SOCIETÀ GEOGRAFICA ITALIANA

VILLA CELIMONTANA
Home of Geography

IGU
UGI

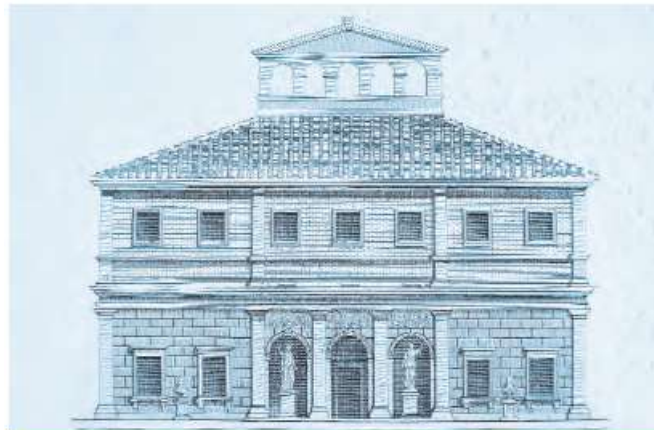Commissione IGU International
Geographical Union
'Geografia della Società dell'Informazione'

GEOGRAPHY OF INFORMATION SOCIETY
New contributions and directions

INTERNATIONAL WORKSHOP

Roma
martedì, 20 febbraio 2007

Aula "Giuseppe Dalla Vedova"
Palazzetto Mattei in Villa Celimontana
Via della Navicella, 12

Large Cities and digital divide in Germany

Edgar Einemann[1]

The internet situation in Germany is investigated based on several initial questions:
- How does the internet power differ; is there a digital divide?
- Can a concentration of internet power be found in a metropolis?
- Which cities and regions show what internet power?
- Does the internet power show an economical and social connection?

The work contributes to the empirical research of internet development and internet economy, with special consideration of the cities.

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.

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.

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 suppliers in Germany accepted the compilation and publication of their media data by the IVW (Information Association for the Determination of the Circulation of Advertisement). 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

---

[1] Hochschule Bremerhaven, Germany, edgar@einemann.de, www.einemann.de

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 municipal government.

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 billion of the 53 million registered **pageviews of meinestadt.de (12)** in June of 2003 concerned internet addresses in the 50 largest cities. 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.

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).

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.

1.3. 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?).

2. Findings

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 1: Average values per indicator

(1) Domains DENIC	56.2		**(14) Access DSL**	63.2
(2) Domains 1&1	39.7		**(15) e-mail addresses**	71.9
(3) Homepage Catalog	56.2		**(16) Online accounts**	80.8
(4) Active Domains	55.4		**(17) Stock market Online**	45.4
(5) Product_suppliers	24.3		**(18) Transfer volume**	56.7
(6) Content supplier IVW	24.2		**(19) User time**	59.5
(7) Car sellers	61.7		Total_consumption	63.4
(8) Webshops	47.8		**(20) New Market**	22.6
(9) Auctions	42.3		**(21) Professors CS**	24.0
(10) CityWebsite	57.6		**(22) StudentsCS**	24.8
(11) Pageviews IVW	19.1		**(23-26) Companies active**	26.5
(12 Pageviews meinestadt	56.5		**(27) DMMV**	5.2
(13) Pageviews 1&1	40.8		**(28-29) Government active**	13.0
Total_production	42.4		**(30) Evaluation**	76.0
			Frame_total	26.0
Total	48.9			

