Does vicinity loose significance through telecommunication? - a glance at our future mobility

1. Basic considerations

To conquer distances – virtually or physically – is a lifelong dream of humanity, which reflects in many symbols, such as the seven league boots, the first step of man on the moon or the internet. At first glance, all of these symbols imply a liberation from natural chains – but the more we get used to them or when looking more closely, we usually also discover a certain ambivalence, which may take years or even decades to become apparent.

This ambivalence appears again, when we try to understand human dreams of mobility in past periods of time and – based on the objective perspective of science – start to build a future forecast on this basis. Forecasts are often seen as a means of planning an ideal, balanced situation which is then expected to remain stable over time in the given form. This however is not what happens in reality, because any stability observed in traffic volumes is based on compensations taking place within the collective. Due to the huge number of mobile persons, this repeatedly leads to similar load factors. Medium term, we can already observe individual reactions to collective peak loads (e.g. by avoiding traffic congestion). On a long term basis we can assume that changes happen in inert processes and that understanding these would considerably help setting up forecasts.

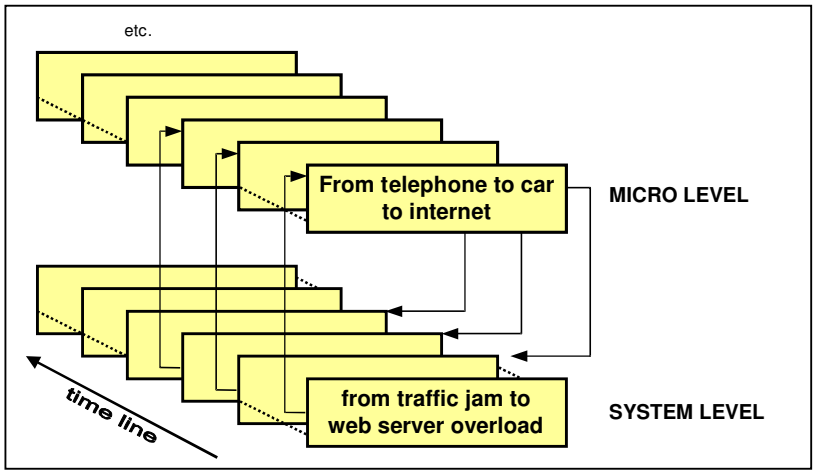

figure 1: transport planning as a process

To better understand these processes it is helpful to distinguish between longitudinal surveys (surveys of one element (individual, car etc) over time) and cross sectional surveys (measuring aggregated values of several elements at one time). Cross sectional counts, registration of licence plates and other snap-shot methods are some examples for cross sectional methods, while household surveys (sometimes) or panel surveys (longitudinal surveys) aim at observing the whole process (see figure 1). Ideally, longitudinal surveys of many elements over long periods of time would lead to a complete separation of intra-personal variances from interpersonal variances. (Question: If each day a 20 % of public transport users are monitored, this does not make clear whether they are the same users every day (20 % of the population who always use public transport) or a variety of different users (a 20 % of all persons using public transport).

2. An empirical view at some individual strategies to conquer distances

To take a look at our future mobility, we therefore need this basic longitudinal data that is able to show up developments, processes and dependencies between causes and effects. Cross-sectional surveys that give a snapshot of a given moment are not applicable in this context. Only a series of snapshots (such as the KONTIV-surveys) allows us to at least document the changes between two given moments. Panel survey methods are more adapt to show processes and developments, as they repeatedly survey the same units in the same sample population. Thus the observed changes can be related to the developments of the framework factors influencing them. As a consequence, this method shows changes in the behaviour of individuals. When we learn about the directions and extents of these changes, demand developments become clearer.

