations (greater activities in Asia and Europe) but also between the different governmental levels (Einemann, 1996, 1999). Undisputably, the government is a relevant player on the local level as well, which cannot only play a part in the setting-up of an infrastructure (as of late not only of broadband structures, but also of WLAN structures), the promotion of companies and projects as well as in making internet access lines available (for instance in public libraries and training centers), but also must get involved in the network society: especially by establishing municipal and state information and communication systems and the integration of the administration into the electronic processes (eGovernment). In order to do so the governmental administration must be capable of processing its own duties in its own networks with the help of suitable software (administrative net, electronic administration).

Figure 9: The electronically networked society



A wide definition of 'eGovernment', as presented by Jörn von Lucke and Heinrich Reinermann (2000, p. 1) in their "Speyerer Definition von eGovernment (The Speyer Definition of eGovernment)", is useful. According to their definition eGovernment first of all is processing "in connection with governing and administration (Government) by means of information and communication technologies via electronic media."

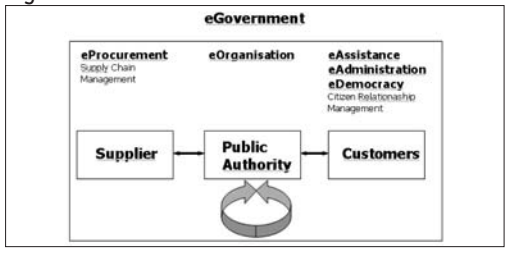
A differentiation according to communication partners reveals that eGovernment takes place within the public sector (Government to Government, G2G) as well as between administrative body and citizen (Government to Citizen, G2C) and between government authorities and the industry (Government to Business, G2B) as well as between government and non-government organizations of the third sector (Government to NGO, G2N).

A differentiation according to the level of interactivity of the communication processes will lead to differentiating between the use of one-way 'information' (such as citizen or tourist information systems), 'communication' (such as e-mail exchange), 'transaction' as well as 'integration' (such as electronic receipt, processing and return of applications and requests, connection of systems of external and internal eGovernment in one medium). 'eCommerce' (for example electronic bidding systems) and 'eServices' (i.e. electronic administrative decisions) are viewed as being parts of the 'area of transaction'. The electronic depiction of business processes ('eWorkflow') and of democratic processes, such as elections or citizen participation ('eDemocracy') goes beyond all fields of application.

The "new access to people, processes, data and objects" (Lucke & Reinermann, 2000, p. 5) is one aspect among others that offers considerable additional benefits for citizens, industry and administration ('eBenefit').

It is important to also include the relation to suppliers (eProcurement) and very specific 'customers' in the definition of eGovernment: not only that to enterprises in the sense of eCommerce but also that to the citizen in the form of eAssistance and eDemocracy (elections, participation).

Figure 10: eGovernment



(Source: Gisler & Spahni, 2001, p. 20)

'eGovernment' does not only mean the modernization of the governmental application of new information and communication technologies but also the reorganization of processes and strategic administrative reforms that also mean a change in the relationship between the citizens and their government. Initiatives of companies or citizens are more and more enabled to take on social tasks themselves (respectively in syncronization/cooperation with the government or under its monitoring). The image of the 'activating government' and metaphors such as 'government as partner instead of patron' or 'let the data, not the citizen do the walking' are indications of the new approach. It is about the restructuring of administration aiming at closeness to the citizens, customer orientation and the improvement of the economical efficiency of state activities.

Administrative and work processes as well as organizational structures are being examined and, if necessary, altered in regards to their online compatibility and the possibility of an increase in efficiency through the use of modern computer solutions. At the same time these actions effect the improvement of attraction of the site for the economy and population by actively altering the structure as well as a more economically efficient administration and the acceleration of administrative processes with direct (costs, deadlines) and indirect (use of tax money) benefits for companies and citizens.

The national, state and municipal governments in Germany want to achieve the following goals in connection with the introduction of eGovernment processes:

- Online-information for citizens and enterprises

- Communication and interaction with the industry and citizens with the use of transactions: i.e. the availability of forms for downloading, the electronic exchange via e-mail, submitting and returning of applications and requests via the internet, the electronic application of financial assistance, the electronic processing of payment processes, the online-monitoring of administrative processes online (transparency), ...
- Optimization of the internal network and communication facilities with other governmental levels in order to carry out all-in-one-medium processes
- The set-up of an eGovernment-IT-infrastructure and the guarantee of safe transactions (encoding, electronic signature, payment processes, filing solutions, form servers, ...)
- Electronic procurement activities
- Counter measures against the digital divide of society by making access available (such as processing stations in public offices)
- Strengthening of rural areas
- Improvement of the citizens' participation, including electronic voting
- The employees' participation in the reform processes and the processing of qualification measures
- Adjustment of the legal frame conditions to the new structures.

Positive effects on the economy as well as for the individual citizens and the state itself are expected. A direct economical advantage for companies and citizens will surface if the government is able to carry out its tasks at lower cost and to achieve not only rationalization effects but also quality improvements.

Processes are completed quicker and cheaper through eGovernment if, for instance,
- data is accessible simultaneously and a reduction of transportation time is achieved
- work steps are reduced (no paper files are required)
- the input and forwarding of data is carried out without manual processes
- processing data, legal sources and specialized information is available electronically.

Direct improvements from the point of view of the economy and citizens are, for instance, if
- the red tape is shortened and reduced because requests and applications can be submitted online
- offers and tax declarations can be submitted online
- the status of proceedings can be checked into online and there is transparency
- the spatial distance of the administrative seat no longer matters.

In Germany the processing of paying back financial assistance for students via the internet for 500,000 recipients, the possibility for millions of citizens and enterprises to submit their tax declarations online (Project ELSTER) as well as an integrated system for processing customs (ATLAS) are just some examples for large and complex projects of the federal government (Blaschke, Karrlein & Zypries, 2002).

On state level projects such as
- the electronic legal correspondence of concerned parties with the courts and prosecutors' offices
- automated default actions

- the request of data from central registers such as real estate title registers and commercial registers
- access to maps of real-estate parcels
- applications for financial aid, i.e. for agriculture
- the use of electronic procurement systems

are being offered.

The German city states, which primarily act on the municipal level, play a special part. Thus the Senate of Hamburg (Bürgerschaft der Freien und Hansestadt Hamburg, 2002) announced a comprehensive catalog of short-term, intermediate and long-term measures that included

- an integrated online-procedure for the application of financial incentives
- economical planning procedure and zoning plans online
- job vacancies online
- forums on public issues
- relocating
- application for identification cards and passports
- online filing of complaints
- registration/re-registration of privately owned vehicles
- online registration for exams.

Without the installation of ICT technology in all administrative bodies eGovernment naturally is not feasible. For the most part this has been accomplished. Almost all workplaces have personal computers. Automated payment mode has been initiated just as much as modern communication technologies have been introduced to law enforcement, customs or the agricultural administration. What remains a problem, however, is the fact that the installation of different systems causes interruptions even in one and the same state – not to mention the different systems in the states, the municipalities and the federal government. The unification process of the systems, which is necessary for the internal communication of the public sector, meets with complications (for instance, in the State of Lower Saxony there were over 20 different personnel management software solutions). Reinermann correctly observed that the new technical possibilities for the modernization of public administration in practice "were mostly used only in limited suitable fields without achieving a possible integration of administrative activities." (Reinermann, 1999, p. 12). Subsequently it should be even more difficult to grant outsiders – therefore the citizens, enterprises and organizations – a unified and simple access to administrative processes and to realize all-in-one-medium interaction.

In reality, the much-acclaimed reduction of public tasks and the restructuring and reduction of bureaucratic structures and processes proves to be extremely slow. However, administrative structures and processes that are clear and simple for the user are another essential precondition for the realization of eGovernment. Also eGovernment can only become reality if the industry, organizations and citizens actively go along with it so that nothing hinders their acceptance. Trust in the functionability of the processes and the safety of personal data, the easy handling of a secure access and the adjustment of legal regulations are necessary frame conditions for eGovernment which, however, are still limited.

Even today neither a gapless realization of electronic access to administrative bodies nor a broad concrete offer of eGovernment can be assumed for Germany; this particularly applies to the local level so important for the citizens. In the year of 2000 a survey of the 200 largest muni-

cipalities, conducted by the consulting company PriceWaterhouse Coopers and the German Union of Cities and Communities, revealed a strategy for the realization of the virtual city hall only for 10%; 67% had no financial concept and 90% failed to have their own personnel planning for internet activities (*Computer-Zeitung*, 2000, p. 18). So the diagnosis for large cities and municipalities was: no concept, no funds, no human resources. Though the Bertelsmann Foundation recognized positive changes, it issued another negative diagnosis: The project of the "virtual mayor's office" in fact was a major concern for merely 26% of all 190 municipalities with over 50,000 inhabitants (Friedrichs, 2000; Pröhl, 2001).

A success story from Bremen for the end of 2005 tells a lot about the practical situation regarding eGovernment and interactivity in Germany: The latest accomplishment of this city (therefore definitely not everywhere in Germany) supposedly enables attorneys to communicate online with the courts and to submit petitions online by using their digital signatures. At the end of 2005 the State of Lower Saxony announced that a Chief Information Officer (CIO) at the Department of Internal Affairs had been appointed for the (at least until now not optimally realized) central coordination of all information technology of the state administration, also responsible for the field of eGovernment. The fact that Germany ranks 11 in a worldwide ranking for eGovernment (and is No. 6 in Europe) may be acceptable for Germany (United Nations, 2005, p. 27, 35), but unfortunately it is no evidence of the functioning of eGovernment on the municipal level throughout the country.

II. Findings on the digital contrast in Germany

1. The empirical approach

The following will first introduce an analytical model with indicators, for which internet-related data on the 100 largest German cities for the years of 2000 and 2003 were available (therefore no 'wish lists'). The evaluation, however, focuses on the 50 largest cities and on data from 2003, because differenciated empirical material is available on their traditional economical positions (Lichtblau, 2004) and can be evaluated in relation to the collected internet data. The data from the year 2000 will only be considered as supplementary information.

The selective criterion 'number of inhabitants' has led to the fact that rather interesting smaller towns, such as Darmstadt (i.e. home of the largest Internet Provider T-Online) or Heidelberg (a town of science with the World Market Leader of ERP software, SAP, in its vicinity) or even Bremerhaven (a traditional industrial town with a high rate of unemployment), are not systematically included in the research. Since there is internet-related data available on 100 cities, single aspects can be used for additional evidence that will strengthen argumentation.

Table 2: The 10 largest and the 10 smallest of the 50 German cities

Berlin	3,388,434
Hamburg	1,726,363
Munich	1,227,958
Cologne	967,940
Frankfurt	641,076
Essen	591,889
Dortmund	589,240
Stuttgart	587,152
Düsseldorf	570,765
Bremen	540,950
Total_Top10	10,831,767
Total_City50	21,468,965
Share_Top10	50,5
Federation	82,440,309
Share Fed.	13.1

Mainz	185.293
Hamm	183,805
Saarbrücken	182,858
Herne	174,018
Mülheim	172,332
Solingen	165,032
Osnabrück	164,195
Ludwigshafen	162,458
Leverkusen	160,829
Oldenburg	155,908
Total_Low10	1,706,728
Total_City50	21,468,965
Share_Low10	7,9
Federation	82,440,309
Share Fed.	2.1

Figure 11: Germany and its state capitals

(Source: http://map.4call.de/)

In 2003, a total of 21.47 million residents lived in the 50 largest German cities; that equals 26% of a total of 82.44 million German inhabitants. Berlin, boasting 3.388 million inhabitants, is the largest city, while Oldenburg with its 155,908 registered residents is the smallest city. A concentration of one half (50.5%) of the inhabitants of the 50 largest cities (13.1% of residents) is found in the 10 'metropolises' (totalling 10.8 million inhabitants); among the 50 largest German cities, the 10 smallest combined have merely as many residents as the second largest city, Hamburg (1.7 million), and house only 2.1% of all German inhabitants.

At the end of the year 2000, using a multitude of indicators, I published a first study on the internet position of the 100 largest German cities, which differentiated between the players "company", "private individuals" and "government" (Einemann, 2000).

Matthew Zook (2005b) had only few indicators at his disposal for his very broad analysis of 2,500 cities on an international level (Castells, 2003, p. 219). However, he was able to include the domain registrations, the 'top websites' frequented the most, the locations of internet companies and the amount of internet users based on U.S. Census (p. 16-39) in his most recent study on the locations of American internet production (2005a). The available venture capital is taken into consideration as an explanatory factor (p. 57).

Aharon Kellerman (2002) achieved further development of the analytical instrument and differentiated between the technology, the production, the provision of contents, the data transfer and the consumptive aspect of the use. He also took indicators of 'traditional economy' (such as for the use of media) into consideration, which serve in finding explanations for the results. The indicators used by Kellerman, which are not always convincing and often only available on a selective basis, can be summarized as follows:

Figure 12: Kellerman's indicators

Production/ Storage	**Transfer/ Nodes**	**Consumption/ Use**	**Explanation**
Domain registrations Server farms (location) Pageviews Number of pages	Server farms Data flows	Access lines Broadband access lines E-mail addresses Transfer volume Duration of use	Population Capital Centers (Finances, Media) Company seats

(Based on Kellerman, 2002)

Based on the studies at hand, for the purpose of operationalizing the term 'internet position', the sectors and the indicators can be re-defined, and analysis models can be developed by taking the data situation into account.

1.1. Indicators and data situation

At first it shall be clearly defined how the internet development or the internet position of cities can be operationalized and which indicator permits which statement.

Based on Kellerman's differentiations (2002) it makes sense to differentiate among the 3 large areas of supply (production), demand (consumption) and frame conditions (culture). The technical infrastructure (glassfiber kilometers, switches) will not be taken into consideration for this study, since no reliable data is available on the local level (this also applies to the number of server farms and WLAN hot spots), and since that issue probably is no essential differentiation criteria for Germany due to Germany being equipped very well overall. Data flows are analyzed with the aid of several indicators: on the level of the utilization of offers (as selections on pages) as well as from the user's perspective (transfer volume). Within the dimensions of supply, demand and frame conditions it can be detailed between company activities, the role of private individuals and governmental activities; separate evaluations will be made on this in a second step.

1.1.1. Supply (Production)

For the analysis of internet production, respectively making supply available, it must be detailed between potential and real supply as well as the utilization of it.

Thus the indicator **'Domains'** used again and again is usually based on information from the registration offices – however, the registered domains are merely potential and not necessarily real offers. Domains are being reserved on supply, domains are not active, and to prevent mistakes companies link all modifications to their address with their actual homepage.

Potential supply

Those who reserve an internet address may be considered potential suppliers. The German registration office DENIC had issued approx. 5.8 million **German domain addresses (1)** at the time this data was compiled, and approx. 2.2 million of those were issued for the 50 largest cities. In addition to that the **more than 1.2 million domains (2) maintained by Company 1&1** (not only those ending with .de), for whom a differentiation into companies and private individuals is possible, were integrated into the study. For those indicators the data on the level of individual cities could only be compiled with the help of DENIC (conversion and supplementation of the published data) and Company 1&1 (internal statistical assessments).

Real Supply

Much more relevant than data on potential supply is information indicating real suppliers of 'products'. The **entries into an internet catalog (3)**, which offers the public the opportunity to find pages, serve the analysis of same. About 113,000 entries of the total of approx. 500,000 entries offered by allesklar.com (and their product 'meinestadt.de') can be allocated to the cities. In addition to that, the Company 1&1 manages over 360,000 **active websites (4)** in the cities alone and has made that data available. Regarding both indicators, there is the data on companies as well as on private individuals. In view of the excellent data supply it is unnecessary to integrate the analysis of **Companies with Internet Presence** from 2000, which could be put into relation to all companies existing in the city (Source: Schober Business Information).

The analysis of the location of origin of the 112 **suppliers of internet products (5)** at one of the world's largest computer fairs in 2003 (Cebit in Hanover) serves to determine the production sites of the internet industry. Mid-2005 (the only empirical post-evaluation) 381 professional websites in Germany accepted the compilation and publication of their media data by the IVW (Information Association for the Determination of the Circulation of Advertisement) (on the method of compilation: Welker, Werner & Scholz, 2005, p. 205). 182 out of a total of 252 **content suppliers (6)** were located in the 50 largest cities.

Cars are offered in those 50 large cities by approx. 14,000 **sellers (7)** through mobile.de; the amount of cars (about 122,000 of a total of approx. 750,000 cars offered throughout Germany are offered in the large cities) is not taken into consideration. The Company mobile.de made the data on cars and sellers available to dealers as well as to private customers.

Company 1&1 maintains 938 **active webshops (8)** in the 50 large cities; those webshops (not the approx. 2,400 webshops registered) are taken into consideration. The data on the **auctions (9)** carried out mainly by private individuals in the large cities, which eBay offered in encoded form back then, stems from the year 2000 – in 2003 this was no longer possible.

The **internet page of the municipal government (10)** depicts a real offer. The evaluation of its quality with the help of 139 indicators will be explained in detail later; however, that factor is relevant for the internet position of the city.

Use of the supply

The use of the supply is a central indicator for the internet position of a city. A site with many million pageviews per month has a greater effect (i.e. on proceeds through advertisement) than unknown and hardly registered internet presences. Here the attractivity of the page allocated to a city is measured; the activities assignable to the user's city will be described at a later point.

Mid-2005, the IVW somewhat officially registered a total of more than 8 billion pageviews; 5.3 billion **pageviews (11)** concerned the 50 largest cities – 66.3 % of the total German volume.

17 million of the 53 million registered **pageviews of meinestadt.de (12)** in June of 2003 concerned internet addresses in the 50 largest cities. In part the municipal governments published their own user statistics on the internet; two thirds reacted to a survey and made their data available: over 60 cities combined register a total of approx. 103 million pageviews of stadtweb.de. Unfortunately, since the data compilation is not ideal overall and the compilation processes differ (Welker, Werner & Scholz, 2005, p. 137), taking that indicator into consideration for a quantitative analysis does not seem advisable. Company 1&1 made information on the **clicks on the domains (13)** hosted by it available; these were approx. 2.2 billion for the 50 largest cities during the month of September 2003.

The turnover of over 5 m Euros per month of the webshops supported by 1&1 probably makes up less than 1% of German eCommerce turnover and will not be considered separately.

Due to the low amount of data and the missing relation to the actual job vacancies the **job vacancies** per city offered on the internet and compiled in 2000 (provided by Company Jobs&Adverts) are, taken all together, rather evidence of the job market than of the internet activity of the city and are therefore not considered for the purpose of evaluating either.

1.1.2. Demand (consumption)

For the analysis of internet consumption it must also be differentiated between potential and real user activities, whereby the installation of access lines in itself can be viewed as an internet activity.

Potential demand

The frequently applied indicator of internet access lines is merely an indication of the potential use – the availability of the access does not necessarily result in an activity on the internet. Information on the **broadband access lines (14)** existing in the large German cities was provided by Company 1&1 (here the total of 127.000 access lines were not very high yet). Also the existing **e-mail addresses (15)** are no indication of the real use; as optimization of the data basis for the City of Bremen the amount of used POP boxes could be taken into consideration, whereby the factor of the operation of several e-mail addresses by one and the same individual can be somewhat corrected. According to an evaluation of a 1% random check (evaluated by Company GMX) around 4.5 million of the approx. 16 million German addresses at GMX are located in the 50 largest cities.

The absolute number of **online accounts** as well as the **share of online accounts (16)** considering all accounts can be regarded as an indicator of the potential use of the internet; the Direktbank DiBa issued information on the volume of online banking shared by the 50 largest German cities (a total of over 440,000 accounts), however, not on real activities, such as the amount of transactions. In the year of 2000 the online-broker Consors uncovered the share of the citizens registered for dealing in **online trading (17)** (67,000 in the 50 largest German cities).

In the year 2000 it was still very difficult to assess the number of schools connected to the internet (which is no indicator of real activities, however) (Einemann, 2000, p. 16) – but already in 2003 almost all schools were equipped with access to the internet, so that this indicator has become irrelevant.

Actual demand

The **transfer data volume (18)**, measured by Company 1&1 (the transfer volume is comprised of an average of 90% download volume and 10% upload volume), is an outstanding indicator for the real use of the internet (in the following text the term of download volume will be partially used not quite precisely as a synonym of transfer volume). An evaluation of the share of approx. 755 terabyte among companies and private individuals is possible for the 50 largest German cities. Furthermore the distribution of online hours, respectively **duration of use (19)**, which, according to evaluations by Company 1&1, amounting to approx. 12 million hours per month in the 50 largest German cities, could be examined for the individual cities according to companies and private customers as well. In 2003 the average transfer volume per broadband internet access in the large German cities showed an extremely high 5.1 GB, the average duration of use, respectively hours online, amounted to 37.4 hours per month or approx. 1 hour 15 minutes per day.

1.1.3. Frame conditions and culture

An analysis of the sites of IT companies in the so-called '**New Market' (20)** stock market (which has disappeard in the meantime) stems from the time before the Dotcom Crisis. That indicator is incorporated into the study even though it does not allow for a statement on the actual situation of the cities (many of the companies no longer exist today, at least not in the form in which they existed then) – however, it offers as much as an indication of the quality of frame conditions for new company foundations.

Worldwide the universities as centers of innovation were of great importance for the internet development. For that reason the distribution of **computer science professors (21)** (54.4% of a total of 1,458 work in the 50 largest cities) as well as that of the **computer science students** as a mix of the older semesters (53.5% of a total of 125,744 in the 50 largest cities) and **first semester students (22)** (53.6% of a total of 27,184 in the largest 50 cities) was taken into consideration. The numbers were provided by the German Census Bureau and the German Association of University Presidents and also permit a differentiation according to universities and higher technical colleges.

The internet culture of a city is mainly coined by activities of its companies and the public services. With the help of internet research it was determined how many companies engage in supra-regional associations/organizations such as the **ECO (23)** (internet economy), the German Domain Registry **(DENIC) (24)**, the **Initiative D 21 (25)** or the Trades Association **BITKOM (26)**. In 2000 the city-related distribution of memberships in the German Multi Media Association **(DMMV) (27)** could be compiled, which gives an indication on the activity of pioneering in the city. Regarding governmental activities the participation of the cities in networks such as the European **Telecities Initiative (28)** or the Global Cities Dialog **(GCD) (29)** was determined. With the aid of an online survey of the municipal governments the **evaluation of internet activities of the city (30)** was analysed (is the information about the pageviews of their own website published on the net or provided by request?). The indicators on entrepreneurial internet activities (23-26) in

organizations and associations are combined for the presence, as are the governmental activities (28 and 29).

Altogether there is basic data on all 50 cities regarding those 30 indicators with additional subdivisions (such as according to companies and private individuals). The EXCEL and SPSS tables on the internet-city-position contain approx. 3,000 basic numbers, based on which further calculations (i.e. downloads per user, domains per resident, point evaluation, ranking) were made. The data stems from mid-2003, the supply measured by IVW were compiled in a post-evaluation in the middle of 2005.

Figure 13: Indicators according to sectors

Supply/Production		**Demand/Consumption**		**Frame/Culture**	
1	Domain .de reg	14	Broadband access lines	20	New Market
2	Domains 1&1	15	e-mail addresses		
		16	Online accounts	21	CS professors
3	Catalog entry	17	Stock market activity	22	CS students
4	Websites active 1&1				
5	Product suppliers	18	Download volume	23	ECO
6	Content supplier IVW	19	User time	24	DENIC
7	Car sellers			25	D21
8	Webshops active			26	BITCOM
9	Auctions			27	DMMV
10	City website				
				28	Telecities
11	Pageviews IVW			29	GCD
12	Pageviews meinestadt				
13	Pageviews 1&1			30	Evaluation

1.1.4. Differentiation according to companies, private individuals and government

Due to the numbers available 36 indicators can be used for allocation purposes according to companies, private individuals and the government. Altogether 18 indicators are available for the companies, 12 for private persons and 6 for governmental authorities, whereby the company and governmental activities are each combined. A different selection of the raw data material is made for the evaluation. Altogether more indicators are integrated since there is a lot of separate data for companies and private individuals. Only 2 indicators have not been taken into consideration because distinct allocations are not possible (Pageviews meinestadt.de, DMMV membership). In order to avoid serious distortions in comparison with the overall model the indicators 'domain reservations with DENIC' (fully for companies) and 'e-mail addresses by GMX' (fully for private individuals), which cannot be differentiated by players, are included despite certain objections.

Figure 14: Indicators according to players

Companies	Private individuals	Government
Domains DENIC	Domains 1&1 reg.	City website
Domains 1&1 reg.	Catalog entry	CS professors
Catalog entry	Websites active 1&1	CS students
Websites active 1&1	Pageviews 1&1	Government active
Product suppliers	Website access lines	Evaluation
Content suppliers IVW	e-mail addresses	
Car sellers	Car sellers	
Webshops active	Auctions	
Pageviews IVW	Online accounts	
Pageviews 1&1	Stock market activities	
Website access lines	Download volume	
Download volume	User time	
User time		
Companies active		
New Market		

1.1.5. Explanatory factors

For purposes of explaining the differentiations regarding the internet position among the cities indicators of the 'traditional position' are employed. These are

- the regional allocation also in connection with the sectoral focal point (traditional industry)
- the size of the city by number of population
- its function as center of politics, media, finances, innovation and enterprises
- the level of wealth, work, economy, site, structure and governmental function.

The determination of the economical and social position of the 50 largest cities in comparison is a task that would have exceeded the limits of this work. Insofar it is a lucky coincidence that the compilation and processing of a multitude of data and the development of a complex model was completed by a team of researchers at the Institute of German Economy (Lichtblau, 2004) in 2004, the results of which can be referred to.

Regarding the 50 German cities with the highest population the question where the wealth is greatest was looked into and for that purpose a ranking of levels was developed. Overall there are about 60 single indicators (weighted) which were subsumed into the following 6 spheres (Lichtblau, 2004, p. 9):

- wealth (income in city and income tax range),
- job market (unemployment and employment),
- site (work costs, productivity, infrastructure, human capital, etc.),
- economy (economical power and structure),
- structure (social and socioeconomical structure),
- government (public budgets, public employment).

Altogether the following indicators were included in the study (p. 12):

a) on site quality
- productivity and work costs,
- cost level (rents, assessment rates, travelling costs),
- degree of agglomeration of cities (citizen-workplace density, amount of headquarters of larger companies, commuter incomes, diameter of bordering communities),
- infrastructure (education, transportation, socio-cultural institutions),
- human capital (scientists per residents, patents and R&D intensity),
- attractivity and climate for companies.

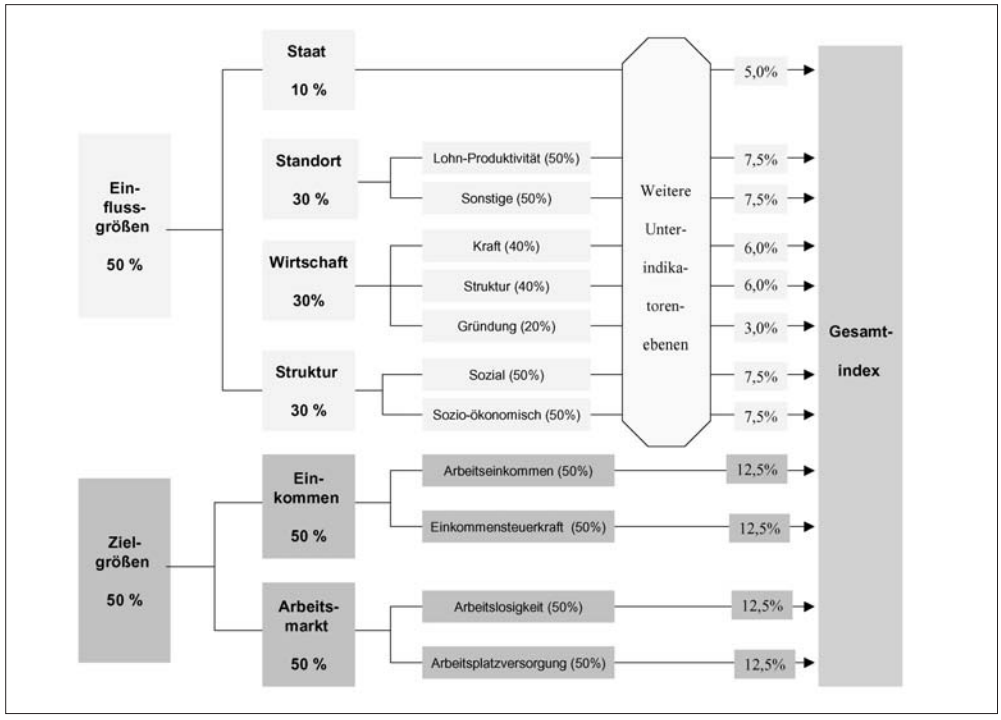
b) on the economical power
- gross domestic product per resident,
- income per employee,
- quality of the economical structure,
- employees in services requiring a high degree of special knowledge,
- intensity of foundations and bankruptcies.

c) on the social structure
- recipients of welfare per resident,
- recipients of public training measures for the re-integration into the job market per resident (structure),
- percentage of long-term unemployed in overall unemployment (structure),
- integration quotas (structure),
- quotient from back-to-work versus newly unemployed (structure),
- duration of measures offered (structure),
- unemployment rate among older employees,
- rate of females employed,
- percentage of juvenile residents under 15,
- public safety measured in crime rate and quotas of solved crimes.

d) on the government
- public employees,
- tax power and debts per resident,
- self-financing and investment quota in municipal budgets.

The following overview of the total index and weightings was published (p. 39):

Figure 15: Comparison of large cities: Overview of total index and weightings



(Source: Lichtblau 2004, p. 39)

1.2. Compilation methods

The data the research is based on was compiled with the aid of different methods. Many companies were so generous as to evaluate their internal data on city level and make them available for this study, among them market leaders in internet business: 1&1, GMX, mobile.de, meinestadt.de, DiBa, Consors (2000) and eBay (2000). The Census Bureau and the Association of University Presidents provided their data on the professors and students of Computer Science, and the German registry of internet addresses (DENIC) carried out supplemental calculations for this research study. The evaluation of research on the internet itself made the procurement of city-related data on pageviews registered by IVW, on company presence at the New Market and at the Cebit Fair, on the quality of municipal websites as well as on the activities of companies and government related to the internet possible. The information (not included in the evaluation) about the pageviews of the municipal website as well as each city's evaluation of of its own provisions (uncovering of the number of pageviews) are based on a survey of the cities (public relations/marketing and Webmaster) included in the research.

1.3. The 'Internet-City-Position' Model

If it is possible to describe the internet position of a city with 30 or more indicators in greater detail, then certainly this will raise the question of the overall picture: Which city is in top position, which one is rather at the bottom, which are the strong points and where are the weaknesses of a city? Such an overall evaluation and a ranking offer indications for initial interpretation attempts: What puts one city into a better position and another into a worse position; what causes for that could there be?

Obviously the selected indicators (for whose selection the availability of data naturally played a role) cannot offer the same impact and expressivity. The pageviews of the internet pages produced (and accompanied by revenues from advertising) will be of extreme importance for the future development of the city and internet economy – in comparison, the membership of the city in an organization such as Global Cities Dialog clearly is of lesser importance.

Therefore the indicators were weighted by taking the relevance and impact of the data into consideration and were combined into one model; that model and the assumptions it is based on are disclosed; any other weightings (that might also be of good value) would lead to different (probably, however, not fundamentally different) results. Simulation calculations are possible without any problem.

The basic assumptions of this (and any other) model are not completely unproblematic. It is alleged, for instance, that the internet position of a city improves with the amount of broadband access lines – that seems logical. However, it is not a proven fact, at least not indefinitely, whether a high volume of downloads or a long duration of use can be exclusively considered to be positive quality features (since they could also be an indication of online addiction or violations of copyrights or such). Insofar a critical view at the approach is always helpful in the detail, and additional developments of the model are necessary.

It is assumed that the page of supply and production is more relevant for the city (60%) than the consumption (35%) and that the measurable (cultural) frame conditions do not represent the most relevant factor (5%). Particularly important and particularly broadly based indicators are weighted especially high.

10% of the overall weight are given to the registered domain addresses at DENIC (2.3 million for the 50 largest cities), the pageviews measured officially by IVW (no less than a total of 5.3 billions per month for the cities examined), the pageviews registered by 1&1 (2.2 billions) and the e-mail addresses (4.5 million). The download volume (755 terabyte) and the online times (12 million hours) are weighted with 8% each. The broadband access lines (a total of merely 127,000) and the domains maintained by 1&1 (1.2 million) are included with 5% each. The quality of the web presence of the city contributes with a weight of 4%. The catalog entries at meinestadt.de (113,000), the websites active with 1&1 (360,000), the suppliers of internet products at Cebit (112), the content suppliers (182) registered with IVW as well as the pageviews at meinestadt (17 million) are weighted with 3% each. Continuous user activities such as holding accounts and trading with stocks and shares are assigned a weight of 2% each; this also applies to the offering of webshops, cars and auctions. The frame conditions for innovation (new market, professors and students of computer science) are included with 1% each; memberships in associations were weighted as minimally (0.3%, resp. 0.1% for state clubs) as the evaluation of the city's presence on the internet (0.3%).

The selected weightings result in the following overall model (the weightings within each sector are indicated separately; they allow for easier comparability among the cities according to supply, use and frame conditions):

Figure 16: Model of city position on the internet

Supply/ production			Demand/ consumption			Frame/ culture		
	weight	%		weight	%		weight	%
Domains DENIC	10	16.7	Broadband access lines	5	**14.3**	New market	1	**20**
Domains 1&1 reg.	5	8.3	e-mail addresses	10	**28.6**			
			Online accounts	2	**5.7**	CS professors	1	**20**
Catalog entry	3	5.0	Stock market activities	2	**5.7**	CS students	1	**20**
Websites active 1&1	3	5.0						
Product suppliers	3	5.0	Download volume	8	**22.9**	ECO	0.3	**6**
Content suppliers IVW	3	5.0	User time	8	**22.9**	DENIC	0.3	**6**
Car sellers	2	3.3				D21	0.3	**6**
Webshops active	2	3.3				BITCOM	0.3	**6**
Auctions	2	3.3				DMMV	0.3	**6**
City website	4	6.7						
						Telecities	0.1	**2**
Pageviews IVW	10	16.7				GCD	0.1	**2**
Pageviews meinestadt	3	5.0						
Pageviews 1&1	10	16.7				Evaluation	0.3	**6**
Total sector		100	Total sector		**100**	Total sector		**100**
Total model	60		Total model	35		Total model	5	

For the ranking model according to players the weightings are kept as much as possible, however, some re-weightings are unavoidable. The domain-related indicators for the private section (registered domains, catalog entries, active websites and pageviews) are evaluated with 2% each; they therefore have a total weight of 8% and are not overemphasized in comparison with the e-mail addresses and use.

For a structural comparison the final results per city within each group are converted in such a way that a maximum of 100% can be achieved for the total. An alternative overall model with a

reduced set of indicators shall not be constructed; for that reason there will be no additional measurements in reference to the total of the city.

Figure 17: Model of city position on the internet according to players

Companies			Private individuals			Government		
	weight	%		weight	%		weight	%
Domains DENIC	10.0	13.5	Domains 1&1 reg.	2.0	4.3	City website	4.0	61.5
Domains 1&1 reg.	5.0	6.7	Catalog entry	2.0	4.3	CS professors	1.0	15.4
Catalog entry	3.0	4.0	Websites active 1&1	2.0	4.3	CS students	1.0	15.4
Websites active 1&1	3.0	4.0	Pageviews 1&1	2.0	4.3	Government active	0.2	3.1
Product suppliers	3.0	4.0	Access lines	5.0	10.6	Evaluation	0.3	4.6
Content suppliers IVW	3.0	4.0	e-mail addresses	10.0	21.3			
Car sellers	2.0	2.7	Car sellers	2.0	4.3			
Webshops active	2.0	2.7	Auctions	2.0	4.3			
Pageviews IVW	10.0	13.5	Online accounts	2.0	4.3			
Pageviews 1&1	10.0	13.5	Stock market activities	2.0	4.3			
Access lines	5.0	6.7	Download volume	8.0	17.0			
Download volume	8.0	10.8	User time	8.0	17.0			
User time	8.0	10.8						
Companies active	1.2	1.6						
New Market	1.0	1.3						
Total		100.0	Total		100.0	Total		100.0

The analysis of the differentiation among the large cities must take the size of each city into consideration – the mere findings that there are more e-mail addresses in a city with over 3 million inhabitants than in a city with a population of 150,000 express little. Therefore the values of all indicators (excluding the state activities evaluation and memberships in associations) are converted using the population (per 1,000 residents as a rule). Thus different proportions between number of inhabitants and number of local companies are neglected for the overall model. Re-

garding the player-related model, however, the number of companies in that city and not the number of population apply.

Three indicators are put together in that aspect that two different partial indicators were measured and included in the overall results for the total indicator with 50% each: In regards to the car sellers the dealers as well as private sellers were assessed separately, the number of online accounts for online banking were included just as the quota of the online accounts as compared to all accounts (online quota), and regarding the students the older semesters as well as the first-year students were taken into consideration.

