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What about time in urban planning & design in the ICT age?

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'This web of time – the strands of which approach one another, bifurcate, intersect or ignore each other through the centuries – embrace every possibility'.

(Jorge Luis Borges, The garden of forking paths)

OUTLINE

Time is connected to network thinking in urbanism. It comes into play when households or companies make actual selective use of urban technology systems for their special purposes – as revealed by space-time budgets or logistic spaces. Hence urban planning and design can be seen as a search for spatial concepts satisfying the needs of household and company networks. Therefore it is important to focus on the mutual interactions of time and space. If the spatial concepts often lack a temporal dimension then, first of all this temporal dimension needs to be highlighted; that is:

- major trends of temporal development,
- basic rhythms of time use,
- some facts about time use.

Space-time budgets and business logistics chains are ways of combining time and space, taking into account their mutual interactions. The author of this essay functions as a 'guinea-pig' in presenting his personal space-time budget, picturing a typical day. This prepares the ground for discussing space-time budgets in more general terms including the impact of ICT on them plus some final remarks about the company counterpart of space-time budgets.

The gist of all this is the search for new instruments of planning and design in line with the New Charter of Athens. It seems more promising to be guided by network thinking than by speculations about emerging, continuous cities. There are different ways of putting network thinking to a test:

- analyzing emergent network-based concepts,
- rereading the classics,

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- a design studio,
- urban time policies,
- mobility in prospect.

Putting network thinking to a test means investigating the (potential) time sensitivity of the different approaches and the spatial concepts they may produce. Testing them includes checking for the role of ICT. It is important to integrate ICT because it supports the development of new temporal regimes.

By asking ourselves 'What about time in urban planning and design?' we are also asking 'What about people in urban planning and design?' This is most clearly proven by urban time policies. They are also the best way of answering Lynch's time-honored question 'What time is this place?'

1 TIME AND THE 'NETWORK CITY'

The 'Network City' has been treated elsewhere as a paradigm challenge for urban design and planning (Drewe, 2003a). In fact, it is not a new, ready-made spatial concept, but rather a matter of network thinking in urbanism. See also < http://www.networkcity.nl

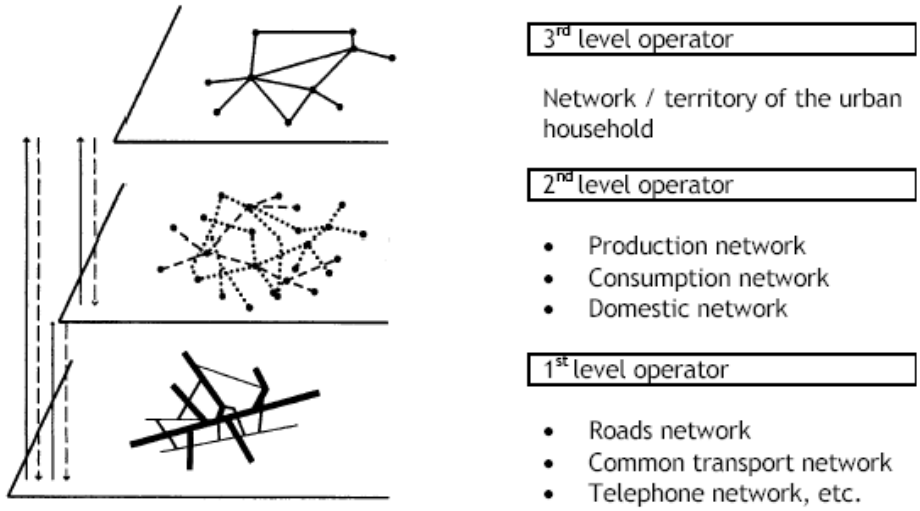


Figure 1 has become the trademark of network thinking focusing on three, interacting levels of network operators that (re)organize urban space (Dupuy, 1991: 119):

- level one involves the suppliers of technical networks such as water and sewer, energy, transport and ICT; level one covers the infrastructure, the services offered and the operators (Graham and Marvin, 2001 refer).
- on level two we find functional networks of common-interest users centering on consumption, production, distribution and social contacts; specific location factors apply to each of the networks.
- on level three both households and companies make actual, selective use of technical networks and services for their special purposes.

It is on level three that time comes into play.

Household networks can best be measured in terms of space-time budgets or action spaces (see Dijst and Vidakoviæ, 1997). Company networks, on the other hand, are closely related to logistics, logistic chains and logistic space (Hesse, 2002).

The framework shown in figure 1 has also been applied to the Internet (see Drewe, 2002, for details). Level three referred to how the data actually flows on the Internet between points of origin and points of destination. Trace routes of the data flows have revealed an important time dimension of the Internet: the number of milliseconds that it takes a ping packet from the point of origin to each hop (from the node of origin to the node of destination) and back. The response time of accessing and downloading the home pages of web sites is an important performance indicator of the Internet.

The interrelations between level one (the Internet infrastructure), level two (the Internet industry) and level three (traffic on the Internet) can be conceptualized as interrelations between respectively supply, demand and performance. Figure 2 refers.

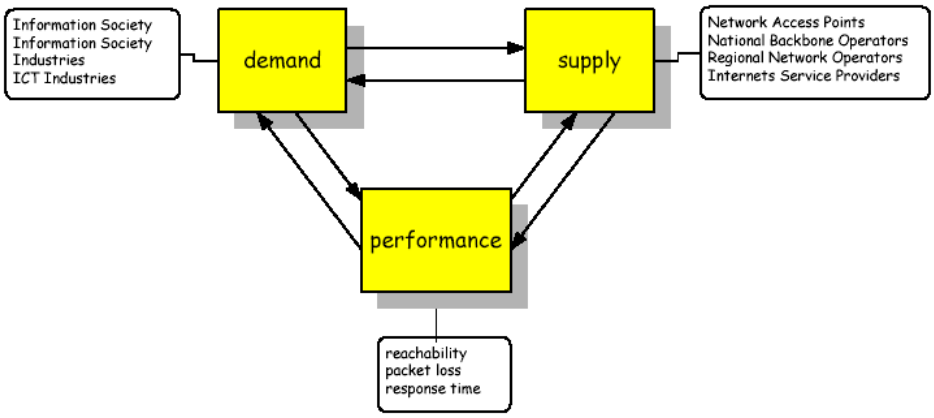


Fig. 2. The Internet – interrelations between supply, demant and performance

2 TIME AND SPACE, MUTUAL INTERACTIONS

If the spatial concepts applied in urban planning and design lack a temporal dimension (Klaasen, 2003) then, first of all, this temporal dimension needs to be highlighted. Why is time important? Or why has it become so important that it features – at least in some countries – on the political agenda? See, for example, Boulin and Mückenberger (2002).

Could it be that time has undergone significant changes that clash with cities or space lagging behind? Has not the demand of citizens expanded and diversified whereas the urban service supply, to a large extent, still functions according to traditional rhythms – as Gwiazdzinski (2002) sees it?

It does not suffice, however, to highlight only the time dimension. If the focus is on urban planning and design, one needs to introduce space as well: first, the spatial impact of significant changes of temporal patterns, changes which in turn are caused by societal changes and, then, the impact of changing spatial structures on temporal patterns.

Changes in spatial structure can result from urban design and planning interventions. This is where new spatial concepts come in, concepts that take into account the mutual interactions of time and space. Hence urban planning and design can be seen as a search for spatial concepts satisfying the needs of household and company networks. This quest is far from simple. As our argument is progressing, the complexity of the task will be revealed.

To summarize this section a simple scheme is shown in figure 3. It includes some of the dichotomous terms used to describe time and space and their mutual interactions.

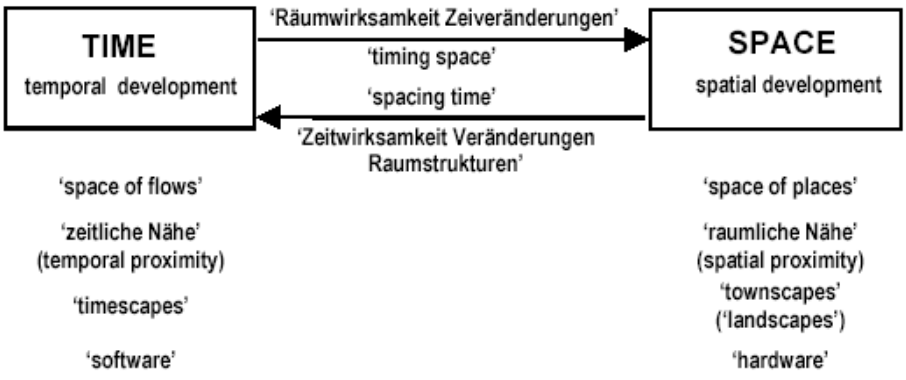


Fig. 3. Time and space, mutual interactions

3 TEMPORAL DEVELOPMENT – MAJOR TRENDS

The root causes of major trends in temporal development are economic, social and technological in nature. There are six major trends according to DATAR (2001):

- a globalizing economy pressures companies to function around the clock, 'following the sun',
- lifestyles tend to invidualize which leads to a less synchronized daily life,
- old ways to synchronize life via work hours no longer function what with flexibility,
- women's labor participation has increased significantly starting in the sixties,
- new types of multiform mobility have emerged daily, weekly and annually,
- ICT has spread massively.

The overall effects on temporal development are threefold: acceleration, expansion and flexibilization. Take for example shorter product or branch–life–cycles; faster transport systems, in particular air traffic and, similarly, ICT (acceleration). Temporal expansion affects all kind of supplies and individual options whether related to consumption or work (flexible working hours). Acceleration is pushing expansion and flexibilization as well. The latter causes instability in temporal patterns. See Henckel and Eberling (2002) for a wealth of details.

Moving on with our argument and in order to become more specific, the question of how to measure the use of time must be tackled.

4 TIME USE: BASIC RHYTHMS

Time use is usually described in terms of basic rhythms: daily, weekly, yearly and life cycles (figure 4).

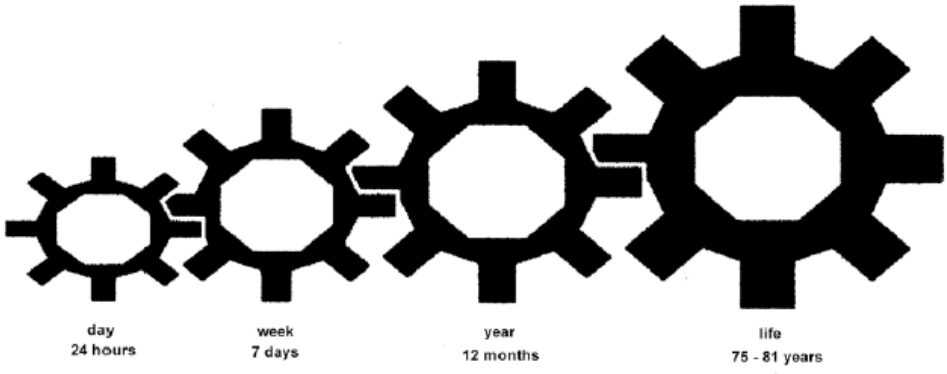


Fig. 4. Basic rhythms of time

A time budget describes **what** is done, **when** and **by whom**. One usually distinguishes activities such as work, leisure, education, shopping, public and private services, and travel. The actors can be classified in terms of sex, phase-in-the-life cycle, socio-economic position, ethnic origin and the like. Figure 4 in fact depicts the basic cycles of single-person households. In the case of multiple-person households different rhythms need to be coupled or synchronized. Without distinguishing different kinds of actors one would gloss over the distributional side of time use, that is the issue of distributional justice. With the increase in woman's labor participation, the issue is often related to the position of women (versus men). Another trend is the massive spread of ICT which, however, is far from evenly distributed among actors as revealed by the so-called digital divide (Drewe, Fernandez and Hulsbergen, 2003). Once time use or time budgets have been measured, one is able to specify what is at stake when it comes to a distributional debate:

- life expectancy,
- disposable time, free from labor (but not involuntary as in the case of unemployment or inconvenienced by night shifts),
- discretion or choice with regard to time use,
- collective time institutions such as weekends or holidays allowing for stability and predictability of time use, in especial social contacts.

See also Henckel (2002).

Once time budgets have been measured, it also becomes possible to specify the impact of the acceleration, expansion and flexibilization of temporal development. Take for example **flexible working hours** with their rather 'disturbing' effects on basic rhythms and time budgets (Henckel, 2002). Flexible working hours reduce times shared with others and make times less predictable. Commuter distances tend to shrink and so does mobility for leisure purposes. Speed accelerates and the amplitudes of rhythms change (oscillate). And finally, flexible working hours allow for a high degree of individualization.

What about the time use of companies? In logistics, the usual order cycle time is 24 hours which is also a daily rhythm. Rush orders have a cycle of less than 24 hours and therefore are closely linked to express services. The stock order cycle, on the other hand may be weekly or even yearly. One might also consider product-life-cycles or branch-(company-)life-cycles.

This is as far as the temporal analysis goes. It is time to introduce the 'where', that is the location of activities or activity spaces. Time budgets more often than not reflect spatial effects, in particular spatial constraints.

But before the construction of space-time budgets (in section 6), some empirical illustrations will be presented in order to prevent speculations about temporal developments. The degree to which acceleration, expansion and flexibilization actually occur is an empirical question. And as to future developments, it is still uncertain. Without the existence of major uncertainties, there would be no reason to build scenarios of time use. Here is a French example of scenario building. In DATAR (2001) three possible futures are sketched:

- 'la fuite en avant': time use dictated by market forces, continuous time (around the clock) and individual times dominate
- 'la fuite en arrière': growing resistance to flexibilization, back to traditional rhythms and collective times
- a scenario combining individual and collective rhythms of time use.