One method for measurement and observation with these characteristics has been established in transportation sciences since 1994. The so-called German Mobility Panel (MOP) (see www.mobilitaetspanel.de), sponsored by the Federal Ministry of Transport, Building and Urban Affairs[1], collects annual data from a small representative sample (about 750 households per year) describing their travel behaviour in everyday life. “Travel behaviour in everyday life” usually also includes long-distance travel, if these long distance trips occur within the period of one week covered by the questionnaire. The German Mobility Panel started in 1994 in the old Western German states; since 1999 the survey also includes the new Laender. The empirical approach implies an annual survey on the basis of written questionnaires, asking for household and personal data as well as details on travel behaviour within one week. As a means of control, the MOP is structured as a rotating sample. This means, that a part of the households is newly recruited each year, while an equivalent part of the old households is taken out, so that the representativity of the sample over time is maintained while also avoiding an aging of the sample compared to the total.

2.1 Vicinity

Since starting the survey of the MOP in 1994, a largely constant level of demand has been observed on a macro level. Increases or decreases of traffic volume are within a statistical confidence level and do not suggest an increase of mileage per average German person. The current demand level is around 39 km per person and day. This finding is opposed to the growth rates that we are used to, as well as to the official growth expectations – voiced even among traffic experts – for the near future in Germany.

A comparison of these findings with the findings of other surveys on travel behaviour (KONTIV 76, 82 and 89) shows the following development[2] (see figure 2):

1 The data are property of the Federal Ministry of Transport, Building and Urban Affairs and can be used under certain conditions ((BMVBW, Referat A 40, Postfach 20 01 00, 53170 Bonn)

2 However, the findings of KONTIV 89 impede a sensible analyses of the time series, as this survey still had methodological problems to overcome. See Kunert, Uwe; Kloas, Jutta (1994): Über die Schwierigkeiten Verkehrsverhalten zu messen. Die drei KONTIV-Erhebungen im Vergleich - Teil I, Teil II, in: Verkehr + Technik (47) 1994, Heft 3 und Heft 5.

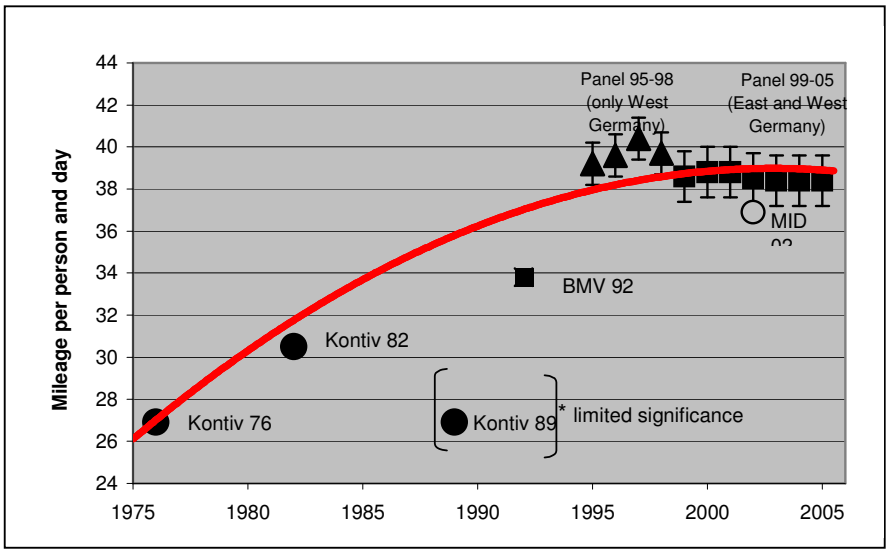

figure 2: mileage per day (source: MOP, Verkehr in Zahlen)

In simple terms, we can observe a more or less continuous growth of mileage throughout the post war years up to about 1990 from about 5 km per person and day (mileage sustainably possible for a pedestrian within a time budget of 1,2 to 1,3 hours per day) to about 39 km per person and day, which represents an eightfold growth. This can be explained mainly by an increase of available income, improvements of the traffic infrastructure and higher travel speed. The time used for travel per person (the so-called time budget) has grown slightly from 1,1 to about 1,3 hours per day. In the early 90s this growth process slowed down considerably and changed to a more or less stagnating development.