2. The dominance of the large cities

26% of the population live in the 50 largest German cities, 33% in the 100 largest cities; that also means that 2 out of 3 German residents live in a municipality with less than 80,000 inhabitants, and that nearly 3 out of 4 residents have a population of less than 150,000 in their town. The 50 largest German cities house only 26% of the German population but almost 60% of the headquarters of the 1000 largest German companies (Losse, 2004). A comparison of internet data on the 50 largest cities with the rest of the republic can offer an insight into the part the cities play and possible disconnections of the rural areas. Unfortunately, due to the source conditions the data available and usefully interpretable for this research study is reduced to 15 indicators, some of which are summarized – and yet they tell an interesting story.

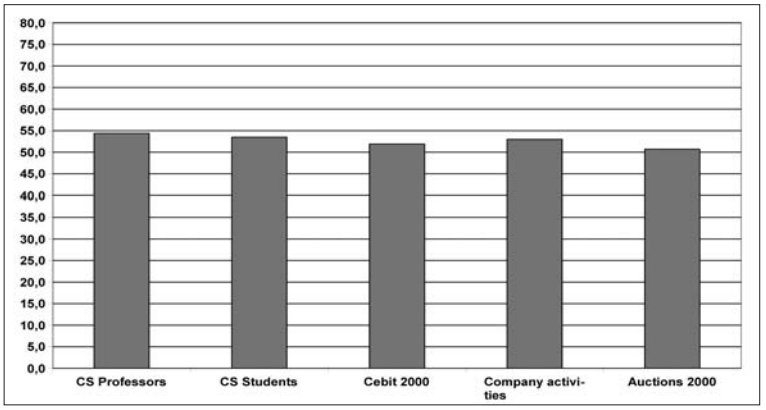
First of all the results clearly show that the cities as centers of innovation are the dominating pioneers of German internet development. Over 50% of Computer Science faculties at the universities, software companies with internet products, enterprises with an active support of associations for the promotion of innovation and internet interests as well as the pioneers of internet auctions stem from the 50 largest cities.

Concrete facts: 54% of the Professors and students of Computer Science are located in the top 50 cities. 52% of the providers of internet products at Cebit 2000 came from the large cities that also house 53% of those companies that are active in a variety of associations (ECO, DENIC, BITKOM, D 21). In 2000, 51% of all auctions were initiated in the metropolises.

Table 3: Cities as internet innovation centers

	Top 50	Federal Republic	Share of Top 50
CS professors	793	1,458	**54.4**
CS students	67,233	125,744	**53.5**
Cebit 2000	716	1,380	**51.9**
Company activities	604	1,140	**53.0**
Auctions 2000			**50.7**

Figure 18: Cities as internet innovation centers



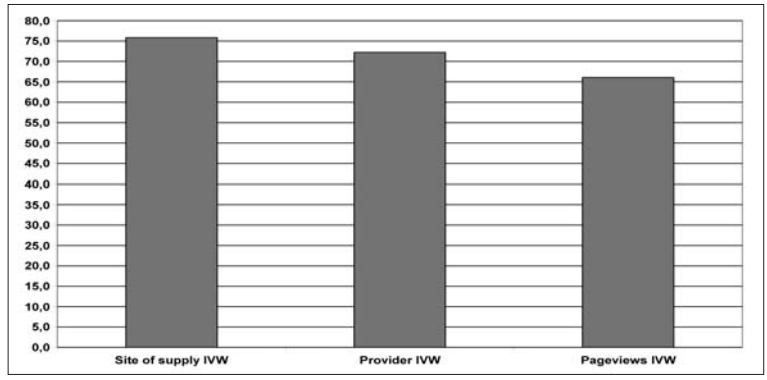
On the other hand: If nearly half of all German innovative activities occur in towns with a population of under 150,000, one can no longer talk of a digital divide according to the size of the city – rather of a strong digital differentiation.

However, one piece of obvious proof of the 'concentration thesis' can be found: In the field of internet production relevant to advertising and officially measured and its use one *can* talk of a digital divide. 76% of the offers registered with IVW are made in the 50 largest cities; 72% of the providers live there and 66% of all pageviews of the measured pages take place there. Restrictively it can be stated that the compilations under the aspect of the reach of advertisements are requested not by each content provider but rather by professional media operations under the aspect of securing profits (advertising). But at least a large share of content production and proceeds through advertising are concentrated clearly and massively.

Table 4: Concentration of the content production in the large cities

	Top 50	Federal Republic	Share Top 50
Site of supply IVW	289	381	**75.9**
Provider IVW	182	252	**72.2**
Pageviews IVW	5,342,769,096	8,086,161,447	**66.1**

Figure 19: Concentration of the content production in the large cities



The consideration of additional indicators of the production and consumption of internet offers relativizes the concentration thesis. Outside the large cities the reservation of domains, the pageviews of homepages, the offering of cars and the reservation of e-mail addresses is done almost according to the share of population.

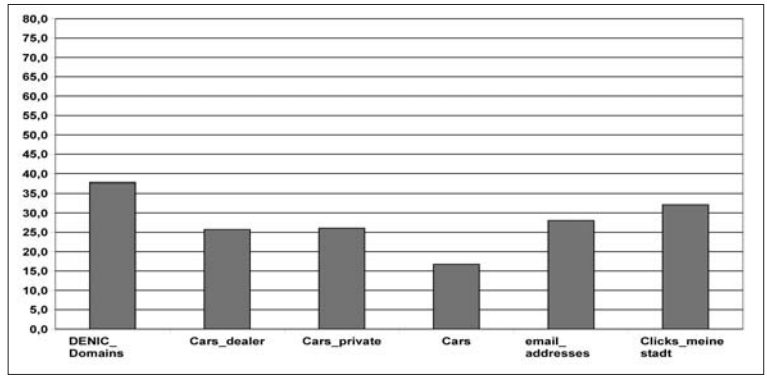
Even though 38% of the domains reserved with DENIC are located in the large cities, nearly two thirds can be found in towns with smaller populations. The web activities of car dealers and private car sellers are visibly less centralized and, with 26% in the large cities, they represent the exact level of population percentage. The amount of offered cars (17%) even falls below the proportion (however, a glance at the largest 100 cities shows their vicinity to production sites or import sites of the automobile industry; Wolfsburg and Flensburg had surprisingly high results).

The assumption that the internet use is spread wider and that there is a smaller differentiation among private households is supported by a look at the e-mail addresses, where the share of the large cities (28%) somewhat equals the share of the population. The total clicks to the internet addresses within a city measured by meinestadt.de also did not greatly exceed the percentage of the population in regard to the large cities with 32%.

Table 5: Greater dispersion of internet activities

	Top 50	Federal Republic	Share Top 50
DENIC_Domains	2,173,858	5,760,360	**37.7**
Cars_dealers	4,299	16,716	**25.7**
Cars_private	10,173	39,044	**26.1**
Cars	122,992	734,491	**16.7**
e-mail_addresses	4,488,933	16,000,000	**28.1**
Clicks_meinestadt	17,023,743	53,000,000	**32.1**

Figure 20: Greater dispersion of internet activities



In summary it can be stated that

- many cities really are centers of innovation dominating the internet development – however, without controlling it completely
- there is a concentration of those parts of content production relevant to revenues from advertisements in a few large cities that nearly has the quality of a digital and economical divide
- there is no obvious concentration on large cities for a multitude of internet activities from reserving a domain or an e-mail address to the sale of cars on the net, and no digital divide between large cities and the rest of the Republic can be found.

Overall the term 'digital differentiation' describes the difference in Germany more precisely than that of 'digital divide'; however, there are great differences and a digital divide concerning the content production relevant to advertising.

3. Differentiations among the large cities

3.1. Internet city ranking

If all cities showed the internet data of each leading city in the model of 'internet city position', they would gain 100% of all scores possible – Munich reaches the top with 81.9%, Mülheim is at the bottom with 19.6% (see Appendix for Table 1). Only 4 cities achieve a sound value of over 60%: Besides Munich, these are Karlsruhe, Bonn and Frankfurt. Less than a third of all possible scores are claimed by 9 cities that, without exclusion, are located in the traditional industrial region of West Germany (Hamm, Herne, Hagen, Mülheim) or in the East of the Republic (Erfurt, Magdeburg, Rostock, Chemnitz, Halle).

Table 6: Internet position of the large German cities: Tops and flops

		Production	Consumption	Frame	Total	Index
1	Munich	82.7	84.6	53.4	81.9	**167.5**
2	Karlsruhe	67.7	84.3	63.1	73.2	**149.8**
3	Bonn	70.3	70.5	35.6	68.6	**140.3**
4	Frankfurt	56.5	77.1	42.8	63.0	**128.7**
5	Aachen	42.7	89.6	51.6	59.6	**121.8**
6	Düsseldorf	54.2	71.3	27.2	58.8	**120.3**
7	Cologne	61.2	84.2	27.0	57.9	**118.5**
8	Mainz	45.1	55.4	28.5	57.4	**117.5**
9	Dortmund	36.4	93.6	34.7	56.3	**115.1**
10	Münster	46.2	73.6	14.8	54.2	**110.8**
41	Leverkusen	25.5	52.0	7.5	33.9	**69.3**
42	Erfurt	26.4	44.5	29.7	32.9	**67.3**
43	Hamm	19.9	55.8	6.2	31.8	**65.0**
44	Herne	18.7	56.5	6.4	31.3	**64.0**
45	Magdeburg	27.0	40.0	19.3	31.2	**63.8**
46	Rostock	23.1	42.1	15.9	29.4	**60.1**
47	Chemnitz	25.5	37.5	16.4	29.2	**59.7**
48	Hagen	19.4	43.4	16.7	27.7	**56.6**
49	Halle	20.5	38.7	15.7	26.6	**54.4**
50	Mülheim	22.8	15.0	14.6	19.6	**40.1**
	Total	42.4	63.4	26.0	48.9	**100.0**

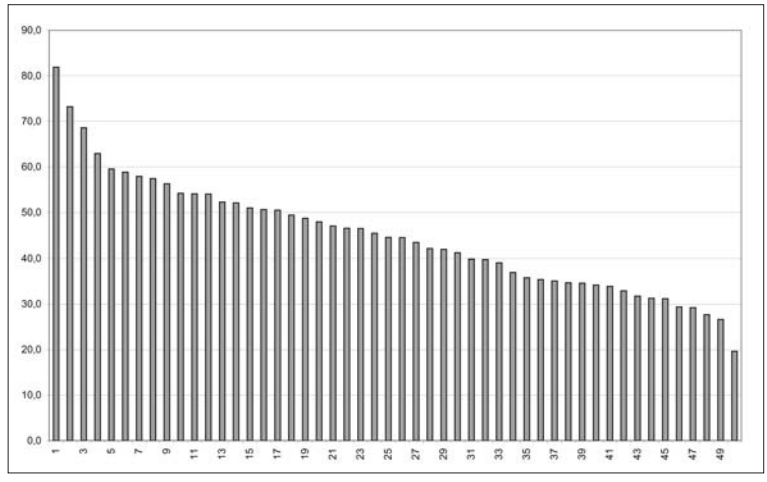
The overall average amounts to 48.9%. This illuminates the fact that, only by raising all cities to the values of today's top, there will be an enormous potential for development in the future: We are still at the starting point and not nearly at the end of the internet penetration into society.

Table 7: Average values per indicator

DomainsR_DENIC	**56.2**		**Access_DSL**	**63.2**
DomainsR_1&1	**39.7**		**e-mail**	**71.9**
Homepage_Cat	**56.2**		**Bank_Online**	**80.8**
Active_Domains	**55.4**		**Stockmarket_Online**	**45.4**
Product_providers	**24.3**		**Volume GB**	**56.7**
Content_providers	**24.2**		**User time in hours**	**59.5**
Car_sellers	**61.7**		Total_consumption	63.4
Webshops	**47.8**		**New Market**	**22.6**
Auctions	**42.3**		**Profs_CS**	**24.0**
CityWebsite	**57.6**		**Students_CS**	**24.8**
PI's_IVW	**19.1**		**Companies_Active**	**26.5**
PI's_meinestadt	**56.5**		**DMMV**	**5.2**
PI's_1&1	**40.8**		**Government Active**	**13.0**
Total_production	42.4		**Evaluation**	**76.0**
			Frame_total	26.0
Total	48.9			

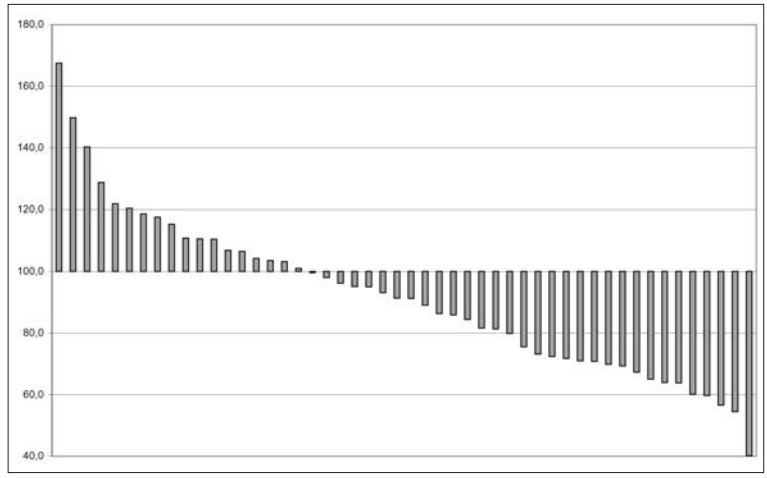
A closer examination of the internet position of the 50 largest German cities supports the thesis of the digital differentiation with a partial digital divide between the poles.

Figure 21: Internet position of the 50 largest German cities



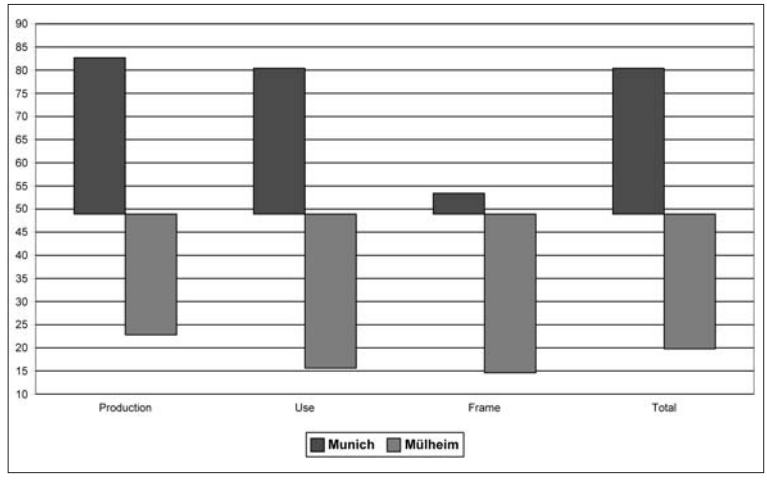
When creating an index (the average equals 100), Munich scores the value of 167.5 and Mülheim reaches 40.1; the graph very clearly illustrates the differences among the large German cities.

Figure 22: Internet position of the 50 largest German cities (Index)



It is difficult to counter the thesis of the digital divide between individual cities if one directly compares the values of the 'internet capital' Munich with those of the city with the weakest position on the internet – Mülheim an der Ruhr. Munich surpasses the average in the fields of production, consumption and frame conditions just as clearly as when considering the overall picture – this statement also applies to Mülheim – but the other way around.

Figure 23: Digital divide 1: Comparison between Munich and Mülheim/Ruhr (Sectors)



The detail results for the individual indicators certainly point out the weaknesses of single data items, but all in all they are very precise. Only for reasons of illustration (subject to the size of the resulting numbers) there are different focal points (per resident, per 100 residents, per 1 million residents) in the numbers 'per resident' of the following table; therefore they are only comparable in the relation Munich to Mülheim, but not among each other. The seeming incompleteness of parts of the table is misleading: There are no detailed numbers on the auctions; however,

Company eBay provided in 2000 at least anonymous data as an exception to general practice; for the evaluation of the city website and the results of its evaluation as well as for governmental activities in associations, detail calculations, such as in relation to the number of population, make no sense.

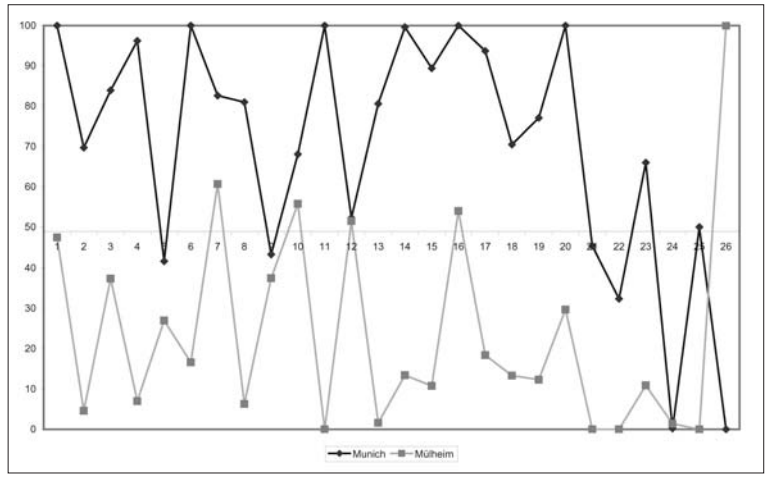
Table 8: Digital divide 2: Comparison between Munich and Mülheim/Ruhr (Details)

	Scores		Total		Shares TOP_50		Per resident	
	Munich	Mülheim	Munich	Mülheim	Munich	Mülheim	Munich	Mülheim
DomainsR_DENIC	100.0	47.6	221,427	14,791	10.2	0.7	180.3	85.8
DomainsR_1&1	69.7	4.6	124,076	1,143	10.0	0.1	101.0	6.6
Homepage_Kat	83.9	37.4	9,697	607	8.5	0.5	7.9	3.5
Active_Domains	96.2	7.0	35,875	366	9.9	0.1	29.2	2.1
Product_Providers	41.7	27.0	11	1	9.8	0.9	9.0	5.8
Content_Providers	100.0	16.6	43	1	23.6	0.5	23.0	0.5
Car_Sellers	82.6	60.7	1,089	131	7.7	0.8	0.9	0.8
Webshops	81.0	6.3	91	1	7.4	0.6	9.7	0.1
Auctions	43.4	37.5						
CityWebsite	68.1	55.8						
PI's_IVW	100.0	0.0	1,600,571,538	13,818	30.0	0.0003	1.303.4	0.1
justrightPI's _meinestadt	52.3	51.5	901,432	124,663	5.3	0.7	0.7	0.7
PI's_1&1	80.6	1.6	246,100,280	706,260	11.3	0	200.4	4.1
Total_Production	82.7	22.8						
Access_DSL	99.6	13.4	14,469	241	9.4	0.2	11.8	1.4
e-mail	89.4	10.8	319,389	5,427	7.1	0.1	26.0	3.2
Bank_Online	100.0	54.0	35,309	1,015	8.0	0.2	28.8	5.9
Stockmarket_ Online	93.7	18.4	7,996	220	11.9	0.3	6.7	1.3
Volume GB	70.5	13.3	53,660	1,420	43.7	8.2	7.1	0.2
User time in hours	77.1	12.3	879,481	19,610	7.4	0.2	716	114
Total_Consumption	80.4	15.6						
New Market	100.0	29.7	24	1	25.3	1.1	19.4	5.8
Profs_CS	45.5	0.0	86	0	10.8	0	7.0	0.0
Students_CS	32.4	0.0	6,063	0	7.5	0	493.7	0.0
Companies_Active	66.0	10.9	86	2	14.2	0.3	7.0	1.1
DMMV	0.2	1.4	1	1	0.2	0.2	0.8	5.8
Government_Active	50.0	0.0	1	0	7.7	0		
Evaluation	0.0	100.0						
Frame_Total	53.4	14.6						
Total	80.4	19.8						

Altogether Munich – measured by its total population (!) – has more than four times the internet power of Mülheim. When examining the total numbers, the different dimensions become especially clear in face of the fact that Munich houses almost seven times as many residents (1.22 million as compared to 172,000) – Munich scores the values of Mülheim many times over.

Thus there are more than 220.000 .de domains registered in Munich (180 for 1,000 residents each!) – in Mülheim there are less than 15,000. 43 of the content providers measured by IVW are situated in Munich, one is located in Mülheim. 30% of all IVW-pageviews in large cities relevant to advertisement are registered in Munich – 0.0003% in Mülheim. Munich has 86 professors and over 5,000 students in the field of Computer Science, Mülheim has none. A look at the details shows only one advantage for Mülheim: The amount of pageviews of the city's website was made known, Munich chose not to disclose that.

Figure 24: Digital divide 3: Comparison between Munich and Mülheim/Ruhr (Indicators)



Contrary to the findings 'advantage Munich in all disciplines' is the result of the detail examination of the user dates (download volume, user online time) per private access. When evaluating the user data for Munich, that city comes up ahead of Mülheim in its total numbers as well as per resident – simply because more participants are active. The relatively few users in Mülheim, however, seem to be much more active than the average resident of Munich. Even though the numbers must not be over-interpreted (in Mülheim there may be larger households per user access and therefore more individuals using it than in Munich): In Mülheim a broadband access is used for 36.1 hours per month on the average, in Munich only 30.1 hours; the data transfer per access is 5.7 GB per month in Mülheim, in Munich it is 3.8 GB. This data prompts a detailed discussion of the digital divide.

Table 9: Internet use per broadband access

	GB per private _participant	Hours per private _participant
Munich	3.8	30.1
Mülheim	5.7	36.9
Average	5.1	37.4

3.2. Production, consumption and frame conditions

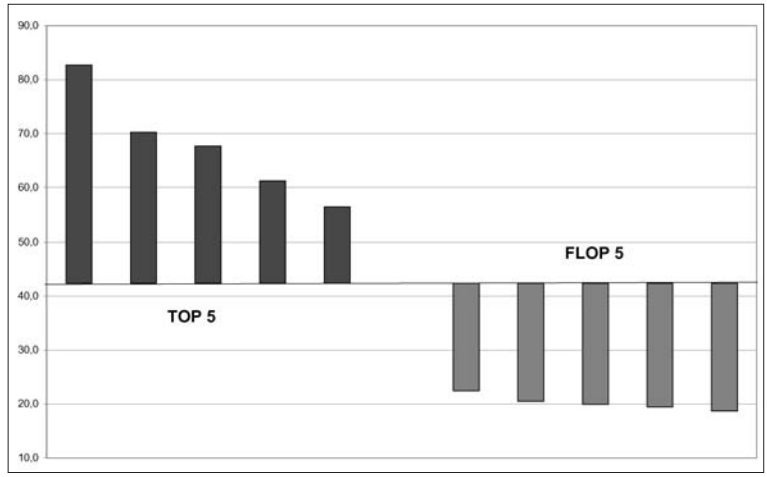
3.2.1. Production

When concentrating on the side of the production of the internet (in the sense of potential supply, real supply and success of supply), there are only slight digressions as compared to the overall results. With its average of 82.7% Munich reaches the top position and Herne takes last place with 18.7%. In the group of top rankers Cologne moves up to the 4th position and Bonn and Karlsruhe switch positions. Again 4 cities from the west (Gelsenkirchen, Hamm, Hagen and Herne) and one city from the east (Halle) rank at the bottom. Mühlheim/Ruhr moves up to Position 45 (with 22,8%). The differences between top and bottom must be seen as a dramatic digital divide, since the revenues generated from the internet supply mean an additional economical strengthening of those cities that already are stronger. There is a manifest danger of disconnecting.

Table 10: Differentiation between the cities: internet production

Rank	City	Scores		Rank	City	Scores
1	Munich	82.7		46	Gelsenkirchen	22.4
2	Bonn	70.3		47	Halle	20.5
3	Karlsruhe	67.7		48	Hamm	19.9
4	Cologne	61.2		49	Hagen	19.4
5	Frankfurt	56.5		50	Herne	18.7

Figure 25: Differentiation between the cities: internet production



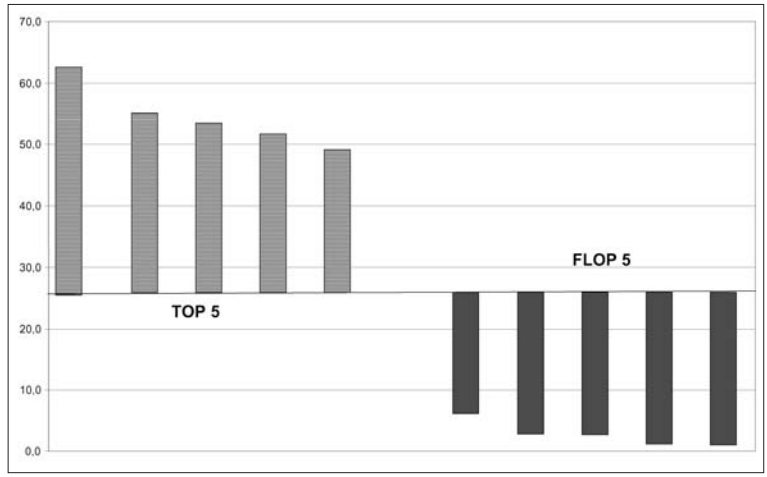
3.2.2. Consumption

A closer examination of the results on the sector of internet consumption shows a different picture. On one hand the average value of the 50 cities is relatively high (at 63.4%), on the other hand there is a change in the ranking. The metropolis of the Ruhr Region, Dortmund, with its top score (93.6%) moves ahead of Aachen (89.6%), and 4 cities from East Germany (Rostock, Magdeburg, Halle, Chemnitz) as well as Mülheim in the Ruhr Region, which has fallen off clearly, move to the bottom. The top position of Dortmund can be seen as an indication of the digital differentiation: Not all cities of the Ruhr Region have only poor internet scores (Dortmund takes a position in the middle, Position 24, regarding the production ranking). The consumption ranking places the Ruhr Region City of Bochum with 78.4% into 6th place. The question remains if there may be a connection between a rather lower production intensity and a higher user intensity (as the comparison of the user activities between Munich and Mülheim already indicates).

Table 11: Differentiation between the cities: internet consumption

Rank	City	Scores		Rank	City	Scores
1	Dortmund	93.6		46	Rostock	42.1
2	Aachen	89.6		47	Magdeburg	40.0
3	Munich	84.6		48	Halle	38.7
4	Karlsruhe	84.3		49	Chemnitz	37.5
5	Cologne	84.2		50	Mülheim	15.0

Figure 26: Differentiation between the cities: internet consumption



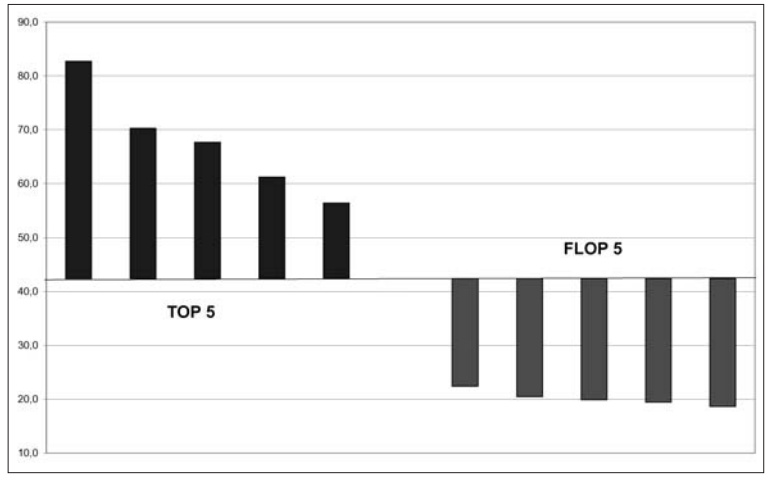
3.2.3. Frame conditions

The frame conditions were included in the evaluation with a very low share of merely 5%, and some indicators have a reduced impact (and were therefore weighted low). Altogether the cities reached an average value of only 26%. Besides Karlsruhe and Munich the cities Saarbrücken, Aachen and Augsburg are found in the top cluster – this mainly results from the decision to include the number of professors and students of Computer Science per resident into the evaluation. Again 4 cities from the traditional industrial region in North Rhine Westphalia (Hamm, Solingen, Wuppertal and Oberhausen) as well as the site of the chemical industry, the City of Ludwigshafen/Rhine ranked lowest.

Table 12: Differentiation between the cities: internet frame conditions

Rank	City	Scores		Rank	City	Scores
1	Karlsruhe	63.1		46	Hamm	6.2
2	Saarbrücken	55.2		47	Ludwigshafen	2.9
3	Munich	53.4		48	Solingen	2.7
4	Aachen	51.6		49	Wuppertal	1.3
5	Augsburg	49.1		50	Oberhausen	1.1

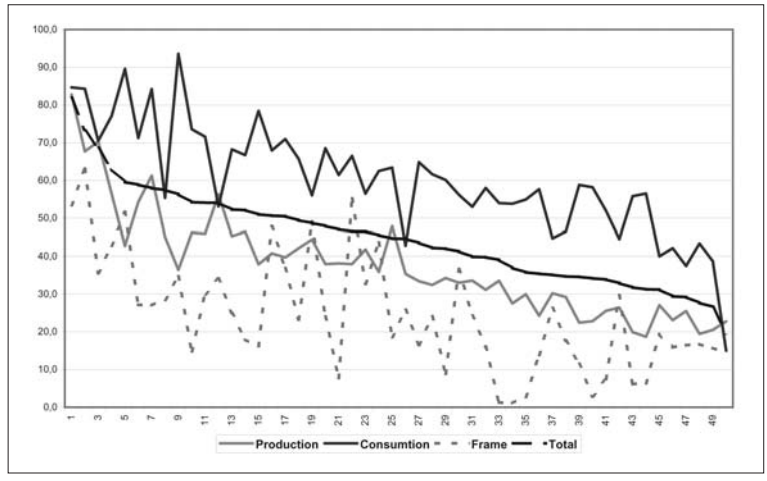
Figure 27: Differentiation between the cities: internet frame conditions



3.2.4. Overall evaluation

A comparison of the curves for production, consumption and frame conditions based on the overall ranking illustrates the different levels.

Figure 28: Results of the city ranking according to sectors



The statistical calculation shows a significant correlation in the relation of production and consumption.

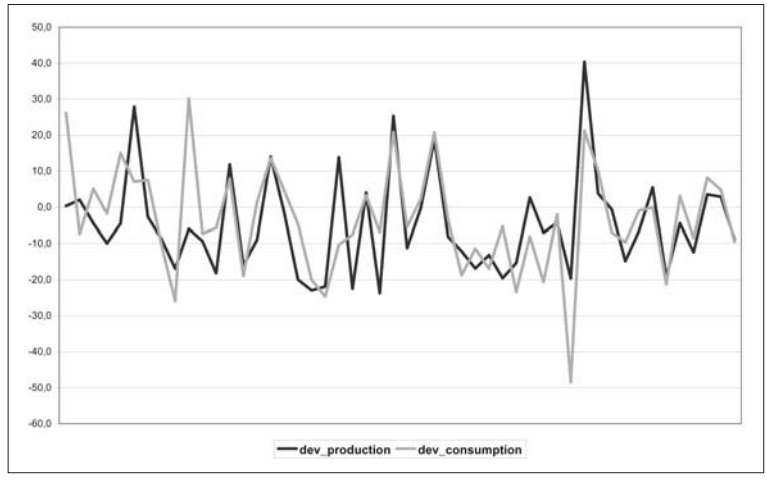
Table 13: Correlation between production and consumption

		Production	Consumption
Production	Correlation according to Pearson	1	.655(**)
	Significance (2-sided)		.000
	N	50	50
Consumption	Correlation according to Pearson	.655(**)	1
	Significance (2-sided)	.000	
	N	50	50

** The correlation is significant on the level of 0.01 (2-sided)

The visualization of the comparison between the deviations from the average for all cities affirms the findings.

Figure 29: Comparison of the deviations between production and consumption



Yet for a few cities there are remarkable discrepancies between production on the one side and consumption on the other side. Apart from the exceptional City of Mülheim (here the production falls 19.6% below the average of the 50 largest cities, the consumption even 48.4%) one result is striking: The comparison of the deviations from the average between production and consumption is clearly positive for Hamburg, Bonn, Munich, Mannhein and Mainz, while it is especially negative for the Ruhr Region cities Gelsenkirchen, Herne, Bochum and Dortmund as well as for the City of Aachen. In different words: The relative consumption values for some Ruhr Region cities are considerably better than their production values and therefore lead to a higher position in the overall ranking, while the cities with a positive deviation only show a relatively low level of consumption.

Table 14: Difference between the deviations from the average for production and consumption

Hamburg	24.2		Gelsenkirchen	-15.3
Bonn	20.8		Herne	-16.8
Munich	19.1		Bochum	-19.5
Mannheim	13.6		Aachen	-25.8
Mainz	10.7		Dortmund	-36.1

Principally there are similar results for the cities in all 3 sectors. The frame conditions also significantly correlate with the values in the area of production as well as with the results in the area of consumption. Single cities show an overall strength and an overall weakness identified by the ranking.

Table 15: Correlation between internet production and frame conditions

		Production	Frame
Production	Correlation according to Pearson	1	,635(**)
	Significance (2-sided)		,000
	N	50	50
Frame	Correlation according to Pearson	,635(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant on the level of 0.01 (2-sided).

Table 16: Correlations between internet consumption and frame conditions

		Frame	Consumption
Frame	Correlation according to Pearson	1	,473(**)
	Significance (2-sided)		,001
	N	50	50
Consumption	Correlation according to Pearson	,473(**)	1
	Significance (2-sided)	,001	
	N	50	50

** The correlation is significant on the level of 0.01 (2-sided)

3.3. Companies, private individuals and government

The findings that have been made so far shall be complemented by a differentiation according to individual players (companies, private persons and government). For that purpose specific data will be used for each player and weighted in an approximation to the overall model.

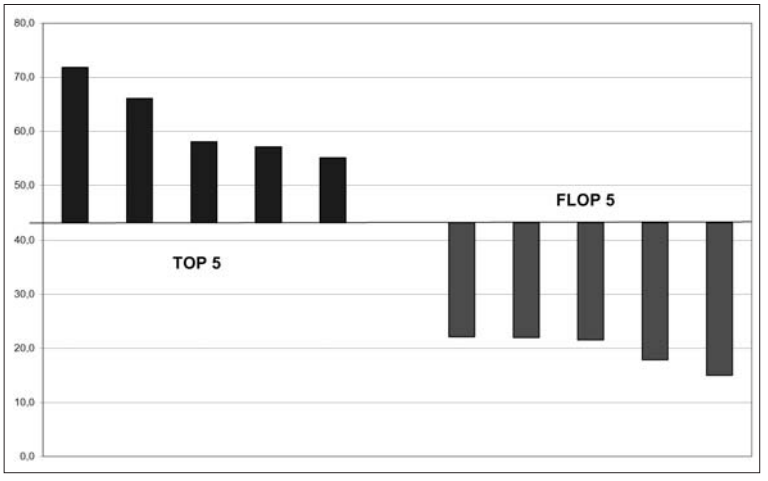
3.3.1. Companies

Regarding the internet power of companies in the cities (including the production side, consumption side and frame conditions) Munich with 71.8% holds the top position, while Mülheim/Ruhr with 15% is at the bottom. The average value is 43.1%. The top group consists of the additional cities Karlsruhe, Bonn, (surprisingly:) Kiel as well as Cologne. The western cities Herne, Hamm and Hagen as well als Mülheim, and Halle in East Germany are found at the low end of the table. The differentiations are so great that they give reason for the conclusion of a partial digital divide and the tendency for the disconnection of several cities.

Table 17: Internet power of the cities: companies

1	Munich	71.8		46	Herne	22.1
2	Karlsruhe	66.1		47	Hamm	22.0
3	Bonn	58.1		48	Hagen	21.6
4	Kiel	57.1		49	Halle	17.8
5	Cologne	55.1		50	Mülheim	15.0

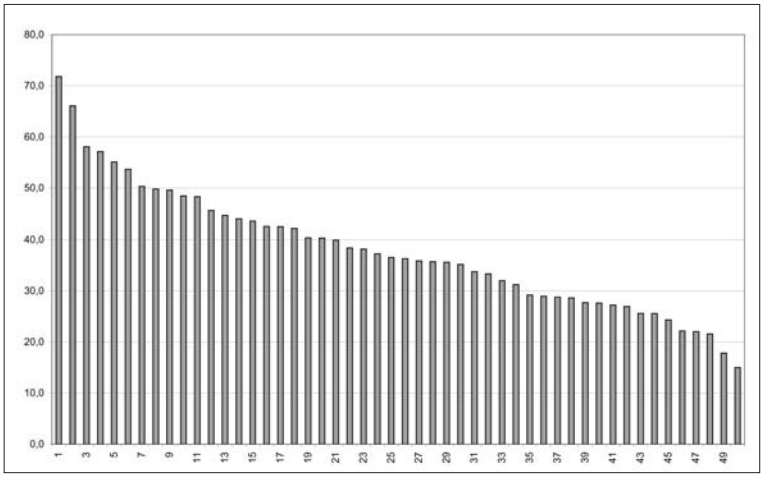
Figure 30: Internet power of the cities: companies



A look at the existing overall differentiation shows that a total of 15 cities are in above-average positions (Munich, Karlsruhe, Bonn, Kiel, Cologne, Augsburg, Wiesbaden, Frankfurt, Düsseldorf, Berlin, Hamburg, Dortmund, Bochum, Aachen and Stuttgart). This is a definite indication to look for explanations of the results, which will be done at a later point: Two cities of the Ruhr Region – Dortmund and Bochum – are positioned above the average; this implies that disconnecting tendencies of single cities do not apply to whole regions.