Stiens (2002) who has also constructed three scenarios has focused more explicitly on the spatial impact of different 'timescapes'.

5 TIME USE: SOME FACTS

Time Use Surveys are held in most countries. European Communities (2003) (Eurostat) contains results from 13 European countries focusing on time use at different stages of life. An example is given in table 1 emphasizing differences (similarities) between women and men, and countries.

Table 1 **Average time per day spent on different activities and the percentage performing an activity on the average per day for females and males.**

Age group	Belgium 12 - 95 years		Denmark 16 - 74 years		France 15 - years		Finland 10 - years		Sweden 20 - 84 years		UK 8 - years		Estonia 10 - years		Hungary 15 - 84 years		Slovenia 10 - years		Norway 10 - 79 years	
	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%	Hours and min	%
Sleep	**8:34**		**7:53**		**9:03**		**8:38**		**8:08**		**8:40**		**8:49**		**8:43**		**8:36**		**8:15**	
women	8:41	100	7:58	100	9:10	100	8:42	100	8:12	100	8:43	100	8:50	100	8:49	100	8:40	100	8:20	100
men	8:27	100	7:47	100	8:58	100	8:33	100	8:03	100	8:37	100	8:50	100	8:36	100	8:31	100	8:09	100
Meals and personal care	**2:40**		**2:48**		**3:01**		**2:03**		**2:22**		**2:10**		**2:11**		**2:24**		**2:09**		**1:54**	
women	2:42	100	2:52	100	3:01	100	2:06	100	2:30	100	2:16	100	2:09	100	2:19	100	2:07	100	2:01	100
men	2:37	100	2:42	100	3:00	100	1:59	100	2:14	99	2:04	99	2:12	100	2:30	100	2:11	100	1:48	100
Gainful work	**2:02**		**3:27**		**2:34**		**2:35**		**3:17**		**2:40**		**2:22**		**2:33**		**2:42**		**2:59**	
women	1:28	31	2:59	37	1:55	30	2:04	30	2:40	37	1:56	29	2:00	29	2:01	28	2:13	27	2:20	34
men	2:38	46	4:00	46	3:16	43	3:12	41	3:57	49	3:25	43	2:49	36	3:08	39	3:13	36	3:38	47
Study	**0:43**		**0:37**		**0:30**		**0:35**		**0:16**		**0:40**		**0:30**		**0:30**		**0:44**		**0:36**	
women	0:41	16	0:40	13	0:30	9	0:36	13	0:18	6	0:40	13	0:27	10	0:29	9	0:44	14	0:38	12
men	0:45	17	0:33	9	0:31	9	0:34	11	0:13	5	0:40	13	0:34	12	0:30	9	0:44	13	0:35	11
Household work and family care	**3:12**		**2:51**		**3:17**		**2:52**		**3:10**		**2:53**		**3:32**		**3:39**		**3:26**		**2:42**	
women	3:58	98	3:20	96	4:13	96	3:32	96	3:44	96	3:41	93	4:27	96	4:39	96	4:25	94	3:16	96
men	2:23	96	2:17	90	2:16	80	2:05	66	2:33	92	2:03	63	2:28	64	2:33	64	2:24	79	2:09	69
Volunteer work	**0:09**		**0:13**		**0:13**		**0:14**		**0:12**		**0:10**		**0:14**		**0:10**		**0:08**		**0:09**	
women	0:08	16	0:11	12	0:12	11	0:14	13	0:12	14	0:12	13	0:13	11	0:07	6	0:06	6	0:09	10
men	0:09	16	0:16	12	0:15	10	0:15	11	0:13	13	0:09	9	0:16	11	0:13	6	0:10	7	0:09	8
Socialising	**1:02**		**1:21**		**0:55**		**1:04**		**1:10**		**1:07**		**0:50**		**0:51**		**1:09**		**2:02**	
women	1:05	63	1:26	79	0:55	62	1:08	71	1:15	77	1:13	69	0:51	64	0:48	49	1:08	66	2:15	90
men	0:59	76	1:16	66	0:54	46	1:00	66	1:04	63	1:02	66	0:48	47	0:54	61	1:10	64	1:49	76
Leisure time	**1:13**		**1:00**		**0:53**		**1:23**		**1:20**		**1:06**		**1:04**		**0:56**		**1:26**		**1:18**	
women	1:08	67	0:51	59	0:41	42	1:12	72	1:13	71	0:57	59	0:54	56	0:47	41	1:12	66	1:13	66
men	1:18	66	1:11	59	1:06	49	1:36	72	1:27	70	1:15	59	1:17	60	1:06	49	1:40	71	1:23	64
TV video	**2:18**		**1:38**		**2:07**		**2:16**		**1:33**		**2:26**		**2:27**		**2:44**		**2:01**		**1:37**	
women	2:12	93	1:51	81	2:02	77	2:08	86	1:45	82	2:16	87	2:15	86	2:39	86	1:50	83	1:45	83
men	2:24	94	2:06	83	2:12	80	2:26	86	2:02	84	2:37	86	2:40	87	2:49	87	2:12	87	2:10	86
Radio, music, reading	**0:39**		**0:34**		**0:29**		**0:58**		**0:43**		**0:33**		**0:49**		**0:29**		**0:31**		**0:44**	
women	0:34	66	0:34	67	0:28	39	1:00	76	0:45	67	0:33	60	0:49	69	0:25	33	0:31	44	0:47	70
men	0:44	71	0:33	60	0:30	39	0:56	66	0:41	67	0:33	46	0:51	66	0:34	43	0:32	43	0:41	61
Travel	**1:23**		**1:15**		**0:55**		**1:08**		**1:23**		**1:24**		**1:07**		**0:56**		**1:06**		**1:15**	
women	1:16	92	1:14	86	0:51	67	1:06	76	1:20	87	1:21	87	1:00	76	0:51	76	1:01	76	1:10	87
men	1:31	96	1:15	84	1:00	73	1:11	80	1:27	91	1:27	89	1:11	81	1:02	81	1:11	83	1:20	89
Unspecified activities	**0:05**		**0:03**		**0:03**		**0:14**		**0:06**		**0:11**		**0:05**		**0:05**		**0:02**		**0:09**	
women	0:07		0:04		0:02		0:12		0:06		0:12		0:05		0:06		0:03		0:06	
men	0:05		0:04		0:02		0:13		0:06		0:08		0:04		0:05		0:02		0:09	
Total	**24 h**		**24 h**		**24 h**		**24 h**		**24 h**		**24 h**		**24 h**		**24 h**		**24 h**		**24 h**	

Hours and minutes gives average time per day over the whole year, % gives percentage of persons per day who has performed the activity. Survey period: A full year during 1998-2001. Sources: National Time use studies, see Methodological Notes.

The table depicts the daily cycle, but hours and minutes and averages over the whole year. Here are some of the highlights:

- there (still) is a large difference in the gender division of gainful work and domestic work,
- watching TV takes about 40% of free time in most countries both for women and men,
- employed persons sleep less and have less free time,
- the differences in time use between women and men are larger in households with children.

European Communities (2003) provides a cross section of time use. But what about changes over time? A Dutch Time Use Survey can serve as an illustration as it covers the years 1975 - 2000 (Breedveld and Van den Broek, 2001).

Three tables have been selected for summarizing 'time use in an increasingly busy society'. Tables 2a through 2c describe weekly cycles with regard to time budgets, the structuring of time, and free time.

Table **2a** Time budget in outline, population aged 12 and over, 1975-2000 (in hours per week)[a], in percent and index 2000, 1995 = 100)

	1975	1980	1985	1990	1995	2000	index
committed time	40.7	40.8	40.7	42.0	42.6	43.9	103
work	14.8	14.0	14.1	16.6	17.3	19.4	112
care	19.1	19.5	19.4	18.5	18.9	19.0	100
education	6.7	7.3	7.2	6.9	6.4	5.5	86
personal time	76.3	76.8	75.3	75.5	75.0	76.6	102
free time	47.9	47.0	49.0	47.2	47.3	44.8	95
% combining tasks (20-64 years)	20	24	28	33	38	47	125

a The three categories do not add up to exactly 168 hours, because some activities cannot be attributed precisely to one of the main categories.

Table **2b** Timing of paid and domestic work, population aged 20-64 years, 1975-2000 (in hours per week, in percent and index 2000, 1995 = 100)

	1975	1980	1985	1990	1995	2000	index
paid work	17.7	17.2	17.3	19.0	20.4	22.4	110
daytime on weekdays	15.3	14.8	14.7	16.0	17.3	19.2	111
evening, night and weekend	2.4	2.4	2.6	3.0	3.1	3.2	103
% paid work evening/night/weekend	*14*	*14*	*15*	*16*	*15*	*14*	*93*
domestic work	25.0	24.5	25.1	23.4	23.5	22.9	97
daytime on weekdays	15.4	14.9	15.0	13.7	13.2	12.4	94
evening, night and weekend	9.6	9.6	10.1	9.7	10.3	10.5	102
% domestic work evening/night/weekend	*38*	*39*	*40*	*41*	*44*	*46*	*104*

Table **2c** Use of free time, population aged 12 years and older, 1975-2000 (in hours per week and index 2000, 1995 = 100)

	1975	1980	1985	1990	1995	2000	index
total free time	47.9	47.0	49.0	47.2	47.3	44.8	95
printed media	6.1	5.7	5.3	5.1	4.6	3.9	86
electronic media	12.4	12.1	13.6	13.7	14.2	14.8	104
social contacts	12.7	12.5	11.5	11.4	10.9	10.1	93
social participation	2.0	2.0	2.2	2.1	2.2	1.8	81
going out	2.4	2.2	2.4	2.6	2.6	2.5	97
sport and exercise	1.5	1.6	2.1	1.8	2.1	1.8	85
other hobbies	8.2	8.7	9.0	7.7	7.5	6.8	91
free time mobility	2.6	2.3	2.9	2.9	3.2	3.0	94
% free time spent out of home	36	35	37	37	39	36	93

In reading these tables one has to take into account a number of contextual variables: October 2000 represented the peak of the economic cycle as well as a period of bad weather. Moreover, since 1996 two laws came into force allowing for greater variation in

working hours and opening hours for shops (in the evening and on Sundays). Interpreting the tables shown here, background information from the survey will be used, too. Time pressure due to increased labor participation (especially of women) has increased over the 25-year period. Hence more people needed to combine and work tasks (but women still performed two thirds of the domestic and care tasks). The structuring of time can be measured in terms of collective peak times for activities such as work or in terms of individual routines. Despite of more opportunities for variation in working hours and opening hours for shops, time structures showed little change. And, finally, total free time has declined and this decline has accelerated with one major exception: time spent on electronic media. While the use of computers has grown, the 'digital divide', measured in terms of PC use, has widened.

A final word about mobility: 'After increasing for several years in succession, the time spent on mobility stabilized in 2000 at the level of 1995. Car use increased within the mobility budget at the expense of other means of transport' (Breedveld and Van der Broek, 2001: 132).

The examples given in this section point to the importance of time use surveys and hence of monitoring actual temporal developments. Time use surveys may contradict 'grand trends'. But radical changes may still lie ahead, i.e. long-term changes and as such subject to uncertainty.

6 TOWARDS SPACE-TIME BUDGETS

Surveys measuring time use tend to hide the spatial dimension. Ever since Hägerstrand (1970), however, the use of time and of space are combined. See for example the space-time budget of a four-person household on a weekday in the town of Lund (figure 5).

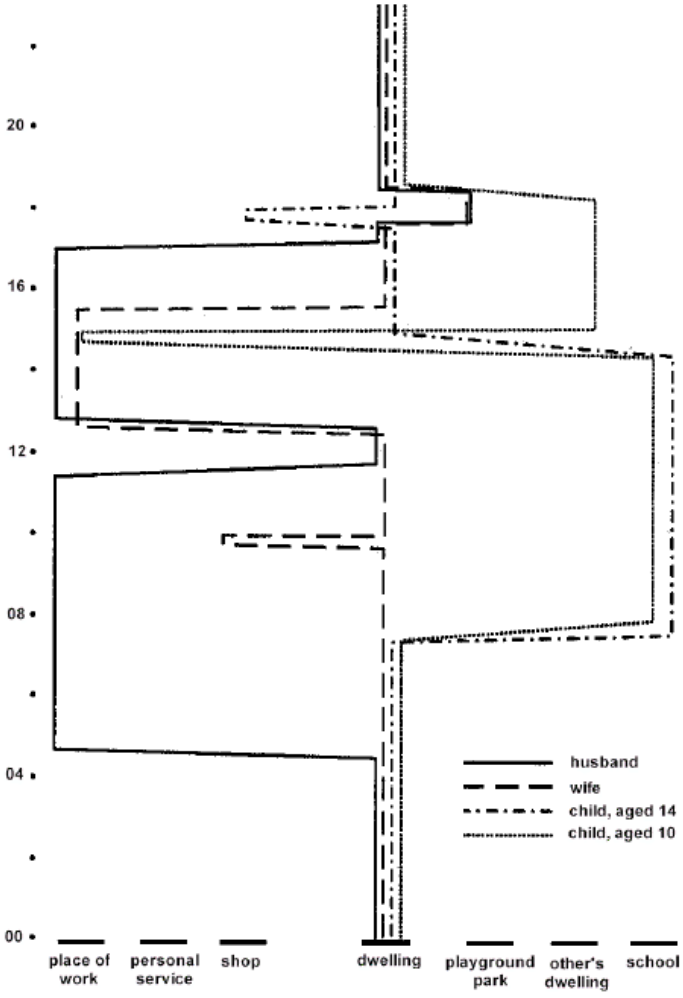


Fig. 5. Time-space budget of a four-person household in Lund, Sweden

This figure combines the daily cycle with various locations or activity places over town. In fact, there are four cycles (of husband, wife and two children respectively) which are obviously coupled or synchronized. In order to switch locations one has to travel. In principle, the space-time budget allows for the calculation of travel times and should also indicate the mode of transport.