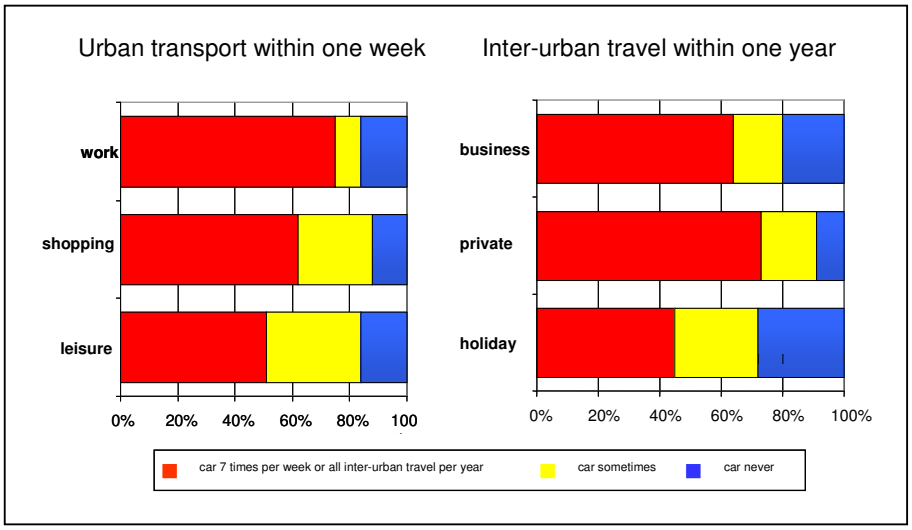

figure 3: non-use of the car by persons with full car availability, by trip purpose

Clearly, important changes of the inner structure of mobility are hidden behind this seemingly stable development. In particular, the use of cars as well as of public transport has initially gone through a monomodal development (*captive drivers* for cars and *captive riders* for public transport), which has then transformed into a much stronger multimodal use of all available modes of transport. Long-term surveys of travel behaviour – in this case one week for urban transport and one year for long-distance travel - help to quantify this effect (see

figure 3). Analysis shows that today about 25 % of persons with full car-availability use other environment-friendly means of transport (public transport, bicycle, walk), even if the car could have been used. Patterns are quite similar for urban transport and long-distance travel.

2.2 Distant destinations

When looking at the various means to conquer distances, it seems fairly obvious to look at them in the order chosen here, insofar as urban transport is predominantly characterized by every-day situations, while inter-urban travel and telecommunication in particular provide more sophisticated tools for an implementation of the dream of the seven league boots. Longitudinal surveys of inter-urban journeys (which were first realized with the project INVERMO[3]) are an indispensable instrument to reveal the internal structures of this market segment, especially as there is an extreme heterogeneity of trip intensities per person.

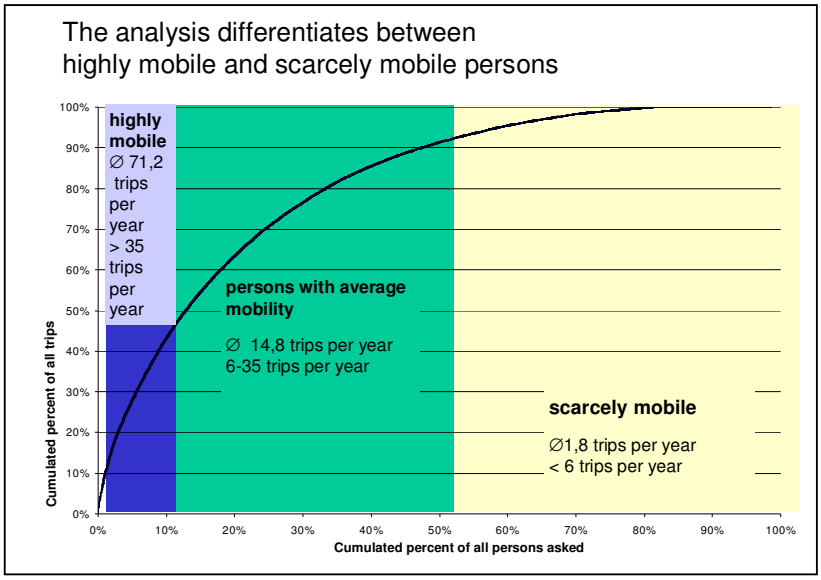

figure 4: heterogenity of trip intensities per person

highly mobile persons
- middle age
- high education level
- income above average
- mostly employed or self-employed