A structural internet weakness in the field of companies can be diagnosed for the 16 cities that reached less than 30% of maximum scores. These cities are Rostock, Gelsenkirchen, Kassel, Bremen, Leverkusen, Oberhausen, Magdeburg, Chemnitz, Ludwigshafen, Erfurt, Lübeck, Herne, Hamm, Hagen, Halle and Mülheim.

Figure 31: Digital differentiation: companies



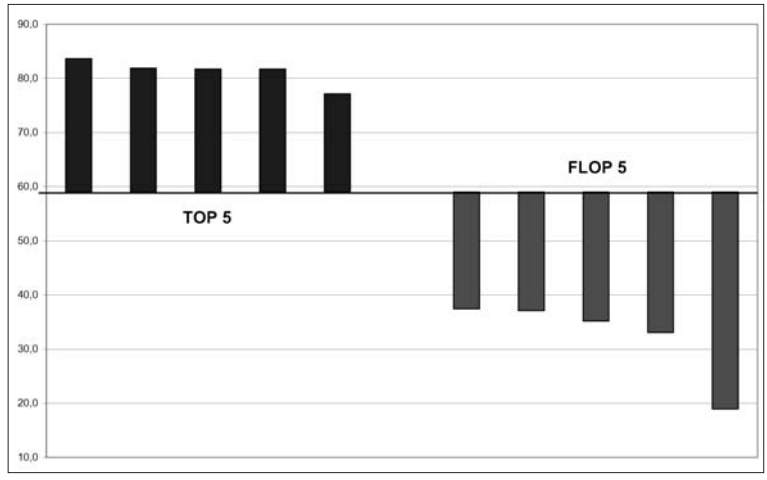
3.3.2. Private users

When examining the internet position of the group of private individuals, the same picture of a differentiation with a strong polarization at each end occurs, whereby the average value of 58.6% is relatively higher than that of the other players. Dortmund and Aachen range even higher than the other cities placed at the top (Munich, Karlsruhe and Mainz) – this comes as a surprise. The bottom positions show the picture which is already familiar: Here we find Magdeburg, Chemnitz and Halle in the East as well as Hagen and Mülheim in the West. Here that result again relativizes the hypothesis of the disconnection of a whole region (the top position held by Dortmund suggests an inner differentiation between the internet-weak Ruhr Region). Dortmund and Aachen again claim the top as in the analysis of internet consumption.

Table 18: Internet power of the cities: private individuals

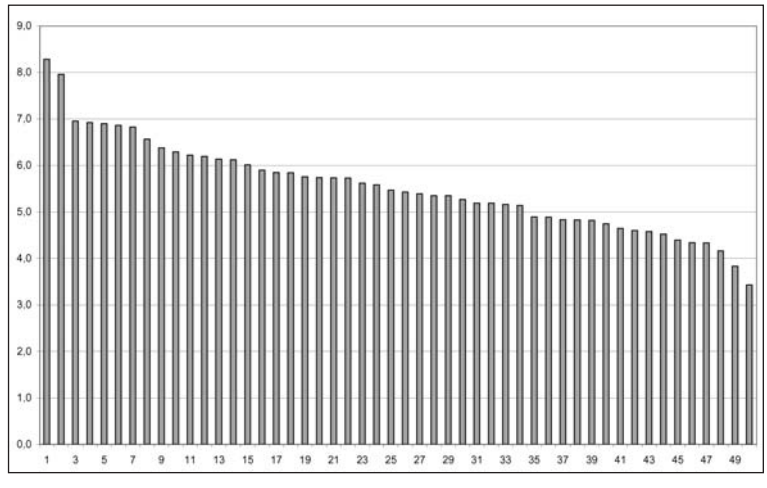
1	Dortmund	**83.7**		46	Magdeburg	**37.4**
2	Aachen	**81.9**		47	Hagen	**37.1**
3	Munich	**81.7**		48	Chemnitz	**35.2**
4	Karlsruhe	**81.7**		49	Halle	**33.1**
5	Mainz	**77.2**		50	Mülheim	**18.9**

Figure 32: Internet power of the cities: private individuals



The examination of the **transfer volume per user's internet access** in all cities again shows the digital differentiation in this field: The result (the average transfer volume amounts to 5.1 GB per month) ranges from 8.3 GB in Hamm to 3.4 GB in Augsburg.

Figure 33: Differentiation in the transfer volume per user's internet access

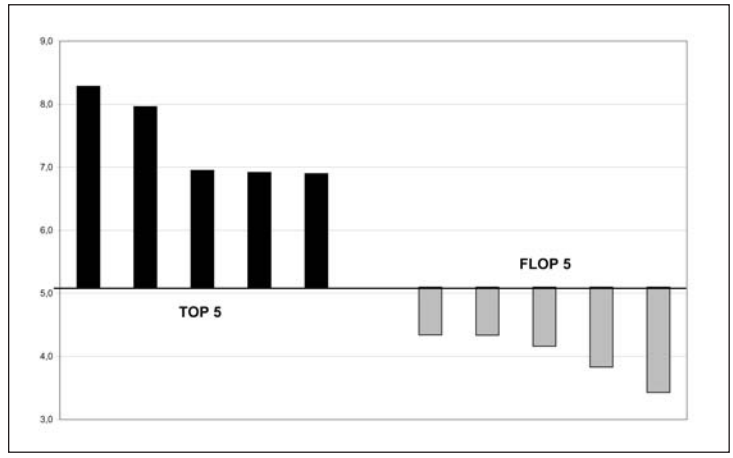


The detail results of the ranking are surprising, however: While the City of Magdeburg in the East is found at the bottom of the table regarding private users, it ranges in the top group when looking exclusively at the transfer volume per user's access. The cities in the West which are weakly represented on the internet and which also rank low regarding private individuals, dominate when it comes to the volume per internet access (Hamm, Gelsenkirchen, Herne). Here two internet-strong cities, Mainz and Munich, range last.

Table 19: Transfer volume per user's internet access

1	Hamm	8.3		46	Wiesbaden	4.3
2	Gelsenkirchen	8.0		47	Mainz	4.3
3	Lübeck	7.0		48	Hamburg	4.2
4	Herne	6.9		49	Munich	3.8
5	Magdeburg	6.9		50	Augsburg	3.4

Figure 34: Transfer volume per user's internet access



The findings indicate that the internet weakness of a city in regard to their private users and consumption stems not so much from a lesser activity per user as rather from the residents' overall low participation; the individual internet user in generally internet-weak cities seems to show a particularly intense user behavior, while the passive downloading assumably prevails.

The examination of the relation of internet power in the field of production with the amount of transfer volume per participant's access shows a significant negative correlation: In cities with a lot of internet power regarding the production of the net, respectively of net contents, the download activities of individuals are rather low, while an internet weakness concerning the production of contents exists in cities with a high download volume of private individuals. This confirms the results of the direct comparison between Munich and Mülheim.

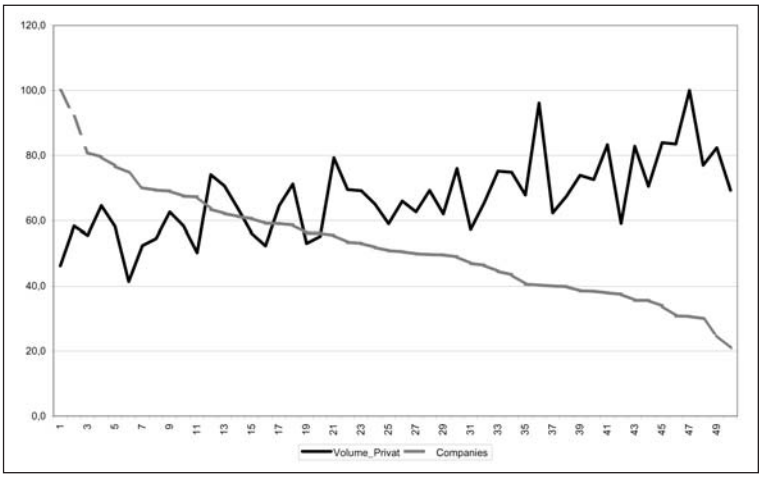
Table 20: Internet production and private transfer volume per user

		Production	Vol_user_private
Production	Correlation according to Pearson	1	-,698(**)
	Significance (2-sided)		,000
	N	50	50
Vol_user_private	Correlation according to Pearson	-,698(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant on the level of 0.01 (2-sided).

Another differentiation in the examination depicts the opposite gap between the overall field of companies and the field of private transfer volume. The index from Munich to Mülheim creates the following picture:

Figure 35: Internet power in the sector of company and private transfer volume (index)

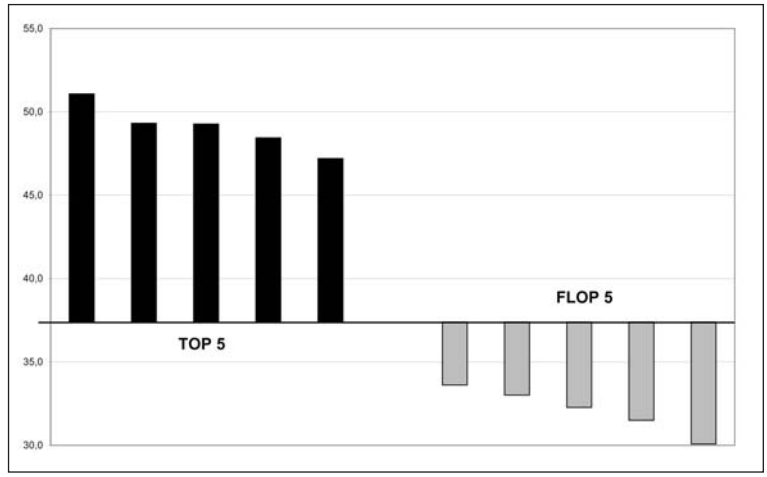


The findings are impressively confirmed by the analysis of the **duration of use per participant's internet access**. Many of the cities who stood out for their massively poor internet scores so far now clearly position themselves at the top, whereas a high number of the cities with particularly strong internet power find themselves at the bottom of the table. While the average online time per user's access amounts to 37.4 hours per month, Hagen boasts 51.1 hours and Munich shows only 30.2 hours. The private household in Munich equipped with a broadband access is online for an average of 1 hour per day, whereas the same household in Hagen spends almost 2 hours per day on the internet.

Table 21: Online time per user's internet access

1	Hagen	51.1		39	Cologne	35.8
2	Hamm	49.3		40	Karlsruhe	35.2
3	Gelsenkirchen	49.3		41	Osnabrück	35.2
4	Herne	48.4		42	Frankfurt	34.6
5	Halle	47.2		43	Bonn	34.3
6	Magdeburg	46.9		44	Stuttgart	34.0
7	Ludwigshafen	45.9		45	Braunschweig	33.8
8	Solingen	44.0		46	Nuremberg	33.6
9	Dortmund	43.7		47	Augsburg	33.0
10	Oberhausen	43.7		48	Hamburg	32.3
11	Duisburg	43.7		49	Freiburg	31.5
12	Leverkusen	43.6		50	Munich	30.1

Figure 36: Online time per user's internet access (Top 5/Flop 5)



There is a statistically strongly significant correlation between transfer volume and online time and - as already seen in respect to transfer volume – a distinctly negative correlation between online time and production power.

Table 22: Correlation between online time and transfer volume per user

		Vol_user_priv	Time_user_priv
Vol_user_priv	Correlation according to Pearson	1	,906(**)
	Significance (2-sided)		,000
	N	50	50
Time_user_priv	Correlation according to Pearson	,906(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided).

Table 23: Correlation between internet production and online time per user

		Time_user_priv	Production
Time_user_priv	Correlation according to Pearson	1	-,728(**)
	Significance (2-sided)		,000
	N	50	50
Production	Correlation according to Pearson	-,728(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided).

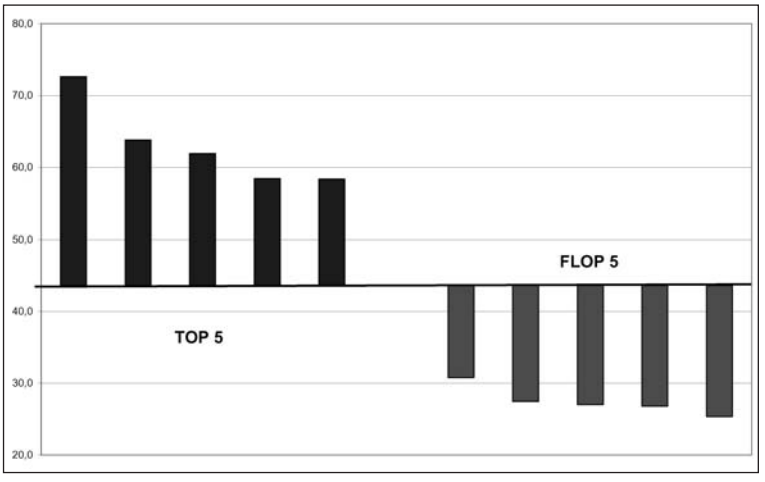
3.3.3. Government

The analysis of the internet position of the government as (overall relatively insignificant) player paints an unusual picture in the top cluster: For the TOP 5 the cities Bremen, Saarbrücken, Magdeburg and Braunschweig follow after Karlsruhe. The City of Lübeck in the North as well as the chemical site of Leverkusen are found at the bottom besides Hamm, Herne and Solingen in the West. The average amounts to 43.6%, and again the differences between the poles are striking.

Table 24: Internet power of the cities: government

1	Karlsruhe	**72.6**		46	Lübeck	**30.8**
2	Bremen	**63.8**		47	Leverkusen	**27.5**
3	Saarbrücken	**61.9**		48	Hamm	**27.0**
4	Magdeburg	**58.4**		49	Herne	**26.8**
5	Braunschweig	**58.4**		50	Solingen	**25.4**

Figure 37: Internet power of the cities: government



One city from the East, namely Magdeburg, ranges in the top group (very good web presence, many Computer Science professors and students in relation to the number of population). Bremen owes its excellent position mainly to its very strong web presence and the municipal internet activities. In Karlsruhe and Saarbrücken the number of CS professors and students greatly surpasses the average. Due to the choice of indicators used for this examination cities without universities housing Computer Science faculties do not stand a chance for receiving good results.

Overall there is a positive correlation between internet power regarding companies and private households on the one side and the governmental section on the other side.

Table 25: Correlation between the players' internet power

		Gov't	Private	Companies
Government	Correlation according to Pearson	1	,438(**)	,559(**)
	Significance (2-sided)		,001	,000
	N	50	50	50
Private	Correlation according to Pearson	,438(**)	1	,758(**)
	Significance (2-sided)	,001		,000
	N	50	50	50
Companies	Correlation according to Pearson	,559(**)	,758(**)	1
	Significance (2-sided)	,000	,000	
	N	50	50	50

** The correlation is significant at the level of 0.01 (2-sided).

3.3.4. Overall examination

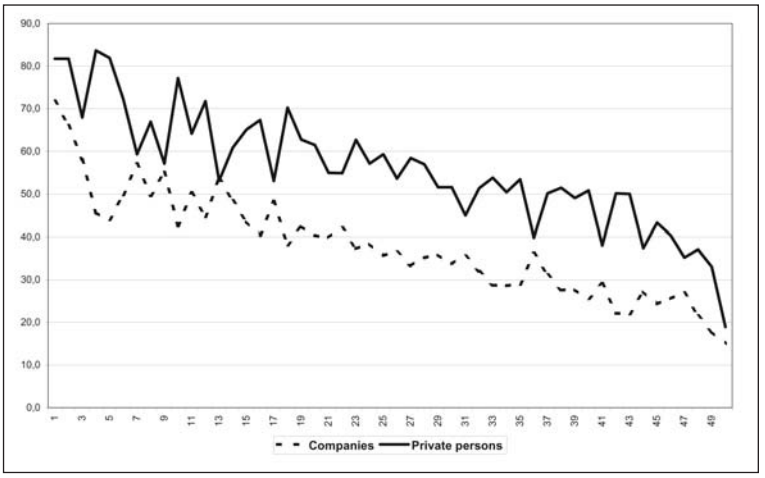
An overall examination of the analysis regarding the players companies, private individuals and government basically confirms the impressions gained while studying production, consumption and frame conditions. Even the further differentiation of the data into companies and private individuals, modest modifications in the weighting and altered allocations do not result in any greatly changed overall impression – the model is relatively robust, and correlation calculations merely underline the correlations found.

Table 26: Internet position of the cities for companies and private individuals

		Companies	Private persons
Companies	Correlation according to Pearson	1	,758(**)
	Significance (2-sided)		,000
	N	50	50
Private persons	Correlation according to Pearson	,758(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided)

Figure 38: Results of the city ranking according to players



3.4. Summary

Undoubtedly the large German cities are the centers of innovation dominating the internet development. A digital differentiation exists not only between the large cities and the rest of the Republic, which takes on the features of a digital divide in separate areas (such as the economically relevant content production) but not on the whole.

These findings also apply to the (very gradual) differentiations between the large cities. Partly the differences on both ends of the scale between those cities that are strongly represented on the internet and those that are not, though, take on an extreme that can be characterized as a dramatic digital divide tending towards disconnection. However: The results imply a picture full of shades of grey in between the black and white. There is no obvious digital gap with a clear dividing line between strong and weak, but a detailed contemplation of the connections between internet positions and other factors is given.

The best internet positions in Germany are claimed by the cities Munich, Karlsruhe, Bonn, Frankfurt, Aachen, Düsseldorf, Cologne, Mainz, Dortmund and Münster – large cities such as Berlin, Hamburg and Stuttgart are not among the 'Top 10'. At the bottom of the chart there are cities that without exception are located in the traditional industrial region of the West (Hamm, Herne, Hagen, Mülheim as well as the chemical site Leverkusen) or in the East of the Federal Republic (Erfurt, Magdeburg, Rostock, Chemnitz, Halle). Individual top positions of Dortmund and Bochum in the Ruhr Region or Magdeburg in the East indicate internal regional differentiations. These findings basically confirm the results of an examination conducted in 2000, which, however, was based on a somewhat different model and a much smaller data basis (Einemann 2000).

The findings also apply – with slight deviations – to the detailed examination of single sectors (production, consumption, frame conditions) and individual players (companies, private individuals and government). Different methods of measurement (e.g. differentiation of the numbers according to companies and private persons) and slight modifications in the weighting (e.g. reduction of the relevance of private homepages) do not result in considerable changes to the overall findings and show the stability of the model.

The analysis of the user activities (transfer volume, online time) per private internet access, however, nearly topples the findings: In internet-weak cities the user activities are far above average, while in cities strongly represented on the internet they tend to fall below average. Firstly that implies that cities with a weak representation on the net have a user amount that overall is way below the average, and secondly that there is a distinct discrepancy between the (rather passive) individual use and the overall productive activity of a city.

The data clearly shows that we are only in the pre-stage or early stage of a new era (William Miller from Stanford University characterized that with the metaphor of the position "below the knee of a hockey stick" a few years ago). The decision to evaluate the 'top student' of each indicator with a score of 100 means that those 100 points can be realized in Germany today, and each city's own difference from the top marks the distance that needs to be conquered in order to catch up – assuming the others will stop and wait. Thus the achieved average scores take on an enormous meaning in the overall results as well as for the single indicators. They give information on the achieved average level (in total 48.9% for large German cities), which is far below the top results and gives us a hint of the giant leaps still ahead of us.

4. Explanatory factors

The search for factors explaining the findings of the digital differentiation with partial digital divides at both poles of the scale shall be conducted on three different levels: At first it will be analyzed which role some of the factors making up the profile of a city play (such as state capital, media center, size) (1.), whether there is a connection between the internet position of the cities and their geographical location (2.) (there have been indications of particular internet weakness in the East and the Ruhr Region), and which relationship to the economical and social position of the city can be found(3.).

4.1. City profiles

There are assumptions that the internet power of a city is related to a specific profile (Kellerman, 2005). Such profile elements could be the size of the city, its function as (state) capital, its role as the site of data-intense media or finance economy as well as the activity of a research-intense innovative circle at universities (particularly the young computer scientists showed great transfer performance during the early phase of the internet). In the following those factors shall be examined closer.

4.1.1. Size of the city

Naturally a city with over 3 million inhabitants will show a greater internet volume in absolute numbers than a town with a population of only 150,000. Thus Berlin with its 3.3 million residents holds 322,623 domain reservations with DENIC and 741,087 e-mail addresses at GMX, while Oldenburg with its population of 155,000 residents claims only 16,862 domains and 36,783 e-mail addresses. An initial look at the cities leading in the internet ranking and at those that show weaker results does not necessarily offer the conclusion of a digital divide along the size line. Five smaller cities – Karlsruhe, Bonn, Aachen, Mainz and Münster with populations between 200,000 and 350,000 – are among the Top 10. On the other hand there is not one single city with over 255,000 inhabitants among the 10 cities at the bottom of the scale. Correspondingly the cor-

relation calculation overall shows no significance at all, respectively merely a slight significance (caused by the factor of 'internet production'):

Table 27: Correlation between internet position and size of city

		Inhabitants
Inhabitants	Correlation according to Pearson	1
	Significance (2-sided))	
	N	50
Production	Correlation according to Pearson	,311(*)
	Significance (2-sided)	0,028
	N	50
Consumption	Correlation according to Pearson	0,233
	Significance (2-sided)	0,103
	N	50
Frame	Correlation according to Pearson	0,153
	Significance (2-sided)	0,288
	N	50
Total	Correlation according to Pearson	,291(*)
	Significance (2-sided)	0,040
	N	50
*.The correlation is significant at the level of 0.05 (2-sided)		
**. The correlation is significant at the level of 0.01 (2-sided)		

It seems that the largest cities with an average population of over 1 million inhabitants are able to transfer their undoubtedly greater 'mass of impact' into a structural advantage over those cities with an average population of 170,000. This statement, however, only applies with limitations: According to its internet power the small city of Mainz would be placed among the 10 large cities, claiming an outstanding 5th position, while the City of Bremen would find itself in 5th position among the 10 small cities, which is a modest score in that category. Out of the 10 smaller cities there are 4 from the Ruhr Region, whose internet weakness, which probably has little to do with their size, lowers the average score even more.

Table 28: Internet position and size of city

		Res_2003	Index				Res_2003	Index
1	Berlin	3,388,434	**98.0**		41	Mainz	185,293	**117.5**
2	Hamburg	1,726,363	**110.5**		42	Hamm	183,805	**65.0**
3	Munich	1,227,958	**167.5**		43	Saarbrücken	182,858	**95.1**
4	Cologne	967,940	**118.5**		44	Herne	174,018	**64.0**
5	Frankfurt	641,076	**128.7**		45	Mülheim	172,332	**40.1**
6	Essen	591,889	**89.1**		46	Solingen	165,032	**73.1**
7	Dortmund	589,240	**115.1**		47	Osnabrück	164,195	**91.3**
8	Stuttgart	587,152	**110.6**		48	Ludwigshafen	162,458	**69.9**
9	Düsseldorf	570,765	**120.3**		49	Leverkusen	160,829	**69.3**
10	Bremen	540,950	**81.6**		50	Oldenburg	155,908	**93.2**
	TOP 10	1,083,177	**114.0**			FLOP 10	170,673	**77.9**

Altogether the size of the city does not seem to be the deciding factor for the strength of the internet position.

4.1.2. Political function as state capital

With the exception of Schwerin (Mecklenburg-Vorpommern) and Potsdam (Brandenburg), all other 14 state capitals (Dresden, Düsseldorf, Erfurt, Hanover, Kiel, Magdeburg, Mainz, Munich, Saarbrücken, Stuttgart, Wiesbaden), respectively city states (Berlin, Bremen, Hamburg) are among the 50 largest cities. 12.5% of all Germans and nearly 50% of the residents of the 50 largest German cities live in these state capitals.

The results show that the state capitals do not differ from the average of the other cities – with the one small exception of frame conditions, where the political functions (especially in the city states) are of greater importance. That becomes particularly obvious during a separate look at the players that shows a slight deviation regarding the government.

Table 29: Internet position of the state capitals

	Res_2003	Production	Consumption	Frame	Total	Index
Capitals	738,430	43.9	61.8	30.6	50.0	**102.2**
Total	21,468,965	42.4	63.4	26.0	48.9	**100.0**
	Res_2003	**Companies**	**Private individuals**	**Government**		
Capitals	738,430	43.7	59.0	50.2		
Total	21,468,965	43.1	59.0	43.6		

The analysis of internet power shows no evidence of any relevant deviations concerning the state capitals with their special political functions from the average of the other cities.

4.1.3. Dominance of branches

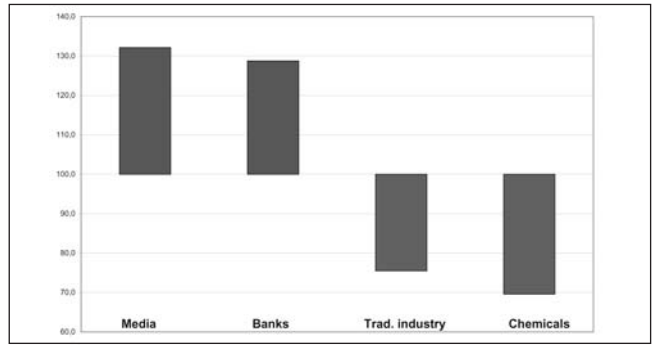
In order to examine the influence of traditional industrial branches (coal, steel, metal processing) the large West German cities (Bochum, Dortmund, Duisburg, Essen, Gelsenkirchen, Hagen, Hamm, Herne, Mülheim, Oberhausen, Solingen and Wuppertal) are treated as one group; in addition to that the 'media metropolises' Munich, Cologne and Hamburg are examined as one group, and the 'bank city' Frankfurt am Main as well as the 'chemical sites' Leverkusen and Ludwigshafen are studied.

The findings imply a connection between the local branch dominance and internet power. The average results of the two chemical cities Leverkusen and Ludwigshafen are even weaker than the score of the West German cities. On the average the media sites Munich, Cologne and Hamburg show values that more than double those of the chemical sites; the bank city Frankfurt is also far ahead of others in the top section. Even a very careful assessment (the media cities Munich, Cologne and Hamburg are also sites of modern industry, service enterprises and corporate centers) allows for an interpretation of the numbers as proof for a correlation between internet power and industrial branch dominance: While the internet power of sites of the modern service industry (media, banks etc.) distinctly exceeds the average, sites of the traditional industries (coal, steel, metal processing, chemicals) have an internet power that is clearly below average. The solid score of Bonn, where the Deutsche Telekom AG has its corporate seat, underlines that theory.

Table 30: Internet position and industrial branch dominance

	Res_2003	Production	Consumption	Frame	Total	Index
Banks	641,076	56.5	77.1	42.8	63.0	**128.7**
Media	1,307,420	66.7	74.0	38.2	64.6	**132.1**
Chemicals	1,61,644	24.2	55.1	5.2	34.0	**69.6**
Traditional industry	320,303	27.2	57.2	11.8	36.9	**75.5**
Total	21,468,965	42.4	63.4	26.0	48.9	**100.0**

Figure 39: Internet position and industrial branch dominance



4.1.4. Science/innovative information technology

The number of professors and students of Computer Science has already been included in the ranking, as well as the (modestly weighted) innovative software companies (suppliers at the Cebit Computer Trade Fair) and the information technology companies noted in the New Market in 2000 (however, from today's point of view only to be evaluated as an indication of the innovative quality of the local success factor). It is to be examined whether there is a connection between these indicators of internet-related innovation potential of a local success factor and the internet power of the city.

The correlation calculation signals a strong connection between the overall results and the companies active at that site offering internet products, the innovative frame conditions and the number of Computer Science students; the connection with the number of Computer Science professors is significant as well (everything always in relation to the number of residents!).

Table 31: Correlation between innovative power and internet power

		Total
Total	Correlation according to Pearson	1
	Significance (2-sided)	
	N	50
Product_Supplier	Correlation according to Pearson	,584(**)
	Significance (2-sided)	0,000
	N	50
New Market	Correlation according to Pearson	,482(**)
	Significance (2-sided)	0,000
	N	50
Professors _CS	Correlation according to Pearson	,315(*)
	Signifikanz (2-seitig)	0,026
	N	50
Students_CS	Correlation according to Pearson	,411(**)
	Signifikanz (2-seitig)	0,003
	N	50
**. The correlation is significant at the level of 0.01 (2-sided)		
*. The correlation is significant at the level of 0.05 (2-sided)		

The existing number must not be over-interpreted. Fact is that as a whole the German Internet Capital Munich has the greatest number of professors teaching Computer Science and that this circumstance certainly is one of many factors for the city's outstanding internet position; the same applies to Karlsruhe placed in second position, which has a very strong and traditional Computer Science faculty.

4.1.5. Company sites

Research into the sites of the 1,000 largest German corporations revealed that 598 of them (i.e. 59.8%) hold their company headquarters in one of the 50 largest German cities (Losse, 2004, p. 30). Five cities in the East (Chemnitz, Erfurt, Halle, Magdeburg and Rostock) as well as Hamm and Herne fail to house one single corporate center, while 9 cities (Munich, Hamburg, Frankfurt, Berlin, Cologne, Düsseldorf, Stuttgart, Hanover and Essen) are the seats of 20 or more corporations. 15.7% of all German company headquarters in the 50 largest cities (94) are located in Munich, 11.4% in Hamburg and 9.5% in Frankfurt.

Table 32: Sites of corporate headquarters (index)

1	Munich	100.0		18	Duisburg	8.5		35	Mainz	2.1
2	Hamburg	72.3		19	Bochum	7.4		36	Mönchengladbach	2.1
3	Frankfurt	60.6		20	Bonn	7.4		37	Oberhausen	2.1
4	Berlin	48.9		21	Wuppertal	7.4		38	Osnabrück	2.1
5	Cologne	45.7		22	Karlsruhe	6.4		39	Dresden	1.1
6	Düsseldorf	39.4		23	Saarbrücken	6.4		40	Freiburg	1.1
7	Stuttgart	28.7		24	Gelsenkirchen	5.3		41	Leverkusen	1.1
8	Hanover	24.5		25	Mülheim	4.3		42	Lübeck	1.1
9	Essen	21.3		26	Braunschweig	3.2		43	Solingen	1.1
10	Augsburg	16.0		27	Hagen	3.2		44	Chemnitz	0.0
11	Mannheim	16.0		28	Kassel	3.2		45	Erfurt	0.0
12	Nuremberg	16.0		29	Kiel	3.2		46	Halle	0.0
13	Bremen	13.8		30	Krefeld	3.2		47	Hamm	0.0
14	Wiesbaden	12.8		31	Ludwigshafen	3.2		48	Herne	0.0
15	Aachen	8.5		32	Münster	3.2		49	Magdeburg	0.0
16	Bielefeld	8.5		33	Oldenburg	3.2		50	Rostock	0.0
17	Dortmund	8.5		34	Leipzig	2.1				

(Based on: Losse 2004)

The analysis of the connection between the internet position and the site of the seat of company headquarters reveals a significant correlation:

Table 33: Sites of company headquarters and internet position

		Internet_Pos	C_seat
Internet_Pos	Correlation according to Pearson	1	,594(**)
	Significance (2-sided)		,000
	N	50	50
C_seat	Correlation according to Pearson	,594(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided) signifikant.

The connection found here gives reason to the assumption that a closer analysis of internet power and economical power will also reveal a positive connection.

4.1.6. Summary

In summary the following applies to single factors which affect the profile of the city:

- A distinct result of the research is that the internet power of the cities does not depend on their function as political centers; neither the German Capital of Berlin nor the state capitals as a group show relevant deviations from the average of the 50 largest cities.
- There is a weakly marked connection between the size of the city (population) and its internet power, which is not a decisive factor though; naturally the large cities show the highest absolute values and many of the smaller cities hold a weak internet position. However, other factors than merely that of size seem to be responsible for that.
- The industrial branch dominance seems to be the decisive factor for the internet power of a city: Sites of the modern service industry (media, banks and others such as telecommunications) have an internet power that clearly is above average, while the internet power of sites of traditional industry (coal, steel, metal processing, chemicals) definitely falls short of the average.
- Furthermore, there are indications that a positive connection between the internet power of a city and the presence of innovative computer technology companies, computer science faculties and favorable frame conditions for company foundations does exist.
- There also is a positive correlation between the function of the city as seat of large corporations and its internet power.

4.2. Geographical location

The findings presented in this section could also have been included as 'regional differentiations' in the analysis section – however, they are made part of the discussion on the causes in which the connection between the internet power and a certain profile of cities (influenced by their regions) shall be analyzed. To that extent a certain (definitely prejudiced) preliminary understanding regarding the city profile comes into the definition that will be examined in detail in later sections. One "source of digital divide refers to geography", as claimed by Manuel Castells from a more global perspective (Castells, 2003, p, 250). Does that apply to Germany, too?

The groups of cities to be studied regarding their differences are:

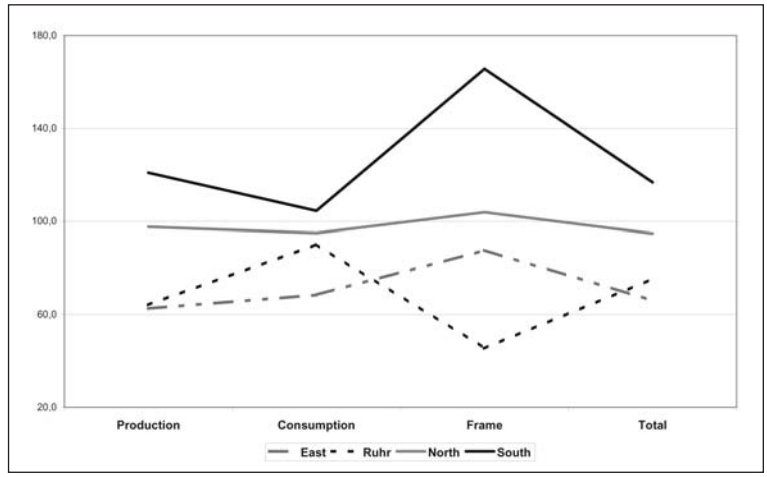
- The cities in **East Germany** – with the exception of Berlin – that were coined by 40 years of a non-capitalist economy within the former GDR during the Post-WWII Era and that have received trillions of financial aid from the former West Germany. The 7 cities Chemnitz, Dresden, Erfurt, Halle, Leipzig, Magdeburg and Rostock out of the 50 largest cities are included in this group. The state capitals Schwerin (Mecklenburg-Vorpommern) and Potsdam (Brandenburg) were not considered in the overall research due to the size of their population.
- Cities in the **West, with the Ruhr Region as the center**, that were shaped by traditional industry (coal, steel, metal processing) for over a century and now have to cope with the structural changes. The 12 cities Bochum, Dortmund, Duisburg, Essen, Gelsenkirchen, Hagen, Hamm, Herne, Mülheim, Oberhausen, Solingen and Wuppertal out of the 50 largest cities are included here. This group of cities shall be called **Ruhr** in the following even though that collective term does not exactly mirror the regional identities.
- The cities in **Northern Germany** located in regions with the image of a less strong economical position (there is the German term of 'North-South-contrast'). Here the 8 cities Braunschweig, Bremen, Hamburg, Hanover, Kiel, Lübeck, Oldenburg and Osnabrück are included in the 50 largest cities.
- The cities in **Southern Germany** situated in regions that boast the image of an even international economical top position (in the states of Bavaria and Baden-Württemberg). Here the 50 largest cities are represented by the 7 cities Augsburg, Freiburg, Karlsruhe, Mannheim, Munich, Nuremberg and Stuttgart.

The unambiguity of the results is astonishing. The calculation of the average values for the regions shows overall and in all sectors a clear hierarchy: The cities in Southern Germany achieve top values, the Northern German cities show mediocre values, the cities in the Ruhr Region lie distinctly below average, and the East German cities find themselves at the very bottom (except for frame conditions).

Table 34: Internet power of the regions (index)

	Population	Production	Consumption	Frame	Total
East	299,910	62.6	68.4	87.8	65.9
Ruhr	320,303	64.1	90.2	45.4	75.5
North	474,386	97.6	95.0	103.8	94.8
South	480,073	120.9	104.5	165.6	116.7
Total	21,468,965	100.0	100.0	100.0	100.0

Figure 40: Internet power of the regions



The examination of the German internet geography shows a digital contrast which does not run from North to South, but rather a differentiation apparently orientated along the 'lines of wealth': The cities in the South achieve above-average scores, the East and the Ruhr Region are well below average, and the Northern cities show average values but overall fall slightly below average.