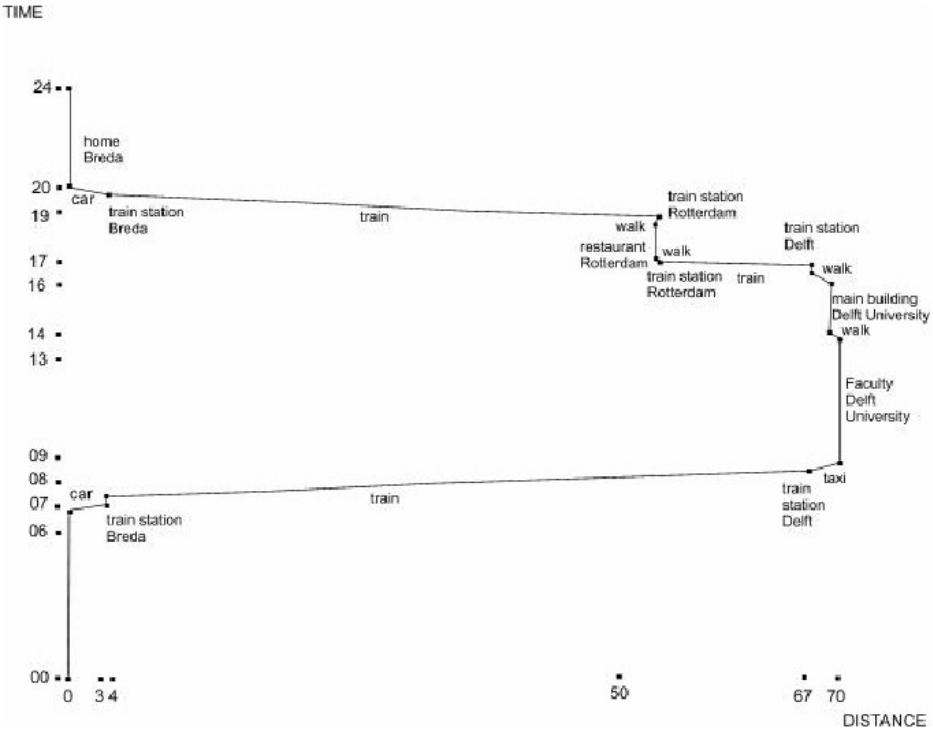


Fig. 6. A typical day of Paul Drewe

Figure 6 pictures a typical day of the author of this essay hereafter referred to as the actor. He works at some 70 kilometers from home as a professor at a university. On his way back home he stops twice. First, he chairs a committee meeting at the university's main building. Then, he stops at a restaurant in a nearby city for dinner and 'networking'. The chain of mobility is rather complicated as it comprises private car, train, taxi, walk, train, walk, train and private car again. As the actor's wife takes him to the station and picks him up there ('kiss and ride'), their respective time uses need to be synchronized at this point. The evening meal is prepared for one person only and the actor is unable to do any shopping except for shops located at the stations or in their vicinity (or during the walk to the station for that matter). If the train is late, the mobile telephone is used as a 'synchronization technology'.

By the way, the train rides of more than two hours are usually combined with work and leisure activities such as reading.

Figure 5 and 6 are not exactly sophisticated drawings though they depict the essential features of space-time budgets. Ever since Hägerstrand has introduced the spatio-temporal model, mapping, visualization and modeling have advanced in sophistication using ICT as a tool. Here are a few examples:

- *the space-time cube revisited from a geovisualization perspective (Kraak, 2003),*
- *a GIS approach to invidual accessibility in space-time (Kwan, 2003), see also:*
- *< http://www.csiss.org/events/workshops/2003.AST2003/materials.html >*
- *the city as a process in time and space (Ferschin et al, 2002),*
- *the visualization of territories and cities (Debarbieux and London, 2003) including chronotopic mapping, among others (Laousse, 2003); see also the work of Stabilini on chronographic maps and GIS tools,*
- *graphs and networks, and multilevel modeling (Mathis, 2003).*

Figure 6 shows an individual action space. Attempts have been made to model this space (Dijst and Vidakoviæ, 1997). This includes a typology of actual action spaces and a simulation model. Within a time internal of 13.5 hours, the actor visits three activity places and stays there for some 9 hours altogether. To be able to do so the actor must travel approximately 3 hours covering about 137 kilometers. It is important to calculate travel time apart from time spent on activities at destinations unlike Eurostat has done for the journey-to-work classifying it 'as part of work' as distinguished from 'travel excluding travel as part of work'. This separation is important because a household's time (and money) budget restricts its mobility behavior. Usually, a constant fraction of daily time is spent on travel, typically between 1.1 and 1.5 hours (Schafer and Victor, 1977; also Zahavi, 1979). With 3 hours devoted to the journey-to-work, the actor's mobility behavior is not really typical (neither is the fact that he takes the train). But obviously a total

travel of time 3 hours is affordable. Moreover, it allows for combining interesting work with pleasant living outside the country's metropolitan area. However, the frequent malfunctioning of the railway system puts a serious strain on the actor's space-time budget. But so would a journey-to-work by private car because of frequent traffic jams.

Generally speaking, an individual action space is restricted in three ways, by:

• money and time budgets that limit mobility, the availability of means of transport and the ability to use them,

• coupling constraints with regard to places and the time plans of institutions and other individuals,

• institutional restrictions such as limited access to institutions caused by property, opening hours, entrance fees or prices.

How about the impact of ICT on space-time budgets, especially on constraints? The actor's space-time budget shown in figure 6 is not repeated five times a week. Depending on the amount and

urgency of research activities some days are spent at home undisturbed, teleworking. Teleworking saves 3 hours. A laptop, connected to the university, allows for substituting face-to-face contacts at the university, online networking with colleagues elsewhere and online consulting of sources of information. Similarly during working hours a colleague's PC is sometimes used for networking and search purposes although face-to-face contacts are prevailing. Networking, starting either from the university or from home, is an essential part of a research program, i.e. The Network City Design Studio: < http://www.networkcity.nl >. This studio is linked to researchers in Latin America, Europe and the United States. Networking includes an occasional videoconference with Mexico.

Similarly, ICT provides access to banks, shopping, entertainment and other non-working activities. With ICT the individual action space becomes much less constrained, provided of course one has access to ICT. A shift to e-activities is a shift to a higher speed. And a higher speed means a higher reach. A little time goes a long way in 'travel on the electronic highway' (a longer way even than in air travel and travel by high-speed trains). If one embeds time and ICT in accessibility analysis, a picture of space-time budgets evolves like the one shown in figure 7 (Janelle, 2002).

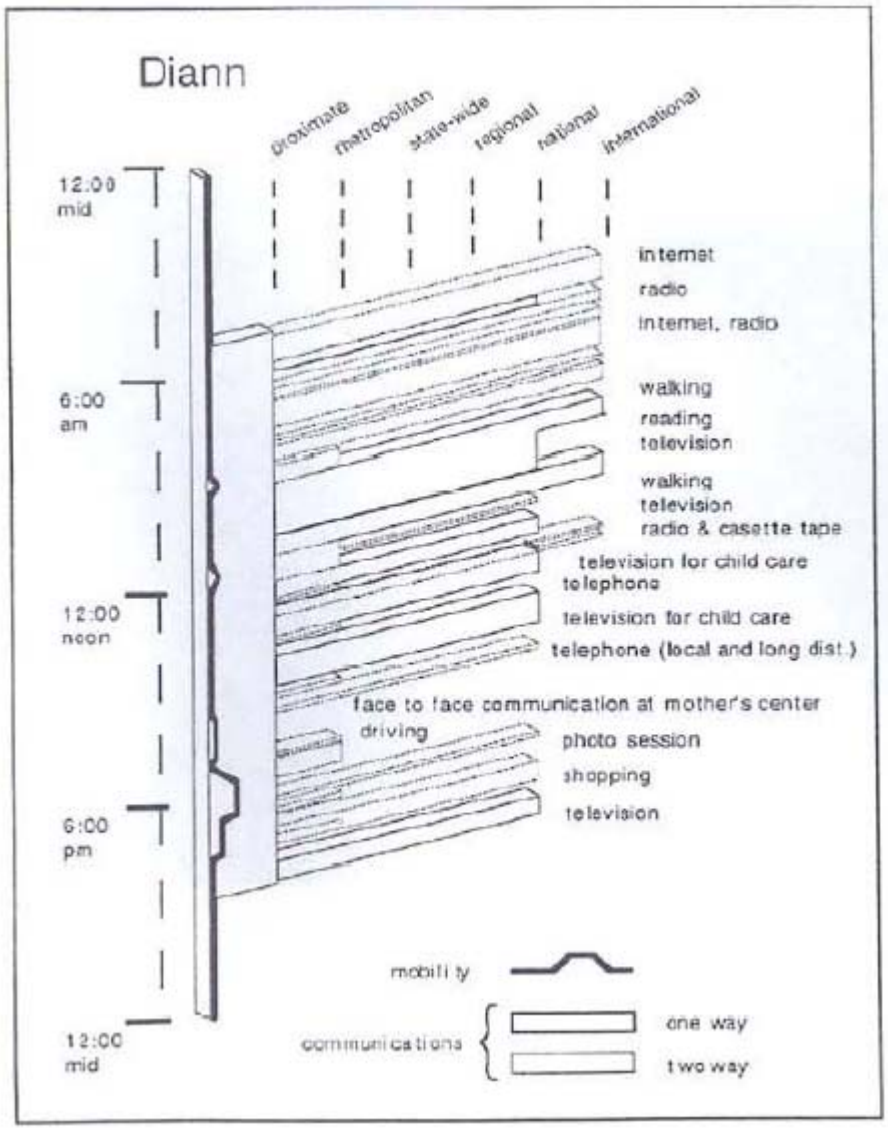
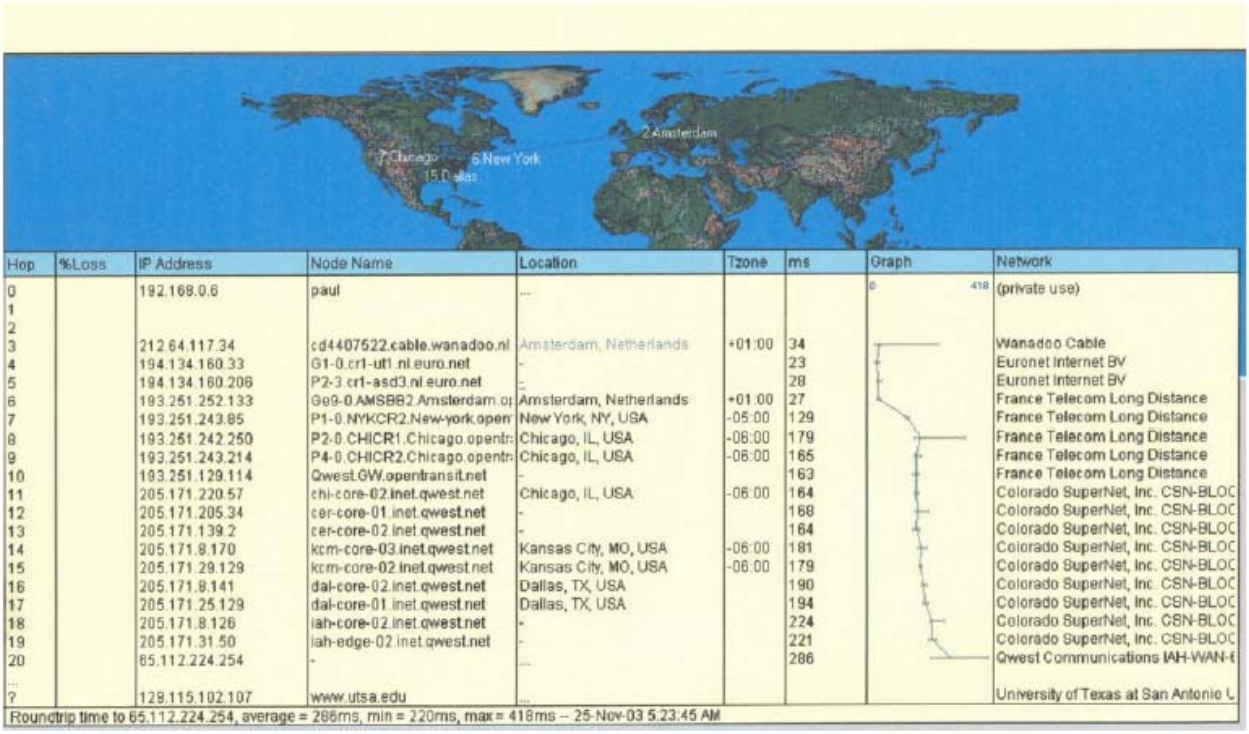


Fig. 7. Diann's extensibility for a typical Thursday, autumn 1997 Paul Adams (2000)

But does the digital reach really have a spatial dimension? Or are the innumerable websites and email addresses located in the 'blue nowhere' (Google, by the way provides access to some two and half billion sites). It is indeed possible to trace physical destinations of data flows by applying so-called traceroutes. Visiting the home base of a colleague at the University of Texas at San Antonio took less then 300 milliseconds of roundtrip time (table 3). Another examples revealed a little more than 200 milliseconds, visiting Amazon in Seattle to order a book (table 4). The traceroute reports can be compared to weather reports. The Internet may function smoothly in 'good weather' with physical distance between cities turning into milliseconds. But one may encounter 'bad weather', too, such as delays. Information packets may get lost or even blocked, not reaching their destination (see Drewe, 2002 for earlier traceroute applications). These problems are the equivalents of private or public transport disturbances.