persons with average mobility
- distribution relatively homogenous or average
- more similarities with highly mobile persons

scarcely mobile persons
- predominantly very young or old
- lower or middle education level
- income below average
- often homemakers or retired persons

figure 5: classification of trip makers

[3] INVERMO, Mobility panel for long-distance travel. Project sponsored by BMBF, Bahn AG, Lufthansa AG. Also see http://verkehrspanel.ifv.uni-karlsruhe.de/

Figure 4 shows that about 10 % of the highly and extremely mobile persons conduct 50 % of all long-distance journeys, while on the other end of the scale 50 % of the scarcely mobile persons are responsible for only about 10 % of long distance trips. This shows a distinct classification of trip making following a pattern such as shown in figure 5:

This shows that an equal distribution of mobility chances and thus of mobility in a wider sense is hardly the case in long-distance travel. This pattern becomes even more evident in the following chapter, when dealing with telecommunication as another means to conquer distances.

2.3 Telecommunication

The strong correlation between the process of market penetration of the telephone and the growth of the car market suggests that new telecommunication services belong to the most effective trigger of the process of physically overcoming (long) distances. New telecommunication services can result in more traffic, as they help us to contemplate new and distant destinations (see figure 6).

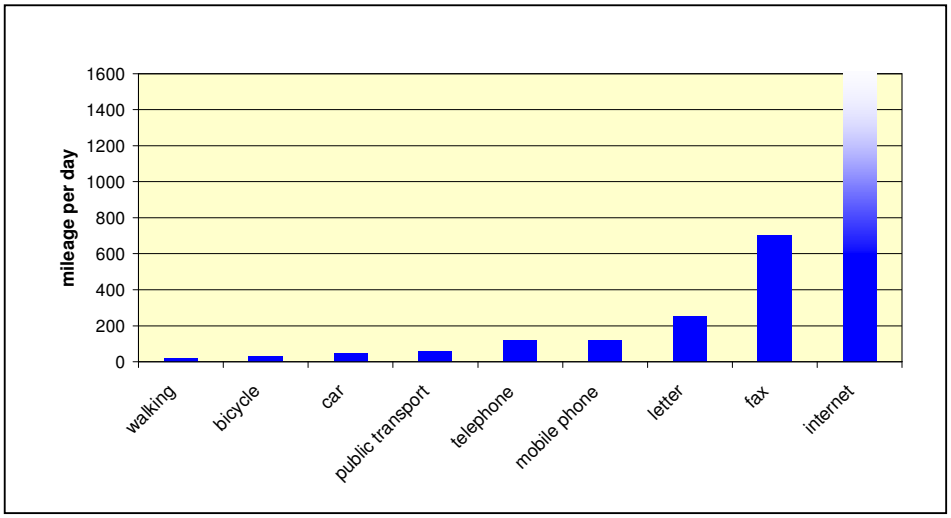

Figure 6: mileage by means of transport and telecommunication

When comparing physical (trips) and virtual (contacts) mobility by profession (figure 7), we can observe a noticeable hierarchy in the sector of physical mobility as to the distances per mobile person per day. This is however much more distinctive in the field of virtual contacts.

From this we can conclude that telecommunication does in fact not lead to a more equal distribution of mobility chances. On the contrary, the different groups and their mobility options show increasing social divide, due in particular to limited access through lacking competences in the field of telecommunication. This is also shown in the structure of combined trip-/contact patterns (figure 8) as well as the temporal distribution of transport- and telecommunication activities (figure 9). Contacts in the day to day activity patters are usually combined with trips between work/school and back home and thus lead to a higher efficiency in the spatiotemporal interaction between activities.