Despite all polarization between the South and the East/Ruhr, despite all findings of digital divide, e.g. between Munich (South) and Mülheim (Ruhr): A digital differentiation also exists within the regions themselves. Dortmund and Bochum of the Ruhr Region claim positions and values above the results of the internet-weakest cities of the South (Mannheim, Nuremberg, Augsburg). The same applies – with limitations – to the East: The city in the highest position for that region, Dresden, ranks 30, still falling behind the internet-weakest cities in the South.

Table 35: Differentiation within the regions

Rank		Res_2003	Index
9	Dortmund	589,240	**115.1**
15	Bochum	390,087	**104.2**
19	Augsburg	257,836	**99.6**
23	Nuremberg	491,307	**95.0**
26	Mannheim	308,385	**91.2**
30	Dresden	478,631	**84.4**

Selecting the slightly expanded area of the 'Ruhr Region' instead of a state such as North-Rhine Westphalia is founded on the results of previous studies (Einemann, 2000, 2003), during which a particularly high internet power was discovered in the cities along the Rhine (from Düsseldorf to Freiburg except the chemical sites of Leverkusen and Ludwigshafen). Great differences, for example between Düsseldorf, Cologne and Bonn/Rhine as well as between the Ruhr Region cities, exist within the Western region or the State of North-Rhine Westphalia.

If a geographical line had to be drawn through Germany to separate internet power, it would not run between North and South or East and West but rather be sectioned into three parts which would place the North into center field and separate Rhine/South on the one side from Ruhr/East on the other side.

A new group formation of **Ruhr/East** without Dortmund and Bochum (as well as Berlin) and with the 17 cities Chemnitz, Dresden, Erfurt, Halle, Leipzig, Magdeburg and Rostock in the East as well as Duisburg, Essen, Gelsenkirchen, Hagen, Hamm, Herne, Mülheim, Oberhausen, Solingen and Wuppertal in the West with the Ruhr Region as its core serves to clarify the regional differences. This is opposed by a group formation of **South/Rhine** (except Leverkusen and Ludwigshafen) with the 12 cities Augsburg, Bonn, Düsseldorf, Freiburg, Karlsruhe, Cologne, Mainz, Mannheim, Munich, Nuremberg, Stuttgart and Wiesbaden. Obviously the results are exaggerated by taking out the high-ranking cities Dortmund and Bochum in Ruhr/East as well as the internet-weak chemical sites Leverkusen and Ludwigshafen in the Rhine Area, but now the picture offers an especially clear impression of the different dimensions of internet power in those regions.

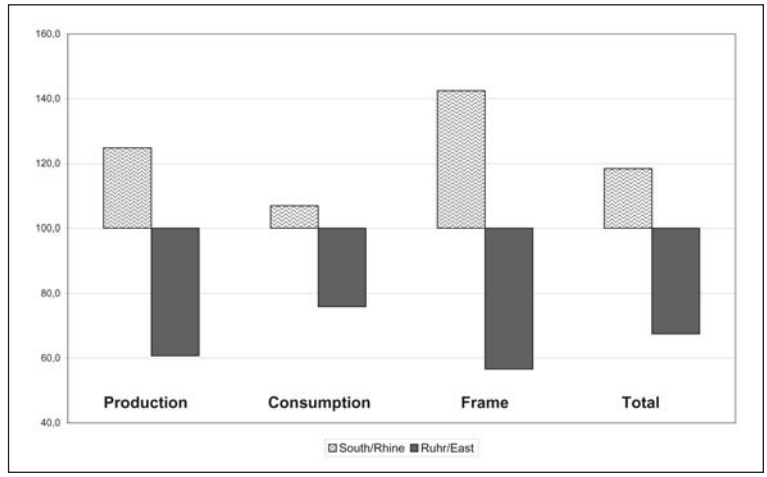
Six of the 12 cities in the South/Rhine grouping rank among the top 10 (Munich, Karlsruhe, Bonn, Düsseldorf, Cologne, Mainz), 11 are in the first half and and Mannheim, ranking 26, holds the last position. The 17 cities of Ruhr/East are all in the bottom half, with Essen topping them (Position 27), and 15 out of the 18 cities with the weakest internet results are located in the Region Ruhr/East. The last 9 ranks are completely claimed by the Ruhr/East Region (Erfurt, Hamm, Herne, Magdeburg, Rostock, Chemnitz, Hagen, Halle and Mülheim).

The cities in the Ruhr Region and the East combined achieve only two thirds of the average scores, whereas the cities in the South and Rhine Area jointly accomplish approximately 20% above average. The production power and frame conditions are dramatically stronger in the South/Rhine Area than in the Ruhr/East Section, while the gap is somewhat smaller when it comes to the use of the internet.

Table 36: Comparison between the Ruhr/East and South/Rhine Regions (index)

	Production	Consumption	Frame	Total
South/Rhine	124.8	106.9	142.4	118.4
Ruhr/East	60.8	75.9	56.7	67.5
Average	100.0	100.0	100.0	100.0

Figure 41: Comparison between the Ruhr/East and South/Rhine Regions (index)



The exaggerated illustration for purposes of elucidation (leaving out the strong cities in the weak regions and the weak cities in the strong regions) is made relative if a larger number of (then naturally smaller) cities in the regions is included. However, an expansion of the examination to the 100 largest German cities and a division into the 5 large sections of Rhine, South, Ruhr, East and North (to which 72 cities can clearly be allocated), based on another model (Einemann, 2003) came to a conclusion where the picture of the digital separation into three sections is less distinct: The Southern cities are positioned only slightly above the average, while the northern Rhine-cities (here limited to Bonn, Darmstadt, Düsseldorf, Koblenz, Cologne, Leverkusen, Mainz and Wiesbaden) score top values.

Table 37: Internet power and regions (72 cities)

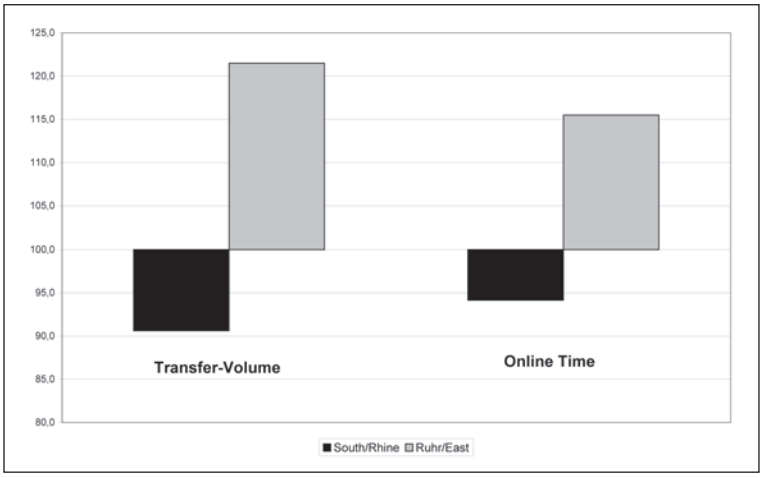
Region	Number	Internet	Index
Rhine	8	50.4	118.9
South	21	43.6	102.8
Ruhr	17	33.4	78.8
East	14	34.3	80.9
North	12	40.4	95.3
Total	72	42.4	100.0

The whole picture turns upside down when only focussing on the **internet use by private individuals** for the 50 largest cities. It confirms the findings of the 'turned around gap' which has already been mentioned. The relatively few users in the internet-weak cities show longer online times and larger transfer volumes than the users in the top regions.

Table 38: Use per participant in the Ruhr/East and South/Rhine regions (Index)

	GB_PT_Priv	Hrs_PT_Priv
South/Rhine	90.6	94.1
Ruhr/East	121.5	115.5
Average	100.0	100.0

Figure 42: Use per participant in the Ruhr/East and South/Rhine Regions (index)



It has already been indicated that this phenomenon must be interpreted as evidence of the generally low internet participation of private users in the internet-weak cities; the assumably contrary total results are caused by the fact that company data has been included in the values concerning the sector 'consumption' and many other indicators have been taken into consideration for the group of players 'private individuals'. The result points at a special form of digital differentiation: While in internet-strong cities with a high participation even in the production of contents the rather passive private consumption (high transfer volume) per person falls short of the average, in internet-weak cities it distinctly exceeds the average. A comparison between Bremerhaven (here not included due to its size) and Munich offers a perfect example: While Munich boasts about 18 domain reservations per 100 residents, Bremerhaven has merely 3.5 (in position 100 of 100); regarding the transfer volume per internet access Bremerhaven tops all other cities with 8.8 GB per month (Position 1 of 100), whereas Munich with 3.8 GB found itself in the bottom section of the chart (Einemann, 2003).

In summary one can talk of a geographical differentiation, even a geographical polarization of internet power in Germany. However, there is no continuous digital divide. The results in picture form would perhaps show a cluster of isles with large differences between the individual islands – though even the most gorgeous islands suffer at least one not-so-pretty spot, and the less beautiful isles (except the East) offer at least one top location.

The diagnosis of regional differentiation in the sense of a division into three sections, i.e. South/Rhine on the one side and Ruhr/East on the other side as well as a center field in the North and parts of the former West Germany, also contains an explanatory component if the generally

known socioeconomical differences in Germany are taken into account: The South and the cities along the Rhine are considered to be strong economies, the economical image of the East and the Ruhr Region is rather poor, and the North is claimed to considerably lag behind the South. This explanatory approach shall be investigated in the following by means of social and economical data.

Figure 43: The digital division of Germany into three sections

4.3. The socioeconomical position

The results of Lichtblau's research study (2004) place Munich into the position of the city with the highest level of wealth, followed by Stuttgart, Frankfurt, Düsseldorf and Mainz.

Table 39: Levels of wealth of the large cities

	City	Scores			City	Scores
1	Munich	77.9		41	Kassel	39.9
2	Stuttgart	67.7		42	Gelsenkirchen	39.2
3	Frankfurt/Main	67.0		43	Erfurt	37.4
4	Düsseldorf	65.0		44	Herne	37.4
5	Mainz	64.6		45	Chemnitz	36.4
6	Wiesbaden	63.2		46	Rostock	36.1
7	Leverkusen	61.4		47	Berlin	34.3
8	Karlsruhe	60.9		48	Magdeburg	33.8
9	Augsburg	58.8		49	Leipzig	31.8
10	Hamburg	58.3		50	Halle (Saale)	29.0

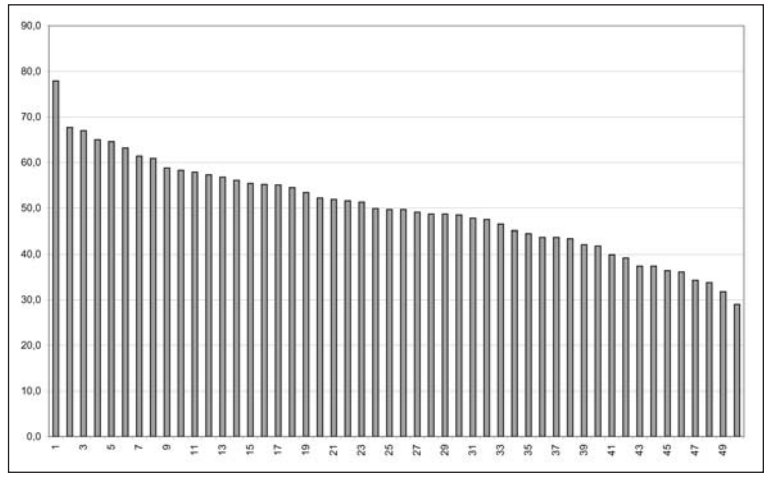
Source: Lichtblau 2004. p. 7

"Munich is the winner in the level ranking. The city on the Isar River claims first position in the categories of wealth, work and structure. Its values that distinctly exceed the average and show a clear advantage over its competitors Stuttgart and Frankfurt are decisive for the overall victory in the level ranking. High incomes, strong tax power, low unemployment, a large supply of jobs to the residents in productive age groups are coupled with a positive social structure in Munich." (Lichtblau, p. 12).

The top cluster is opposed by a group of cities at the bottom end of the table that achieve low values in nearly all examined categories (Kassel, Gelsenkirchen, Erfurt, Herne, Chemnitz, Rostock, Berlin, Magdeburg, Leipzig, Halle). There definitely is an economical and social polarization within Germany: "The cities on the last ten ranks in the level ranking achieve bad grades in all categories." (p. 13).

The overall picture shows a differentiation between the cities with an obvious gap between the poles. The graph depicts graduations between the cities, but no clear separating line indicating a gap.

Figure 44: Economical overall position of the cities



(Based on: Lichtblau 2004. p. 7)

The results provided by Lichtblau assist in making it possible to analyze in detail the connections between the internet power and the economical position of the 50 largest German cities.

The central findings give evidence to the fact that a distinct connection between a strong position on the internet and the overall economy does exist. The internet-strong cities also have a strong economical position, and the cities with a weak position in the overall economy have a weak internet position as well.

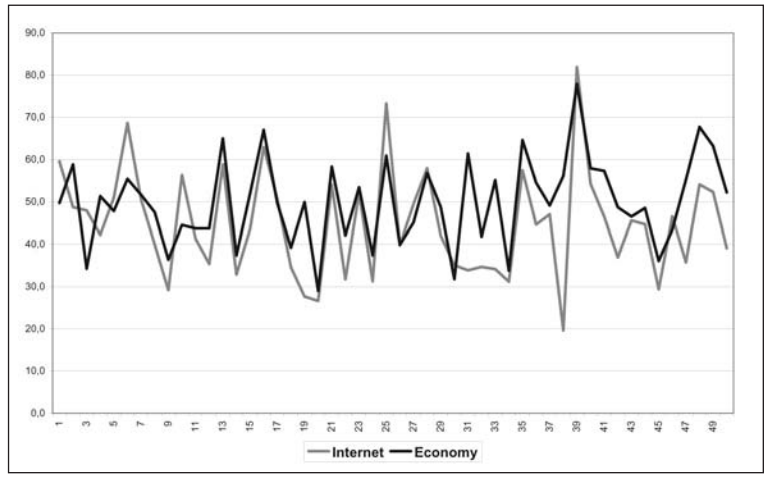
Table 40: Correlation between internet power and economical power

		Inter-net_Pos	Economical.position
Internet_Pos	Correlation according to Pearson	1	,653(**)
	Significance (2-sided)		,000
	N	50	50
Economical.position	Correlation according to Pearson	,653(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided).

A detailed examination from Munich to Mülheim shows greater deviations between the values regarding the internet position and the economical power of some cities.

Figure 45: Correlation between economical power and internet power



The average values of the large cities regarding internet power (48.9%) and the overall economy (50.0%) are very similar. A total of 16 cities shows deviations of over 10 percent between both positions. Berlin, Bonn, Karlsruhe and Dortmund achieve better values for their internet position than for their economical position. The traditional industrial cities Solingen, Hagen and Mülheim as well as the chemical sites Leverkusen and Ludwigshafen have a particularly weak internet position as compared to their position in the overall economy (a deviation of 20% or more).

Table 41: Deviations between internet power and position in the overall economy

	Internet	Economy	Difference
Solingen	35.8	55.2	-19.4
Ludwigshafen	34.2	55.1	-20.9
Hagen	27.7	49.9	-22.2
Leverkusen	33.9	61.4	-27.5
Mülheim	19.6	56.1	-36.5

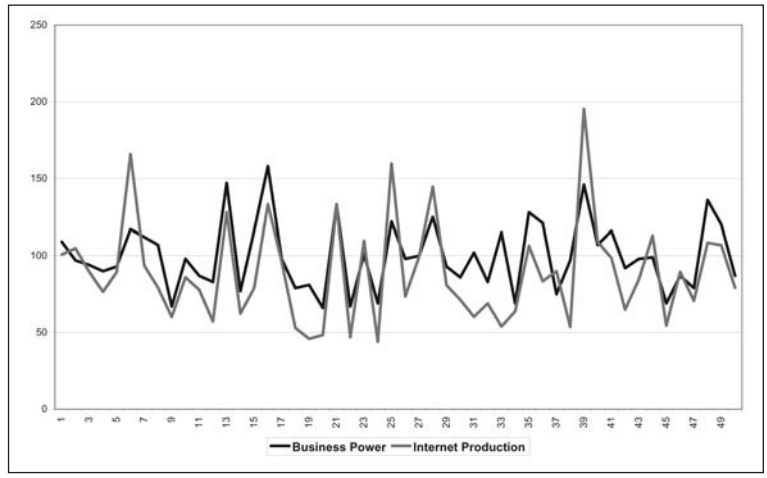
The connection between the overall economy and the internet becomes even clearer in a detailed examination of the power of internet production and the business power of the cities.

Table 42: Correlation between internet production and business power

		Internet_production	Business power
Internet_production	Correlation according to Pearson	1	,765(**)
	Significance (2-sided)		,000
	N	50	50
Business power	Correlation according to Pearson	,765(**)	1
	Significance (2-sided)	,000	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided).

Figure 46: Correlation between internet production and business power



The connection between the power on the internet and in the categories of wealth (income) and work (meaning a low unemployment rate and plenty of jobs) is clearly visible as well. The conclusion also shows the other side of the coin: Cities with low income rates and high unemployment rates also score badly on the internet.

Table 43: Correlation between internet power and wealth/jobs

		Internet_Pos	Wealth	Jobs
Internet_Pos	Correlation according to Pearson	1	,619(**)	,568(**)
	Significance (2-sided)		,000	,000
	N	50	50	50
Wealth	Correlation according to Pearson	,619(**)	1	,869(**)
	Significance (2-sided)	,000		,000
	N	50	50	50
Jobs	Correlation according to Pearson	,568(**)	,869(**)	1
	Significance (2-sided)	,000	,000	
	N	50	50	50

** The correlation is significant at the level of 0.01 (2-sided).

Due to the strongly positive correlations within the blocks of indicators as well as when examining the values regarding the internet and the economy a **provable distinct economical and social correlation of the internet** can be claimed. The No. 1 German economical metropolis Munich is Germany's internet capital as well. The economical flops among the 50 largest German cities also show the lowest internet values. Berlin is good for a surprise: While the German capital achieves a relatively weak yet still average internet position (ranking 20 with 47.9% of all scores possible and an index value of 98), concerning the overall economy it finds itself in 47th place with no more than 34.3% of all scores possible!

Geographical polarizations in the overall economy become obvious in Lichtblau's (2004) regional analysis of states and urban areas. It differentiates between the sections of North, East, South and West. The strong polarization between the cities in the South and East of Germany is striking. The Western Region owes its center position to the circumstance that the economically strong cities along the Rhine and the Ruhr Region are evaluated combined here.

Table 44: Wealth levels of the regions

	North		East		South		West	
	Scores	Rank	Scores	Rank	Scores	Rank	Scores	Rank
Wealth	**12.1**	**3**	**6.6**	**4**	**15.2**	**1**	**13.2**	**2**
Work income	5.8	3	4.1	4	7.7	1	6.3	2
Income tax level	6.3	3	2.5	4	7.5	1	6.9	2
Job market	12.5	2	8.3	4	15.1	1	12.5	3
Unemployment rate	6.7	2	2.6	4	7.7	1	6.6	3
Jobs provided	5.8	3	5.7	4	7.4	1	5.9	2
Economy	**7.8**	**2**	**5.8**	**4**	**8.9**	**1**	**7.2**	**3**
Income	2.3	3	1.1	4	3.0	1	2.6	2
Gross Domestic Product	0.6	2	0.4	4	0.8	1	0.5	3
Structural effect	2.1	2	1.6	3	2.2	1	1.5	4
Site	**7.6**	**2**	**7.2**	**4**	**8.0**	**1**	**7.3**	**3**
GDP per income holder	1.9	2	1.0	4	2.3	1	1.9	3
Job training provided	0.9	2	0.6	4	1.2	1	0.9	3
Share of highly skilled indiv.	0.2	3	0.3	1	0.3	2	0.2	4
Structure	**6.5**	**3**	**5.6**	**4**	**8.6**	**1**	**7.9**	**2**
Social security and unemployment security recipients	1.6	3	1.3	4	2.1	1	2.1	2
Transfer position job market	0.4	2	0.2	4	0.5	1	0.4	3
Crimes per 100.000 residents.	1.2	4	1.4	3	2.0	2	2.2	1
Government	2.5	3	1.9	4	2.7	1	2.6	2
Public officials per resident.	0.2	3	0.2	4	0.2	2	0.3	1
Tax income per resident.	0.2	3	0.2	4	0.3	1	0.3	2
Debts per resident	0.5	2	0.6	1	0.5	4	0.5	3
Total	**49.1**	**3**	**35.3**	**4**	**58.5**	**1**	**50.7**	**2**

(Source: Lichtblau 2004. p. 19)

Based on these findings on the economical differentiation between the German regions it may be assumed

- that the split of the society into three parts concerning the internet finds its equivalence in the real economy, apart from some minor exceptions of inner-regional differentiation, and
- that there also is a distinct connection for all three areas between the position on the internet and in the overall economy.

In order to prove this connection Lichtblau's data (2004) was reassembled for the individual cities as for the analysis of the internet geography. Within the Region West it is detailed between the expanded Ruhr Region and the cities along the Rhine; for the benefit of gaining clarity the Rhine/South grouping is examined without the chemical sites Leverkusen and Ludwigshafen, and the Ruhr/East cluster is studied minus Dortmund, Bochum and Berlin. The 8 cities in the North are included as a comparative group.

The results affirm the thesis of the synchronicity of the regional differentiation in the overall economy as well as on the internet. An economical split into three sections exists as much as there is a digital split into three sections: The economically strong cities on the Rhine and in Southern Germany find themselves at the top, the cities along the Ruhr and in the East of Germany are at the bottom, and the Northern German cities make up the center field with average scores. **There is an economical and social correlation of the internet which reproduces itself on the regional level as a digital and economical division of Germany into three sections.** That result also takes on a particular importance since it is a combination of findings based on different sets of data and different models that were independently processed by two different research facilities.

Table 45: Position on the internet and in the overall economy according to regions

	Internet	Economy	Wealth	Work	Business
Rhine/South	118.4	122.0	129.2	128.4	122.8
Ruhr/East	67.5	85.2	79.1	82.7	80.6
North	94.8	98.2	97.0	100.4	104.1
Total	100.0	100.0	100	100	100.0

Figure 47: Position on the internet and in the overall economy according to regions 1

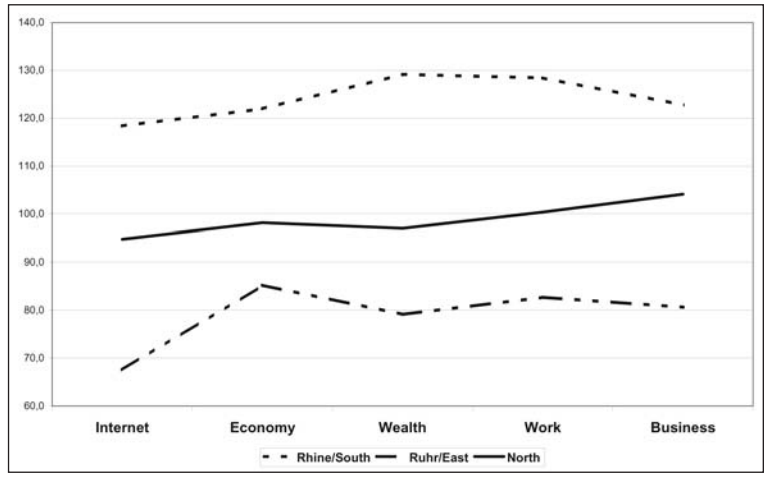
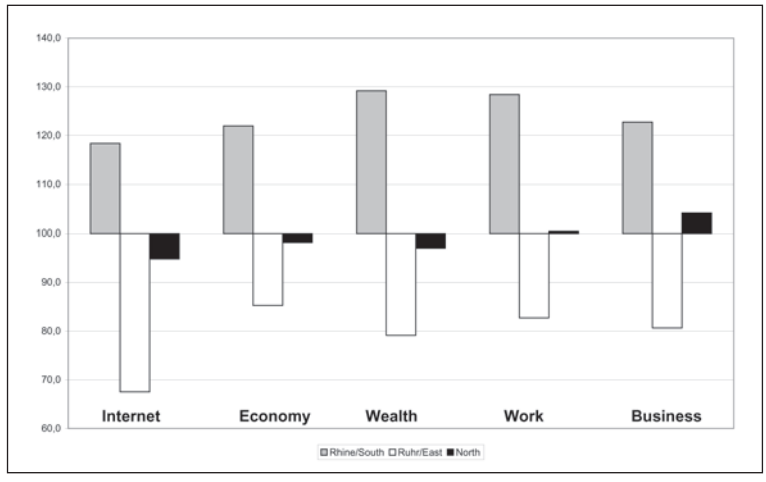


Figure 48: Position on the internet and in the overall economy according to regions 2



In conclusion it should be pointed out again that these somewhat exaggerated results interpretable as a diagnosis of a digital divide do not replace the core results of a digital differentiation in the sense of a contrast. The positions of the individual cities in the economy and on the internet and – more pointedly – their strength in internet production and their economical strength can be clearly illustrated in scatter diagrams that clarify the differentiations, the contrast, the polarizations, respectively the digital divides, as well as the economical and social correlation of the internet and simultaneously offer an indication about the regional differences.

Figure 49: Economical and internet power of the cities

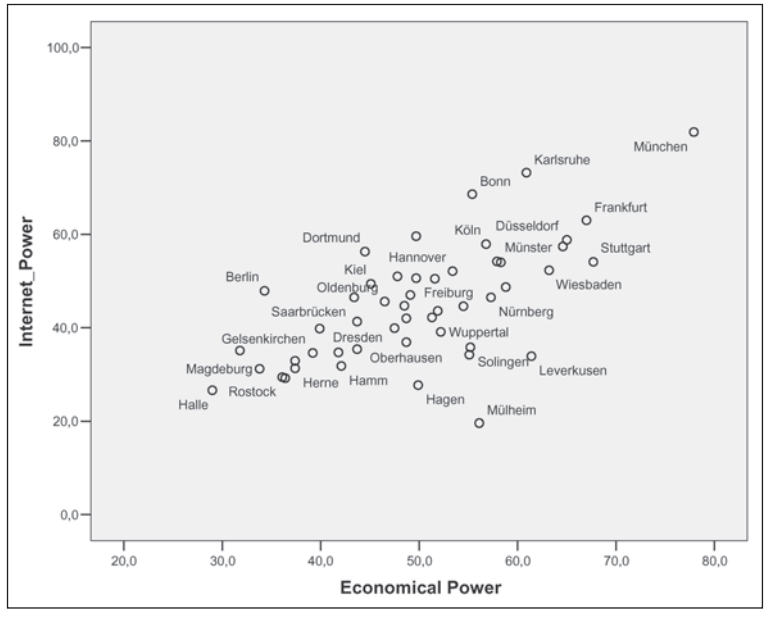
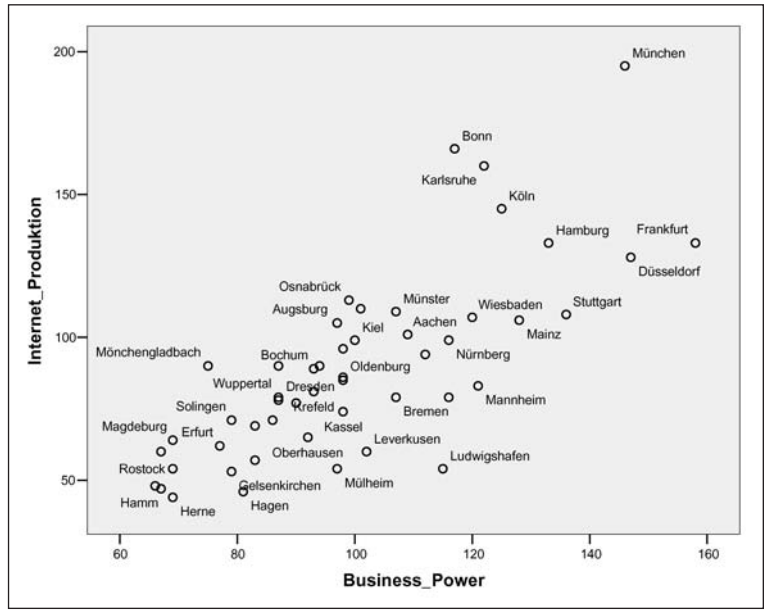


Figure 50: Position of the cities in the business power and internet production



5. Findings

Innovation centers that dominate the internet development especially in the category of economically relevant content production are found in the group of the 50 largest German cities. A particularly extreme example: 1.5% of all Germans live in Munich; on the other hand, the share of that area in the approx. 8 billion monthly pageviews measured by IVW and particularly relevant to revenues from advertisements was 1.6 billion or approx. 20%. However, in many areas of production, consumption and internet frame conditions the share of the 50 largest German cities exceeds the German average only slightly or not at all, so that there can be no mentioning of a continuous digital divide between urban and rural areas.

There is a digital differentiation between the large German cities in the sense of a digital contrast with polarizations, resp. digital divides between the strongest and the weakest cities at both ends of the scale. That result applies to the sector of production, consumption and frame conditions as well as to the different players companies, private individuals and government. The use per participant's internet access (transfer volume, online time) is much higher in cities with a weak internet position than in internet-strong cities – which is an indication of an overall low internet participation in internet-weak cities and a discrepancy between a more creative production in the internet-strong cities and more passive consumption in the internet-weak cities. The average, of all cities, which is low on the whole (48.9% of 100 scores possible), offers evidence on a generally high need to make up for lost time that allows us to expect some dynamic developments in the future.

The differentiations and digital divides regarding internet power correlate to the position of the cities in the overall economy. There is a clear connection between the 'traditional' economical and social position of the city and its internet position. The correlation is obvious: The socioeconomical and the digital contrast show a comparable differentiation.

The dependence of the internet power on the power in the overall economy is confirmed through positive connections between the internet position and the city's ability to furnish company headquarters, innovative potentials and the presence of certain industrial branches (banks, media, telecommunications); cities who function as sites of the traditional industry (coal, steel, metal processing, chemicals) tend to be internet-weak.

On the other hand, the size of a city as well as its function as political center are of minor importance for the internet position. Munich as the unchallenged top city regarding wealth as well as internet aspects is considerably smaller than Berlin or Hamburg; the cities Karlsruhe, Bonn and Mainz, which are found in the top group, have less than 10% of Berlin's population, but are way ahead of the German capital in respect to their economical strength and their position on the internet.

The differences reproduce themselves on the regional level (with small exceptions) as a digital and economical separation of Germany into three sections. The large cities in Southern Germany and along the Rhine (except the sites of the chemical industry) and especially Munich reach top values, while the cities in the East and Ruhr Region (with the exceptions of Dortmund and Bochum) fall far behind with regard to the economy as well as to the internet. An exclusive look at the poles (for instance a comparison between Munich and Mülheim, respectively Halle) shows dramatical digital divides and disconnections. However, there also are distinct differentiations within the regions; Bochum and Dortmund in the Ruhr Region, for example, score considerably higher than several cities in the internet-strong Rhine/South Region.

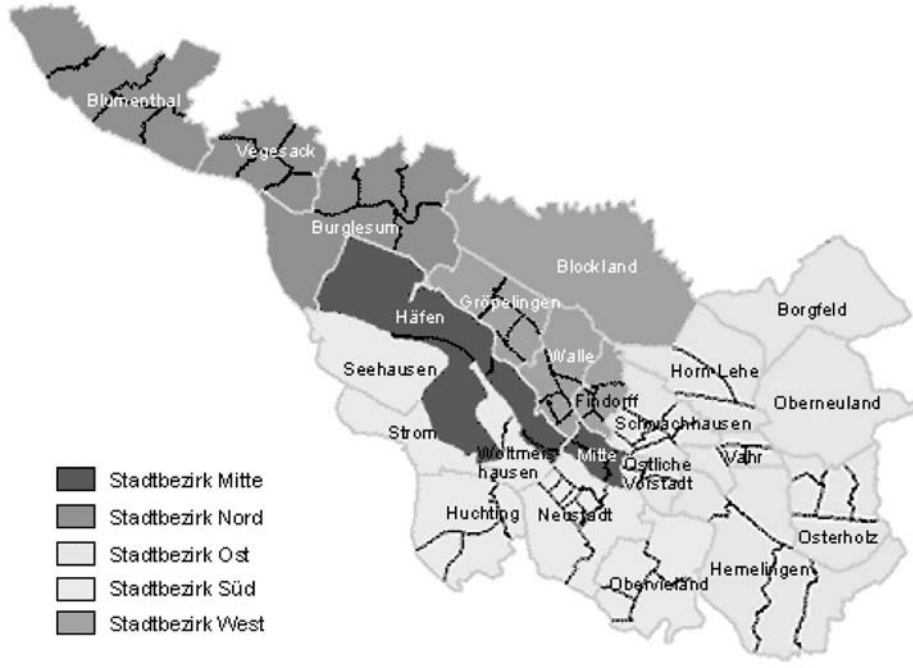
The results in picture form would perhaps show a cluster of isles with large differences between the individual islands – though even the most gorgeous islands suffer at least one not-so-pretty spot, and the less beautiful isles (except the East) are equipped with at least one top location.

III. Case study: The digital contrast in the City of Bremen

1. The empirical approach

The analysis of the differentiations within one city is done via a case study of the 10th largest German city, Bremen (541,956 inhabitants). Bremen was selected due to the fact that there is extremely detailed data provided by the Census Bureau (Statistisches Landesamt Bremen, 2003) and profile descriptions of the city districts (Focke-Museum & Weser-Kurier 2003) available on this city, which makes up the essential part of the City State of Bremen, and also because internet data so detailed it even includes the level of the city quarters could be obtained. In addition to that it is the author's hometown, and he has therefore experienced the city in many of its facets and was able to acquire a 'social instinct' for its structures and spaces. The study includes the 5 city sections, 22 districts and – on micro-level – 89 quarters (with evaluable data on 75 quarters) of Bremen. The smallest quarter has a population of less than 1,000 (Hohweg), the largest quarter holds over 13,000 residents (Kattenturm).

Figure 51: Bremen and its city sections with some districts



(Source: http://www2.bremen.de/info/statistik/hbkleinraeumig/ortsteilatlas.htm)

There is internet data on Bremen that allows for useful analyses: The dimension of the internet access is analyzed with the aid of the indicator **broadband access lines**, the dimension of production with the help of the indicator **active domains**, the dimension of potential use with the assistance of the indicator **e-mail addresses/boxes** and the dimension of the real use by means of the indicators **transfer volume** as well as **online time**.

Altogether the examination is based on 3,770 DSL-access lines, 22,507 active domains, 106,283 e-mail addresses (to be more exact: installed POP boxes), a monthly download volume of 10,964 GB and a total of 527,143 online hours per month (in June 2004). The e-mail addresses are POP boxes provided by Company GMX that also allow the handling of several e-mail addresses – therefore a much more precise indicator than the simple number of e-mail addresses.

Without taking the size of the population into consideration, it would be most likely that the districts with the most residents should also have the best internet data – a comparability such as on the level of the quarters and statistical analyses of correlations would not be possible. For that reason the numbers are converted into the indicators: For 1,000 residents, resp. households or the number of existing companies each. In addition to that, regarding the transfer volume and online time the respective data can be measured per user access – this will show if there are different user intensities per access (resp. per individual by mathematical correction by the size of the average household) on the de-central level. The data for the indicators domains, access lines, volumes and online time is available as detailed as the micro-level of quarters separately on private individuals and companies; the e-mail boxes with GMX (mostly free of charge) are presumably mainly used by private households.

Even if the statistics registrars of a company (1&1, GMX) are willing to share any data, the procurement of very detailed, internet-related data on a large city meets with great exertion if one strives for a connection to 'traditional' data for explanatory purposes. In the case of Bremen a zip code may contain socially very different districts (e.g. parts of Oberneuland and Osterholz) – new allocations of the internet data on the level of street blocks (partly within the limits of certain building number sections) were required here, a favor generously carried out by Company 1&1.

Digital differentiations within the city are examined

- on the level of the city for differentiation between city sections
- on the level of a section for differentiation between districts
- on the district level for differentiation between quarters
- on the level of the individual user for his/her download volume and online time.

The opportunity to use a multitude of data on an existing city and (few but) detailed internet data makes the discussion about fuzziness of method and a more precise approach possible. Data on private households and on companies is separated and a separate examination that takes the size of a household into consideration is conducted. Deviations in the findings according to selected indicators and calculations can thus be made plain.

Subsequently a 'quarter ranking' for private individuals is carried out on the basis of a simple model (25% each for access lines, domains, e-mail addresses and use, whereby these are separated into the volume and the duration in equal parts). This gives an impression of the extent of the differentiations and creates a reference for an explanatory approach.

These attempts to explain the findings are based on a mass of detailed data on the profiles of each city quarter. Besides an overall ranking of the districts and quarters (Focke-Museum & *Weser-Kurier*, 2003) details are available on:

- professional status
- work/employment branches
- the number of those earning an income, the unemployed and welfare recipients
- the percentage of foreign nationals in accordance with their countries of origin
- the residential situation according to apartment size and rent level
- level of education
- basic political orientation (parties voted for in elections).