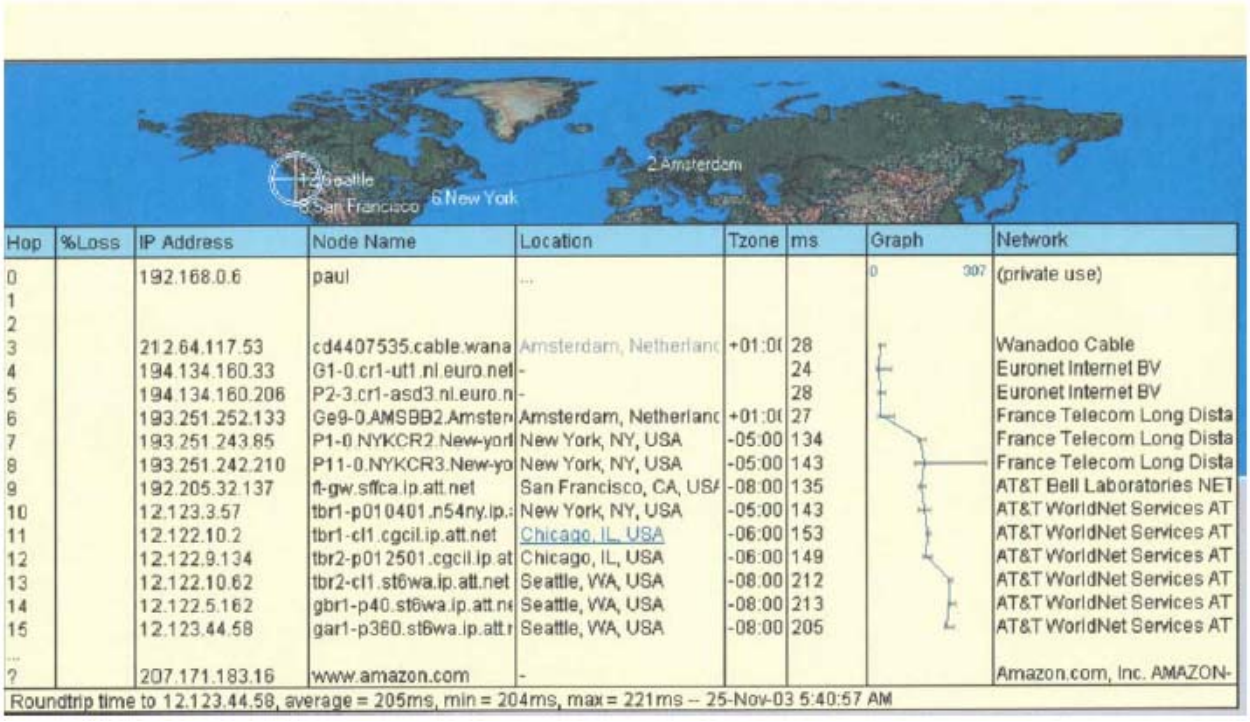
Report for www.utsa.edu [129.115.102.107]



Hop	%Loss	IP Address	Node Name	Location	Tzone	ms	Graph	Network
0		192.168.0.6	paul	...			0 418	(private use)
1								
2								
3		212.64.117.34	cd4407522.cable.wanadoo.nl	Amsterdam, Netherlands	+01:00	34		Wanadoo Cable
4		194.134.160.33	G1-0.cr1-ut1.nl.euro.net	-		23		Euronet Internet BV
5		194.134.160.206	P2-3.cr1-asd3.nl.euro.net	-		28		Euronet Internet BV
6		193.251.252.133	Ge9-0.AMSBB2.Amsterdam.op	Amsterdam, Netherlands	+01:00	27		France Telecom Long Distance
7		193.251.243.85	P1-0.NYKCR2.New-york.opentr	New York, NY, USA	-05:00	129		France Telecom Long Distance
8		193.251.242.250	P2-0.CHICR1.Chicago.opentr	Chicago, IL, USA	-06:00	179		France Telecom Long Distance
9		193.251.243.214	P4-0.CHICR2.Chicago.opentr	Chicago, IL, USA	-06:00	165		France Telecom Long Distance
10		193.251.129.114	Qwest.GW.opentransit.net	-		163		France Telecom Long Distance
11		205.171.220.57	chi-core-02.inet.qwest.net	Chicago, IL, USA	-06:00	164		Colorado SuperNet, Inc. CSN-BLOC
12		205.171.205.34	cer-core-01.inet.qwest.net	-		168		Colorado SuperNet, Inc. CSN-BLOC
13		205.171.139.2	cer-core-02.inet.qwest.net	-		164		Colorado SuperNet, Inc. CSN-BLOC
14		205.171.8.170	kcm-core-03.inet.qwest.net	Kansas City, MO, USA	-06:00	181		Colorado SuperNet, Inc. CSN-BLOC
15		205.171.29.129	kcm-core-02.inet.qwest.net	Kansas City, MO, USA	-06:00	179		Colorado SuperNet, Inc. CSN-BLOC
16		205.171.8.141	dal-core-02.inet.qwest.net	Dallas, TX, USA		190		Colorado SuperNet, Inc. CSN-BLOC
17		205.171.25.129	dal-core-01.inet.qwest.net	Dallas, TX, USA		194		Colorado SuperNet, Inc. CSN-BLOC
18		205.171.8.126	iah-core-02.inet.qwest.net	-		224		Colorado SuperNet, Inc. CSN-BLOC
19		205.171.31.50	iah-edge-02.inet.qwest.net	-		221		Colorado SuperNet, Inc. CSN-BLOC
20		65.112.224.254	-	...		286		Qwest Communications IAH-WAN-E
...								
?		129.115.102.107	www.utsa.edu	...				University of Texas at San Antonio L

Roundtrip time to 65.112.224.254, average = 286ms, min = 220ms, max = 418ms -- 25-Nov-03 5:23:45 AM

Table 3. Traceroute report: home – University of Texas at San Antonio



Hop	%Loss	IP Address	Node Name	Location	Tzone	ms	Graph	Network
0		192.168.0.6	paul	...			0 307	(private use)
1								
2								
3		212.64.117.53	cd4407535.cable.wana	Amsterdam, Netherlanc	+01:0(	28		Wanadoo Cable
4		194.134.160.33	G1-0.cr1-ut1.nl.euro.net	-		24		Euronet Internet BV
5		194.134.160.206	P2-3.cr1-asd3.nl.euro.n	-		28		Euronet Internet BV
6		193.251.252.133	Ge9-0.AMSBB2.Amster	Amsterdam, Netherlanc	+01:0(	27		France Telecom Long Dista
7		193.251.243.85	P1-0.NYKCR2.New-yorl	New York, NY, USA	-05:00	134		France Telecom Long Dista
8		193.251.242.210	P11-0.NYKCR3.New-yo	New York, NY, USA	-05:00	143		France Telecom Long Dista
9		192.205.32.137	ft-gw.sffca.ip.att.net	San Francisco, CA, USA	-08:00	135		AT&T Bell Laboratories NET
10		12.123.3.57	tbr1-p010401.n54ny.ip.a	New York, NY, USA	-05:00	143		AT&T WorldNet Services AT
11		12.122.10.2	tbr1-cl1.cgcil.ip.att.net	Chicago, IL, USA	-06:00	153		AT&T WorldNet Services AT
12		12.122.9.134	tbr2-p012501.cgcil.ip.at	Chicago, IL, USA	-06:00	149		AT&T WorldNet Services AT
13		12.122.10.62	tbr2-cl1.st6wa.ip.att.net	Seattle, WA, USA	-08:00	212		AT&T WorldNet Services AT
14		12.122.5.162	gbr1-p40.st6wa.ip.att.n	Seattle, WA, USA	-08:00	213		AT&T WorldNet Services AT
15		12.123.44.58	gar1-p360.st6wa.ip.att.r	Seattle, WA, USA	-08:00	205		AT&T WorldNet Services AT
...								
?		207.171.183.16	www.amazon.com	-				Amazon.com, Inc. AMAZON-

Roundtrip time to 12.123.44.58, average = 205ms, min = 204ms, max = 221ms -- 25-Nov-03 5:40:57 AM

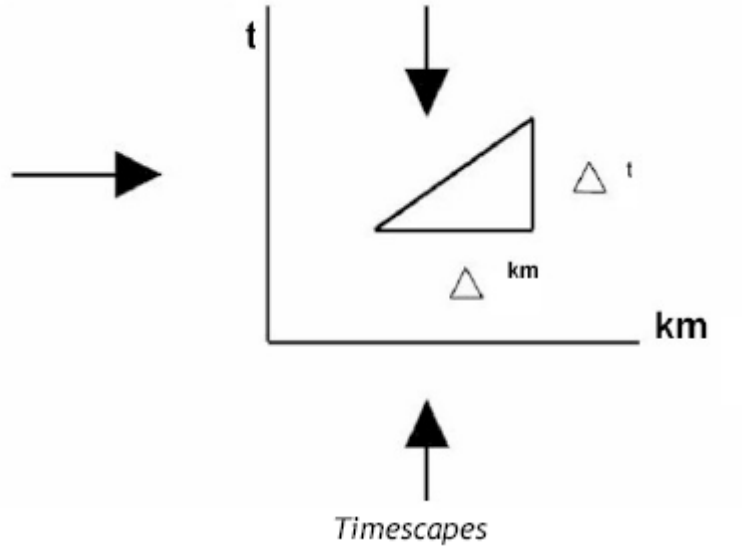
Table 4. Traceroute report: home – Amazon, Seattle

So far the space-time budgets of households or individuals.

As far as companies are concerned, it is the business logistics chain that provides the framework for 'inserting' locations in order cycles (24 hours, rush or stock orders). There are activity places of material management as well as physical distribution management. The former includes raw materials and semi-final products suppliers, and production planning. Physical distribution management comprises final products storage, wholesalers, retailers and consumers. First, companies respond to their clients' needs. Second, these companies (in particular large, multinational companies) employ logistic service providers to set up logistic chains which allow to deliver goods to points of sale in time according to the cycle required. Third, in order to compose logistic chains, choice is made of modes of transport, European or regional distribution centers and transit platforms. This includes the choice of ports as entry points into the European market. Logistic chains from factories to points of sale necessarily tend to be tailor-made (see also Drewe and Janssen, 2002). The resulting space-time budgets can be analyzed in terms of 'logistics zones' and (non-spatial)' logistic regimes' (Hesse, 2002). See also Läpple (1995). To handle the information flows and synchronize the different activities involved, ICT is indispensable (in particular EDI). One notes a trend towards infogistique as the French call it (Irepp, 2000). E-commerce is generally considered as one of the new driving forces behind logistic chains, i.e. business-to-business (B2B) e-commerce and business-to-consumer (B2C) e-commerce. As space or physical distribution still matters, one needs to construct space-time budgets for companies, too.

7 IN SEARCH OF NEW INSTRUMENTS OF PLANNING AND DESIGN

Dealing with time and space, one has to take into account their mutual interactions. This is a matter of timing space as well as spacing time, of townscapes as well as timescapes. It is the space-time budget of both households and companies which provides the appropriate frame of reference:



Changes occur with regard to the temporal and spatial dimension or the mobility pattern (including digital mobility). Searching for new instruments of urban planning and design the focus is, of course, on the spatial dimension. But to be able to deal with time, the practitioners need to be aware of time use, basic rhythms and major trends, and students need to be trained in this. For practitioners in Italy, 'Territorial Time Plans' are even required by law for municipalities with more than 30000 inhabitants (Mareggi, 2001). In fact, some countries are more advanced, i.e. more sensitive to urban time policy issues than others. More about this later.

Taking into account mobility patterns in urban planning and design is closely linked to network thinking in urbanism (see section 1). Although time sensitivity, too, leads to network thinking. The 'Network City' as a new paradigm translates into an integrated planning of land use and urban technology networks, including ICT (Drewe, 2003b).

Should we look for new city concepts from which new instruments can be derived? In 2003 the New Charter of Athens has been published, seventy years after its predecessor which has provided the

dogma of mainstream urbanism until today (European Council of Town Planners, 2003).

> *The Athens Charter of 1933 is based on two false premises: '(a) it is desirable to concentrate functions into giant packages; (b) the geometry within each package is homogenous. Nevertheless, a city contains so many complex functions that it is impossible to isolate them, let alone concentrate them, so that imposing a simplistic geometry on urban form inhibits the human activities that generate living cities' (Salingaros, 2000: 15).*

Over the years important changes have occurred in every conceivable domain, changes that are challenging future cities. ICT or urban time policies are just two more recent issues. The New Charter may contain all the right 'sound bites' – such as sustainability,

connectivity and the like – but still must be translated into new instruments of planning and design to become effective and to reassert the grounding powers of urbanism. Time, by the way, is not a topic in the New Charter.

Why not start from time-oriented city concepts right away. Gwiazdzinski (2002) lists a number of emerging continuous cities, that is cities functioning around the clock:

- the **global city** (Sassen, 1991) such as New York, London or Tokyo where the consumer can find (almost) everything each hour of the day and all year around;
- the **linear city** of international transport connections (motorways, railways….) and their oases of continuous time (stations, motorway stops, seaports, airports, taxi stops);
- the **archipelago city** with their emerging 'bastions of continuous time'-services and production still largely organized in a 24 hours sequence: industrial plants, restaurants, hospitals, hotels, police stations, fire brigade stations;
- the **festive city**, specialized like Ibiza or Las Vegas: living in the utopia of leisure and permanent fun;
- the **virtual city** of networks, the WWW and its electronic appendices (computers, telephones, television…) which have colonized our homes and urban space.