Innovation centres 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.
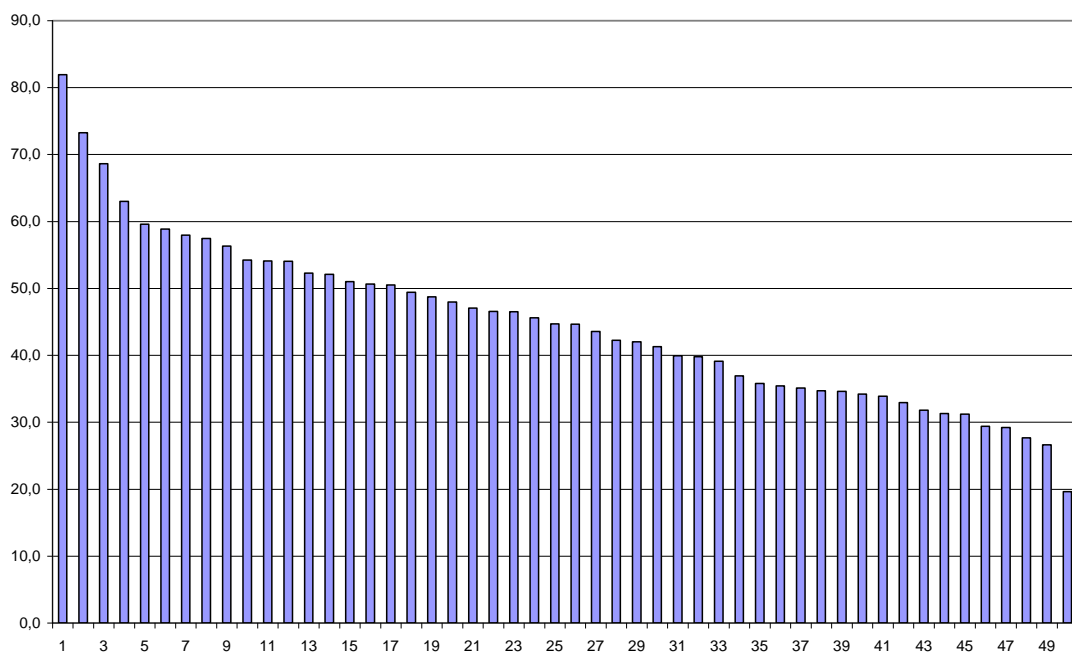
There is a digital differentiation between the large German cities in the sense of a digital contrast with polarizations (digital divides) between the strongest and the weakest cities at both ends of the scale. That result applies to the sector of production, consumption and frame conditions as well as to the different players companies, private individuals and government. If all cities claimed 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%, Muelheim is at the bottom with 19.6%. 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, Muelheim) or in the East of the Republic (Erfurt, Magdeburg, Rostock, Chemnitz, Halle).

Table 2: Internet position of the large German cities

		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**

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 1: Internet position of the 50 largest German cities

The findings also apply – with slight deviations – to the detail 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 home pages) don't 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 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 economic and social position of the city and its internet position. The correlation is obvious: The socio-economical and the digital contrast show a comparable differentiation. The findings apply to the sectors of production, consumption and frame conditions as well as to the different players companies, private individuals and government.

Table 3: Correlation between internet power and economical power in Germany

		Internet pos.	Economic pos.
Internet pos.	**Correlation according to Pearson**	1	.653(**)
	Significance (2-sided)		.000
	N	50	50
Economic pos.	**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).

The dependence of the internet power from 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 centre is 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 in relation to the economy as well as the internet. An exclusive look at the poles (for instance a comparison between Munich and Muelheim, respectively Halle) shows dramatic 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.

References:

Castells, M. (2003). *The Internet Galaxy*. Oxford/New York: Oxford University Press.

Einemann, E. (1997). Global Trends and Regional Strategies. Available from http://www.einemann.de

Einemann, E. (2006). *The Internet in Germany*. Marburg: Schueren.

Florida, R. (2004). *The Rise of the Creative Class*. New York: Basis Books.

Florida, R. (2005). *Cities and the Creative Class*. New York, London: Routledge.

Graham, S. & Marvin, S. (1996). Telecommunications and the City. New York: Routledge.

Graham, S. (ed.). (2004). *The Cybercities Reader*. London, New York: Routledge.

Kellerman A. (2002). *The Internet on Earth. A Geography of Information*. Chichester: Wiley.

Lichtblau, K (2004). *Deutsche Großstädte im Vergleich*. On 4/24/2004 available from http://www.wiwo.de/staedte

Mitchell, W. (2003). *ME ++: The cyborg self and the networked city*. Cambridge/MA, London: MIT Press.

Sassen, S. (ed.). (2002). *Global Networks – Linked Cities*. New York, London: Routledge.

Taylor, P. J., Walker, D. R. F. & Beaverstock, J.V. (2002). Firms and Their Global Service Networks.
    In: S. Sassen (ed.). (2002). *Global Networks – Linked Cities*. New York, London: Routledge.

Wilson M. & Corey K. (ed.). (2000). *Information Tectonics*. Chicester: Wiley.

Zook, M. (2005). *The Geography of the Internet Industry*. Malden/MA and Oxford: Blackwell.