For the purpose of this study, in regards to the level of education it is differentiated between the percentage of residents without high school and that holding a high school diploma or one year of college. The professional status is separated into employers/freelancers, public officials, employees, skilled workers and unskilled workers. No reliable data is available to assess the wealth (especially not on income), so that in the end the statements relate to the social level of the city, respectively its quarters.

Figure 52: Indicators for the analysis of the city quarters

Education	Professional status	Other indicators
Highschool /1 yr college	Employers/Freelancers	Unemployed
Without highschool	Public officials	Welfare recipients
	Employees	Percentage of foreign nationals
	Skilled workers /unskilled workers	

2. Differentiations within the city

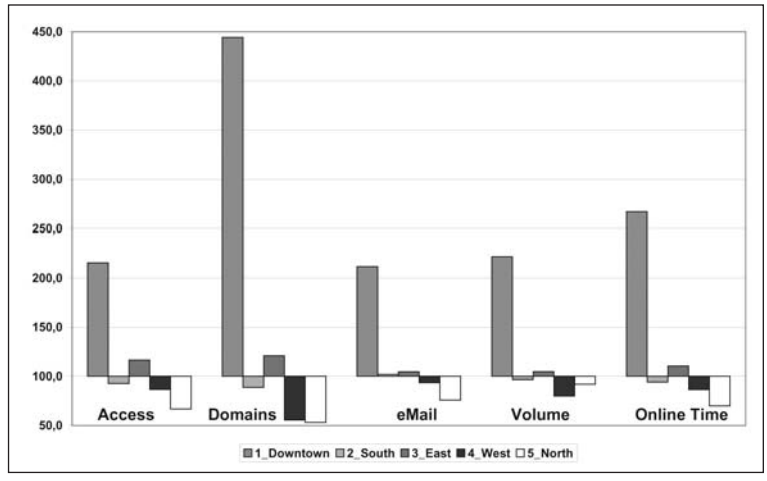
2.1. City sections

On the level of city sections the (relatively small) district Downtown reaches a plentifold of the average, while the sections West and North are generally more or less below average. The clarity of the numbers (and the graph) signal a digital divide between the section Downtown and the rest of the city, particularly the sections North and, in part, West as well.

Table 46: Differentiation between city sections (index)

	Access	Domains	E-mail_address	Volume	Onl time
1_Downtown	215.5	444.3	211.8	221.8	267.0
2_South	92.7	88.8	101.9	96.7	94.2
3_East	116.5	120.8	104.6	104.7	110.4
4_West	86.6	55.6	93.6	79.9	86.6
5_North	66.8	53.1	75.9	92.0	69.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Figure 53: Differentiations between city sections



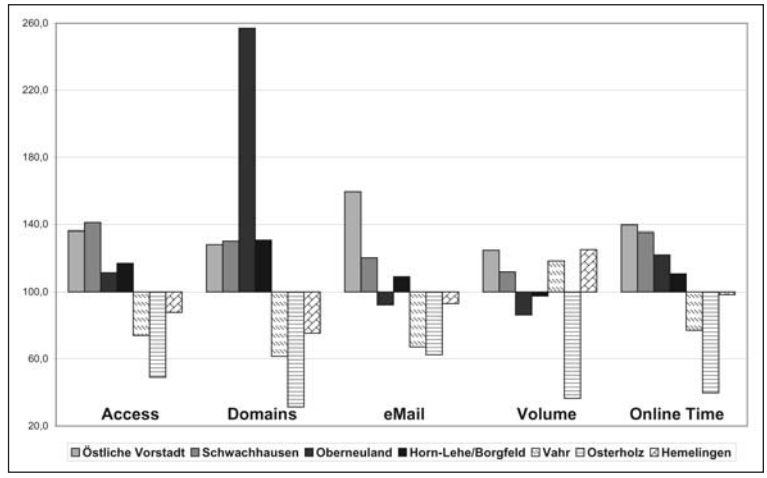
2.2. Districts

Almost 40% of all inhabitants reside in Section East with its 7 districts and 30 quarters; regarding all indicators it scores slightly above the city average. A glance at the differences between that section also seems to clearly and illustratively affirm the theory of the digital differentiation that in some aspects takes on the quality of digital divides and disconnections. On the district level it shows that there is at least one dramatic digital divide and disconnection: The district Osterholz scores very poorly in all dimensions examined, whereas the Östliche Vorstadt, Schwachhausen and (with limitations particularly concerning the domains) Oberneuland play dominant parts.

Table 47: Digital differentiation within Section East (index)

	Access	Domains	E-mail	Volume	Onl time
Östliche Vorstadt	136.2	128.2	159.4	124.9	139.6
Schwachhausen	141.1	130.3	120.4	112.0	135.5
Oberneuland	111.5	257.1	92.3	86.3	122.1
Horn-Lehe/Borgfeld	117.2	130.9	109.2	97.6	110.9
Vahr	74.0	61.6	67.2	118.5	77.1
Osterholz	49.1	31.5	62.5	36.6	39.9
Hemelingen	87.8	75.4	93.1	125.3	98.4
Total East	100.0	100.0	100.0	100.0	100.0

Figure 54: Digital differentiation within Section East



2.3. Quarters

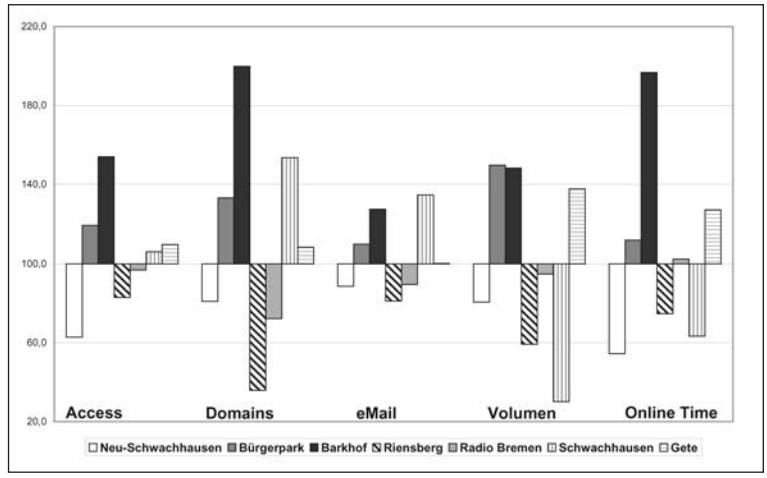
Does the digital differentiation continue between the quarters at district level? That question shall be looked into by means of the example of two of the larger districts – Schwachhausen with its constantly strong internet results and Osterholz with its constantly low internet values.

A differentiation between the quarters that takes on dramatic features in a few cases can be found in the District Schwachhausen. Continuously low values are found in the Quarters Neu-Schwachhausen and Riensberg, as opposed to the Quarters Bürgerpark and Barkhof, which show constantly high values.

Table 48: Digital differentiation within the District Schwachhausen (index)

	Acces	Domains	E-mail	Volume	Onl time
Neu-Schwachhausen	62.8	81.0	88.7	80.7	54.5
Bürgerpark	119.2	133.2	110.0	149.8	112.0
Barkhof	154.1	199.8	127.4	148.3	196.7
Riensberg	83.0	35.9	81.1	59.3	74.8
Radio Bremen	96.9	72.3	89.6	94.9	102.5
Schwachhausen	106.1	153.5	134.6	30.2	63.3
Gete	109.8	108.5	100.3	137.7	127.0
Schwachhausen	100.0	100.0	100.0	100.0	100.0

Figure 55: Digital differentiation within the District Schwachhausen

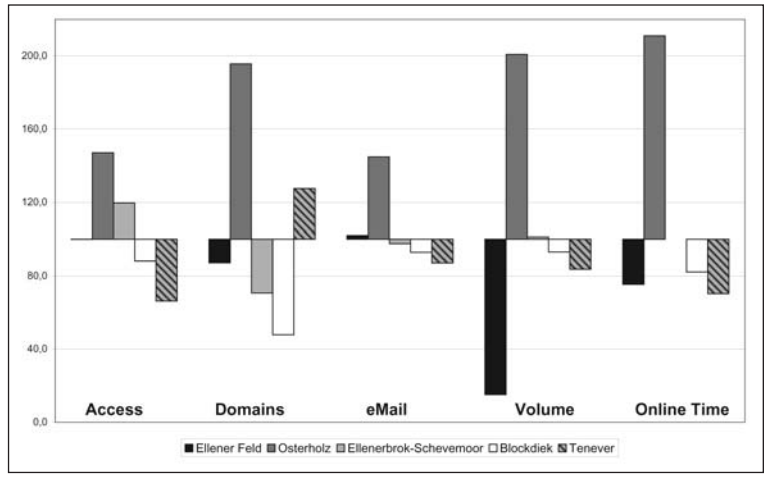


A closer look at the District of Osterholz, where 40,000 or more than 7% of Bremen's residents live, shows another differentiation between its 5 individual quarters. In other words: even within a mostly disconnected district there is an interior differentiation with a top quarter ('Alt'-Osterholz) and 2 - 3 quarters (Tenever, Blockdiek, Ellener Feld) whose values are below average within the disconnected district.

Table 49: Digital differentiation within the District Osterholz (index)

	Access	Domains	E-mail	Volume	Onl time
Ellener Feld	99.9	87.2	102.1	15.1	75.4
Osterholz	147.1	195.6	144.8	200.8	211.0
Ellenerbrok-Schevemoor	119.6	70.6	97.6	101.2	100.0
Blockdiek	88.1	47.8	92.8	93.1	82.2
Tenever	66.3	127.5	87.1	83.7	70.3
Osterholz	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Figure 56: Digital differentiation within the District Osterholz



2.4. Summary

So far the results on a distinct digital differentiation (with many diffusions and unexpected deviations) on city level (between the city sections) as well as on section level (between the districts) and on district level (here between the quarters) show a continous pattern of differentiation and some tendencies towards a digital divide. Thus

- the Section Downton deviates from all other sections in reference to the active domains, access lines, e-mail addresses and online time by being distinctly higher, while the results for the Sections West and especially North are clearly below the average;
- the District Osterholz (with more than double the number of residents than the Section Downtown) stays dramatically below average with regard to all indicators, whereas districts such as Östliche Vorstadt, Schwachhausen and Oberneuland show high values;

- the quarters Tenever, Blockdiek and Ellenerfeld appear particularly weak within the generally nearly disconnected District Osterholz, in contrast to which the Quarter 'Alt'-Osterholz scores strongly above average in all categories;
- there are considerable differentiations even between the quarters within the internet-strong District Schwachhausen, showing constantly weak values (Neu-Schwachhausen, Riensberg) as well as constantly high values (Bürgerpark, Barkhof).

These findings support the theory of the dominating digital differentiation – there is not only black and white, but also differences with individually strong distinctions that deserve a closer analysis.

3. Relativizing the results

With the aid of the example of the indicator 'active domains', it shall be illustrated that the findings on differentiation, resp. digital divides can be relativized if it is differentiated between private individuals and companies. Today maintaining a homepage for business reasons is more common than maintaining a private homepage. The available numbers (that only stem from one provider and do not reflect all internet activities of the city) show a density of private homepages of 2 % of inhabitants, while there is a domain for nearly every second enterprise (that means a density of company domains of almost 50%). When examining the approx. 12,000 private and approx. 10,500 company domains as a whole, it shows a strong dominance of districts, in each case a greater concentration of companies is found than in other districts. Alone for that reason a useful comparison of the internet position for private individuals and companies must be conducted separately. Similar facts apply to the broadband access lines. The e-mail addresses are nearly all related to private persons. Furthermore differentiations between private individuals and companies may have dissimilar dimensions. For that reason company domains must be put into relation with the number of enterprises, and domains for private individuals must be put into relation with the number of population.

It can be relativized further if – at least for the broadband access lines – the selected indicator 'per 1,000 inhabitants' is replaced with 'number of households'. There are distinct differences between sections, districts and quarters regarding the number of residents per household.

The private internet access lines can be evaluated more precisely on the level of households. The e-mail addresses can clearly be allocated to individual persons.

3.1. Relativizing 1: Private households and companies

At first a differentiation according to private households and companies shall be conducted in regards to the indicators 'domains' and 'broadband access lines', researching how apparently clear digital divides are partly relativized – namely softened, enhanced or shifted.

The findings of digital divides concerning active domains is relativized if the structure of the sections is taken into consideration – the Section Downtown has a high concentration of (also smaller) companies. If the indicator 'active domains' is split into those of private individuals and those of companies, the strong dominance of company domains in the Downtown Section becomes apparent – three quarters of all domains are operated by companies here, while two thirds of all domains in the Sections East and West are maintained by private citizens.

Table 50: Active domains in city sections according to private persons and companies

	DomainsP	Private share	DomainsC	Company share	Domains
1_Downtown	779	**26.4**	2,175	**73.6**	2,954
2_South	2,092	**46.8**	2,381	**53.2**	4,473
3_East	6,685	**61.7**	4,142	**38.3**	10,827
4_West	1,339	**66.5**	676	**33.5**	2,015
5_North	1,091	**48.7**	1,147	**51.3**	2,238
Total	11,986	**53.3**	10,521	**46.7**	22,507

This is not a preliminary attempt to explain the digital divide but rather a critical relativizing of the digital divide result: Even if the indicator 'registered domains per region' common in the literature (Castells, 2005; Kellerman, 2002; Zook, 2005a) is expanded into 'active domains per 1000 residents' and made more precise, it will still contain a distortion, since a relatively high business share in the region increases the number 'per 1,000 residents'. In order to clarify the issue of the level of inner-city digital differentiation regarding active domains better, an in-depth analysis of the data according to private individuals and companies is required. How high is the share of the companies holding active domains at the level of city sections, how high is the percentage of domains maintained by private persons regarding the population? How much does the result of digital divides really relativize itself?

3.1.1. Reduction of the differentiation

A closer examination reveals that at the level of domains held by companies one can talk of a strong differentiation, while the share of companies keeping their own domains strongly deviates in the Sections West (which has a more traditional industrial profile) and North.

Table 51: Active company domains per enterprise according to city sections

	Enterprises	CompanyDom_enterpr	Company_level
1_Downtown	3,915	55.6	**112.3**
2_South	4,089	58.2	**117.7**
3_East	7,537	55.0	**111.1**
4_West	2,715	24.9	**50.3**
5_North	3,011	38.1	**77.0**
Total	21,267	49.5	**100.0**

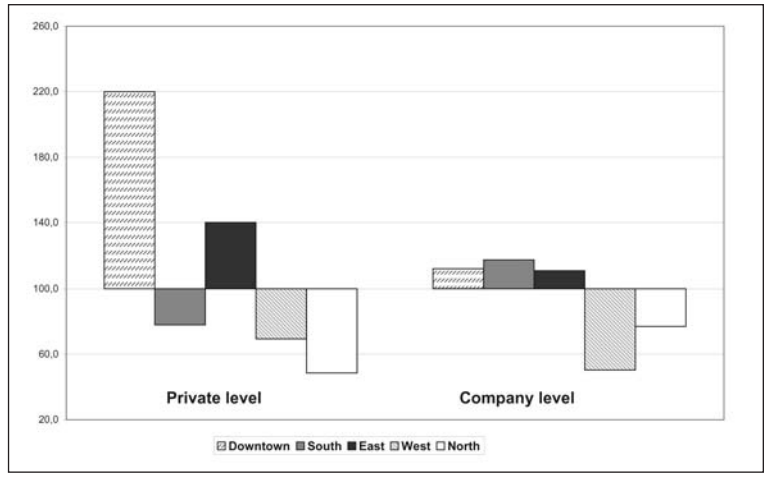
The analysis of domains maintained by private individuals show much stronger differences between the sections.

Table 52: Active private domains per 1,000 inhabitants according to city sections

	Residents	PrivateDom_res	Private_level
1_Downtown	16,011	48,7	**220.0**
2_South	121,359	17.2	**77.9**
3_East	215,744	31.0	**140.1**
4_West	87,266	15.3	**69.4**
5_North	101,576	10.7	**48.6**
Total	541,956	22.1	**100.0**

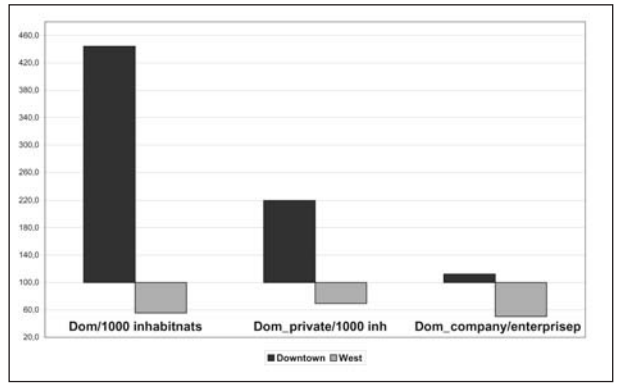
The determined differences in the operation of domains must still be qualified as a very strong digital differentiation in relation to the companies; regarding private individuals one can already claim a digital divide. The great dominance of the District Downtown of active domains therefore is firstly explained by the particularly high number of private domains and secondly by the structurally high percentage of companies that, however, have a share in domains in the District Downtown that is only slightly above the average.

Figure 57: Domain level for private persons and companies according to city sections



The experiences gained from the empirical detail work offer evidence on the relevance of the selected method, respectively the precise disclosure of the chosen indicator. The detail data presented here demonstrates how quickly seemingly plausible digital divide findings are relativized through an analysis of sufficient in-depth. The result (tendencies towards a digital divide in the private sector, differentiations in the company sector) becomes less dramatic than the initial result of an extreme digital divide – based on the same data but a more superficial evaluation. For purposes of illustrating once again the different levels – each according to selection of indicator – between Bremen's Sections Downtown and West regarding active domains:

Figure 58: Digital differentiation regarding active domains according to indicator



3.1.2. Intensification of differentiation

Not only a relativized differentiation (regarding the domains between the sections distinct differentiations approaching digital divides remain, but they are less drastic!) but also the intensified digital divide in a partial sector can be the result of a detailed examination.

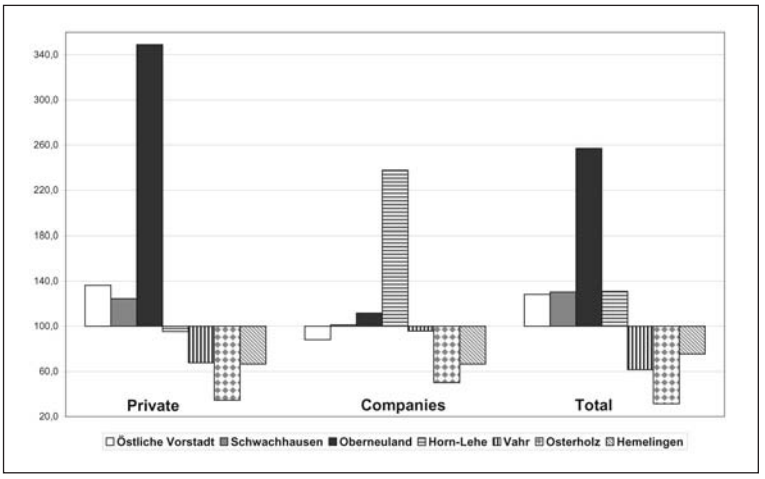
Therefore the findings on the districts of Section East are surprising: When looking at the active domains, a much larger gap regarding private users becomes obvious so that one must talk of a digital divide. In the District of Oberneuland the values extremely surpass the average, and in the Districts Schwachhausen, Horn-Lehe/Borgfeld and Östliche Vorstadt they still clearly exceed the average. In contrast to that Osterholz shows dramatically low values, and in Vahr and Hemelingen they are still distinctly below the average.

The difference between the Districts Osterholz and Oberneuland is greater than that between the Sections Downtown and West. These findings only surfaced at all because the Statistics Department of 1&1 divided the data on the zip code area, part of which is shared by Oberneuland and Osterholz, according to the official statistics on the level of street blocks and building numbers in a way that makes useful comparisons possible. The high company values in the District Horn-Lehe/Borgfeld is striking as well (and is probably explained by the existence of a technology park around the university).

Table 53: Active domains according to private individuals and companies in the districts of Section East

	DomP_Res	Level_Priv	DomComp_Comp	Level_Comp	Total_Res	Level_Total
Östliche Vorstadt	42.2	**136.4**	48.4	**88.1**	64.3	**128.2**
Schwachhausen	38.6	**124.5**	55.7	**101.4**	65.4	**130.3**
Oberneuland	108.2	**349.0**	61.4	**111.6**	129.0	**257.1**
Horn-Lehe/Borgfeld	29.5	**95.3**	130.6	**237.7**	65.7	**130.9**
Vahr	21.0	**67.6**	52.6	**95.8**	30.9	**61.6**
Osterholz	10.7	**34.6**	27.6	**50.2**	15.8	**31.5**
Hemelingen	20.6	**66.5**	36.5	**66.5**	37.8	**75.4**
Total East	31.0	**100**	55.0	**100**	50.2	**100**
Total Bremen	22.1		49.5		41.5	

Figure 59: Active domains according to private individuals and companies in the districts of Section East



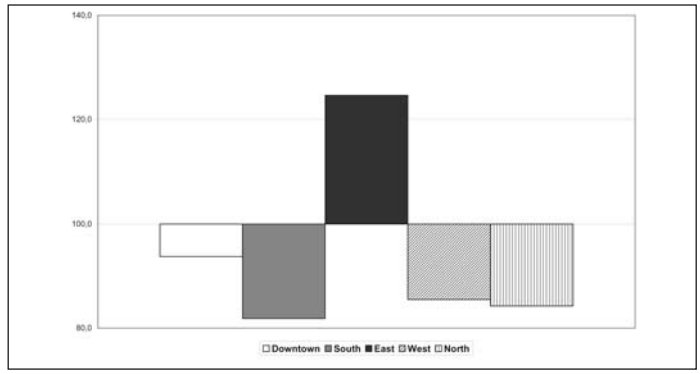
3.1.3. Shifting of the differentiation

The tendency towards rather slight differentiations in the company sector is also confirmed when taking a look at the distribution of broadband access lines according to city sections (overall a rather small number, though). This even shows a shifting of dominance in favor of Section East:

Table 54: Broadband access lines of companies per 1,000 enterprises according to city sections

	Enterprises	Company_access lines	Per 1000 companies	Level
Downtown	3,915	68	17.4	**93.8**
South	4,089	62	15.2	**81.8**
East	7,537	174	23.1	**124.6**
West	2,715	43	15.8	**85.5**
North	3,011	47	15.6	**84.3**
Total	**21,267**	**394**	**18.5**	**100.0**

Figure 60: Broadband access lines of companies per 1,000 enterprises according to city sections



3.2. Relativizing 2: Private households and inhabitants

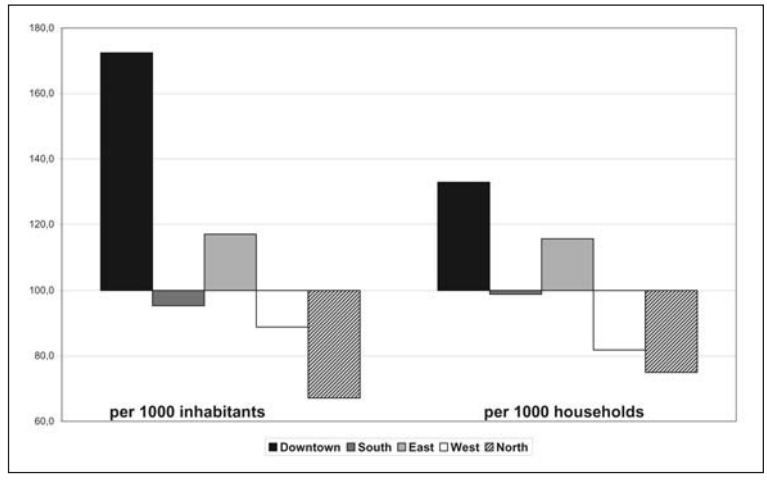
A very strong differentiation between Section Downtown and the rest of the city, particulary Section North, is found for the broadband access lines per 1,000 inhabitants. The differences with regard to private individuals, however, are not to undergo a closer examination at the level of number of population – a relation to the number of households is much closer to reality; differently sized households lead to a distortion of the picture. While 1.6 inhabitants are registered per household in Section Downtown, in Section West it is 1.9, and in Section North even 2.3.

The findings of a very strong differentiation between the city sections regarding private users are replicated in a distinctly weaker form at the level of households.

Table 55: Private broadband access lines per 1000 residents/households according to city sections

	Per resident	Per household
Downtown	172.5	132.9
South	95.4	98.9
East	117.2	115.8
West	88.9	81.8
North	67.2	75.0
Total	**100.0**	**100.0**

Figure 61: Private broadband access lines per 1,000 residents/households according to city sections



3.3. Relativizing 3: Internet use

For the purpose of measuring internet activities by private users with the aid of the indicators 'transfer volume' and 'online time' a relation to the number of population definitely makes sense. Regarding companies this is more difficult since the sizes and number of users certainly differ considerably; as long as these factors remain unknown the evidence offered by the company indicators is so limited that they shall not be examined further.

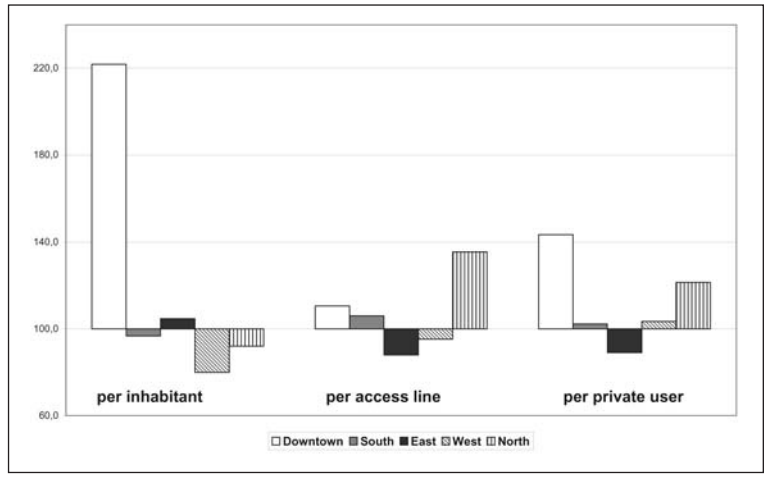
When concentrating on the private user activities per broadband access, a clearly different picture from the overall examination on the level of population comes into view. Of course this can be explained by the different household sizes: It will not surprise anyone that areas with many inhabitants per household show higher user numbers per internet access. However, a separate explanation is required if nearly contrary results ensue despite a mathematical correction of the findings by household size: if the few active users in internet-weak areas show distinctly higher online numbers than the average in internet-strong areas.

A comparison of the transfer volume of private users measured per resident, per internet access and per mathematically corrected access (statistically by household size) for the city sections reveals a considerable reduction in the advantage of Section Downtown and a very good position for the assumably low-scoring Sections North and West. These findings indicate distinctly higher (passive?) values on the level of individual users in sections with overall relatively low internet activities. On the other hand no distinct reverse relations as during the comparison between cities can be found at the level of city sections.

Table 56: Private transfer volume according to city sections

	Per resident	Per access	Per priv user
Downtown	221.8	110.6	143.5
South	96.7	106.0	102.3
East	104.7	88.0	89.0
West	79.9	95.3	103.4
North	92.0	135.5	121.4
Total	**100.0**	**100.0**	**100.0**

Figure 62: Private transfer volume according to city sections

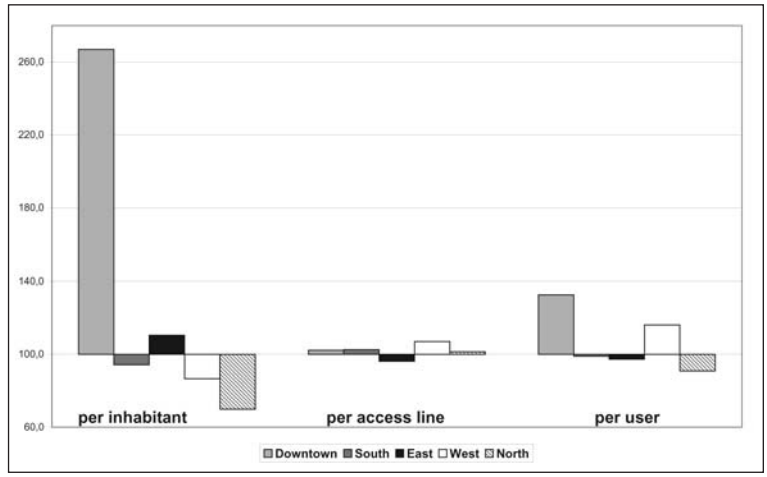


A distinct reduction in the advantage of the Downtown Section and a strong increase of Section West also becomes apparent when examining the online times. Contrary to the situation regarding transfer volume the position of Section North is relatively weak here as well. The great discrepancy between the result per resident (calculated from the section volume and number of residents) and the measured volume per internet access (hardly any differences between the city sections are found here) is interesting. Especially the illustration shows how relevant the selected indicator, respectively the assessment method are to the results. The 'clear digital divide' revealed by the examination concerning the population makes way for the 'hardly recognizable differentiation' regarding internet access lines!

Table 57: Private online time according to city sections

	Per resident	Per access	Per user math corrected
Downtown	267.0	102.2	132.6
South	94.2	102.5	98.9
East	110.4	96.1	97.3
West	86.6	106.9	116.1
North	69.9	101.4	90.8
Total	**100.0**	**100.0**	**100.0**

Figure 63: Private online time according to city sections



4. Differentiations between the city quarters

In spite of all differentiatons at all levels the question remains: Where is the 'face' of the city, and where is its 'rear', how great are the differences between top and bottom, and are there any further indications of dramatic digital divides and disconnections beyond all differentiations? Which quarters (in which districts) have which internet position when using which indicator?

Due to the methodical problems described in the section on the differences between the city sections (a great density of companies will distort the results), the different economical functions of districts (in some residential areas there are hardly any companies at all) and the unclear allocation possibilities of data on company use (volume, online time) especially regarding company size the examination focuses on private households.

Only the most explicit indicators will be taken into consideration: The domains kept by private households per 1,000 inhabitants, the private broadband access lines per households, all e-mail addresses (nearly all private) as well as the private transfer volume and online times according to the number of population.

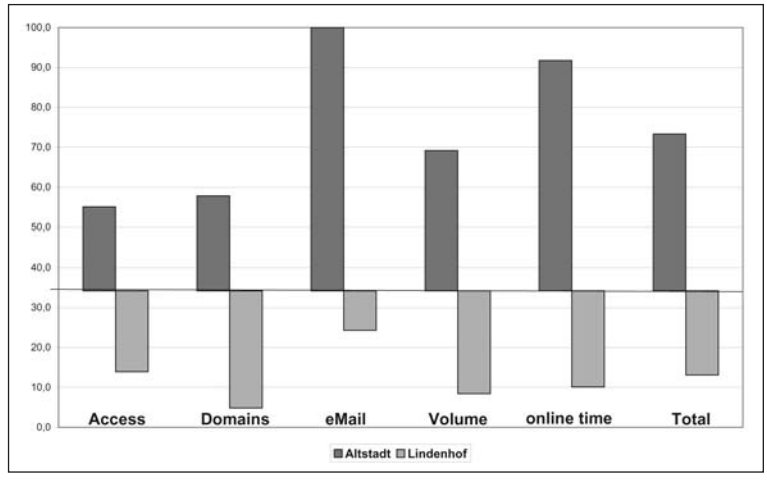
Only 75 of the 89 quarters of Bremen could be included, since single detail data of the Census Bureau was not available for some quarters (partly for reasons of data privacy because those quarters are very small). 519,417 of the 541,956 residents of Bremen live in the 75 examined quarters; that is 95.8% of the population. The smallest quarter has less than 1000 inhabitants (Hohweg), the larges one houses over 13,000 (Kattenturm).

All 5 indicators of the highest value each were defined with 100% for the quarter ranking; the single indicators were weighted on that basis. The access lines, domains, e-mail addresses and use contain 25% each of the final results. The value 'use' is a combination of the transfer volume and online time at 50% each; those two indicators of use therefore have a weight of 12.5% each on the overall results. Theoretically a city quarter could reach an overall maximum score of 100% – deviations towards lower values and differences between the quarters issue information

on the developmental situation and on differentiations, resp. digital divides. The five strongest and the five weakest city quarters are studied closely under that aspect.

The comparison between the top quarter Altstadt in Section Downtown and the quarter on the bottom, Lindenhof, in Section West shows the antipodes of the digital differentiation so dramatically that it forces the diagnosis of an inner-city digital divide. The indicators have been selected carefully, all further relativizing and imaginable alterations to the models will have little impact on the findings: There *is* an inner-city digital divide! While the Quarter of Altstadt scores at least 50% of the Bremen top values in all categories, the Quarter Lindenhof achieves as top value merely regarding e-mail addresses 25% of the results of Bremen's top quarter (in that case Altstadt). On an individual basis the Quarter Altstadt scores very high in all categories: regarding broadband access lines it scores 55.1%, for domains 57.8%, concerning e-mail addresses it is No. 1 (100%) and regarding internet use it boasts 69.2% (volume), resp. 91.7% (online time) – that is on overall result of 73.3% weighted. On the other hand the extremely low values for the Quarter of Lindenhof are striking: 13.9% regarding access lines, 4.9% for domains, 24.3% for e-mail addresses, 8.5% regarding the transfer volume and 10.1% for online time – its overall results are a spectacularly low 13.1%. This places the Altstadt Quarter 39.1% above the average of all quarters, and the Lindenhof Quarter 21.1% below the total average.

Figure 64: Digital divide between the quarters: tops and flops



In order to give a detailed description of the extent of differentiation, resp. digital divide, the five quarters showing the best values and those five showing the lowest values are taken out and analyzed closer. Tops are the Quarters Altstadt, Barkhof, Ostertor, Oberneuland and Bürgerpark in Section Downtown (Altstadt, Ostertor) resp. East with its Districts Schwachhausen (Barkhof, Bürgerpark) as well as Oberneuland. At the bottom of the table we find the Quarters Tenever, Hohweg, Aumund-Hammersbeck, Blockdiek and Lindenhof in the Districts Osterholz (Tenever, Blockdiek) of Section East, in Gröpelingen (Lindenhof) and Walle (Hohweg) from Section West as well as Vegesack (Aumund-Hammersbeck) from Section North.

Table 58: Digital divide between the quarters: tops and flops

	Access	Domains	e-mail	Volume	Online time	Total
	Scores	Scores	Scores	Scores	Scores	Weighted
Altstadt	55.1	57.8	100.0	69.2	91.7	**73.3**
Barkhof	71.1	67.5	53.9	64.9	100.0	**68.8**
Ostertor	65.3	51.4	63.5	78.7	80.2	**64.9**
Oberneuland	75.0	100.0	32.4	36.7	62.9	**64.3**
Bürgerpark	62.0	65.5	46.5	66.4	68.7	**60.4**
Tenever	22.4	13.2	19.1	13.3	15.5	**17.3**
Hohweg	13.5	3.9	43.7	8.3	7.2	**17.2**
Aumund-Hammersbeck	21.6	5.9	24.6	8.8	21.9	**16.9**
Blockdiek	23.3	6.0	20.4	14.4	17.4	**16.4**
Lindenhof	13.9	4.9	24.3	8.5	10.1	**13.1**
Total	41.3	21.0	34.0	38.8	42.0	34.2

The examination of the two blocks with its five strongest and weakest quarters each serves a further analysis of the digital divide results. This also involves preparing the pursuit of explanations, which shall be based on a data volume that is not too small. Both blocks are roughly of the same size according to the number of population and households: A total of 30,627 inhabitants (5.7% of all Bremen residents) live in 15,684 households (6.0%) in the five strongest quarters. The five weakest quarters have a total of 35,339 residents (6.5%) and 15,195 households (5.8%). The household sizes show no great deviations: While 2.1 Bremen residents share one household on the average, 2.0 persons live in the average household of the internet-strong quarters and 2.3 in the internet-weak quarters.

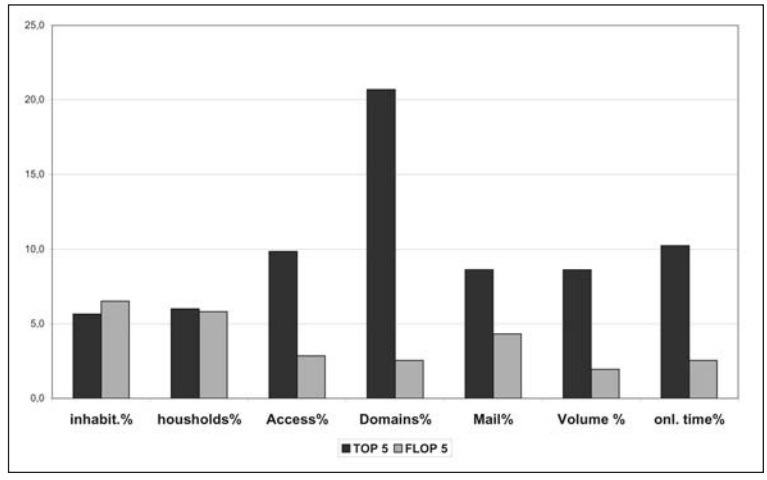
The results are unexpected. Even if it depends on the selected way of calculation and visual depiction how obvious the size of discrepancies turns out to be (compare e.g. Berger, 1974), the signal of an almost dramatical digital divide is clearly independent of the point of view.