person groups	trips			contacts		
	percentage of non-mobile persons	number of trips per mobile person and day	distance per mobile person and day	percentage of non-mobile persons	number of contacts per mobile person and day	distance per mobile person and day
manager	5,0	4,9	48,7	24,1	7,3	278
worker	7,9	4,6	35,5	30,8	4,8	82
student	4,1	5,3	24,4	30,0	2,6	184
homemaker / unemployed	4,9	4,2	23,7	25,7	2,4	133
retired	7,3	3,9	38,9	33,6	2,1	157
all	5,7	4,6	33,9	29,0	3,8	171

figure 7: use of transport and telecommunication by profession

Nr	trip patterns	employed persons only		
		percentage in all patterns	percentage in activity patterns	associated trip / contact patterns
1	H-W-H	38%	0,6	H-W-H-C H-W-C-H-C
2	H-W-H-L-H	12%	0,5	H-W-C-H-L-H H-W-H-L-H-C
3	H-W-H-S-H	6%	as 1	
4	H-W-H-W-H	4%		
5	H-S-H	3%	0,4	H-S-H-several C
6	H-W-S-H	3%	as 1	
7	H-L-H	3%	0,5	H-L-H-several C
8	H-S-H-L-H	2%	0,4	many patterns with series of contacts to work and home
9	H-W-H-S-H-L-H	1%		
10	H-W-W-W-H	1%		
11	rest	28%	0,4	

H-home, W-work, S-Shopping , L-leisure, C-communication

figure 8: structure of combined trip-/contact patterns

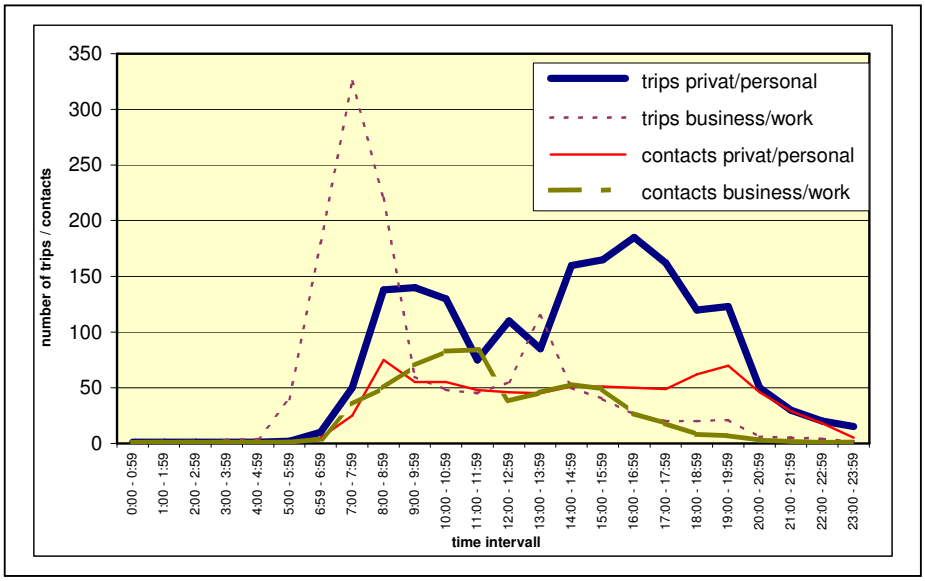

figure 9: temporal distribution of transport and telecommunication activities (weekdays)

How about the effects of telecommunication on the spatial distribution between urban and rural areas? Figure 10 shows the findings of an empirical study of integrated trip- and contact behaviour in Baden-Wuerttemberg/Germany, for a corridor between Stuttgart and the surrounding rural areas. Very simplified, these findings show that the effects of location on the number of contacts are not very large. However increasing urbanity does lead to a slightly decreasing average mileage and a significantly increasing average contact distance.