These city concepts may inspire same designers, but to reassert the grounding powers of urbanism they, too, need to be translated into instruments. Moreover, the assumption of an emerging continuous city needs to be checked against known facts of time use and uncertainties concerning future developments.

Why not choose the 'Network City' as starting point for our search of new instruments? In session 1 its relationship with time has been explored. Throughout this essay the 'Network City' is conceived of as a new way of thinking cities, not as a new ready-made spatial concept. Hence it is not to be confused with 'réseaux de villes' (France), 'Städtenetze' (Germany) or 'stedelijke netwerken' (The Netherlands). In an earlier paper (Drewe, 2003) network thinking has been put to a test by:

- analyzing emergent network-based concepts,
- rereading the classics,
- a design studio.

In the part that follows these are the steps will be followed. But this time the emphasis will be on time sensitivity. To this will be added urban time policies and prospective mobility. The least one can hope to achieve is to prepare the stage for research into the matter.

7.1 Emergent network-based concepts

Two examples from the US are selected: the 'Millennium City' (Page et al, 2003) and the 'Hudson County Cyberdistrict' (WRT, 2003). See also the related case of Jersey City (Page and Phillips, 2003). These are examples from planning and design practice, examples of integrating urban technology systems in land-use design. As these systems include ICT, the cases also illustrate how to design with ICT.

The winning entry for the Millennium City competition for Orange County tries to achieve smart sprawl through a network-oriented development. This is a process in seven steps:

- development of a county-scale organization to stimulate the growth of e-commerce, e-business, e-government, distance education and telemedicine;
- creation of a county-wide high capacity Metropolitan Area Network (MAN) with commercial, non-profit and government components;
- establishment of a system of Network Stations of different sizes at dozens of strategic locations throughout the county to provide access to the MAN (including high speed access to the Internet);
- transformation of single-function buildings into mixed-function buildings with Network Stations adding functions;
- creation of plans for adding a mix of functions to single-function districts such that housing, jobs and services will be integrated at distances no greater than 2 miles (also using infill bricks and mortar projects as well as Network Stations for this purpose);
- creating of Neighborhood Transportation Zones around the Network Stations (mixed vehicle streets catering to low-impact vehicles);
- begin of reclaim of some of the land devoted to the high-performance automobile (such as housing construction on surface-parking lots in retail centers or office parks or reclaim of streets).

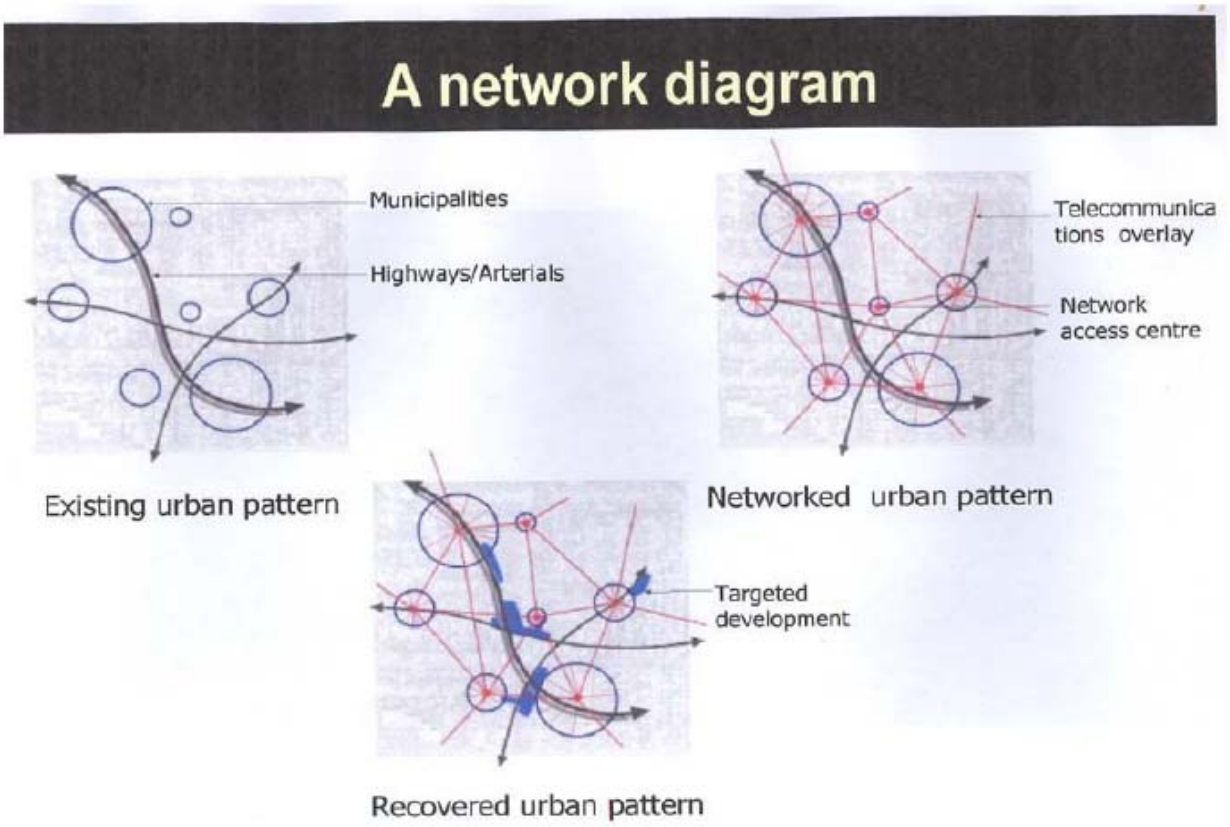


Fig. 8. A network diagram

Figure 8 illustrates how the existing urban pattern is recovered by means of a networked urban pattern. As a follow-up to the Millennium City, the Hudson County Cyber Strategy requires three initiatives, the:

• Network Neighborhood Initiative,

• Network Enterprise Initiative,

• Cyber Strategy Coordination Initiative.

The first and the second initiative comprise design elements. According to the Network Neighborhood Initiative, ICT is used to increase the pull of existing activity centers to the immediately adjacent residents and business reducing demand for trips of over a mile or two. This initiative is also meant to reinforce a local sense of pride-of-place in neighborhoods. The initiative includes the following projects.

• Network Neighborhood Centers Plan (Centers Plan) comprising shared network access facilities or Network Stations (as in Orange County) to start with Centers Pilot Projects (three centers);

• Mixed use public facilities such as schools, libraries, public transportation stations, parks and city halls (to be combined with the Centers Plan) plus a Mixed Use Public Facilities Pilot Project focusing on rail platforms and stations;

• Centers Plan Revision and Developer Recruitment (after the implementation of the two pilot projects);

• Neighborhood Transportation Zones, Vehicles and Services Pilot Project (similar to the Millennium City) in the service areas for each designated center.

The Network or Electronic Initiative is not an initiative in itself but rather a complement to the Network Neighborhood Initiative The general idea is to facilitate the transition of delivery activities of each enterprise (production and services): from 'bricks and mortar' to digital networks and to create demand for mixed function facilities. Several projects are envisaged:

• e-government targeting government services to citizens;

• countywide micro business incubator, using the new infrastructure of Network Stations;

• regional telework focusing on the administrative component of material handling and information companies;

• micro business web assistance, for example 'bricks and clicks" of retail stores;

• electronic meetings to cope with parking and congestion problems.

The proposed projects do not only affect the space-time budgets of households but also those of companies with a pivotal role of ICT. No attempt has been made yet to map potential 'chronotopes', say, of Network Neighborhood Centers or to do so as part of a pilot project. Chronotopes are '…physical places of spatial and temporal architecture animated by the rhythms of presence and co-presence of its citizens and temporary inhabitants' (Bonfiglioli, 1999: 125). Chronotopes are a tool used in urban time policies that will be dealt with in section 7.5.

7.2 Rereading the classics

In this section a few examples will be presented of how classic can be reread. Today's investigations of time and space, in particular the space-time budget analysis own a lot to a classic; that is to Hägerstrand's space-time model developed in the 1970s (see Corbett, 2003).

'Over thirty years after it was first introduced, Hägerstrand's space-time model continues to provide new ways of understanding human activity in space, and promises novel solutions for solving difficult issues of transportation and access in modern society' (Corbett, 2003: 3).

Hägerstrand is a geographer. But what about the classics in urban planning and design? Ancient concepts, however, cannot simply be cut and pasted to provide a panacea for current and future urban problems. They must allow for the inclusion of ICT and space-time analysis. The 'Network City', as a new paradigm, in fact is not really new but rather the result of rereading classical network thinkers namely by Dupuy (1991). It proved possible to apply the framework shown earlier in figure 1 (section 1) to the Internet with traceroutes enabling us to grasp and measure the 'death of distance' in milliseconds. The network in its modern meaning is characterized by three principal criteria:

- **'Topological Criterion**. The research of direct relations without intermediary and the desire for ubiquity, produces a very specific interest in the topology of a network.
- **Kinetic Criterion**. Instantaneousness, homogeneity of speeds, the interest for rapid transfers without losses of time or interruptions make the network apt to movement and defines the kinetic criterion.
- **Adaptive Criterion**. As presently conceived, networks are based on a choice of connections in space and time. The connections can necessitate a permanent support, a fixed infrastructure. On the other hand, the network has to ideally, be able to constantly adapt to the need of new connections, when they are requested and chosen by its users' (Dupuy, 2000: 5).

Both the kinetic and the adaptive criterion relate to the time dimension. Take for example the actor's daily space-time budget described in section 6. The actor's action space, in especial the reach of a working place at some 70 kilometers from home depends on the kinetic quality of a railway network. The latter is about to adapt to a higher speed which implies that with high-speed train links working places at longer distances will become within reach of the actor.

	TOPOLOGY	KINETICS	ADAPTATION	HISTORIC MARKS
Haussmann	⊗	○	○	
Paxton	⊗	⊗	○	Railroad
Cerda	●	●	○	
Henard	⊗	⊗	○	
Soria Y Mata	●	●	●	
Wagner	●	●	●	Electricity
Insull	●	●	●	
Chambless	○	●	●	
Hart	⊗	○	○	
Pinchot	●	○	○	
Ford	●	⊗	⊗	Automobile
Wright	●	●	●	
Rouge	●	⊗	⊗	Telephone (in France)
Riboud	●	●	○	
De la Rochefoucauld	●	⊗	⊗	Telematics
Virilio	○	●	○	

● Very large emphasis ○ Large emphasis ⊗ Middle or weak emphasis

Fig. 9. Emphasis on topological, kinetic and adaptive dimensions of networks

As shown in figure 9, the classical network thinkers in urbanism have put different emphasis on the three criteria (Dupuy, 1991: 105). Wright is one of the few who has dealt fully with all dimensions. Wright has also inspired Fishman (1988) who has laid the foundation of the very framework of today's network urbanism. Are there still lessons to be learned from Wright's 'Broadacre City' (Wright 1940, 1943; Grabow, 1977). And what about the other classics such as Cerdà? Are Cerdà's urbanistic propositions for Barcelona a source of inspiration for new instruments of planning and design (Magrinyà, 1996)?

A modern network thinker is Salingaros as his 'theory of the urban web' clearly shows. He could equally be ranked among those who have produced emergent network-based concepts though his 'connecting the fractal city'-unlike e.g. the Hudson County Cyberdistrict- is primarily a conceptual contribution. Its importance lies in the fact that he raises a number of fundamental questions: '(i) what these fractal properties are; (ii) the intricate complexity of the living urban fabric; (iii) methods of repairing urban space; (iv) an effective way to overlay pedestrian, automotive, and public transports; and (v) how to integrate physical connections with electronic connections

Theory of the Urban Web

'The processes that generate the urban web can be summarized in terms of three principles. Though not exhaustive, they are entirely general, and this paper will describe how they translate into practical design rules for specific situations. Everything has to do with connections, and the topology of those connections. The three principles may be stated as follows:

1. ***Nodes:*** *The urban web is anchored at nodes of human activity whose interconnections make up the web. There exist distinct types of nodes: home, work, park, store, restaurant, church etc. Natural and architectural elements serve to reinforce human activity nodes and their connective paths. The web determines the spacing and plan of buildings, not vice versa. Nodes that are too far apart cannot be connected by a pedestrian path.*
2. ***Connections****: Pairwise connections form between complementary nodes, not like nodes. Pedestrian paths consist of short straight pieces between nodes; no section should exceed a certain maximum length. To accommodate multiple connections between two points, some paths must necessarily be curbed or irregular. Too many connections that coincide overload the channel's capacity. Successful paths are defined by the edge between contrasting planar regions, and form along boundaries.*
3. ***Hierarchy:*** *When allowed to do so, the urban web self-organizes by creating an ordered hierarchy of connections on several different levels of scale. It becomes multiply connected but not chaotic. The organization process follows a strict order: starting from the smallest scales (footpaths), and progressing up to the higher scales (road of increasing capacity). If any connective level is missing, the web is pathological. A hierarchy can rarely be established all at once'.*

(Salingaros, 1998)

(As far as practical action is concerned, the work of Salingaros is close to that of the Prince's Foundation in Britain: < http://www.princes-foundation.org >).

The reason for referring to Salingaros, a modern network thinker, in the present section is his rereading of Alexander, in particular the pattern language. (Alexander et al, 1977). The patterns of Alexander do not have an explicit time dimension, nor do the so-called functional properties connected by 'functional notes' to the original patterns (See Alexander, 2002).