The first mode of depiction relates to the unweighted shares of the 5 strongest and weakest quarters each in the total volume of the city – it effectively documents the large differences. This point of view shows that the 5 strongest quarters of the city nearly double the extent of internet activity expected when considering their share of population or households, while the weakest quarters barely reach half of that level.

Table 59: Digital divide in the city: shares in the overall results

	Res %	HH %	Access lines %	Domains %	Mail %	Volume %	Online time %
TOP 5	5.7	6.0	9.9	20.7	8.6	8.6	10.2
FLOP 5	6.5	5.8	2.8	2.5	4.3	1.9	2.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figure 65: Digital divide in the city: shares in the overall results

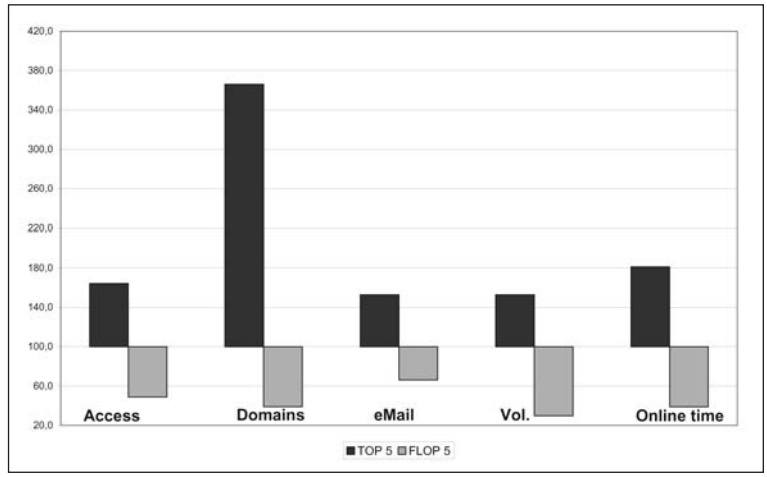


For reasons of a better comparison (and also for an illumination of the dramatic extents) the 'usual' calculations shall still be carried out and introduced: The numbers for the indicators per 1,000 residents, resp. per 1,000 households (regarding access lines) are put into relation to the average values of the city (= 100) and identified as index. Particularly the graph illuminates the extreme digital divide between the top and the bottom.

Table 60: Digital divide in the city: deviations from the average (index)

	Access lines	Domains	e-mail	Volume	Online time
TOP 5	164.2	366.1	152.9	152.8	181.3
FLOP 5	48.9	39.0	66.3	29.8	38.9
Total	100.0	100.0	100.0	100.0	100.0

Figure 66: Digital divide in the city: deviations from the average



Despite the clear results of a digital divide the theory of a digital differentiation with partial digital divides is not refuted: There are rather small (and here not analyzed further) differences regarding companies, no relevant differentiations concerning the use per participant('s access) and a broad field of the other 65 city quarters whose values are found somewhere in between the two extreme poles.

The serious discrepancy in the use (volume and online time) is primarily due to the number of users. When looking at the internet access lines there are no grave differences – this is likely to indicate that the few active internet users in the internet-weak quarters show no drastically different behavior than those in the internet-strong quarters. A mathematical correction by household size here even results in an advantage of internet-strong quarters; the data does not confirm the suggestion of a particularly strong use in internet-weak quarters.

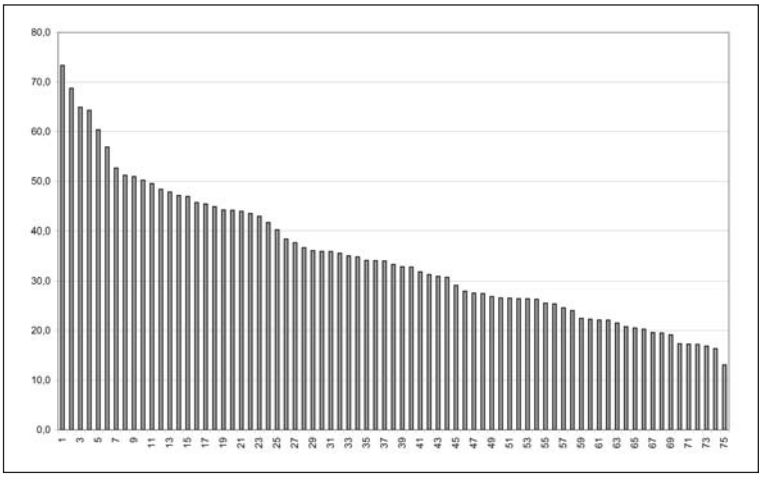
Table 61: Comparable behavioral pattern of users

	Volume per user	**Onl time per user**
	GB	Hours
TOP 5	2.6	131.9
FLOP 5	2.0	113.4
Total_Bremen	**3.0**	**127.0**

A closer survey of all quarters shows a broad center field between top and bottom with, among other things, an interesting hint of a differentiation within the districts: The ranking table shows the strongest quarter within the disconnected District Osterholz (i.e. the quarter of that same name) with 31.3% in 42nd position of the ranking, while the weakest quarter of the very strong District Schwachhausen (Neu-Schwachhausen) also merely achieves 27th position. Even if a glance at the poles at both end of the scale suggests a digital divide: There still is a widespread digital differentiation, and between the black and white at both extremes there are all kinds of

different shades of grey (the ranking table showing the details is documented in the appendix) as well. The average value of all 75 city quarters (34.2%) is reached by nearly half of them, parts of the other half score distinctly lower.

Figure 67: Digital differentiation between the city quarters



5. Explanatory factors

The empirical analyses of the internet positions within the city revealed that the level of city quarters turned out to be the most expressive. At first, essential information on the causes of digital differentiation and even indications of digital divide shall be gained from examining the digital poles at the beginning and end of the scale. For that purpose the 5 internet-strongest and the 5 internet-weakest quarters will be examined with regard to their 'real' structure before the connection between social profile and internet power of the quarters will be analyzed.

A first glance at the group of the internet-strongest quarters and the internet weakest ones leads to the hypothesis of a socioeconomical correlation based on stereotypes about the individual districts known to those familiar with the city structure of Bremen. The Districts Downtown, Schwachhausen and Oberneuland are deemed to be bourgeois and privileged; the Districts Osterholz and Gröpelingen are supposed to be at a social disadvantage. An excellent book on Bremen and its districts (*Bremen und seine Stadtteile*, Focke-Museum & *Weser-Kurier*, 2003) renders a detailed description on the profiles of Bremen districts, mentions each individual quarter and conducts a ranking introduced as a "social indicator": "The social indicator is assessed from set single social characteristics and results in a ranking of disadvantage. Of a total of 89 quarters 79 are taken into consideration, whereby the quarter with the most serious social problems ranks No. 1 and that with the best social conditions ranks in 79th position (p. 27). That quarter ranking shows the following results concerning the internet poles:

- **Social indicator for the internet top positions**
- Altstadt (23), Barkhof (72), Ostertor (46), Oberneuland (78), Bürgerpark (74)
- **Social indicator for the low internet positions**
- Tenever (1), Hohweg (33), Aumund-Hammersbeck (45), Blockdiek (5), Lindenhof (12)

The above ranking confirms the hypothesis on principle but not in every detail. The internet-strongest quarters are mostly also the socially strongest quarters; the internet-weakest quarters also rank low on the social scale. There are some minor exceptions, though: The internet-weak Quarter Aumund-Hammersbeck in the District Vegesack claims a higher position in the social ranking than the internet-strong Quarter Ostertor in the Downtown District.

The hypothesis of social correlation shall undergo a closer examination based on the data on city quarters provided by the Census Bureau (Statistisches Landesamt Bremen, 2003). The examination centrally focuses on the connection between internet activities and educational background, professional status and nationality.

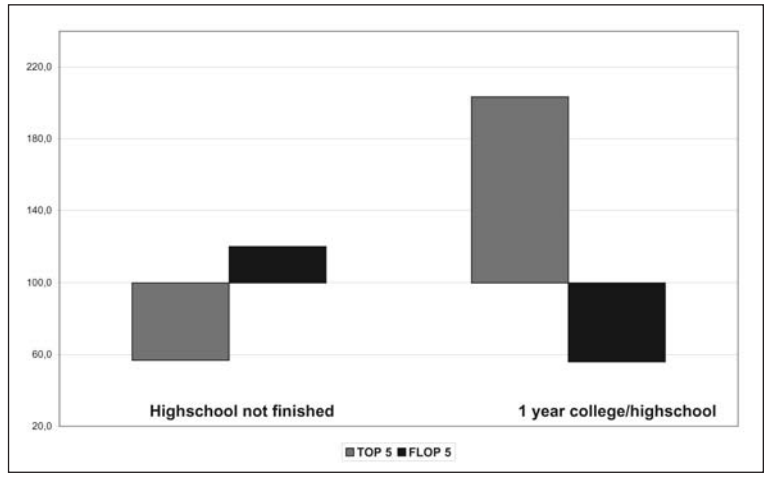
5.1. Education

The percentage of residents whose educational level is that of highschool diploma or one year of college is nearly four times as high in the internet-strongest quarters as that of residents in the internet-weakest quarters, while the percentage of residents without a highschool diploma is only half as high. A comparison with the average of the whole city clearly shows the deviations. There is no way around it: A distinct connection between the level of education and internet activity does exist. The quarters with a high amount of internet activity are also the quarters with a generally high level of education.

Table 62: Population in the quarters according to education

	Highschool not finished	**1 yr coll/ highschool**		**Highschool not finished**	**1 yr coll/ highschool**
	Per 100 res	Per 100 res		Index	Index
TOP 5	21.4	24.0		56.8	203.4
FLOP 5	45.3	6.6		120.2	55.9
Total	**37.7**	**11.8**		**100.0**	**100.0**

Figure 68: Population in the quarters according to education (index)



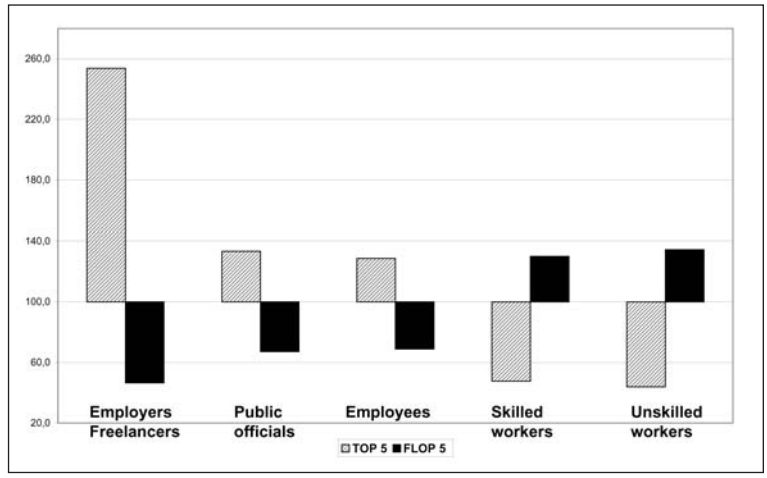
5.2. Professional status

A closer study of the quarters with the strongest and weakest internet positions under the aspect of the professional status of their residents clearly shows that the share of employers/freelancers, public officials and employees is greatly above average in the internet-strong quarters, while the share of skilled and unskilled workers greatly exceeds the average in the internet-weak quarters. Thus the internet-strong quarters house nearly six times as many employers/freelancers per 100 inhabitants as in the quarters with low internet scores. Here the percentage of workers triples that of the internet-strong quarters. The visualization based on the index (average of the city = 100) depicts the differences especially clearly.

Table 63: Population in the quarters according to professional status

	Employers/ Freelancers	**Public officials**	**Employees**	**Skilled workers**	**Unskilled workers**
	per 100 res	per 100 res	per 100 res	per 100 res	per 100 res
TOP 5	7.3	5.3	23.1	3.0	5.8
FLOP 5	1.3	2.7	12.4	8.2	17.7
Total	**2.9**	**4.0**	**18.0**	**6.3**	**13.1**

Figure 69: Population in the quarters according to professional status (index)



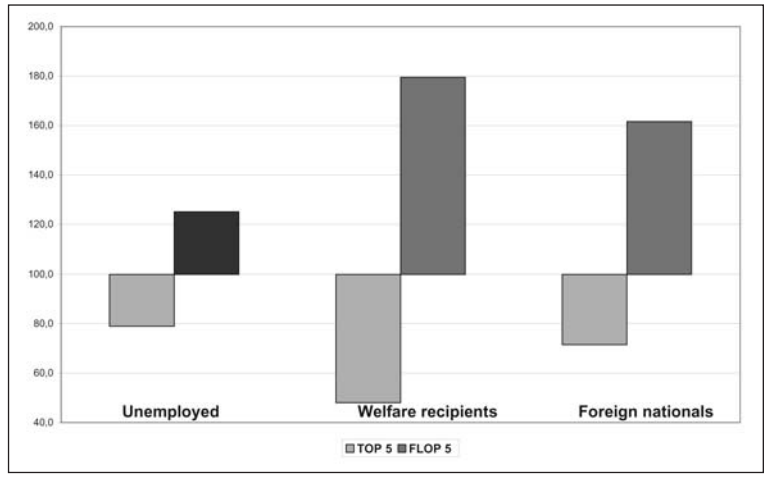
5.3. Other indicators

Within the group of the internet-weakest quarters the share of unemployed is nearly double as much as the percentage of unemployed in the group of the internet-strongest quarters, concerning the share of welfare recipient it is nearly four times as much and regarding foreign nationals it is more than twice as much. Contrary to the findings of a telephonical survey conducted by TNS Emnid (TNS Emnid & Initiative D 21, 2003, p. 13) this enforces the recognition that a large share of foreign nationals is one of the causes of a low local internet power.

Table 64: Population in the quarters according to other indicators

	Unemployed		Welfare recipients		Foreign nationals	
	Share	Index	Share	Index	Share	Index
TOP 5	4.7	**79.0**	4.1	**48.1**	9.0	**71.5**
FLOP 5	7.4	**125.0**	15.4	**179.5**	20.3	**161.6**
Total	5.9	**100.0**	8.6	**100.0**	12.6	**100.0**

Figure 70: Population in the quarters according to other indicators (index)



Even though a look at the details within the single quarters reveals that the Quarters Altstadt and Ostertor out of the group of internet-strongest quarters have a higher percentage of welfare recipients and foreign citizens than the internet-weak Quarters Hohweg and Aumund-Hammersbeck, these deviations do not alter the general picture. The low internet power in Hohweg and Aumund-Hammerbeck can have many reasons (which may also be found in the basic data); among other things many (particularly internet-active) students have an impact on the Quarters Altstadt and Ostertor. More foreign residents (2,861) live in the Quarter Tenever of the District Osterholz, which scores last in a social ranking (Focke-Museum & Weser-Kurier, 2003, p. 183) than in the 5 internet-strongest quarters combined (2,751). While 25% of the residents in Tenever are foreign nationals and 23% are welfare recipients, the Quarter Oberneuland shows a share of 4.6% of foreign citizens and a share of 1.9% of welfare recipients.

5.4. Internet position and social profile

In regards to the private households there is a distinct connection between a high level of education, professional status, citizenship and internet position. The group of the five quarters with the most internet power shows percentages of citizens with highschool diploma, resp. one year of college, as well as employers/freelancers, public officials and white-collar workers that far exceeds the average. The group of the internet-weakest five quarters, however, has percentages of citizens with an education level lower than highschool, workers, unemployed, welfare recipients and foreign nationals that are much higher than the average.

Table 65: Profile of the quarters according to the internet poles

	Internet	Without highschool	Highschool /1 yr col	Employers/ Freelancers	Public officials	Employees
	Index	Index	Index	Index	Index	Index
TOP 5	**194.2**	**56.8**	**203.4**	**253.7**	**133.4**	**128.6**
FLOP 5	**47.3**	**120.2**	**55.9**	**46.5**	**67.1**	**68.8**
Total	100.0	100.0	100.0	100.0	100.0	100.0
	Internet	**Skilled workers**	**Unskilled workers**	**Unemployed**	**Welfare recipients**	**Foreign nationals**
	Index	Index	Index	Index	Index	Index
TOP 5	**194.2**	**47.6**	**43.9**	**79.0**	**48.1**	**71.5**
FLOP 5	**47.3**	**130.0**	**134.4**	**125.0**	**179.5**	**161.6**
Total	100.0	100.0	100.0	100.0	100.0	100.0

Figure 71: Profile of the 5 quarters with the most internet power

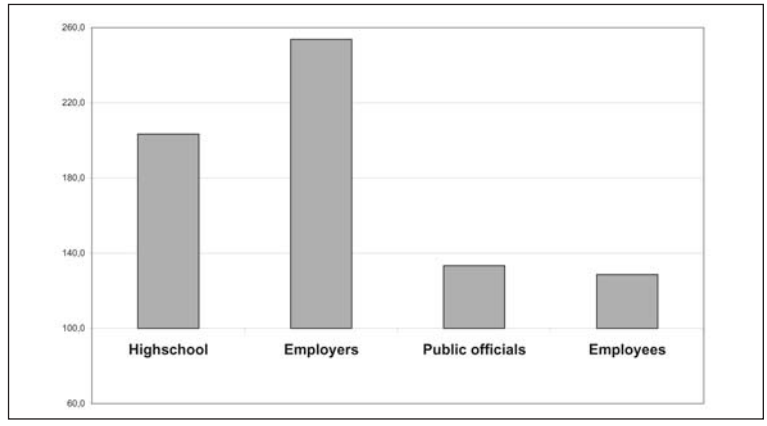
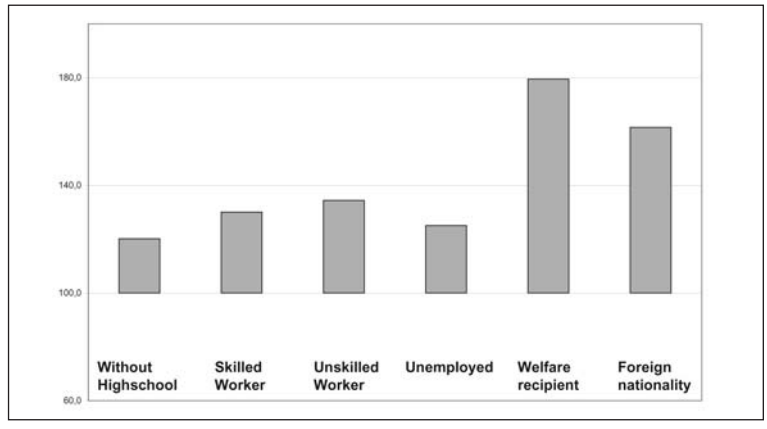
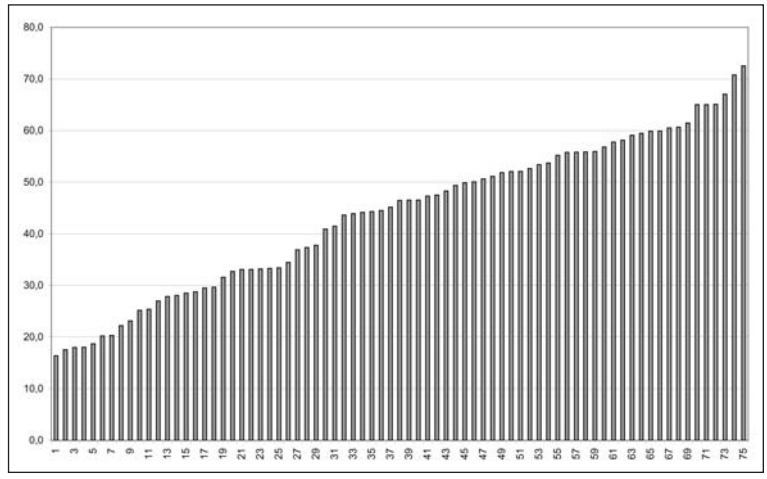


Figure 72: Profile of the 5 quarters with the least internet power



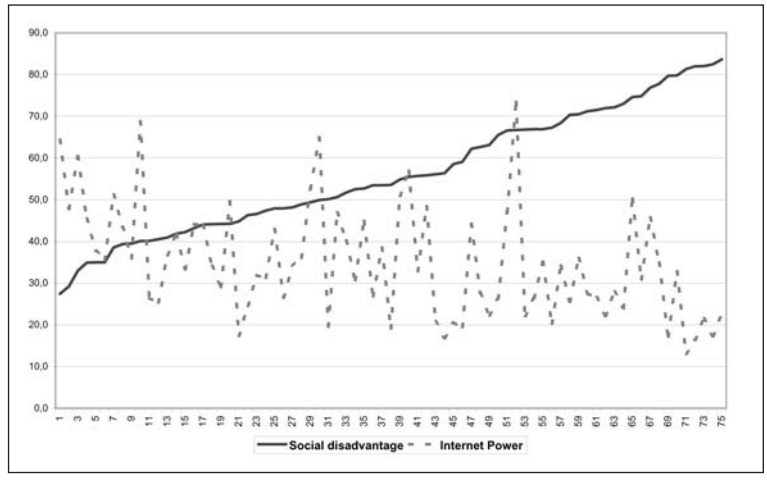
An indicator of 'social disadvantage', which includes the percentage of unemployed, welfare recipients, foreign citizens, workers and individuals without highschool diploma at 20% each, is created for an in-depth analysis of all 75 quarters (each maximum value is assumed to be 100% so that the top score theoretically could reach 100%). The quarters with the lowest shares of the listed groups also score the lowest values. The results show (as those of the internet analysis already did) a differentiation between the districts with strong polarizations at the end. There is a social digital divide between the poles, but there also is a broad center field. The table is similar to that of the internet position – the other way around, however.

Figure 73: Indicator 'social disadvantage' of city quarters



When comparing internet power and social disadvantage it becomes obvious that high scores on the internet position nearly always oppose low scores on social disadvantage and vice versa.

Figure 74: Correlation between social disadvantage and internet position 1



The analysis of correlations with the aid of the application of statistical procedures leads to an affirmation of the presumed connection between a weaker position on the internet and social reality (in the sense of a negative correlation: High values regarding the internet position correlate to low values regarding a low social position).

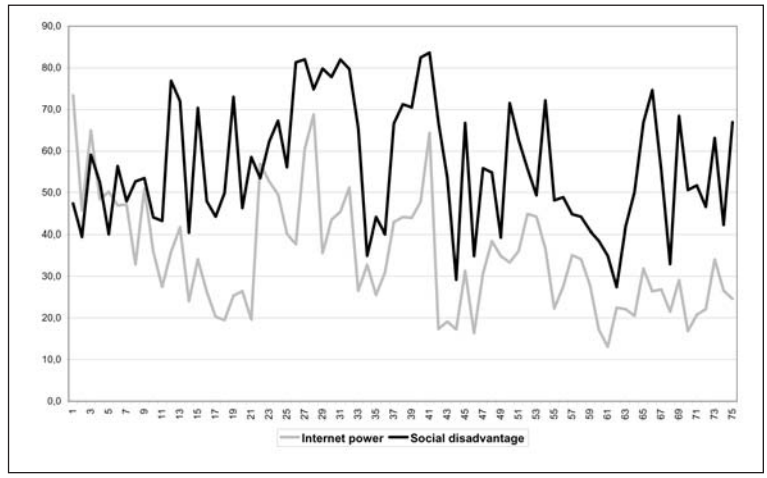
Table 66: Correlation between social disadvantage and internet position

		Low social_status	InternetRanking
Low social_status	Correlation according to Pearson	1	-,436(**)
	Significance (2-sided)		,000
	N	75	75
InternetRanking	Correlation according to Pearson	-,436(**)	1
	Significance (2-sided)	,000	
	N	75	75

** The correlation is significant at the level of 0.01 (2-sided).

Re-defining the social disadvantage for the purpose of clarifying the connections in the sense that the quarter with the lowest social disadvantage is assigned top position – this would even allow for the opposite conclusion of interpreting a low social disadvantage as power; however, this is not done here because social power will subsequently be positively defined – permits a visualization of the correlation between internet power and social disadvantage mainly as a synchronicity of both curves.

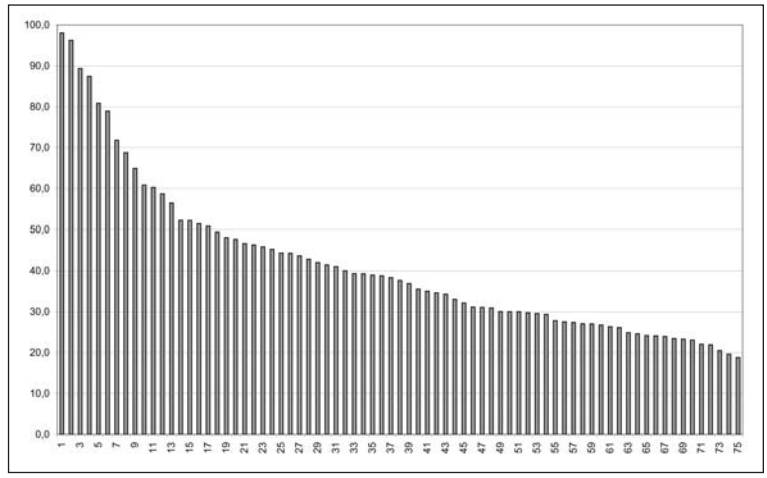
Figure 75: Correlation between social disadvantage and internet position 2



An examination of the social power of the city quarters shows not only the inner differentiation with strong digital divides at the poles but also an unequivocal connection to the power of internet position as well. The percentage of inhabitants holding a highschool diploma or one year of college (50%) and the privileged professional status (a 25% share of employers/freelancers as

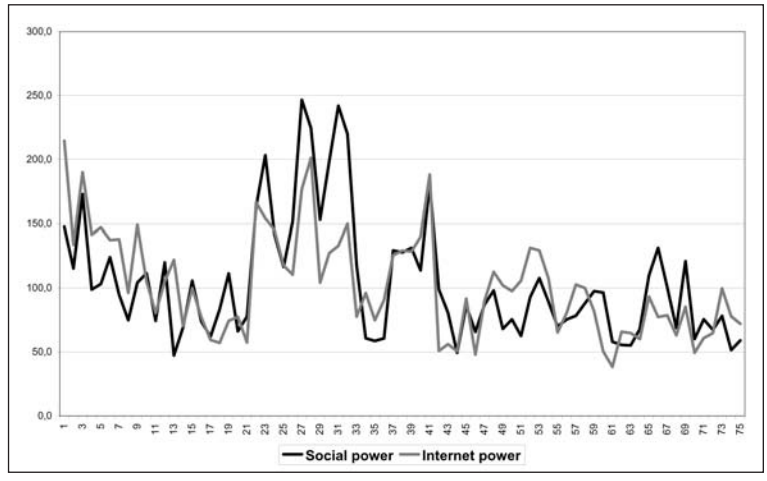
well as a 12.5% share of public officials and employees each) are used as indicators of social advantage.

Figure 76: Indicator 'social power' of city quarters



High values for the internet position obviously equal high values of social power and vice versa with hardly any exceptions. This social correlation is depicted in an illustration sorted by quarter number.

Figure 77: Correlation between social power and internet position



It is hardly surprising that the analysis of the correlation by means of the application of statistical methods also leads to an unambiguous confirmation (high significance) of the assumed correlation between the stronger position on the internet and in the social reality.

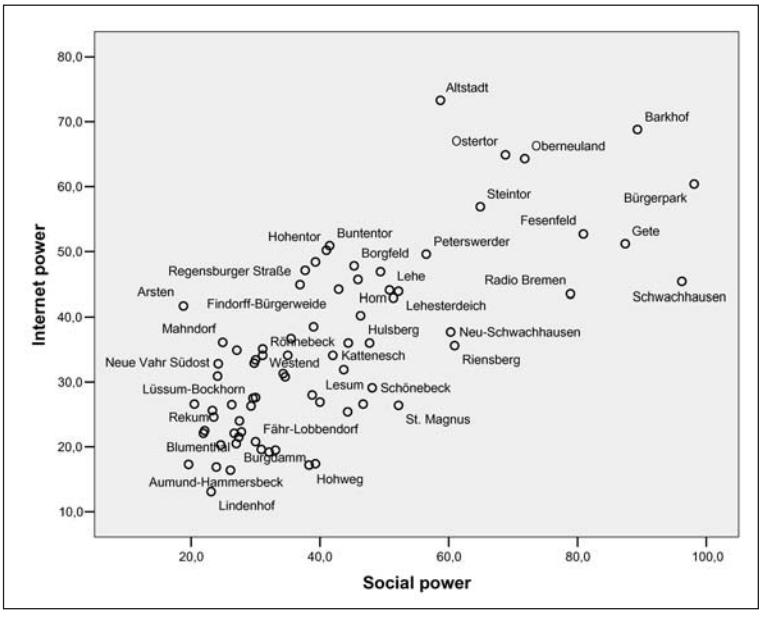
Table 67: Correlation between social power and internet position

		Social_power	InternetRanking
Social_power	Correlation according to Pearson	1	,723(**)
	Significance (2-sided)		,000
	N	75	75
InternetRanking	Correlation according to Pearson	,723(**)	1
	Significance (2-sided)	,000	
	N	75	75

** The correlation is significant at the level of 0.01 (2-sided).

The position of the single quarters on the internet and their social power can be depicted well by means of a scatter diagram that illustrates the differentiations, contrasts, polarizations, resp. digital divides as well as the social correlation of the internet and simultaneously offers an indication of the regional differences within the city.

Figure 78: Social power and internet position of Bremen's city quarters



A deeper statistical analysis reveals detailed indications of connections that would have to be discussed individually. Surprisingly there appears to be no significant correlation between the share of foreign nationals in the quarter and the internet position – one cause of these results may very well be the fact that central city quarters with a large student population and high internet activity house a large share of foreign nationals. Just as surprising is the fact that neither the average dwelling size nor the rent level (as possible indicators of wealth) significantly correlate to the internet position of the quarter. A comparison of the preferred political parties (Federal election 2002) merely shows a positive significance for the conservative CDU Party (stronger

in middle-class quarters) and a negative significance for the nationalistic NPD (stronger in socially disadvantaged quarters).

Table 68: Correlation calculations on the city quarters

	InternetRanking	
Highschool/1 yr coll	Correlation according to Pearson	**.722(**)**
Without highschool	Correlation according to Pearson	**-.536(**)**
employers/freelancers	Correlation according to Pearson	**.674(**)**
Public officials	Correlation according to Pearson	**.500(**)**
Employees	Correlation according to Pearson	**.699(**)**
Workers	Correlation according to Pearson	**-.554(**)**
Unemployed	Correlation according to Pearson	**-0.145**
Welfare recipients	Correlation according to Pearson	**-.455(**)**
Foreign citizens	Correlation according to Pearson	**-0.197**
Size of dwellings	Correlation according to Pearson	**0.063**
Rent level	Correlation according to Pearson	**0.108**
CDU-Voters	Correlation according to Pearson	**.530(**)**
NPD-Voters	Correlation according to Pearson	**-.252(*)**
**. The correlation is significant at the level of 0.01 (2-sided).		
*. The correlation is significant at the level of 0.05 (2-sided).		

Even if a critical evaluation of the data basis gives reasons for relativizing: The internet differentiation, respectively the digital divide corresponds with the social differentiation, resp. digital divide. **One can talk of a social digital correlation of the internet power.** Quarters in the city that show low social levels also hold a low internet position, while socially strong quarters show a strong internet position as well.

5.5. Geographical polarization

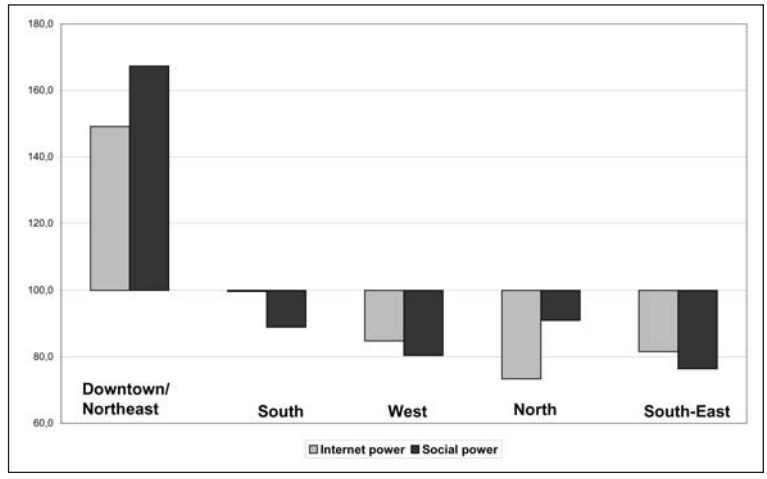
The analysis of the digital differentiations on the level of city sections has revealed the great advantage the Downtown Section possesses. A closer examination has shown an internal polarization within Section East which scores modestly above average. A similar pattern as that revealed by the Germany-wide examination of the West Region, respectively the State of North-Rhine Westphalia, becomes apparent here: Local units from the top of the table mix with units from the bottom. Under the aspect of an analysis of the geographical reproduction of digital divides, differentiations and correlations it helps to split geographically defined large units into (two) parts. With regard to Bremen, for instance the local paper *Weser-Kurier* does this by sorting the real estate ads into 5 urban regions that do not correspond with the city section borders defined by the Census Bureau, but rather reflect something like the price level of the real estate and therefore to an extent the social structure as well. The polarized Section East is simply divided into a northeastern area, combined with the other 'middle-class' districts in the center, and a separate 'Southeast' area.

In order to illuminate the inner-city reproduction of differentiations, digital divides and correlations, a new regional allocation exclusively regarding the private individuals shall be carried out on the basis of the findings on city quarters. The differences in the internet power are dramatic – and they correspond to the differences in the social power. **A geographical reproduction of the social correlation to the internet on the level of a large city can be claimed.**

Table 69: Geographical polarization of internet power and social power

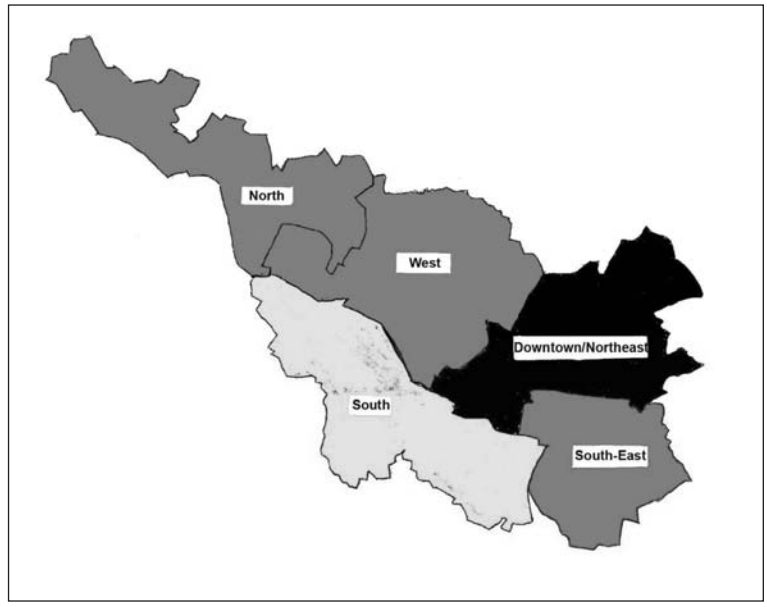
	Quarters	Internet power	Social power	Internet power	Social power
		Scores	Scores	Index	Index
Downtown/ Northeast	19	51.0	66.6	149.1	167.3
South	18	34.1	35.4	99.7	88.9
West	12	29.0	32.0	84.8	80.4
North	12	25.1	36.2	73.4	91.0
South/East	14	27.9	30.4	81.6	76.4
Total	75	34.2	39.8	100.0	100.0

Figure 79: Geographical polarization of internet power and social power



The geographical polarization within the City of Bremen can easily be visualized: A digital division within the city does exist.

Figure 80: Geographical polarization of internet power in Bremen



The findings seem to contradict the non-correlation of internet power and rent level but are unequivocal – any more in-depth reflections for an explanation of this phenomenon shall not be attempted here. The result (which is documented in the city quarter ranking found in the appendix) applies to Bremen the same way it applies to Germany: Namely that there are internet-weak quarters in the internet-strong sections just as much as there are some internet-strong quarters in the internet-weak sections. Thus 2 quarters from Section West rank 18 and 19, while the Quarter Riensberg from the Section Downtown/Northeast only reaches the 32nd position. The situation in Section North, however, is serious: Here the quarter with the highest score (Lesum) only scores No. 41 among the 75 quarters of Bremen.