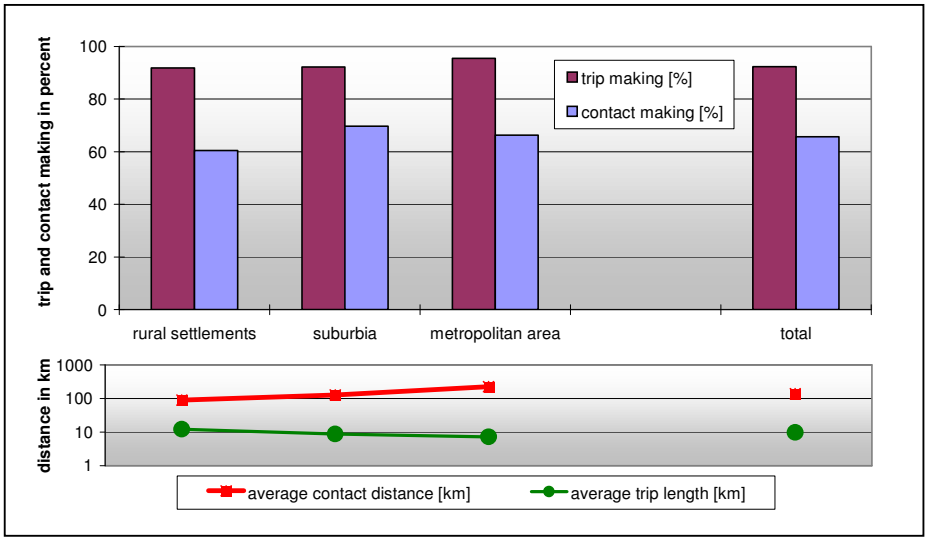

figure 10: basic parameter for travel and contact behaviour

So we can assume that availability of modern telecommunication services does not lead to a further balance of soft factors between urban and rural areas. Possibly it is even inverse – not because of the technical characteristics of these services, which can of course be provided in rural areas in a similar way. But because the population in important urban centers is much more exposed to and thus has a higher qualification and competence in handling modern telecommunication services.

3. Collective consequences

To find an approach to the question “Does vicinity loose significance through telecommunication?”, we now need to transform the picture carved of the spatial behaviour of individuals into a collective pattern. There is a natural area of conflict between individual desires and collective constraints, which leads to a decrease of the individual advantages of new technologies, the more they are used. This process is marked by comparatively large advantages for the first small group of pioneers, followed by a mass movement with average gains and finally taking all of us hostages of our own success. This could be observed for the stagecoach and letter mail as well as for the railroad, the car and the aircraft and is possibly imminent for the telephone and the internet. The cause of such developments usually lies in the fact that each system has it’s own capacity restrictions, which are usually more or less ignored at the beginning, but will be reached sooner or later with increasing demand. This was true for Carl Benz’ first automobile in the same manner as we are experiencing it today with telecommunication, as sporadic mentions of “server overloads” are beginning to be heard.

3.1 Induced demand

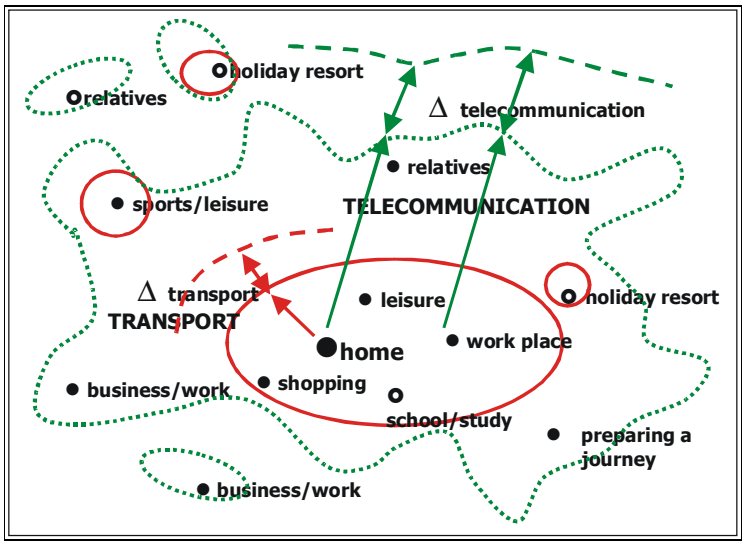

figure 11: cruising radius for transport and telecommunication

Thus we have to acknowledge that strategies to conquer distances never aim at establishing certain balanced situations. They are rather a perpetual process of finding ways how to expand the cruising radius (see figure 11). This applies both to physical transport and to telecommunication, one difference however being that growth rates in the field of telecommunication are currently higher than they could possibly be for physical transport. Chapter 2.1 and 2.2 have shown that this growth process has already happened for physical transport. This view also shows that it is an illusion to hope for compensations between physical transport and telecommunication as a means to relieve our traffic infrastructure, because this is not what is happening in reality. Instead it is highly likely that new telecommunication services will significantly stimulate physical transport – especially long distance travel.