Moreover, neither the patterns nor the properties take into account ICT. Salingaros has posed the question of how to integrate physical connections with electronic connections. Looking for patterns, both the Orange County and the Hudson County provide examples:

- Network Stations plus mixed-function buildings plus Neighborhood Transportation Zones,
- Mixed use public facilities plus Network Neighborhood Centers (or Network Stations),
- Network Neighborhood plus various Electronic Initiative projects.

See also Firmino and Graham (2001) for the interplay between physical and virtual urban spaces. What about time in the pattern language? Both Alexander and Salingaros are committed to the living city or living urban fabric. Combining their concepts with those of urban time policies would only strengthen their case. Because introducing time in urban planning and design means introducing people and their needs as external criteria of the quality of design which is not common practice for example in contemporary architecture which '…has become self-referential; i.e. validated only by how well it conforms to some currently accepted style; and not by any objective external or scientific criteria '(Stringer 1975, quoted by Salingaros, 2000b, 2 & 3-4). The contributors of Salingaros to rereading the classics or to emergent network-based concepts for that matter are not the contributions of a planner of designer, but of a mathematician (and former nuclear physicist). Similarly Barabási (2002), a physicist doing research on complex networks, has demonstrated the multidisciplinary character of the 'new science of networks': awaiting to be applied to the complex network of the city. These 'outside' contributions are important stepping-stones to knowledge-based design, developing urban design into a science (Klaasen, 2003).

Another classic worth rereading is Jacobs. Apart from her plea for organized complexity more than forty years ago, her concept of city diversity is still valuable to day. ICT only strengthens the case for organized complexity. One of the conditions for city diversity in particular ties in to the objective of urban time policies, to wit the 'need for mixed primary uses':

'The district, and indeed as many of its internal parts as possible, must serve more than one primary function; preferably more than two. These must ensure the presence of people who go outdoors on different schedules and are in the place for different purposes, but who are able to use many facilities in common' (Jacobs, 1992).

Note also the emphasis on mixed function districts, buildings and public facilities in the Millennium City as well as in the Hudson County Cyberdistrict.

Our last example is Lynch, perhaps best known for 'the image of the city' (Lynch, 1960). This work has inspired Roberts et al (1999) in developing the 'integrated metropolis', another emergent network-based concept. The image of the city 'has also inspired Scott and Phillips (2003) in their urban design for Jersey City: however, in relation to electronic space or electronic networks.

'To argue today, as Lynch did 40 years ago, that Jersey City is a disorienting, obscure urban form that is no more than its sum of fragmentary enclaves and divisive infrastructure boundaries would be criticism leveled from a traditional urbanism perspective. More accurately, the city should be recognized as being rife with opportunity to explore new forms of urban expression that acknowledges the diverse and flexible interest of the information age' (Scott and Phillips, 2003: 93). See the 'exploded axonometric analysis' for design details in figure 10 (Scott and Phillips, 2003: 91).

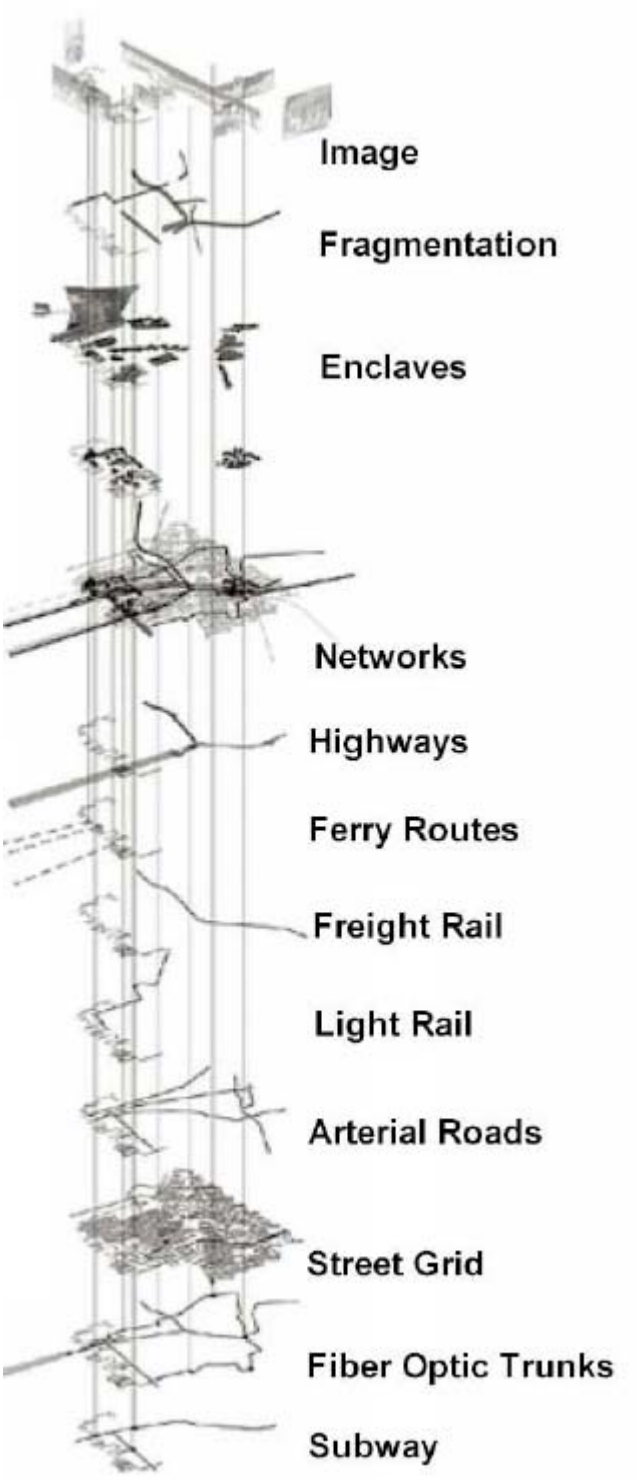


Fig. 10. Jersey City: exploded axonometric analysis

It has already been mentioned that practitioners usually do not work with spatio-temporal concepts so that they find it difficult to deal with time. Lynch has already been an exception to this in 1972 when he published 'What time is this place?' He may be even

considered as a forerunner to urban time policies. Lynch therefore deserves to be(re)read, for example, his attempt to clarify the issue:

'One can think of several dimensions along which time structure can vary:

a) its grain, or the size and precision of the chunks, into which it is divided;

b) its period, or the length of time within which events recur;

c) its amplitude, or the degree of change within a cycle;

d) its rate, or the speed with which changes occur;

e) its synchronization, or the degree to which the cycles and changes are in phase, or begin and end together;

f) its regularity, or the degree to which the preceding characteristics themselves remain stable and unchanging, and

g) (in the human case and more subjectively) its orientation, or the degree to which attention is focused on past, present or future' (Lynch, 1972, 76-77).

Lynch also -as a true practitioner-describes some policies for changing things such as: the organization and celebration of time, change intelligence, prototypes, conservation, preservation, time enclaves and change management. What about instruments or methods of design?

According to Lynch a number of general methods is available to us: 'One is the visible accretion of the signs of past events which makes apparent the depth of historical time [-temporal collage-]. Another is the display of recurrent, opposed states which makes us aware of rhythmic time by contrasting the present state with remembered and expected states [-episodic contrast-]. Still another is the direct display of environmental change, when by transforming the scene – or shifting the viewpoint of the observer – the change can be made sufficiently palpable to be perceived in the experiential present [-the direct display of change & design for motion-]. Finally, there may be ways of symbolically speeding or slowing otherwise imperceptible changes – changes too glacial or too feverish to be seen – so as to bring them within our perceptual grasp [-patterning of long-range change-]. All these modes have their own characters. None of them is practiced today [-in 1972-] in any systematic way' (Lynch, 1972, 168).

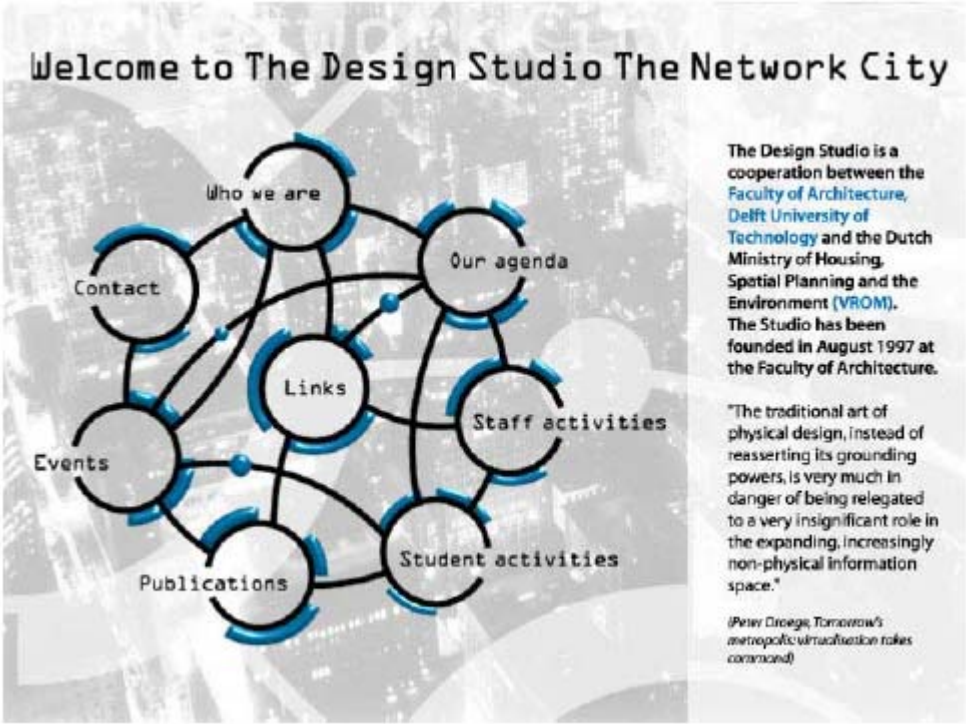
In addition to these four methods Lynch speculates about extending 'our perceptual reach by artificial means, in order or sense environmental changes' ('mutoscopes'). With ICT as a visualization tool this is within reach today.

'All of these ideas open rich possibilities for experiment, for training and for public participation. While adding directly to our enjoyment of the world, they could also serve to vivify and make coherent our image of time' (Lynch, 1972, 189).

With the rise of ICT, the question 'What time is this place?' is indeed an intriguing one. Planners and designers are essentially dealing with the future, in particular with the long run. But how can they succeed without mastering time?

'Being alive is being awake in the present, secure in our ability to continue but alert to the new things that come streaming by. We feel our own rhythm, and also feel that it is part of the rhythm of the world. It is when local time, local place and our own selves are secure that we are ready to face challenge, complexity, vast space, and the enormous future' (Lynch, 1972, 89).

7.3 A design studio



After having dealt with promising new ideas in section 7.1 and some time-honored old ideas in the previous section, the present section will be about a specific approach to the search for new spatial concepts. The Network City design studio started as a cooperation between the Dutch Ministry of Housing, Spatial Planning and the Environment, and the Faculty of Architecture at Delft

University of Technology back in 1997. The studio can be visited at: < http://www.networkcity.nl >. It involves staff, PhD students, contract researchers and undergraduate students in their final year. There are also (international) links to experts working in the same field. A new spatial concept similar to a new product of service, results from a complex interaction between three pillars: a societal or social, an economic-legal and a technological one. Figure 12 refers (Van Mieghem, 1995: 5).

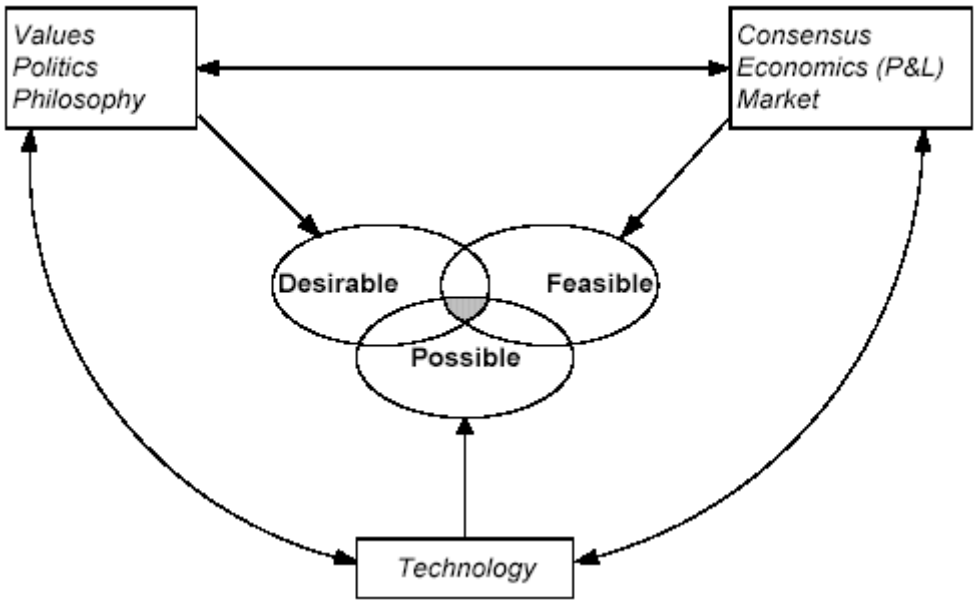


Fig. 12. The three pillars of innovation

The studio approach is one of design-oriented research aiming at possible futures – as design can demonstrate and visualize **what could be**. Possible futures tend to relate to the long term. In order to bridge the gap between a distant future and today's practice a number of location-specific test-beds has been chosen:

• the future urban agglomeration,

• the 'rest' of the Netherlands, beyond the 'periphery',

• the 'mainport' as node of a logistic network,

• the 'euroregion plus', beyond the Dutch border.