A look at the Bremen quarter ranking (based on the author's personal experiences with persons and places in the City of Bremen, which cannot be researched empirically due to the current data situation, however) leads to the hypothesis that there is a strong correlation on the geographical level between the share of academics in the population and the internet power. Internet-strong quarters in the internet-weak sections often have a geographical connection with the internet-strong Section Downtown/Northeast and are popular residential areas for academics (Findorf, Neustadt). Additional work in reference to Richard Florida's findings on the relevance of the 'creative class' would be required.

6. Findings

The analysis of the internet situation within the City of Bremen shows (between the sections and the districts as well as within same as well as between the quarters) digital differentiations on all levels, which are so distinct that all relativizing (different indicators, calculations) can effect little change.

The digital differentiations are clearly less strong on company level as well as on the level of private individuals than in an analytical local comparison regarding the category of private users. The differences between districts and quarters can partly be explained by the number of companies present (higher internet activities in the central quarters and in those with a technology park) and the number of active private users (the download volume and online time per user, respectively per internet access are similar).

Yet a glance at both ends of the scale (between internet strong and weak positions) regarding the quarters still uncovers differences that show the characteristics of a dramatic digital divide. That digital divide is clearly the effect of the existing socioeconomical differences between the quarters. **There is a social correlation that can be proven by statistics**. This, however, does not necessarily lead to the conclusion that for each socially less powerful quarter and each individual living there low internet activities can be assumed, or that each economically powerful district automatically claims a leading internet position. However, the activities are distributed extremely uneven, even though there are not only two poles of the scale but also a digital contrast with a majority somewhere between the top and the bottom. Individuals in the internet-weakest quarters produce similar transfer volume and online hours to individuals in the internet-strongest quarters; in part they even score higher, but a relation, as it occurred during the comparison of cities, cannot be found on quarter level.

The geographical examination reveals a distinct digital and social division within the city. The metaphor of the beautiful and less beautiful isles, where even the less beautiful islands each have their beautiful spots, applies to the internet situation in Bremen to a limited degree. Some singular quarters in the internet-weakest districts almost reach the level of the weak quarters in the internet-strongest districts; this statement does not apply to Section North, where the quarter with the highest score (Lesum) only claims No. 41 (of 75) in the overall ranking. In general the differences have the quality of a digital divide; there is a digital and social gap in the city.

The internet ranking furthermore revealed on quarter level that 34% of a theoretically achievable 100% (if one and the same quarter had scored the top value each for all 5 indicators) were reached on the average. That means that, independent of the further intensification of the internet in the 'top quarters' in each field (such as e-mail addresses or domains), the simple catching-up of all quarters with the one in top position would mean an enormous progress of internet activities. Even on the level of one city and its quarters it shows that Germany still finds itself at the beginning rather than at the end of its internet development.

IV. Findings on the quality differences of city websites

In the early nineties (during the pre-internet era) Germany started to build a public municipal information system that initially was intended to promote tourism, the economy as well as the information and participation of the citizens (Kubicek, 1997). After the first experiences (with a kiosk system in Bremen) the offer was considerably developed by means of the internet. Not only the accessibility of information was of importance, but it was also intended to enhance the communication with the citizens and companies and to enable them to realize transactions and participation. The idea of a modernized administration was another reason for the introduction of eGovernment activities.

In the initial phase it was planned to particularly cover the resorts of jobs and profession, education and science, recreation and sports, health, arts and culture as well as media, politics, social issues, tourism, environment and traffic, administration and economy (Kubicek, 1997, p. 138-140) and to electronically provide offers adapted to special life situations such as relocating.

Altides, Meier and Steuber (2003) attempted to systematically and comprehensively determine the functions of municipal presence on the internet (as part of mass communication); they see four central functional areas with a social, cultural, political and economical dimension each, as well as "fundamental planning and regulating functions" (p. 68). On that basis a multitude of desirable offers filtered out that could also be described as a wish list (or concept of requirements) (p. 113-116). The definition of the requirements made of a perfect city website is also a checklist for the empirical test: Which city achieves what level?

The (top-down) list of requirements, resp. checklist by Altides et al of 2003, which stems from theoretical contemplations, is – apart from minor exceptions (Jüttner, 2005) – identical to a research guideline that proved to be the optimum bottom-up after a series of practical studies (Einemann, 2001, 2002).

The goal of our empirical research was to determine the quality of internet presence of the large German cities, to make an empirically founded contribution to the assessment of the status quo of eGovernment on the municipal level and to be able to render statements on differentiations: Do differences in the websites of cities for instance depend upon the size, the economical power, the political function of the city or its surrounding region? Is there a connection to the internet position of that city?

The evaluation of the quality of internet presence of cities requires a great amount of empirical effort and structurally suffers from never being quite up-to-date: As soon as the results are published they no longer reflect reality because the cities are constantly updating their internet presence. Since this study primarily deals with the analysis of differentiations, structures and explanatory factors and most empirical data stems from 2003, the data used here is that of research conducted very thoroughly by the author himself at the end of 2002 (Einemann, 2002); in addition to that the more recent results of a post-evaluation of the cities with the best web presences (Jüttner, 2005), a study on the participation of the citizens (Initiative eParticipation, 2005) as well as an international comparison (Einemann & Paradiso, 2004b) are included.

1. The empirical approach

1.1. The background

In May 2000, the internet presences of all 630 communities listed under "kommon.de" (of a total of over 13,000 in Germany!) was examined with a group of students, employing 10 indicators. The progressing discussion about the approaches to eGovernment and the internet presences of public facilities led to a considerable expansion of the research concept with the aim of a more detailed analysis of internet realities: The internet websites of all 323 rural districts were evaluated with the assistance of a larger team of students, using 105 indicators; the results were published as a 'Study of Districts' (Einemann, 2001). In May of 2002 the focus was once again on the municipalities as 'the citizens' essential window on the administration'; the 200 largest German cities were tested by students using over 160 indicators. Instead of a publication of the findings with reduced scientific claims (e.g. no publication of detail data due to different perceptions of different test persons) there was a comprehensive quality control revealing an irrefutable observation: Reliable numbers are only gained if all evaluations are carried out by the same individual or a very small professional team (at a high degree of synchronization and control) – otherwise the deviations and error rates are so great that quantifiable statements can hardly be supported. Many of those who attempted such evaluations may have been haunted by the same doubts: Examinations such as the study "E-Town 2002" of Initiative D 21 (2002) renounced the publication of their numbers and restricted themselves to statements of merit and surely supportable quality.

Based on multifold empirical experiences the pre-conditions of the research strategy for an evaluation of the cities were reset:

- The number of the cities to be examined was limited to an amount that could be tested by one person. This was to eliminate the subjective factor and to ascertain that the same is evaluated the same. The 77 largest German cities (all with a population of over 100,000) were included in the study; the data on the 50 largest cities was processed for the updated evaluations.
- The number of the indicators to be examined was limited to 139. This warranted a sufficient breadth and depth of the examination and at the same time a certain stability of the model. The few mistakes and erroneous estimations that certainly may occur even if the evaluation is conducted exclusively by one individual and that can affect all cities equally only have a limited effect on the overall results due to the multitude of indicators.
- Different indicators were weighted differently and integrated into in a complex website-city-position model (WCP-Model) that offers a detailed evaluation of the cities' websites on the basis of a maximum of 260 scores. The weightings were set bottom-up and were adjusted in an iterative process with the top-down setting in a way that ensured a very robust model. The database 'Website City Position' (WCP) created especially for the examination does not only permit a multitude of evaluations but also simulations, such as under the pre-conditions of other weightings.

To ensure the comparability of the results the assessments were limited to a certain time frame (29 August – 15 September 2002). The websites of some cities were 'under construction' during

the aforementioned period and therefore achieved a worse result than they probably would have earned at the time of publication – Aachen is one of those unfortunate cities.

All numbers are disclosed and can be checked – even by the cities in question. The WCP-Model makes modifications to evaluations, an immediate new measurement of the results and benchmarking against other cities or the average scores in the database possible at any time. Every municipality in Germany can enter its values into the database and has therefore an important instrument of quality control at its disposal. Recommendable would be the attainability of each current database via the internet at a central place that provides the opportunity of self-evaluation to all interested cities and communities. The import and export functions available in the database also offer the chance of updating and amending the data of a city by online data exchange.

1.2. Heading, indicators, weighting

Since the beginning of 2000 our examinations of the internet offers of cities and counties have always revealed that 50% of all possible scores were reached on the average – a few presences were excellent, a few other ones extremely bad and the mass showed mediocre values. The hurdle was never put so high that it could not have been taken: For nearly every indicator there was at least one hit. The requirements were never impossible to achieve. Insofar the results were always an indication of expected great dynamics in the progress of the municipal websites – under the precondition that the poorer websites desire to approach the standards of the better ones.

The results of older studies are not comparable to today's approach, however: In the past less indicators were examined and the weightings distributed differently. Today a simple functioning of the websites and the provision of basic information can be taken for granted; today it is the installation of interactive components that is the 'fine art'. This was weighted accordingly higher and thus provides a foundation for a differentiation of the evaluation of the internet offers.

Initially it was differentiated into three major dimensions for the purpose of developing the **indicators**:

(1) Breadth, depth and topicality of the offer, whereby it must be differentiated between
- core offers of the municipal administration to the citizens and the industry
- city information and offers on tourism
- information about politics and offers for the citizens' participation
- additional general information (culture, health issues, additional links)

(2) Interactivity of the offers of administration and politics
- communication by e-mail
- ordering of printed information/leaflets
- download of forms
- electronic sending-off of documents
- monitoring of processes
- participation in debates

(3) The usability that is monitored by examining the
- quality of search methods
- organization of the menu and the comfort of navigation
- reaction time of the system

- provision of form servers
- integration of offers on 'personal life issues'('one-stop').

The interactivity components were integrated into the contained complexes of topics described under (1) in the examination guidelines, while the usability turned into an individual heading of the examination.

Based on a variety of tests the focus was on a total of 72 examined points under aspects of reliable statements and feasability:

Figure 81: Research categories on the quality of city websites

I	**Public service, online administration**			
1	**Public service**		**4**	**Tourism**
1	Registration Office (Vital Statistics)		25	History of the city
2	Internal Revenue Services		26	Sightseeing
3	Building Authority		27	Tourism Center
4	Vehicle Registration		28	Webcam
5	Waste Management		29	Picture gallery
7	Youth Welfare Office		30	Panorama (photos, VR, video)
8	Welfare Office		31	Weather forecast
9	Educational Facilities		32	Bars/clubs
10	Environmental Office		33	Shopping centers and quarters
11	Courts		34	Listing of hotels
2	**Economy**		35	Listing of restaurants
12	Presence of location			
13	Commercial sites		**III**	Politics, participation by citizens
14	Transportation		36	Information about the mayor
15	Information on the establishment of new enterprises		37	City government (heads of departments)
16	Promotion of industry		38	Public Relations
17	Download of forms		39	City council/parliament
18	Public bids		40	Current budget online
			41	Public vacancies
II	**Information on city and tourism**		42	Forums/online participation
			43	Chat
3	**City information**			
19	Presence of the city			
20	Statistics on the city			
21	Current topics in the city			
22	Links to local newspaper(s)			
23	City map			
24	Public transportation (Link)			

IV	**Important Links**			
6	**Cultural facilities**		**8**	**Additional links**
44	Information on events		58	Nearest airport
45	Movies		59	Police Department
46	Theater / opera / musicals		60	Fire Department
47	Museums		61	Associations/NPO
48	Public libraries		62	Yellow PagesEmployment Office
49	Sports events		63	
50	Tickets Online			
			V	**Usability**
7	**Health facilities**			
51	Hospitals		**9**	**Usability**
52	Medical drugstores		64	Menu guide
53	Listing of physicians		65	Navigation
54	Nursing services		66	Website design
55	Emergency service (nights and weekends)		67	Reaction time
56	Physicians on-call		68	Free search
57	Medical drugstores open for emergencies		69	Site map
			70	Multilingual
			71	Form server
			72	Relocation, special life situations

1.3. 'Website-City-Position' Model

For the purpose of a closer analysis of the above points a differentiation into 139 indicators distributed as follows was made:

- 59 indicators under the heading 'service to citizens and industry'
- 27 indicators under the heading 'information on city and tourism'
- 25 indicators under the heading 'political information and citizens' participation'
- 19 indicators under the heading 'important links' (culture, health, links)
- 9 indicators under the heading 'usability'

Today many indicators make up a 'complete website' and are therefore evaluated. Indicators of particular importance are highlighted as more valuable by weighting them accordingly in order to characterize the level of the website (from a purely informational instrument to a portal of interaction and transaction).

Principally all indicators with inter-activity character (e-mail accessibility, download offers, ordering of leaflets, consultation of city map or train/bus schedules, search of the hotel or restaurant listing, chat opportunities, information about and search of events as well as ordering of tickets) were weighted with Factor 2. More comprehensive presences of tasks, respectively services of installations also received a higher weighting (Factor 2).

All invitations to the citizens for electronic communication with the city administration (in the form of given activities concluding in the online sending-off) were weighted with Factor 3. That also applies to offers showing extra effort, such as online environmental information, disclosure of the minutes and decisions of the people's representatives (parliament, council), the transparent invitation of the citizens' opinions in open forums as well as the transparency of the menu.

The points of the functioning of navigation, the opportunity of a free search and the provision of a form server, which are of central importance to usability, were assigned Factor 4.

In the end the described method of 'bottom-up' led to a structure of weighting that comes very close to a 'top-down' approach (the website-city test model is fully documented in the appendix). The distribution of the scores (a maximum of 260) to the single categories – ideal and (in brackets) real – revealed the following picture:

- 40 % (38.8 %) for the heading 'service to citizens and industry'
- 15 % (15.4 %) for the heading 'information on city and tourism'
- 12.5 % (12.7 %) for the heading 'political information and citizens' participation'
- 12.5 % (11.5 %) for the heading 'important links' (culture, health, links)
- 20 % (21.5 %) for the heading 'usability'.

129 indicators were merely tested for the availability of the offer, not for its particular quality (e.g. webcam: yes or no). However, regarding 10 indicators a detailed evaluation of the quality was carried out.

Figure 82: Indicators with qualitative evaluations

Forums	
1	available in one form or another
2	good solution, several forums, moderation
City map	
1	search possible by streets
2	detailed search, suggestions of street names, buildings
Local public transportation	
1	search for connections available
2	easy search with route suggestions for the particular city
Search in calendar of events	
1	any search opportunities available
2	easy search for date, location, special interest of free search
Tickets online	
1	any solution at all, also link to external services
2	Online booking of tickets with delivery service or print-out
Menu guide	
1	problems: missing level, scrolling in lists, confusing windows
2	good and clear structure
Navigation	
1	Partly no return possible, 'new start browser'
2	Problems such as partly no replies (dead links), irritating advertising, orientation problems
3	excellent and convincing solution
Free search	
1	any search opportunity at all (key words)
2	free search available but with deficiencies
3	good free search with results
Form server	
1	few forms, hardly any sorting, only lists
2	good sorting, search opportunities
3	explicit advice on possibility to submit online
Relocation/concept for special life situations	
1	any information at all
2	extensive information, forms
3	Forms to submit online

That distribution of scores with a simultaneous higher weighting factor explains for instance why the 9 indicators under the heading 'usability' enter the overall results with 20% in the end: An optimum navigation, search and presence of forms are worth 12 scores each.

A special '**eGovernment indicator'** was developed for questions on the status of eGovernment realizations. The first heading 'service to citizens and industry' (offers by the city administration, resp. public institutions), the third heading 'political information and citizens' participation' (indications of eDemocracy) as well as the indicators 'form server' and 'relocation/special life situations' from the heading 'usability' are considered combined. 57.3% of the maximum of scores (149 of 260) can be allocated to the category of 'eGovernment'.

Figure 83: Composition of the eGovernment indicator

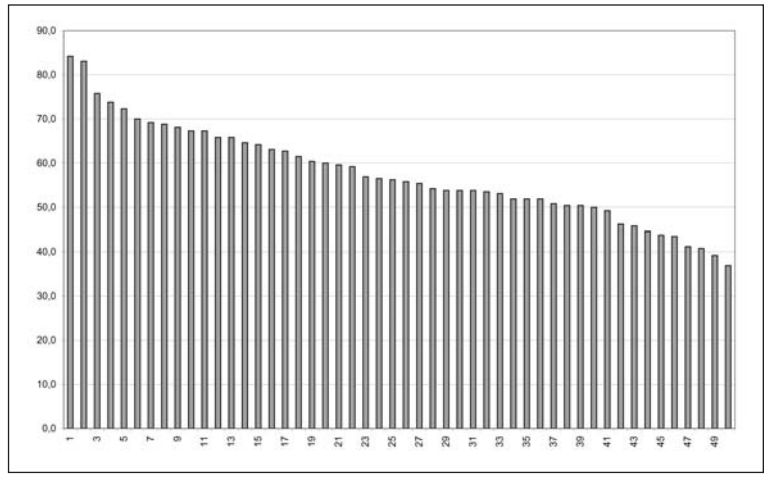
1	**Public service**		**5**	**Political communication**
1	Registration Office (Vital Statistics)		36	Information about the mayor
2	IRS		37	Municipal government (heads of departments)
3	Building Authority		38	Public Relations
4	Vehicle Registration		39	City Council/Parliament
5	Waste Management		40	Current budget online
7	Youth Welfare Office		41	Local public vacancies
8	Welfare Office		42	Forums/Online participation
9	Educational Facilities		43	Chat
10	Environmental Office		**9**	**Usabilitiy**
11	Courts		71	Form server
2	**Service to industry**		72	Relocation/life issues
12	Presence of location			
13	Commercial sites			
14	Traffic and public transportation			
15	Information on the establishment of new enterprises			
16	Promotion of industry and commerce			
17	Download of forms			
18	Public bids			

43 of the 139 indicators can be considered to be indications of the grade of interactivity of the websites and are combined into a special **'interactivity indicator'** to which 50% of all possible scores (130 of 260) can be ascribed. The complete model is documented in Appendix 4.

2. Differentiations between the websites

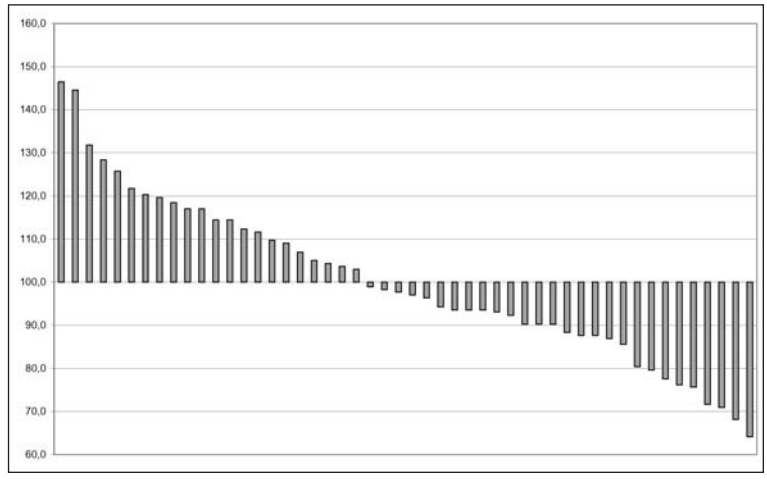
The core results on the web presence of the 50 largest German cities correspond to those of all other questions examined empirically: There is a contrast with a strong polarization between the two ends of the scale. With its average results of 57.5% the test winner Bremen reaches 84.2% of all possible scores and is leading with an index value of 146.4 – while Lübeck with 36.9% and an index value of 64.2 tumbles to the bottom of the scale.

Figure 84: Differentiation regarding the quality of city websites 1



An examination of the deviation from the average makes the differentiation, resp. polarization particularly obvious.

Figure 85: Differentiation regarding the quality of city websites 2



In 2002, the city states (Bremen, Hamburg, Berlin) as well as several state capitals (Stuttgart, Düsseldorf, Magdeburg, Mainz and Munich) and Karlsruhe, Dortmund and Cologne were at the top.

Table 70: The best city web presences 2002

Ranking	City	Result	Index
1	Bremen	84.2	146.4
2	Hamburg	83.1	144.5
3	Stuttgart	75.8	131.8
4	Düsseldorf	73.8	128.3
5	Magdeburg	72.3	125.7
6	Karlsruhe	70.0	121.7
7	Berlin	69.2	120.3
8	Dortmund	68.8	119.7
9	Munich	68.1	118.4
10	Cologne	67.3	117.0
10	Mainz	67.3	117.0

A new evaluation on the basis of a somewhat modified and expanded (e.g. by the indicator 'web accessibility to the disabled') model led to changes among the top group. Subsequently Hagen, Hanover (state capital), Wuppertal and Wiesbaden (state capital) moved up in the hierarchy.

Table 71: The best city web presences 2005

Ranking	City	Result
1	Bremen	75.9
2	Düsseldorf	74.3
3	Hamburg	72.7
4	Berlin	70.2
5	Cologne	68.9
6	Dortmund	66.0
7	Hagen	64.4
8	Hanover	63.8
9	Wuppertal	62.9
10	Wiesbaden	62.5

Source: Jüttner. 2005, p. 94

Even though the year of Jahr 2002 showed 5 cities in the West (Duisburg, Hamm, Herne, Solingen, Gelsenkirchen) and one in the East (Rostock) of Germany at the bottom of the scale, Freiburg, internet-strong in other categories, as well as the state capitals Kiel and Lübeck in Schleswig-Holstein scored among the last 10.

Table 72: The worst city web presences 2002

Ranking	City	Result	Index
41	Duisburg	49.2	85.6
42	Freiburg	46.2	80.3
43	Rostock	45.8	79.7
44	Leverkusen	44.6	77.6
45	Hamm	43.8	76.2
46	Herne	43.5	75.7
47	Solingen	41.2	71.7
48	Gelsenkir-chen	40.8	71.0
49	Kiel	39.2	68.2
50	Lübeck	36.9	64.2
	Total	57.5	100.0

That picture and the placing of Dortmund (Ruhr Region) and Magdeburg (East) among the Top Ten of 2002 as well as the cities Dortmund, Hagen and Wuppertal among the Top Ten of 2005 provoke the assumption that the previous findings and explanatory factors on the internet power of the cities cannot be transferred to their web presences. At first glance the political function of the city (city state, German capital, state capital) seems to be a deciding factor.

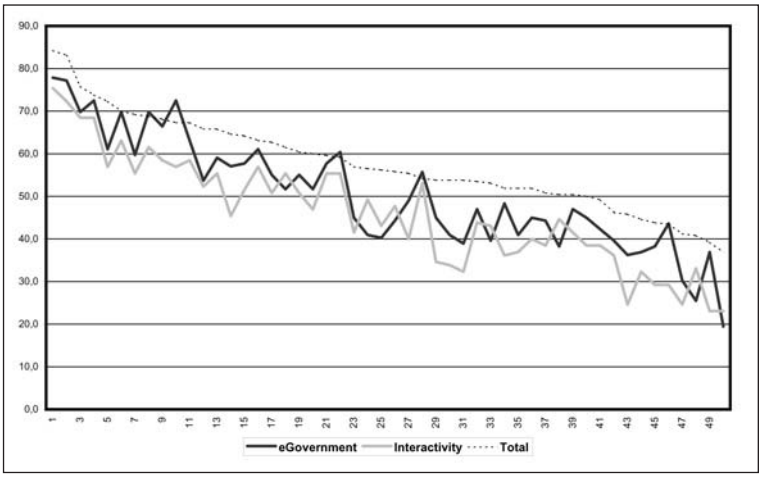
The values achieved by the cities in the overall results clearly exceed those that are registered when limiting the examination to the aspect of interactivity and eGovernment. While a total average value of 57.5% was found for 2002, eGovernment achieved a mere 50.5% and the interactive offers only reached 46.1%. A distinct polarization showed in regards to interactivity (the realization of which is quite elaborate): Only few cities reached high scores (Bremen and Hamburg were at the top, earning over 70%).

Table 73: Total results according to interactivity (2002)

Group	Result	Cities	Share cities
1	over 70%	2	4.0%
2	over 60%	4	8.0%
3	over 50%	15	30.0%
4	over 40%	12	24.0%
5	over 30%	11	22.0%
6	over 20%	6	12.0%
	Total	50	100%

Altogether there is a connection between the quality of the city websites in the area of eGovernment and interactivity: The cities in top positions show constantly good values, the cities with a weak internet presence are positioned low in general.

Figure 86: Correlation between eGovernment quality and interactivity



The interactive quality of city websites was the central focus of a short international comparative study (Einemann & Paradiso, 2004b). The 100 largest cities in Germany and Italy were analyzed and evaluated according to the following guidelines:

Figure 87: International comparison: Germany/Italy

1. eProcurement		
	1	Information on public bids
	2	Online interaction
	3	Online submissions
2. Form server		
	1	Forms available
	2	Good collection of forms, search
	3	Online submission: information/reality
3. eDemocracy		
	1	Online participation/complaints
	2	Chat available
	3	Good forum
4. Events and tickets		
	1	Information on events
	2	Good calendar of events
	3	Online ticket reservations integrated
5. City map		
	1	City map available
	2	Good city map/street search
	3	City map/extensive search

At least in two aspects the findings offered a surprise: Firstly, the quality of the web presences of Italian cities seems to be better overall than that of the German cities; to relativize that it can be assumed that the distinctness of the results may also be based on the different degree of the strictness of evaluation conducted by the two different test persons (the author in Germany, Maria Paradiso in Italy). An especially dramatic difference, however, should reflect reality at least to a certain degree: The provisions for citizens' participation (eDemocracy) are clearly higher developed in Italy than in Germany.

Table 74: Results of the comparison Germany-Italy regarding interactivity

	eProc	Forms	eDemo	Events	Map	Total
Germany	23.7	52.3	22.3	52.7	72.3	**44.7**
Italy	49.7	66.3	77.3	68.3	50.0	**62.3**

A research study conducted at the end of 2005 concentrating on the aspect of electronic citizens' participation in Germany evaluated the web presence of the 83 cities with a population of over 100,000. In that examination (1) the information supplied, (2) the instruments for active participation (e.g. web forms, forums, chats) and (3) the opportunities of influencing decision-making processes by offering suggestions (Initiative eParticipation, 2005, p. 7) were studied.

The top group is clearly composed differently than in previous results (Einemann, 2002; Jüttner, 2005), though again 5 state capitals, namely Berlin, Munich, Stuttgart, Hamburg, Düsseldorf, are represented:

Table 75: Top group regarding electronic participation of citizens

1	Berlin	43,9
2	Essen	41
3-4	Munich	35
	Augsburg	35
5-6	Frankfurt am Main	34
	Stuttgart	34
7	Hamburg	32
8-10	Duisburg	32
	Düsseldorf	32
	Freiburg im Breisgau	32

Source: Initiative eParticipation (2005), p. 15

The latest general picture provided by Initiative eParticipation is also interesting under the aspect of the cities with the weakest internet presence as compared to older findings. Based on our results and experiences it is surprising that Bremen and Hagen are no higher than in the center field and that Magedeburg finds itself in the bottom group. The findings of Initiative ePar-

ticipation show several cities in the Ruhr Region and East Germany in the top cluster, and the State Capital of Saarbrücken despite its strong internet position among the bottom group.

Figure 88: Results on the electronic participation of citizens

Source: Initiative eParticipation (2005), p. 15

3. Explanatory factors

3.1. Regional differences

Regional differences play hardly any part at all when it comes to the quality of websites. While the North again approaches the line of average, the cities on the Rhine and in the South slightly exceed the average, and the cities on the Ruhr and in the East fall slightly below average.

Table 76: Website quality according to regions

	eGovernment	Interactivity	Total	Index
Rhine/South	58.5	53.7	62.5	108.6
Ruhr/East	46.2	41.9	54.4	94.6
North	50.8	46.4	58.5	101.7
Total	50.1	46.1	57.5	100.0

3.2. Size of city

The large cities have an advantage with regard to their internet presence; a positive correlation does exist between the number of population and the quality of website presence.

Table 77: Website quality and number of population

		Website	Res_2003
Website	Correlation according to Pearson	1	,445(**)
	Significance (2-sided)		,001
	N	50	50
Res_2003	Correlation according to Pearson	,445(**)	1
	Significance (2-sided)	,001	
	N	50	50

*** The correlation is significant at the level of 0.01 (2-sided).*

A look at the different size categories shows, however, that the advantage of large cities is rather small and in no relation to the advantage of size of population. Even though the cities exceeding 500,000 residents are considerably ahead concerning the quality of their website, the average size of population shows a greater deviation in size.

Table 78: Website quality and size category 1

Population category	Cities	Residents (Average)		Result (Average)	
		Residents	Index	Scores	Index
over 500.000	12	985,334	229.9	67.6	117.6
250.000 - 500.000	15	334,530	78.1	58.6	101.9
under 250.000	23	199,334	46.5	51.7	89.9
total	50	428,533	100.0	57.5	100.0

The results are confirmed for the most part when the 77 largest cities are studied (Einemann, 2002), i.e. if 27 additional cities with a population of 100,000 to 150,000 are included.

Table 79: Website quality and size category 2

Population category	Cities	Residents (Average)		Result (Average)	
		Residents	Index	Scores	Index
over 250.000	27	623,776	194.7	62.6	116.6
150.001 - 250.000	24	197,279	61.6	51.7	96.3
100.000 - 150.000	26	119,178	37.2	46.3	86.2
total	77	320,458	100.0	53.7	100.0

3.3. City function as state capital

The average value regarding the quality of the city website amounts to 57.5% for the 50 largest cities – that value rises to 64.8% for cities with state capital function and is therefore distinctly if not dramatically higher than the average. A remarkable deviation is seen in the city states of Bremen, Hamburg and Berlin. These city states function as federal states and at the same time as large municipalities; here the administrative functions on both levels largely correspond. That results in changed possibilities, such as of acquisition and organization of political promotion measures, but assumably also a more direct realization of political decisions of the state into urban politics regarding the participation in the internet development. On the average the internet presence of the city states achieves a value of 78.8% and thus relevantly exceeds the average of all cities (57.5%) as well as the average of all state capitals (64.8%).

Table 80: Website quality and political function

	Result	Index
City states	78.8	136.8
State capitals	68.4	118.8
Total	57.6	100.0

3.4. Dominance according to industrial branches

The examination of the quality of city websites under the aspect of branch dominance in the city uncovers results for the sites of the traditional industries and chemical industry that are slightly below average – as well as for the banking city, Frankfurt. The media sites (Hamburg, Cologne and Munich) are clearly positioned well above average. A lot implies, however, that the extraordinary density of population of the three media cities and Hamburg's function as city state are the essential reasons.

Table 81: Industrial branch dominance and quality of city website

	Res_2003	CityWebsite	Website_index
Banks	641,076	55.4	96.2
Media	1,307,420	72.8	126.4
Chemical	161,644	48.3	83.8
Trad. industries	320,303	53.2	92.4
Total		57.6	100.0

3.5. Science/innovative information technology

There does not seem to be an intense correlation between scientific and entrepreneurial potential for innovation and the quality of the cities' websites. The close connection to the university and the acquisition of means of research also made possible by that was of advantage to the City State of Bremen, though.

Table 82: Correlation of innovative power and quality of websites

		Website
Website	Correlation according to Pearson	1
	Significance (2-sided)	
	N	50
Product_suppliers	Korrelation nach Pearson	,338(*)
	Signifikanz (2-seitig)	0,016
	N	50
NewMarket	Korrelation nach Pearson	,302(*)
	Significance (2-sided)	0,033
	N	50
Profs_CS	Korrelation nach Pearson	0,118
	Significance (2-sided)	0,416
	N	50
Studenten_CS	Korrelation nach Pearson	0,118
	Significance (2-sided)	0,416
	N	50
*. Die Korrelation ist auf dem Niveau von 0,05 (2-seitig) signifikant		
**. Die Korrelation ist auf dem Niveau von 0,01 (2-seitig) signifikant		

3.6. Internet power and overall economy

The correlation assessment shows a connection between the overall economical position, internet power and the quality of the city's website. Those who have a strong economical position and a powerful internet position usually will also have a good internet presence.

Table 83: Correlation between internet power, economical position and web presence

		Website	Internet_Pos	Econom.Pos
Website	Correlation according to Pearson	1	,469(**)	,381(**)
	Significance (2-sided)		,001	,006
	N	50	50	50
Internet_Position	Correlation according to Pearson	,469(**)	1	,653(**)
	Significance (2-sided)	,001		,000
	N	50	50	50
Econom. Pos	Correlation according to Pearson	,381(**)	,653(**)	1
	Significance (2-sided)	,006	,000	
	N	50	50	50

** The correlation is significant at the level of 0.01 (2-sided).

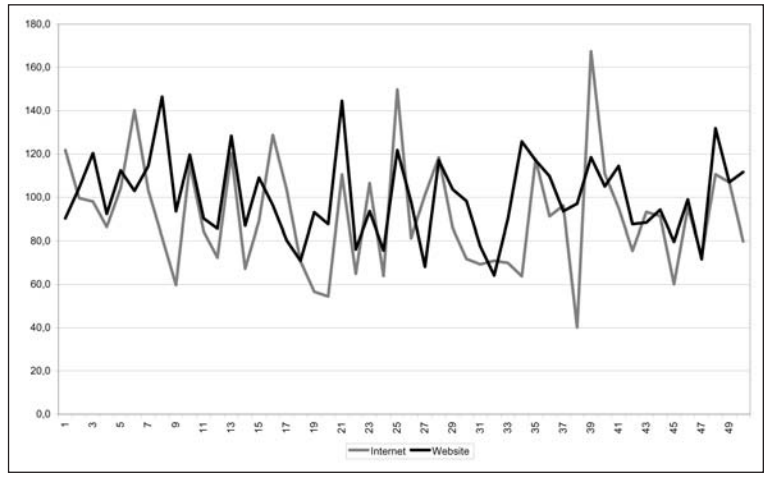
Nevertheless, the internet-weak cities show constantly higher scores in their websites than in the internet ranking; the gap between them and the internet-strong cities is unmistakably smaller.

Table 84: Internet power and web presence

	Internet	**Int index**	**Website**	**Website index**
TOP 10	63.1	129.0	64.2	111.7
FLOP 10	24.5	50.0	42.8	74.4
Total	48.9	**100.0**	57.5	**100.0**

A detailed examination of the relation between internet power and quality of website reveals larger deviations between both indicators for some cities.

Figure 89: Correlation between internet power and web presence



Almost dramatic deviations signal that the statistically assessed connection does not have to apply to every individual case. Bremen, Mülheim and Magdeburg are very well positioned regarding their web presences in contradiction to their internet power, whereas the 'internet capital', Munich, at the top of 'wealth' renders a relatively weak website.

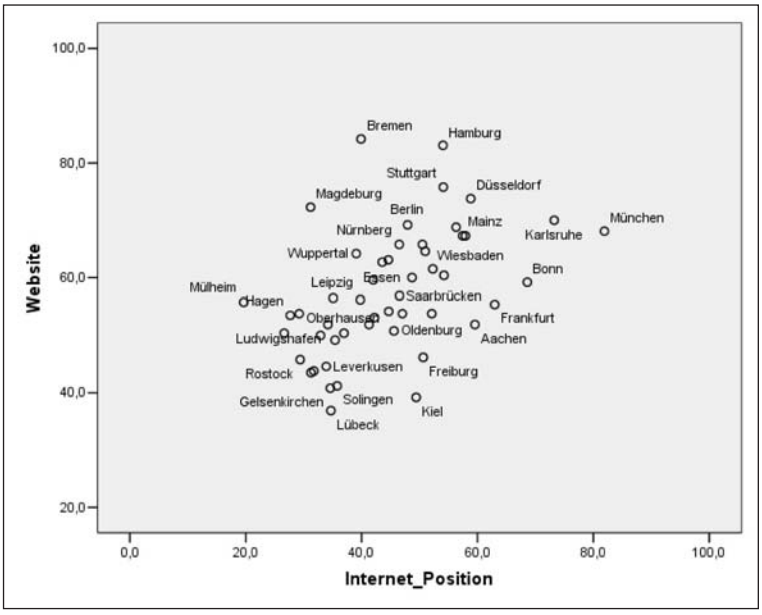
Table 85: Deviations between internet power and web presence

	Internet	Website	Deviation
Bremen	81.6	146.4	-64.8
Magdeburg	63.8	125.7	-62.0
Mülheim	40.1	97.0	-56.9
Munich	167.5	118.4	49.0

The numbers indicate that there does not have to be a correlation between the internet power of a city and the quality of its internet presence, and that even cities with overall weak internet positions have a chance of realizing an excellent web presence and of providing a sound interactive eGovernment. Evidence for that theory is the change in the quality of the web presence of Hagen, which was in Position 32 with 53.5 scores at the end of 2002 and moved up to No. 7 and 64.4 scores by mid-2005.

The position of the cities on the internet and of their website quality is illuminated by the following scatter diagram:

Figure 90: Internet position and quality of website



Regarding the web presences the differences between economically stronger and weaker cities are distinctly smaller than regarding the economical position or internet power.