3.2 Traffic jams, delays, holding loops

We all know the collective consequences of such behaviour patterns.

- we see daily traffic jams on ten percent of the European road networks
- 10-15 % of time spent in transport systems is waiting time
- about 20 % of the railway system are considered bottlenecks
- 10-20 % of time spent in the railway system is due to delays
- a quarter of all flights is delayed.

There seems to be a certain amount of latent demand, which when giving way to this pressure leads to real demand, which will then lead to more or similar symptoms in different bottlenecks of the system.

3.3 Planning solutions for a certain period

Any expansion in traffic infrastructure and of new telecommunication services can be seen as one more step in a process that aims at mentally and then physically conquering distant areas – or rather areas unknown to date. This means that efficient planning solutions of “traffic problems” can always merely be time limited solutions that allow us to take the next

step in the process – or maybe won't allow this next step any more. The latter is particularly true for our material infrastructure: due to it's apparent nature it often leads to irreversible developments – especially when the force of inertia avoids further behavioural changes. This can be especially problematic in infrastructures with intrinsic irreversible environmental problems, when a number of misguided developments (expressways in down-town areas, city airports etc) become apparent (usually too late). A dilemma for the hard-pushed infrastructure planner:

- he either has to find reversible „ planning solutions for a certain period"
- or he cannot prevent „planned long-term errors"

4. Does vicinity loose significance?

How about the question, if vicinity looses significance through telecommunication? Figure 12 attempts a definition of the terms vicinity and distance from a subjective human perspective (many contacts to few people = vicinity, few contacts to many people = distance) as well as from a spatial perspective (from close neighbourhoods to distant locations). We can see that cognitive skills do not enable people to maintain a certain – possibly desired – intensity of contacts across very large spatial dimensions. The term "global village" tries to convey this illusion. We can also see that there are distinctly different person groups when it comes to behavioural patterns of spatial interaction. However they all have in common a certain human disposition which can be described as something like curiosity in a positive sense.

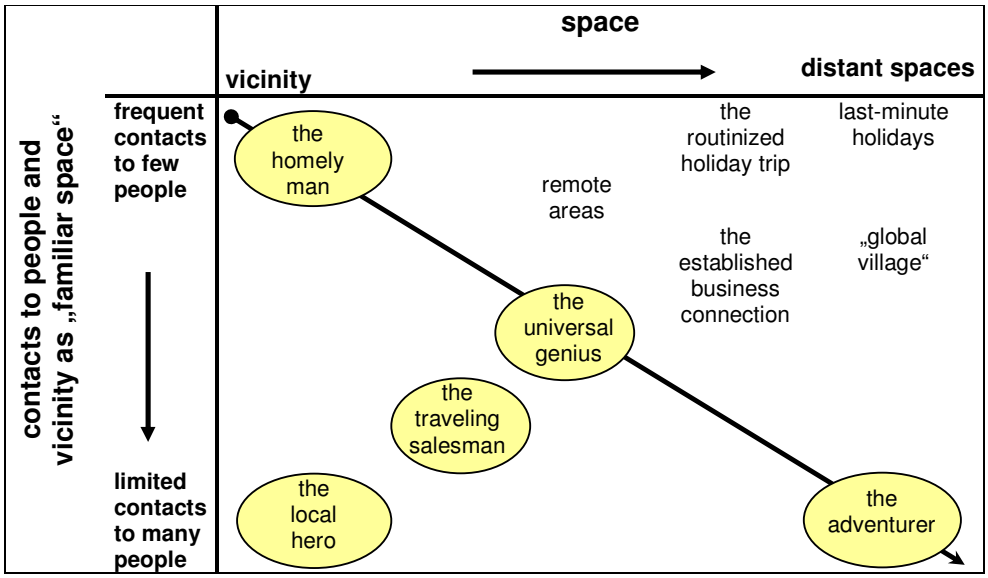

figure 12: From vicinity to distance – the individual's perspective

What are the driving factors that encourage the passed development to continue? Figure 13 illustrates the limitations of a further continuation of the "seven league boot dream" from collective as well as from an individual perspective.