Right from the start (Drewe, 1996) the studio has focused on the opportunities offered by ICT. It is the rise of ICT in the 1990s that has triggered network thinking in urbanism. In order to understand the new technology and its implications for urban form, there are lessons to be learned from other urban technology systems such as water, energy and transport (their infrastructures, services and uses).

Time and the 'Network City' have been sketched at the outset in section 1. But so far in the studio, time has been dealt with mainly in relation to mobility and logistics. One of the projects has been about mobility and space-time behavior of the elderly (outdoor mobility of older people). This has been a European project with partners in Germany, Finland, Italy and Hungary (Mollenkopf et al, 2003, 2004). Another project deals with so-called seamless multimodal passenger mobility, i.e. chain mobility and activity-travel behavior. Logistics have been studied as part of the positioning of seaports and airports (Drewe and Janssen, 2002). Logistics are related to the time use of companies, basic rhythms and space-time budgets as mentioned before.

Hence there is still a large area of research to be covered. An important source of inspiration is the work of LABSAT at the Politecnico di Milano. LABSAT stands for Laboratory of Research and Design of Temporal Architecture Systems. This brings us to urban time policies, our next topic.

7.4 Urban time policies

'Tempi della Città' or times of the city is the expression coined for urban time policies in Italy in the 1980s, imitated by other European countries later on. The aims of these policies in Italy are fourfold:

> • 'improvement of the quality of life for citizens through a better organization and allocation of living and working hours;
>
> • modernization of public administration by simplifying its procedures, the opening of services oriented towards the temporal profile of demand, the decentralization and integration of services and office counters;
>
> • up-grading of public spaces to favour networks of socialization and to accommodate temporary dwellers and residents on mobility conditions;
>
> • reconciliation of the competition between residents and temporal dwellers, between workers and service users'.

(Mareggi, 2001, 4-5)

How has one tried to reach these aims? Mareggi (2001) lists seven thematic areas or domains of intervention each of which refers to real-world experiences or cases (today, between 140 and 170 cities have adopted an urban time policy):

- accessibility of services to the public (focusing on different age groups such as children and the elderly),
- integrated design of public spaces,
- time banks, that is the exchange of periods of time among people with different needs,
- mobility agreements to desynchronize the start/end of activities in an attempt to improve traffic conditions and to promote the use of public transport and sustainable mobility,
- opening hours of shops,
- school hours, desynchronizing them in order to decongest rush hours, create safe routes for pupils and add public transport lines,
- cultural and touristic promotion of cities, e.g. changing opening hours of museums daily, on Sunday and annually.

Similar examples can be found in Germany, Finland, the Netherlands and France. See Boulin and Mückenberger (2002) for details, in especial the second part.

Although the design of public space is the primary domain of intervention of conventional urban design and planning (though the design may not necessarily be integrated), there is much more to urban time policies. They start from a temporal description of spatial phenomena and a multidisciplinary scientific reflection which leads to an innovative problem formulation. The underlying concept of the post-industrial city echoes the New Charter of Athens evoking sustainability, flexibility, dispersal and mobility. As mentioned before, urban time policies are also dictated by law. These policies are closely related to a political process at the local level in which trade unions but, above all, women have played an important part ('Women change Times'). A specific procedure as been set up ensuring a concerted action of politicians and a variety of actors (directors and technicians from public administrations, experts, trade unions and employees, business firms and users). This is referred to as multipartner tables of co-design. Finally, a set of techniques has been developed at the Politecnico die Milano helping to identify, simulate and monitor the transformation processes of an area's spatio-temporal architecture, the key concept being the 'chronotope'.

Searching for new instruments of urban planning and design, the so-called chronotopic maps are of primary importance (chronotopic maps may be synthetic, cinematographic or chronomatic systems for local mobility.)

What exactly is a chronotope? According to Guez (2002) a chronotope refers to:

- an urbanized space, transformed over a long period of time, occupied by residential and temporal populations with cycles of uses that constitute typical temporal architectures,
- where the presence of populations alternates or clusters during daily, weekly and annual (seasonal) cycles,
- spaces attracting populations because of their residences and the accessible activities located there,
- within these urbanized spaces people and goods move in daily, weekly and annual cycles.

Within a chronotope, the distribution of populations in closed and open spaces, public and private spaces depends on rhythms marked by the coupling of activities, means of communication and transport.

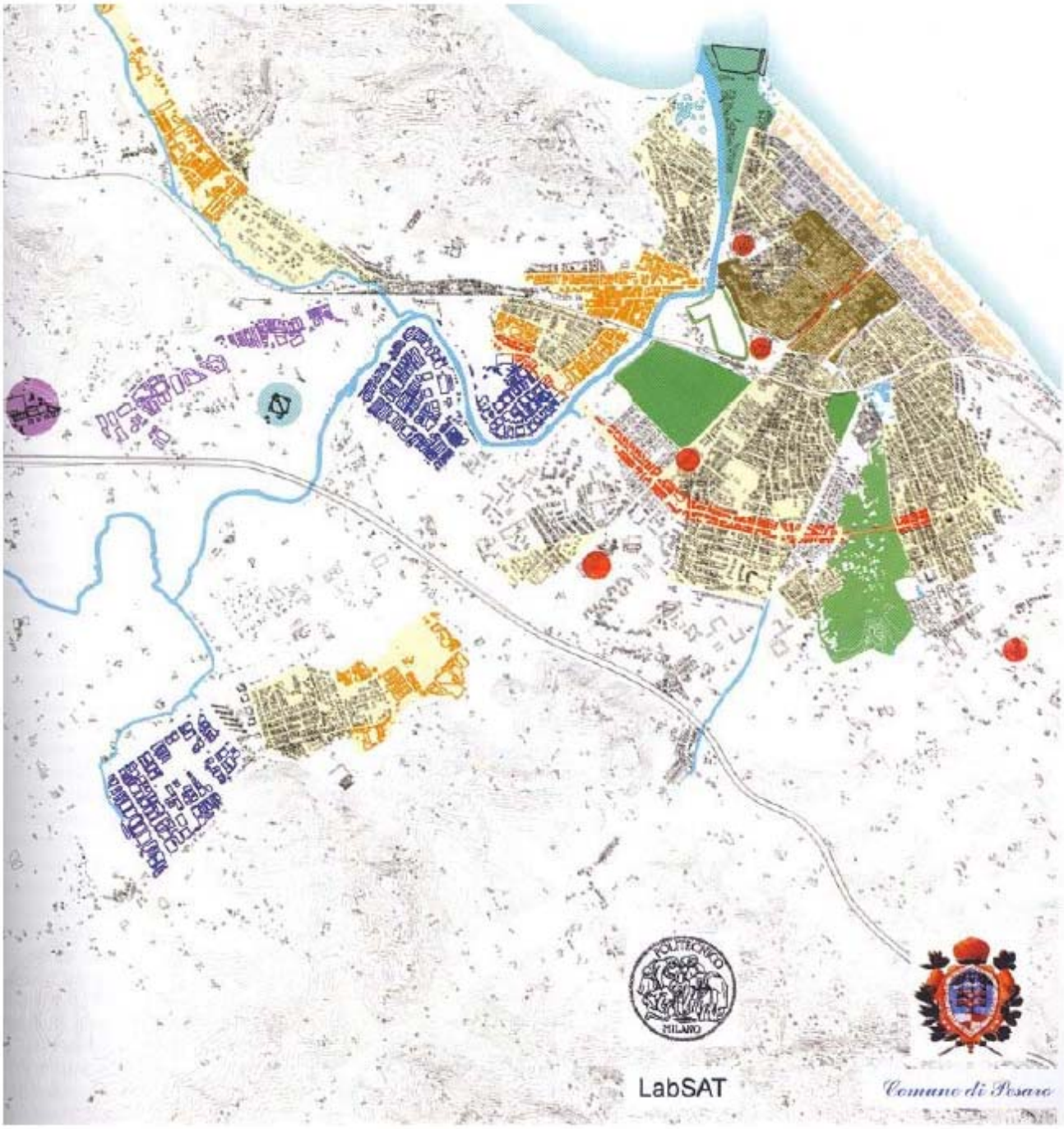


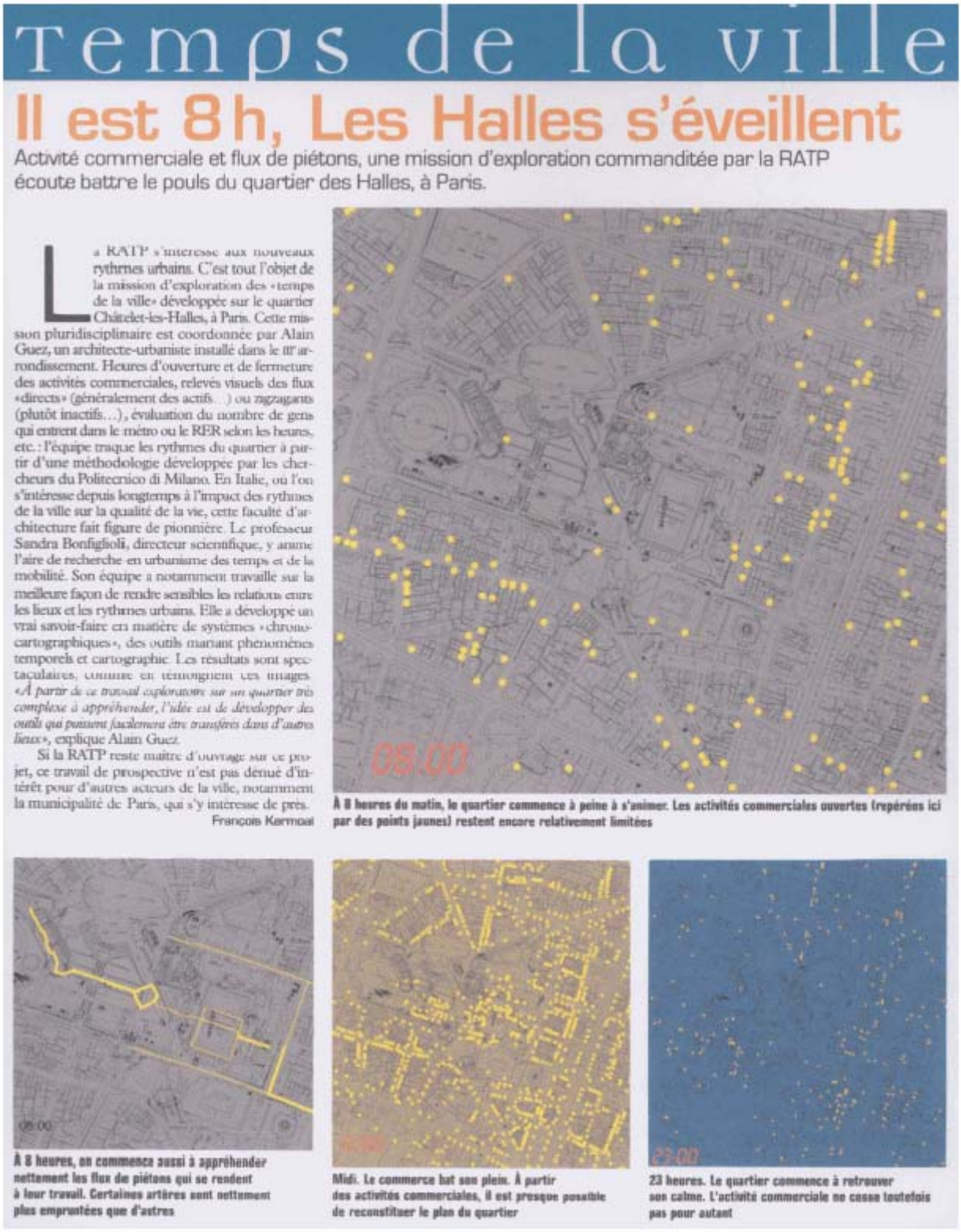
Fig. 12. A chronotopic map of Pesaro (Commune di Pesaro, 1999: 34 & 35)

REGIMI DI ORARIO	Popolazioni	Attività	Tipo di mobilità	Luogo
Durata continua di usi				
	Residenti	Residenza servizi di prossimità	Origine/destinazione zigzagante di prossimità	Il "borgo"
Calendario ciclico con periodo				
Stagione	Turisti city-users residenti	Pubblici esercizi commercio alberghi intrattenimento balneare sulla spiaggia	Sosta passeggio origine/destinazione	Fascia a mare zona turistica balneare abitata stagionalmente
Giorno stagione	Residenti giovani	Passeggio	Lenta origine/destinazione	Spazio pubblico aperto
Stagione estate	City-users residenti	Balneare sulla spiaggia	Origine/destinazione	Spiaggia
Giorno settimana	Residenti	Sportiva ricreativa	Origine/destinazione	Centro sportivo
Feriale diurno giorno settimana anno	Pendolari residenti	Industriale artigianale	Origine/destinazione	Area industriale
Giorno settimana anno	Pendolari city-users businessmen	Terziario industriale magazzini commerciali	Origine/destinazione	Area terziario/industriale
Stagione	Residenti in loco	Agricolo	Origine/destinazione	Area verde agricolo
Mese	Militari	Militare	Origine/destinazione	Caserma
Giorno settimana anno	Pendolari businessmen city-users	Ospedaliera commerciale centro direzionale campus scolastico	Origine/destinazione	Polo servizi
Tempo zero				
				Parco storico Miraflore
Durata continua di usi e calendario ciclico con periodo				
Durata continua di usi residenziali Calendario ciclico feriale diurno e serotino	Residenti city-users	Residenza commercio servizi	Zigzagante	Strada "dei quartieri"
Durata continua di usi residenziali Calendario ciclico feriale	Residenti pendolari city-users	Residenza industria artigianato commercio	Origine/destinazione	Area ad insediamento misto residenziale artigianale - industriale - commerciale
Durata continua di usi residenziali Durata continua di attività portuali Calendari ciclici feriali stagionali	Residenti pendolari city-users	Ristorazione cantieri porto	Sosta passeggio origine/destinazione	Porto
Durata continua di usi residenziali Calendario ciclico feriale stagionale	Residenti city-users	Residenza	Origine/destinazione flusso di attraversamento	Ex Città Giardino
Calendario ciclico con periodo e accadimento				
Calendari ciclici con periodo: stagione e anno Accadimenti occasionali Grandi eventi	City-users residenti	Sport spettacolo	Origine/destinazione	Grande impianto sportivo
Calendario ciclico con periodo: anno Salone del Mobile	Businessmen	Fieristica congressista	Origine/destinazione	Impianti per esposizione e sale riunioni
Calendario ciclico diurno serotino, notturno stagionalmente con periodo: giorno, stagione Accadimenti evenemenziali e occasionali	Residenti city-users businessmen militari	Passeggio sosta incontro ricreazione	Origine/destinazione lenta	Cardo - Decumano Spazio pubblico aperto
Durata continua - calendario ciclico con periodo - accadimento				
Durata continua di usi residenziali Calendario ciclico feriale diurno e serotino con periodo: giorno, settimana, anno Calendario ciclico festivo con periodo: anno Accadimenti evenemenziali e occasionali	Residenti in loco pendolari turisti city-users businessmen	Residenza commercio artigianato servizi amministrativi servizi alla persona culturali spettacoli musei religione ricreazione passeggio associazionismo	Origine/destinazione lenta e zigzagante di prossimità	Centro storico

34

Figure 12 is the prototype of a chronotopic map (Commune di Pesaro, 1999: 34 & 35).