Table 86: Economical power and web presence

	Economy	**Website**
TOP 10	64.5	66.0
FLOP 10	35.5	53.9
Total	50.0	57.5

3.7. Cultural factors

The results of the comparison of the interactive quality of the municipal website presences in 100 German and Italian cities (Einemann & Paradiso, 2004b) with the findings of great discrepancies particularly in regards to citizens' participation indicates another explanatory component: at least on an international basis cultural specifics play a part that is not to be underestimated. A possible explanation for the differences between Germany and Italy on eDemocracy may be the different cultural approach and the different history of municipal internet activities of the two countries: While economical considerations (support of industry and commerce) played an important role in Germany, the idea of public democracy and the mirror effect of the communicative 'piazza culture' probably played a greater role in Italy.

For Germany it is found that the cities that actively participated in international associations, such as the Telecities Initiative of the European Union or the Initiative Global Cities Dialog, also provide better internet presences than less active cities. Networking activities are definitely a local success factor.

Table 87: Municipal internet activities and website quality

		Website	Govt_active
Website	Correlation according to Pearson	1	,371(**)
	Significance (2-sided)		,008
	N	50	50
Govt_active	Correlation according to Pearson	,371(**)	1
	Significance (2-sided)	,008	
	N	50	50

** The correlation is significant at the level of 0.01 (2-sided).

4. Findings

There also is a clear differentiation between the large German cities concerning the quality of their websites. The digital contrast in the quality of the internet presence of a city is not determined by single factors. Even without great wealth and top scores in internet power cities can offer excellent websites and interactive eGovernment services. The city states, where the state and municipal administration coincides at least in parts, seem to have structural advantages. Even though the websites of the media sites, the largest cities and the cities with economical and internet power, particularly along the Rhine River and in Southern Germany, offer web presences that exceed the average, their difference to all others are not gigantic. Germany's relatively poor results regarding citizens' participation in contrast to Italy signal the influence of cultural factors.

Table 88: Explanatory factors for strong websites

	Website	Index
Rhine/South	64.8	112.8
Over 500.000	67.6	117.6
State capital	64.8	112.7
City state	78.8	137.0
Media site	72.8	126.6
Internet-strong	64.2	111.7
Economically strong	64.5	114.8
Total	57.5	100.0

V. The Internet in Germany: Cities, Divides and Differences

Though, according to current knowledge, the road to an electronically networked global capitalistic society will lead through changed structures of regions and national states as well as their power (if not organizations), it won't be accompanied by a dissolution or disappearance of the cities. The cities will keep their role as local success factors of innovative networks that are electronicaly networked on a global as well as on a national and also on a local level. The integration into networks and the quality of a (not only electronic) networking of companies, citizens and government is more and more turning into an essential local success factor – only those who are connected to the global capitalistic network society as ideally as possible will stand a chance in the future. Internet power is a condition for future survival. The internet power is a central factor for the current and future role cities will play (as well as the regions and nations in which they are embedded).

Concerning Germany and its large cities the following can be summarized as the central results of this research study: **There is a continuous digital contrast, whereby the digital differentiations, when comparing the poles, take on the character of digital divides.** That contrast, the differentiations and the digital divides are in synchronicity with economical and social differences of the same kind and same level: **There is an economical and social correlation of the internet in Germany.** The findings apply to the sector of production, consumption and frame conditions as well as to the different players companies, private individuals and government.

The group of the 50 largest German cities includes innovation centers that dominate the internet development especially in the area of the content production that is relevant to the economy. A particularly extreme example of this: 1.5% of all German residents live in Munich; however, the share this area holds in the approx. 8 billion monthly pageviews of internet websites that are assessed by IVW and particularly relevant to revenues from advertisements with its 1.6 billion pageviews amounts to approx. 20%. In many areas, however, the percentage of the 50 largest German cities exceeds the German anverage only slightly or not at all, so that one cannot claim a continuous digital divide between cities and rural districts.

The dependence of internet power from the power of the overall economical power is confirmed by the positive correlations between internet position and the presence of company headquarters, innovative potential and certain industrial branches (financial institutions, media, telecommunication) in a city; cities holding the function of being the sites of traditional industries (coal, steel, metal processing, chemicals) tend to be internet-weak in general.

On the other hand the functions of a city as political center and the size of the city are of minor importance for its internet position. Munich, the unchallenged top city in Germany regarding wealth as well as internet aspects, is much smaller than Berlin or Hamburg; the cities Karlsruhe, Bonn and Mainz that are part of the top group house less than 10% of the number of residents in Berlin, yet they far exceed the German capital in economical strength as well as internet position.

The digital differentiations along the lines of wealth reproduce themselves on the geographical level in form of a **digital and economical division of Germany into three sections.** On the

national level there are areas where the internet power far surpasses the average (Munich and Southern Germany as well as cities along the Rhine), regions with average positions (Northern Germany) and nearly disconnected areas (the Ruhr Region, which is moulded by the traditional industries, as well as the formerly non-capitalist East) that can be subdivided into areas boasting some lighthouses (Dortmund and Bochum in the Ruhr Region) and areas without any distinct highlights (East Germany). Within the bottom class there is a sub-bottom class, and within the top category there is a supertop class (Munich, Karlsruhe, Bonn, Frankfurt). In that regard the metaphorical picture of Germany as a detailed group of isles may be painted as opposed to that of only one metropolis with the concentration of all internet power: There most certainly is a group of islands with three or four main isles, where even the most gorgeous island has a few flawed spots and even the third most beautiful island can still call several spectacular sightseeing spots its own. Only the fourth isle (the East of Germany) gives reason to worry – it can hardly compete with the rest.

To a certain extent the results of this study can be considered to be a confirmation of the assumption of a 'broad top' within Germany (Castells, 2003, p. 220). Internet power cannot be reduced to the indicator 'supply of content power', though; if this is done, then the results provided here show a huge advantage of the internet capital and manifestation of wealth, Munich, while Hamburg holds a reduced position and the German Capital, Berlin, finds itself in a rather troublesome position (No. 47 in the economical and social ranking, No. 20 in the internet ranking). The expressly small regional differentiations of internet power in Germany claimed by TNS Emnid based on telephone interviews (TNS Emnid & Initiative D 21, 2003, p. 18-19, 21) extremely contradict the reality that was analyzed in detail within this study. The results of a ranking of the involvement of large German cities in the world economy (Taylor, Walker & Beaverstock 2002, p. 100) cannot be confirmed, at least not regarding the German internal position of the cities mentioned. According to the definition of 12 different levels the following cities can be entered on the international hit list: Frankfurt (Level 10), Düsseldorf (Level 6), Hamburg, Munich and Berlin (each Level 4), Cologne and Stuttgart (each 2) as well as Dresden (Level 1). From the German point of view an analysis of the internet power and the economical power offers a totally different picture: Here Munich tops the list in both areas, leaving all other cities far behind, and Berlin (Position 20 regarding internet, Position 47 on the economy) and Dresden (Positions 30 and 36) find themselves rather at the bottom of the list of the 50 largest German cities. The data signals that the grown federal structure in Germany has neither created a distinct innovation center nor a German equivalent of Silicon Valley. But the essential results are that the leading German internet innovation center can be found in the Bavarian Capital and greater area of Munich as well as along the Rhine.

This examination is founded on structural data available based on assessments of each smallest unit (cities in Germany, respectively quarters of the City of Bremen); data related to persons have not been used and, due to the Privacy Act, will not be easy to obtain in the future either, at least not in regard to assessments. To that extent statements on the particulars of use of individual persons are hardly possible. The available data on the transfer volume and online time of single internet access lines indicate (for Germany; not unambiguously in detail for the City of Bremen, however) a surprising phenomena: In internet-strong cities the intensity of use clearly stays below the level of internet-weak cities. On the one hand this shows that the major reason for low internet scores lies in the simple non-participation of many individuals and that the active users in internet-weak cities are even especially active; on the other hand these findings may be evidence of a difference between a rather passive consumptive behavior in internet-weak cities and a rather creative and 'productive' use in the internet-strong cities.

A hypothesis on a correlation of internet power and the importance of the locally present 'creative class', which was developed within the frame of this examination but has not yet been clarified systematically, requires additional investigation – it is a connection Richard Florida was able to prove at least regarding economical power (Florida, 2004a, 2004b, 2005). The situation in East Germany where a particularly high share of highly skilled employees find themselves in an economically difficult region (Lichtblau, 2004, S. 19), is most likely an exception that can be explained historically.

The generally low average values of the cities (48.9%) as well as of the quarters of Bremen (34.2%) invite the assumption of dynamic progress in the future – even though it is unclear whether the existing disparaties will increase (certainly to be expected regarding the economically relevant content production but not necessarily true for the total production and consumption), whether they will even out to a certain degree, or if there will simply be parallel differences on a higher level. It can rather be presumed that the positive and negative enhancing mechanisms drafted by Graham and Marvin (1996, p. 169) will catch and the differences particularly in the economy won't be reduced in the future either; a follow-up study after a certain time lapse might provide greater insights on that issue.

A distinct differentiation also exists between the large German cities concerning the quality of their internet presences and their supply of eGovernment, though the digital contrast is not determined by single factors. Even without great wealth and top scores in internet power cities can offer excellent website presences and interactive eGovernment services. The city states, where state and municipal administration coincide at least in parts, seem to have structural advantages. Even though the websites of the media sites, the largest cities and the cities with economical and internet power, particularly along the River Rhine and in Southern Germany, provide websites that exceed the average, their difference to all other cities is not gigantic. Germany's relatively poor results regarding citizens' participation in contrast to Italy signal the influence of cultural factors that should undergo closer examination within future international studies as well. Progressive developments of the website-city-model already under way have shown that a considerable expansion of quality features of the analysis (e.g. not only the issue of the mere existence of a webcam but also the question of the interactive quality of that provision) will enhance the precision of the results as much as it will increase the empirical work.

During the analyses the restriction to the urban area in question proved to be methodically necessary but also questionable. When examining the city, the focus on the region automatically takes a backseat, and the corresponding distortions do not apply to all cities to the same extent. It is the sentiment of the author (a category for which there is no scientific proof) that there are many companies and enterprises set especially in the greater Munich and Stuttgart areas that are of great importance to the innovative power of those regions but that could not be assessed. A follow-up study should include a greater focus on the regional dimension. The results of this study affirm the findings of an examination of the Year 2000 (Einemann, 2000) that indicate a **particular innovative and internet potential** as well as the **special economical power of four metropolitan regions**: The greater area of Munich in Bavaria, the Frankfurt/Darmstadt/Wiesbaden/Mainz Area with its core region in South Hesse, Düsseldorf/Cologne/Bonn on the Northern Rhine as well as the Stuttgart/Karlsruhe/Heidelberg Region in the State of Baden-Württemberg. The Greater Hamburg Area in the North of Germany is not in a bad position particularly regarding internet production (and economical power), whereas the region around the German Capital Berlin fares poorly. Dortmund, Aachen and Bochum owe their relatively good overall position mainly to their fortitude in the area of consumption; they are not among the top addresses of economical and internet dynamics in Germany.

The diagnosis of a digital contrast with a strong polarization at both ends of the scale applies to the City of Bremen as well as the findings of a social correlation to the internet. The social and digital separation of the geographical level are mirrored in Bremen as well. It features a region (Center-Northeast) dominating the rest, consisting of a section of the approximate average level (South) and three areas far below the average (North, West, Southeast), whereby the North Section does not even have one single highlight to show for. These results are based on the examination of private individuals; the large number of companies in the city center would enhance but also distort the picture of the centralization – as Zook (2005a) found out for San Francisco and New York by means of a few indicators (p. 32).

The design of this study and the decisions regarding the weighting (reduced impact of frame conditions and governmental activities) resulted in neglecting an examination of the role internet politics play in Germany. For that purpose it would be important to view all levels that also play a local role in the end. Besides municipal politics this also involves federal politics and particularly state politics – after all the state capitals are the places where many decisions concerning the state are being made and realized. An impression of the relevance of that situation was gained during the search for explanations of the different qualities of municipal websites that showed that the city states are leading when it comes to city websites.

For the future it would be desirable if a broader data base were available and if leading corporations in the internet market, such as providers, search engines, mail-order stores, banks, logistics enterprises and other large internet companies were to provide their data. Essential additional insights could be gained with the aid of an international comparative study on a broader empirical basis.

Appendix

1. Internet city ranking for Germany
2. Internet quarter ranking for the City of Bremen
3. City website ranking for Germany
4. Checklist and Model internet-website-ranking
5. The level of wealth of German cities (ranking)

APPENDIX 1: Internet city ranking for Germany

		Production	Consumption	Frame	Total	Index
1	**Munich**	82.7	84.6	53.4	**81.9**	**167.5**
2	**Karlsruhe**	67.7	84.3	63.1	**73.2**	**149.8**
3	**Bonn**	70.3	70.5	35.6	**68.6**	**140.3**
4	**Frankfurt**	56.5	77.1	42.8	**63.0**	**128.7**
5	**Aachen**	42.7	89.6	51.6	**59.6**	**121.8**
6	**Düsseldorf**	54.2	71.3	27.2	**58.8**	**120.3**
7	**Cologne**	61.2	84.2	27.0	**57.9**	**118.5**
8	**Mainz**	45.1	55.4	28.5	**57.4**	**117.5**
9	**Dortmund**	36.4	93.6	34.7	**56.3**	**115.1**
10	**Münster**	46.2	73.6	14.8	**54.2**	**110.8**
11	**Stuttgart**	45.9	71.6	30.0	**54.1**	**110.6**
12	**Hamburg**	56.3	53.1	34.1	**54.0**	**110.5**
13	**Wiesbaden**	45.3	68.2	25.0	**52.3**	**106.9**
14	**Hanover**	46.5	66.7	18.0	**52.1**	**106.5**
15	**Bochum**	37.9	78.4	16.2	**51.0**	**104.2**
16	**Freiburg**	40.8	67.9	47.9	**50.6**	**103.5**
17	**Braunschweig**	39.7	71.0	36.9	**50.5**	**103.3**
18	**Kiel**	42.1	65.7	23.2	**49.4**	**101.1**
19	**Augsburg**	44.4	56.0	49.1	**48.7**	**99.6**
20	**Berlin**	38.0	68.5	24.0	**47.9**	**98.0**
21	**Mönchengladbach**	38.1	61.4	7.8	**47.0**	**96.2**
22	**Saarbrücken**	38.0	66.5	55.2	**46.5**	**95.1**
23	**Nuremberg**	41.8	56.5	32.7	**46.5**	**95.0**
24	**Oldenburg**	35.9	62.5	43.6	**45.6**	**93.2**
25	**Osnabrück**	47.9	63.4	18.6	**44.7**	**91.3**
26	**Mannheim**	35.4	42.8	25.8	**44.6**	**91.2**
27	**Essen**	33.4	64.8	16.5	**43.6**	**89.1**
28	**Bielefeld**	32.4	61.6	24.1	**42.2**	**86.3**
29	**Krefeld**	34.3	60.1	8.9	**42.0**	**85.9**
30	**Dresden**	33.0	56.2	36.6	**41.3**	**84.4**
31	**Bremen**	33.6	53.0	24.3	**39.9**	**81.6**
32	**Kassel**	31.2	58.0	16.1	**39.8**	**81.4**
33	**Wuppertal**	33.6	54.0	1.3	**39.1**	**79.9**
34	**Oberhausen**	27.5	53.8	1.1	**36.9**	**75.5**
35	**Solingen**	30.0	54.9	2.7	**35.8**	**73.1**
36	**Duisburg**	24.2	57.7	13.9	**35.4**	**72.4**
37	**Leipzig**	30.2	44.7	26.3	**35.1**	**71.8**
38	**Lübeck**	29.2	46.5	17.6	**34.7**	**70.9**
39	**Gelsenkirchen**	22.4	58.8	11.5	**34.6**	**70.7**
40	**Ludwigshafen**	22.8	58.2	2.9	**34.2**	**69.9**

		Production	Consumption	Frame	Total	Index
41	**Leverkusen**	25.5	52.0	7.5	**33.9**	**69.3**
42	**Erfurt**	26.4	44.5	29.7	**32.9**	**67.3**
43	**Hamm**	19.9	55.8	6.2	**31.8**	**65.0**
44	**Herne**	18.7	56.5	6.4	**31.3**	**64.0**
45	**Magdeburg**	27.0	40.0	19.3	**31.2**	**63.8**
46	**Rostock**	23.1	42.1	15.9	**29.4**	**60.1**
47	**Chemnitz**	25.5	37.5	16.4	**29.2**	**59.7**
48	**Hagen**	19.4	43.4	16.7	**27.7**	**56.6**
49	**Halle**	20.5	38.7	15.7	**26.6**	**54.4**
50	**Mülheim**	22.8	15.0	14.6	**19.6**	**40.1**
	Total	**42.4**	**63.4**	**26.0**	**48.9**	**100.0**

APPENDIX 2: Internet quarter ranking for the City of Bremen

		Access	Domain	e-mail	Volume	Online time	Total
		Scores	Scores	Scores	Scores	Scores	weighted
1	**Altstadt**	55.1	57.8	100.0	69.2	91.7	**73.3**
2	**Barkhof**	71.1	67.5	53.9	64.9	100.0	**68.8**
3	**Ostertor**	65.3	51.4	63.5	78.7	80.2	**64.9**
4	**Oberneuland**	75.0	100.0	32.4	36.7	62.9	**64.3**
5	**Bürgerpark**	62.0	65.5	46.5	66.4	68.7	**60.4**
6	**Steintor**	46.3	45.7	70.3	54.7	75.7	**56.9**
7	**Fesenfeld**	55.4	35.9	60.6	47.8	69.7	**52.7**
8	**Gete**	59.3	31.2	42.4	64.5	79.3	**51.2**
9	**Buntentor**	44.9	33.2	54.4	57.8	84.7	**50.9**
10	**Hohentor**	44.7	16.0	52.1	100.0	76.0	**50.2**
11	**Peterswerder**	52.9	42.1	51.8	39.2	63.7	**49.6**
12	**Alte Neustadt**	43.8	24.0	57.5	76.1	60.4	**48.4**
13	**Borgfeld**	100.0	20.8	28.5	25.8	58.1	**47.8**
14	**Südervorstadt**	47.6	20.2	53.9	63.1	70.5	**47.1**
15	**Neustadt**	47.2	27.2	54.1	56.6	62.0	**46.9**
16	**Bahnhofsvorstadt**	38.6	25.9	61.4	65.6	48.3	**45.7**
17	**Schwachhausen**	58.3	36.7	57.0	13.6	45.9	**45.4**
18	**Regensburger Straße**	45.7	20.2	40.9	68.1	77.1	**44.9**
19	**Findorff-Bürgerweide**	41.8	31.1	47.5	36.0	76.9	**44.2**
20	**Lehe**	49.9	32.7	56.0	33.9	42.0	**44.1**
21	**Lehesterdeich**	74.2	20.9	34.2	38.1	54.5	**43.9**
22	**Radio Bremen**	57.6	21.4	37.9	45.3	68.8	**43.5**
23	**Horn**	52.6	43.9	32.4	50.3	35.3	**42.9**
24	**Arsten**	78.6	15.2	25.0	45.5	50.4	**41.7**
25	**Hulsberg**	39.5	27.9	37.9	54.9	56.0	**40.2**
26	**Hastedt**	42.0	25.1	38.3	53.3	43.6	**38.5**
27	**Neu-Schwachhausen**	35.5	39.4	37.5	37.8	39.4	**37.7**
28	**Weidedamm**	58.0	18.5	34.8	31.1	40.2	**36.7**
29	**Mahndorf**	52.8	12.3	31.1	60.0	36.7	**36.1**
30	**Neuenland**	33.9	23.5	59.9	12.6	40.7	**36.0**
31	**Habenhausen**	61.6	13.8	34.2	24.8	43.7	**36.0**
32	**Riensberg**	49.9	16.3	34.3	28.6	55.3	**35.6**
33	**Westend**	36.4	13.0	37.1	47.2	60.5	**35.1**
34	**Hemelingen**	42.5	15.1	33.1	48.4	49.3	**34.9**
35	**Walle**	32.2	16.9	33.4	62.6	45.6	**34.1**
36	**Kattenesch**	49.2	13.7	25.7	47.5	48.3	**34.1**
37	**Rönnebeck**	33.4	12.0	25.0	76.7	55.1	**34.1**
38	**Arbergen**	50.3	20.2	28.4	25.6	43.4	**33.4**

		Access	Domain	e-mail	Volume	Online time	Total
		Scores	Scores	Scores	Scores	Scores	weighted
39	**Gartenstadt Süd**	27.7	18.8	30.2	61.7	48.1	**32.9**
40	**Neue Vahr Nord**	35.9	40.0	20.6	39.8	29.7	**32.8**
41	**Lesum**	39.4	15.9	28.1	51.0	37.3	**31.9**
42	**Osterholz**	49.2	12.5	31.8	31.0	32.5	**31.3**
43	**Neue Vahr Südost**	35.6	8.6	21.4	79.3	36.9	**30.9**
44	**Sebaldsbrück**	33.1	20.2	29.9	47.0	32.7	**30.8**
45	**Schönebeck**	45.3	17.3	26.7	20.9	33.5	**29.1**
46	**Osterfeuerberg**	27.8	17.0	32.6	29.6	39.1	**28.0**
47	**Steffensweg**	27.4	15.3	31.1	28.8	43.9	**27.6**
48	**Huckelriede**	37.0	16.2	35.5	16.4	26.1	**27.5**
49	**Vegesack**	32.2	19.3	31.5	27.1	21.9	**26.9**
50	**Lüssum-Bockhorn**	31.4	6.6	23.0	62.5	28.4	**26.6**
51	**Gartenstadt Vahr**	30.0	14.9	29.1	23.6	40.9	**26.6**
52	**Woltmershausen**	30.4	14.8	30.8	24.8	34.9	**26.5**
53	**St. Magnus**	40.6	10.1	27.6	18.9	35.8	**26.4**
54	**Mittelshuchting**	36.4	14.1	23.2	36.3	26.9	**26.3**
55	**Neue Vahr Südwest**	33.5	8.1	23.5	34.5	39.9	**25.6**
56	**Grolland**	47.6	9.4	21.9	17.6	27.8	**25.4**
57	**Rekum**	45.9	7.9	24.8	16.2	23.3	**24.6**
58	**Kattenturm**	33.7	8.5	26.5	33.7	21.3	**24.0**
59	**Gröpelingen**	26.9	13.3	22.4	23.8	30.9	**22.5**
60	**Utbremen**	32.8	11.1	25.7	17.3	22.1	**22.3**
61	**Oslebshausen**	34.2	8.0	26.0	18.1	22.7	**22.1**
62	**Blumenthal**	26.3	8.1	24.3	32.8	26.7	**22.1**
63	**Grohn**	29.4	11.6	23.0	17.9	26.4	**21.5**
64	**Fähr-Lobbendorf**	15.2	8.4	25.6	50.9	17.2	**20.8**
65	**Burgdamm**	26.2	6.4	25.2	23.5	25.2	**20.5**
66	**Sodenmatt**	27.0	8.0	25.1	26.4	15.6	**20.3**
67	**Rablinghausen**	33.5	11.5	21.3	5.9	18.2	**19.6**
68	**Kirchhuchting**	29.2	13.3	25.0	5.4	15.5	**19.5**
69	**Ellenerbrok- Scheve-moor**	30.8	7.8	21.4	14.7	18.5	**19.2**
70	**Ellener Feld**	26.2	11.3	22.4	2.4	16.8	**17.4**
71	**Tenever**	22.4	13.2	19.1	13.3	15.5	**17.3**
72	**Hohweg**	13.5	3.9	43.7	8.3	7.2	**17.2**
73	**Au-mund-Hammersbeck**	21.6	5.9	24.6	8.8	21.9	**16.9**
74	**Blockdiek**	23.3	6.0	20.4	14.4	17.4	**16.4**
75	**Lindenhof**	13.9	4.9	24.3	8.5	10.1	**13.1**
	Total	**41.3**	**21.0**	**34.0**	**38.8**	**42.0**	**34.2**

APPENDIX 3: City website ranking for Germany

Ranking	City	eGovernment	Interactivity	Total	Total_index
1	**Bremen**	77.9	75.4	84.2	**146.4**
2	**Hamburg**	77.2	72.3	83.1	**144.5**
3	**Stuttgart**	69.8	68.5	75.8	**131.8**
4	**Düsseldorf**	72.5	68.5	73.8	**128.3**
5	**Magdeburg**	61.1	56.9	72.3	**125.7**
6	**Karlsruhe**	69.8	63.1	70.0	**121.7**
7	**Berlin**	59.7	55.4	69.2	**120.3**
8	**Dortmund**	69.8	61.5	68.8	**119.7**
9	**Munich**	66.4	58.5	68.1	**118.4**
10	**Cologne**	72.5	56.9	67.3	**117.0**
10	**Mainz**	63.1	58.5	67.3	**117.0**
12	**Braunschweig**	53.7	52.3	65.8	**114.4**
12	**Nuremberg**	59.1	55.4	65.8	**114.4**
14	**Bochum**	57.1	45.4	64.6	**112.3**
15	**Wuppertal**	57.7	51.5	64.2	**111.7**
16	**Mannheim**	61.1	56.9	63.1	**109.7**
17	**Essen**	55.0	50.8	62.7	**109.0**
18	**Wiesbaden**	51.7	55.4	61.5	**107.0**
19	**Münster**	55.0	50.8	60.4	**105.0**
20	**Augsburg**	51.7	46.9	60.0	**104.3**
21	**Krefeld**	57.7	55.4	59.6	**103.7**
22	**Bonn**	60.4	55.4	59.2	**103.0**
23	**Saarbrücken**	45.0	41.5	56.9	**99.0**
24	**Leipzig**	40.9	49.2	56.5	**98.3**
25	**Kassel**	40.3	43.1	56.2	**97.7**
26	**Mülheim**	44.3	47.7	55.8	**97.0**
27	**Frankfurt/Main**	49.0	40.0	55.4	**96.3**
28	**Osnabrück**	55.7	53.1	54.2	**94.3**
29	**Chemnitz**	45.0	34.6	53.8	**93.6**
29	**Hanover**	40.9	33.9	53.8	**93.6**
29	**Mönchengladbach**	38.9	32.3	53.8	**93.6**
32	**Hagen**	47.0	43.9	53.5	**93.0**
33	**Bielefeld**	39.6	43.1	53.1	**92.3**
34	**Aachen**	48.3	36.2	51.9	**90.3**
34	**Dresden**	40.9	36.9	51.9	**90.3**
34	**Ludwigshafen**	45.0	40.0	51.9	**90.3**
37	**Oldenburg**	44.3	38.5	50.8	**88.3**
38	**Halle/Saale**	38.3	44.6	50.4	**87.7**
38	**Oberhausen**	47.0	41.5	50.4	**87.7**

Ranking	City	eGovernment	Interactivity	Total	Total_index
40	**Erfurt**	45.0	38.5	50.0	**87.0**
41	**Duisburg**	42.3	38.5	49.2	**85.6**
42	**Freiburg**	39.6	36.2	46.2	**80.3**
43	**Rostock**	36.2	24.6	45.8	**79.7**
44	**Leverkusen**	36.9	32.3	44.6	**77.6**
45	**Hamm**	38.3	29.2	43.8	**76.2**
46	**Herne**	43.6	29.2	43.5	**75.7**
47	**Solingen**	30.2	24.6	41.2	**71.7**
48	**Gelsenkirchen**	25.5	33.1	40.8	**71.0**
49	**Kiel**	36.9	23.1	39.2	**68.2**
50	**Lübeck**	19.5	23.1	36.9	**64.2**
	Total	**50.1**	**46.1**	**57.5**	**100.0**

APPENDIX 4: Checklist and Model internet-website-ranking

	Indicator	Scores	Weight	Max.	Interactive	eGov
I	**Public service, online administration**					
	59 Indicators, share: 40% (38.8)					
1	**Public service**					
1	Registration (Vital Statistics)					
1.1	Address/telephone number	1	1	1		x
1.2	Duties/service information	1	2	2		x
1.3	Business hours	1	1	1		x
1.4	e-mail contact	1	2	2	x	x
1.5	Forms to download	1	2	2	x	x
1.6	Forms to submit electronically	1	3	3	x	x
2	Internal Revenue Services					
2.1	Address/telephone number	1	1	1		x
2.2	Duties/service information	1	2	2		x
2.3	Business hours	1	1	1		x
2.4	e-mail contact	1	2	2	x	x
2.5	Forms to download	1	2	2	x	x
2.6	Forms to submit electronically	1	3	3	x	x
3	Building Authority					
3.1	Address/telephone number	1	1	1		x
3.2	Duties/service information	1	1	1		x
3.3	e-mail contact	1	2	2	x	x
3.4	Forms to download	1	2	2	x	x
3.5	Forms tosubmit electronically	1	3	3	x	x
3.6	Online check on processing status	1	3	3	x	x
4	Vehicle Registration					
4.1	Address/telephone number	1	1	1		x
4.2	Duties/service information	1	2	2		x
4.3	Business hours	1	1	1		x
4.4	e-mail contact	1	2	2	x	x
4.5	Forms to download	1	2	2	x	x
4.6	Forms to submit electronically	1	3	3	x	x
4.7	Vanity plates	1	3	3	x	x
5	Waste Management	1	1	1		x
5.1	Forms to download	1	2	2	x	x
5.2	Online change of container size	1	3	3	x	x
6	Health Authority					
6.1	Address/telephone number	1	1	1		x
6.2	Duties/service information	1	2	2		x

	Indicator	Scores	Weight	Max.	Interactive	eGov
6.3	Business hours	1	1	1		x
6.4	e-mail contact	1	2	2	x	x
7	Youth Welfare Office					
7.1	Address/Telephone number	1	1	1		x
7.2	Duties/service information	1	2	2		x
7.3	Business hours	1	1	1		x
7.4	e-mail contact	1	2	2	x	x
8	Welfare Office					
8.1	Address/telephone number	1	1	1		x
8.2	Duties/service information	1	2	2		x
8.3	Business hours	1	1	1		x
8.4	e-mail contact	1	2	2	x	x
9	Education facilities					
9.1	Addresses and telephone numbers	1	1	1		x
9.2	Link to the education facilities	1	1	1		x
10	Environmental Office					
10.1	Address/telephone number	1	1	1		x
10.2	Duties/service information	1	2	2		x
10.3	Business hours	1	1	1		x
10.4	e-mail contact	1	2	2	x	x
10.5	Online environmental information	1	3	3		x
11	Courts					
11.1	Address and telephone number	1	1	1		x
11.2	Presentation of courts	1	2	2		x
2	**Economy**					
1.1	Presentation of location	1	1	1		x
1.2	Commercial sites	1	1	1		x
1.3	Traffic and public transportation	1	1	1		x
1.4	Information on establishing a new business	1	1	1		x
1.5	Address/phone support of industry & trade	1	1	1		x
1.6	e-mail contact support of industry & trade	1	2	2	x	x
1.7	Download of forms	1	2	2	x	x
2.	Public bids	1	1	1		x
2.1	Forms to download	1	2	2	x	x
2.2	Online offers/applications	1	3	3	x	x

	Indicator	Scores	Weight	Max.	Interactive	eGov
II	**Information on city and tourism**					
	27 Indicators, share: 15% (15.4%)					
3	**City information**					
1	Presentation of the city	1	1	1		
2	Statistics on the city	1	1	1		
3	Current topics in the city	1	1	1		
4	Links to local newspaper(s)	1	1	1		
5	City map	1	1	1		
5.1	Street search	2	2	4	x	
6	Public transportation (link)	1	1	1		
6.1	Bus/train schedules/route planner	2	2	4	x	
4	**Tourism**					
7	History of the city	1	1	1		
8	Sightseeing	1	1	1		
9	Tourist Center					
9.1	Address/telephone number	1	1	1		
9.2	Business hours	1	1	1		
9.3	e-mail contact to Tourist Center	1	2	2	x	
9.4	Download of information	1	2	2	x	
9.5	Ordering of leaflets	1	2	2	x	
10	Webcam	1	1	1		
11	Picture gallery	1	1	1		
12	Panoramas (pictures, VR, video)	1	1	1		
13	Weather forecast	1	1	1		
14	Bars/clubs	1	1	1		
15	Shopping: centers, districts	1	1	1		
16	Listing of hotels	1	1	1		
16.1	Search for price level/stars	1	2	2	x	
16.2	Search for location/district/address	1	2	2	x	
17	Listing of restaurants	1	1	1		
17.1	Search for specialty restaurants	1	2	2	x	
17.2	Search for location/district/address	1	2	2	x	
III	**Politics, citizens' participation**					
	19 Indicators; 12.5% (11.5%)					
5	**Political communication**					
1	Information on mayor	1	1	1		x
1.1	Address and telephone number	1	1	1		x
1.2	e-mail contact	1	2	2	x	x

	Indicator	Scores	Weight	Max.	Interactive	eGov
2	Municipal gov't. (heads of departments)	1	1	1		x
2.1	Address and telephone number	1	1	1		x
2.2	e-mail contact	1	2	2	x	x
3	Public Relations					
3.1	Address and telephone number	1	1	1		x
3.2	Current online press releases	1	1	1		x
3.3	e-mail contact	1	2	2	x	x
4	City Council/Parliament	1	1	1		x
4.1	Link to represented parties	1	1	1		x
4.2	of City Parliament	1	1	1		x
4.3	Information on meetings	1	1	1		x
4.4	Current minutes and decisions	1	3	3		x
4.5	Committees	1	1	1		x
5	Current budget online	1	1	1		x
6	Public vacancies offered by city	1	1	1		x
7	Forums/online participation	2	3	6	x	x
8	Chat	1	2	2	x	x
IV	**Important links**					
	25 Indicators; 12.5% (12.7%)					
6	**Cultural facilities**					
1	Information on events	1	2	2		
2	Calendar of events w/search	2	2	4	x	
3	Movies	1	1	1		
4	Theater / opera / musicals	1	1	1		
5	Museums	1	1	1		
6	Public libraries	1	1	1		
7	Sports events	1	1	1		
8	Tickets online	2	2	4	x	
7	**Health facilities**					
9	Hospitals					
9.1	Addresses/telephone numbers	1	1	1		
9.2	Presentation of facility	1	2	2		
10	Medical drugstores					
10.1	Addresses/telephone numbers	1	1	1		
10.2	Divided according to location/district	1	1	1		
11	Listing of physicians					
11.1	Addresses/telephone numbers	1	1	1		
11.2	Divided according to medical fields	1	1	1		

	Indicator	Scores	Weight	Max.	Interactive	eGov
11.3	Divided according to location/district	1	1	1		
12	Nursing care	1	1	1		
13	Emergency services (nights/wee-kends)	1	1	1		
13.1	Physicians-on-call	1	1	1		
13.2	Medical drugstores	1	1	1		
8	**Additional links**					
14	Nearest airport	1	1	1		
15	Police Department	1	1	1		
16	Fire Department	1	1	1		
17	Associations/NPO	1	1	1		
18	Yellow Pages	1	1	1		
19	Public Employment Office	1	1	1		
V	**Usability**					
	9 Indicators; 20% (21.5%)					
9	**Usability**					
1	Menu guide	2	3	6		
2	Navigation	3	4	12		
3	Design of page	1	2	2		
4	Reaction time	1	2	2		
5	Free search	3	4	12	**x**	
6	Sitemap	1	2	2		
7	Multilingual	1	2	2		
8	Form server	3	4	12	**x**	**x**
9	Relocation/special life situations	3	2	6	**x**	**x**
	139 Indicators, maximum scores			**260**	**130**	**149**

APPENDIX 5: The level of wealth of German cities (ranking)

City	Ranking	Scores
Munich	1	77.9
Stuttgart	2	67.7
Frankfurt/Main	3	67.0
Düsseldorf	4	65.0
Mainz	5	64.6
Wiesbaden	6	63.2
Leverkusen	7	61.4
Karlsruhe	8	60.9
Augsburg	9	58.8
Hamburg	10	58.3
Münster	11	57.9
Nuremberg	12	57.3
Cologne	13	56.8
Mülheim/Ruhr	14	56.1
Bonn	15	55.4
Solingen	16	55.2
Ludwigshafen	17	55.1
Mannheim	18	54.5
Hanover	19	53.4
Wuppertal	20	52.2
Essen	21	51.9
Braunschweig	22	51.6
Bielefeld	23	51.3
Hagen	24	49.9
Freiburg	25	49.7
Aachen	26	49.7
Mönchengladbach	27	49.1
Oberhausen	28	48.7
Krefeld	29	48.7
Osnabrück	30	48.5
Bochum	31	47.8
Bremen	32	47.5
Oldenburg	33	46.5
Kiel	34	45.1
Dortmund	35	44.5
Dresden	36	43.7
Duisburg	37	43.7
Saarbrücken	38	43.4
Hamm	39	42.1
Lübeck	40	41.8

City	Ranking	Scores
Kassel	41	39.9
Gelsenkirchen	42	39.2
Erfurt	43	37.4
Herne	44	37.4
Chemnitz	45	36.4
Rostock	46	36.1
Berlin	47	34.3
Magdeburg	48	33.8
Leipzig	49	31.8
Halle (Saale)	50	29.0

Source: Lichtblau 2004, p. 7

Tables

Figures

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