This diagram suggests that the process can continue, if we can provide high value infrastructures through further economic growth and raise both the economic and the cognitive capacities from the perspective of the individual. Thus, vicinity does indeed loose significance, but the process is slow and continuous and highly selective of the person groups involved. On a spatial level we can assume that the process is selective insofar as

- certain spaces attract persons with high cruising radiuses and
- other spaces selectively loose such persons.

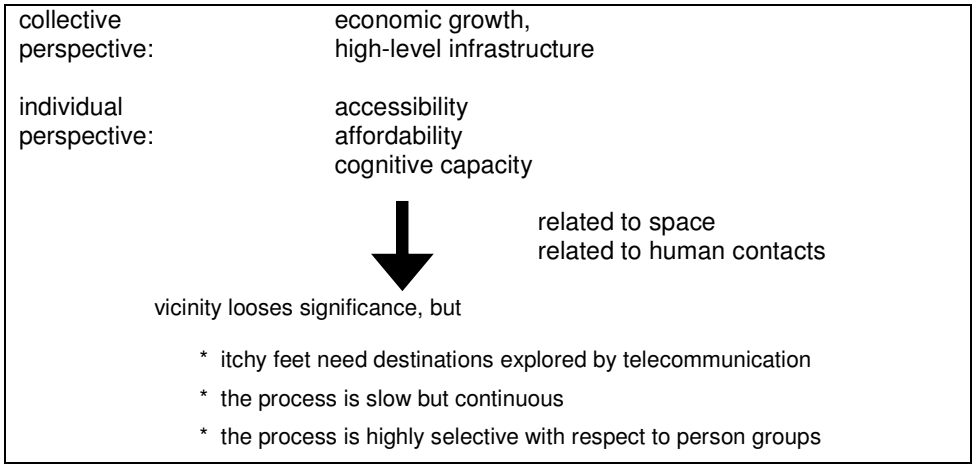

figure 13: limitations of a further continuation of the "seven league boot dream"

The temporal dimensions of this process can vary from weekend outings over second homes to relocations. Figure 14 shows a number of possible pairings for this assumption.

- spaces having the capacity to attract „persons with high cruising radiuses" (so-called attractors), win
- spaces that selectively loose „persons with high cruising radiuses" become less important

some examples

metropolises (with high-level infrastructures to overcome distances)	versus	„middle-sized" cities (with ubiquitous structures to overcome distances)
global networks	versus	local networks
traffic and telecommunication nodes	versus	standard equipment
growth areas	versus	stagnating areas and areas degenerating into slums
tourism centres	versus	remote areas
	etc	

figure 14: consequences on the structures of our towns and regions

This is of course a hazardous perception, considering how erroneous forecasts tend to be. Apart from the empirical findings described above, there is also little to be found in it's justification. And it is of course also variable in time. Nonetheless let's put forth the following theses:

- we are faced with a selective and demographically motivated change process with probably very dynamic progression.
- the resulting loss of significance of vicinity mostly affects rural and "mid-size" areas
- so-called attractors will benefit most from the resulting increase of significance of distance.

A disquieting factor of this process is however that it can lead to an even faster process of social divide

As the Süddeutsche Zeitung said in 2005: “Only 46 % of the German population between 14 and 75 years are “online”, especially the wealthy, well-educated, younger and more men than women”. In a global perspective, this pattern seems to be not very different (see figure 15).

(source: http://www.chrisharrison.net/projects/InternetMap/)

figure 15: World connection density and City to City Connections

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