A similar analysis has been produced for a quarter in Paris, Châtelet-les-Halles. The presence of a metro-RER station is the reason why the RATP has been interested in the daily cycle of commercial activities and flows of pedestrians (as will be shown in the next section, the RATP is interested in organizing transport according to the 'new urban rhythms') See also Laousse (2003). Figures 13 shows Châtelet-les-Halles at different hours of the day.


Temps de la ville

Il est 8h, Les Halles s'éveillent

Activité commerciale et flux de piétons, une mission d'exploration commanditée par la RATP écoute battre le pouls du quartier des Halles, à Paris.

La RATP s'intéresse aux nouveaux rythmes urbains. C'est tout l'objet de la mission d'exploration des «temps de la ville» développée sur le quartier Châtelet-les-Halles, à Paris. Cette mission pluridisciplinaire est coordonnée par Alain Guez, un architecte-urbaniste installé dans le IIIe arrondissement. Heures d'ouverture et de fermeture des activités commerciales, relevés visuels des flux «directs» (généralement des actifs…) ou zigzagants (plutôt inactifs…), évaluation du nombre de gens qui entrent dans le métro ou le RER selon les heures, etc. : l'équipe traque les rythmes du quartier à partir d'une méthodologie développée par les chercheurs du Politecnico di Milano. En Italie, où l'on s'intéresse depuis longtemps à l'impact des rythmes de la ville sur la qualité de la vie, cette faculté d'architecture fait figure de pionnière. Le professeur Sandra Bonfiglioli, directeur scientifique, y anime l'aire de recherche en urbanisme des temps et de la mobilité. Son équipe a notamment travaillé sur la meilleure façon de rendre sensibles les relations entre les lieux et les rythmes urbains. Elle a développé un vrai savoir-faire en matière de systèmes «chrono-cartographiques», des outils mariant phénomènes temporels et cartographie. Les résultats sont spectaculaires, comme en témoignent ces images. *«À partir de ce travail exploratoire sur un quartier très complexe à appréhender, l'idée est de développer des outils qui puissent facilement être transférés dans d'autres lieux»*, explique Alain Guez.

Si la RATP reste maître d'ouvrage sur ce projet, ce travail de prospective n'est pas dénué d'intérêt pour d'autres acteurs de la ville, notamment la municipalité de Paris, qui s'y intéresse de près.

François Kermoal

08:00

À 8 heures du matin, le quartier commence à peine à s'animer. Les activités commerciales ouvertes (repérées ici par des points jaunes) restent encore relativement limitées

08:00

À 8 heures, on commence aussi à appréhender nettement les flux de piétons qui se rendent à leur travail. Certaines artères sont nettement plus empruntées que d'autres

Midi. Le commerce bat son plein. À partir des activités commerciales, il est presque possible de reconstituer le plan du quartier

23 heures. Le quartier commence à retrouver son calme. L'activité commerciale ne cesse toutefois pas pour autant

Fig. 13. Châtelet-les-Halles at different hours of the day

How does the chronotopic analysis relate tot the preceding areas of search for new instruments of planning and design? This kind of analysis would enhance emergent network-based concepts as well as 'reread' classics. Chronotopic analysis in itself, too, would constitute an important avenue research for a design studio 'Network City'. But the preceding areas of search may also provide directions for further developing the chronotopic analysis. This also holds for 'mobility in prospect' to be dealt with in the section that follows.

Urban time policies started before the rise of ICT. The chronotopic analysis does not seem to incorporate ICT properly yet. To do so, should not be too complicated if one takes for example the design proposals for the Hudson County Cyberdistrict as a starting point. It is important to integrate ICT because it supports the development of new temporal regimes.

Urban time policies, if they have a spatial dimension, are essentially geared to site planning. Urban planning and design, however, also deals with the urban whole or claims to do so. This requires links with urban technological networks. See levels one and two of

the 'Network City' (figure 1) or examples from emergent network-based concepts (figures 8 and 10). Mobility, too, is a clear case at hand. Chronotopes include people and goods moving in daily, weekly and annual cycles. These moves may have origins and destinations elsewhere in the city. When the RATP has commissioned a chronotopic study of Châtelet-les-Halles it has concluded that, despite the new insights gained from this kind of analysis, further developments are needed leading to a so-called multilevel spatio-temporal navigation as shown in figure 14 (Laousse, 2003: 154). This includes levels above and below the level of the chronotopic analysis. See also Bailly (2002). Urban time policies, on the other hand, already extend to 'mobility agreements' as demonstrated by the case of Bolzano (Commune die Bolzano, 2000). This brings us to our final topic.

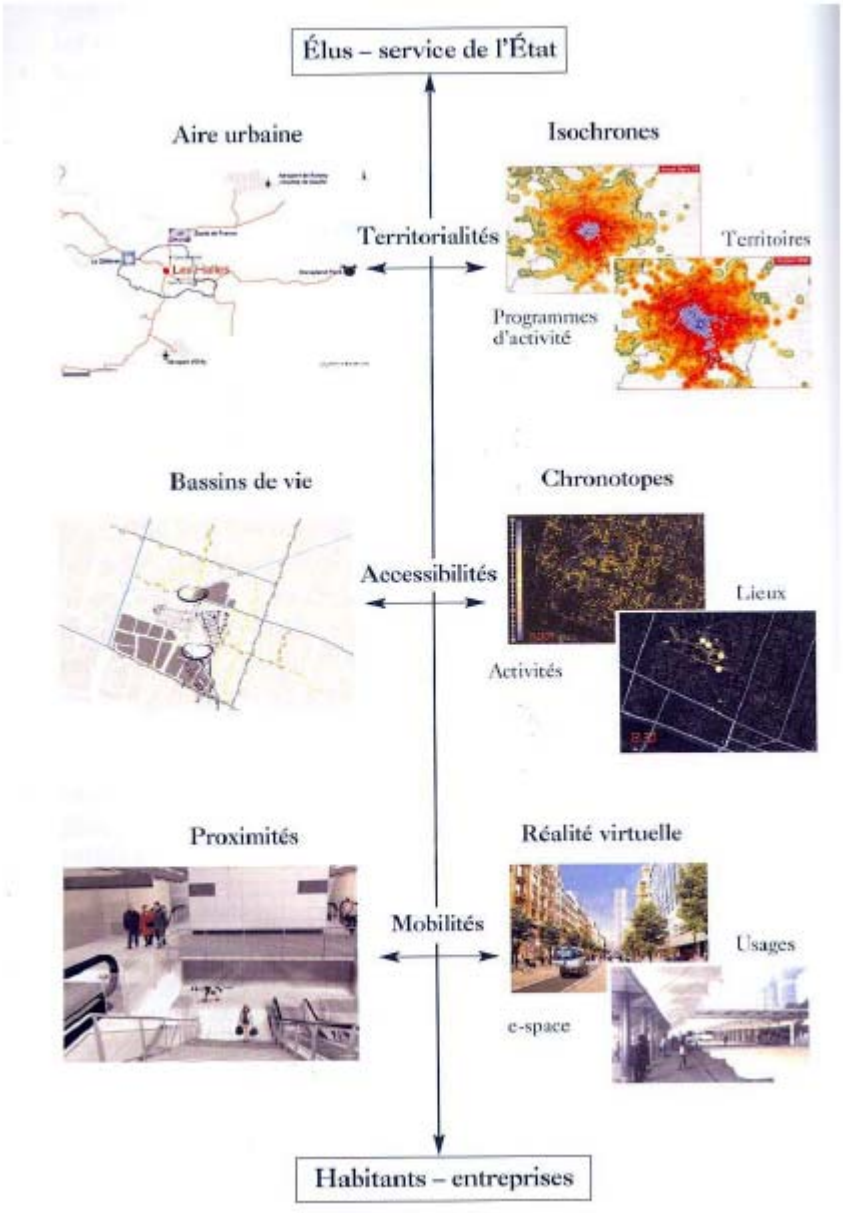


Fig. 14. A modular system of spatiotemporal navigation (Laousse, 2003: 154)

7.5 Mobility in prospect

Throughout this essay, mobility has been an integral part of dealing with time in urban planning and design. In fact, the 'Network City' as a new paradigm translates into an integrated planning of land use and urban technology systems, including those catering for mobility. The latter, however, is not going to stay the same. Mobility, in prospect, has to cope with new urban rhythms. Bailly and Heurgon (2001) from RATP provide directions for future mobility. This includes ICT, not as a substitute for transport, but as an element of choice and convergence (Drewe, 2003). The scene is set by the evolution of urban rhythms before tackling mobility as the target of urban time policies, following French and European, and in particular Italian experiences.

The evolution of urban rhythms has some important consequences for the mobility of passengers:

- mobility increases and becomes more complex,
- trip motives change,
- leisure time and tourism multiply the number of occasional trips,

- big events impact the rhythm of urban life,
- activities become more complex and less regular,
- urban populations are segmented into minorities of hypermobile (nomade) and sedentary populations and a majority of those who display an average level of mobility,
- in a mobile society, immobility is a primary cause of exclusion,
- a mobility education is needed,
- accessibility for all is at stake.

The implications for the organization are that peak hours will stay, but quiet hours will decrease and a continuous function of transport is called for with more tailor-made services. It will not be easy for existing public transport to adapt. Nevertheless the report informs about various initiatives to adapt services to the evolution of urban rhythms. The use of ICT is part of these initiatives.

(By the way, Bailly and Heurgon (2001) also deal with the mobility of goods and entrepreneurs are considered as important actors with regard to mobility. This is in line with the dual notion of space-time analysis adopted in this essay).

By way of conclusion, future mobility -in line with the evolution of urban rhythms- requires:

- new approaches to mobility research (models, mapping such as chronotopes and monitoring),
- innovations in mobility services which ask for concerted actions of different players,
- new regulations.

Let us single out the rethinking of concepts and evaluation criteria applied in today's urbanism and transport policy.

Density, for example, can no longer be used as an indicator of potential exchange unless it is combined with accessibility (taking into account different speeds, from pedestrians tot electrons, and different kinds of transport, i.e. passengers, goods and information). The **continuity** of the built environment, used to delimit politico-administrative boundaries, needs to be revisited as passengers travel beyond 30 km/h. **Physical proximity** or **distance** become less important. As the growth of distance covered by trips correlates with the growth of speed, access time becomes

preferable to distance. A nearby place can be less accessible than a place far away. A final example is geographic **centrality** which within an agglomeration no longer guarantees accessibility. It can even be a handicap for private-car users. New centralities emerge at nodes of interconnection and multimodal platforms polarizing various urban functions. As a consequence, the notion of inner city or city center changes. Notions more operational in future are polarization, functional specialization and thematic concentration. Hence (future) mobility clearly tends to clash with conventional urban planning and design once time is taken seriously in the ICT age. The paradigm challenge becomes even more urgent.

8 EPILOGUE

In 1969 Hägerstrand, the founder of the space-time model, presented a paper to the European Congress of the Regional Science Association in Copenhagen entitled 'What about people in regional science?'

'Historically, social scientists studying the effects of space on human behavior tended to treat time as an external factor, something that is relevant to understanding a given phenomenon, but not essential. Activity choices were seen being made in the context of distance alone such as with the gravity model, and often these decisions were seen in an aggregate sense, with individual decisions viewed as minor variations of those of larger zonal-based groups' (Corbett, 2003: 1).

Does not the question 'What about people?' also hold for conventional urban planning and design? Does not asking 'What about time?' bring back people in urban planning and design? This is most clearly proven by urban time policies. The chronotopic analysis reveals echoes of the past, present rhythms and the simulated presence of the future (Laousse, 2003). What better way of answering Lynch's time-honored question 'What time is this place?'

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