

Patrząc wstecz, przepływ informacji oraz rozwój technologii telekomunikacyjnych zawsze szły w parze. Odległości czyniły dostęp do informacji trudnym co miało swój udział w powstawaniu różnic w rozwoju przestrzennym. Pośród różnorodnych sieci mogących sprostać wymaganiom współczesnej komunikacji, komunikacja bezprzewodowa prezentuje tę formę komunikacji, która jest niezależna od odległości geograficznych oraz miejsc. Telekomunikacja komórkowa jest bardzo złożoną jej formą (np. beeper'y / pager'y, globalne usługi satelitarne itd.). Telekomunikacja komórkowa rozprzestrzeniła się pod koniec XX wieku oraz uzyskała bardzo dynamiczny rozwój. W okresie poprzedzającym zmiany systemowe w Europie Środkowo-Wschodniej, rozwój sektora telekomunikacyjnego nie stanowił priorytetu. Przyspieszenie rozwoju obserwowane jest dopiero w latach 90-tych XX wieku. Widoczny jest znaczący postęp w "tradycyjnych" usługach telekomunikacyjnych ale naprawdę spektakularny rozwój miał miejsce w telekomunikacji bezprzewodowej. Pierwsza firma działająca na polu telekomunikacji bezprzewodowej rozpoczęła swoją działalność na Węgrzech w 1994 roku. Obecnie są cztery firmy świadczące takie usługi. W roku 2000 liczba użytkowników telefonów komórkowych przewyższała liczbę abonentów sieci stacjonarnych. Ich całkowita liczba w 1999 roku wyniosła 1,5 miliona i ponad 5 milionów w 2002 roku (co stanowi około 50 % całej populacji kraju). Pomimo tego, że liczba abonentów telefonii komórkowych rośnie w szybkim tempie, proces ten charakteryzuje się regionalnym oraz strukturalnym zróżnicowaniem. Autorzy niniejszego wystąpienia uważają, że rozprzestrzenianie się technologii bezprzewodowej komunikacji będzie przebiegało zgodnie z hierarchicznym modelem regionalnej dyfuzji. Ma to swoje potwierdzenie zarówno w regionalnej jak i społecznej strukturze. Grupa użytkowników telefonii bezprzewodowej ujawnia duże zróżnicowanie co do wieku, płci oraz wykonywanego zawodu. Niniejsza praca prezentuje całościowy obraz dynamicznie rozwijającego się sektorów trakcie transformacji ekonomicznej.

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The development of wireless telecommunication systems in Hungary

1. Introduction

This work, presented by us, is an introduction and an overview at the same time.

There had been appeared some sensible new challenges for the geography in a close connection with revolutionary development of wireless communications in East Central Europe. With this work we want to contribute to forming of new hypotheses, theoretical and methodological approaches for responding these new challenges.

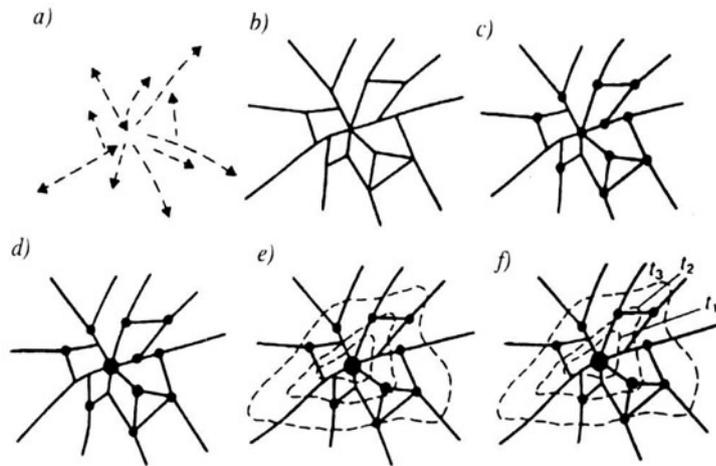
In this introductory phase of the research we consider some possible ways of searching for answers, think about the basis of these problems and their coherence, and, finally we make a rough outline on the spectacular development of wireless telecommunications in Hungary at past and about the perspectives too. However, it can not be explained without elaborating a framework of a comprehensive analysis. It's clear that only such an analysis can give an objective picture about the actual situation of Hungarian wireless communication.

2. Geography and communication. Theories and methods

During the history, the flow of information and the development of telecommunication technologies have always been in close connection. Geographical distances have always made difficult the access to information that contributed to the development of spatial development differences.

The geographers between the two World Wars, and after that too have elaborated several theories describing the phenomenon of spatial differentiation. Some of these theories are important for contemporary geography too, because they can provide some answers to questions of wireless communication as well.

At first, we have to speak about the most known Christaller's model. Certainly, at the time of elaborating of this model it was possible to count only with fixed lines and stations. They were the basic points of a network that was one of most important factor of spatial differentiation at this time.



Haggett's model of social spaces (Source: Nemes Nagy J., 1998, 99.p.)

Haggett's model, „elements of mechanism building social spaces”, elaborated in the middle of sixties, is built up from a more dynamic approach. Inside this model, as one Hungarian researcher on regional issues, Nemes Nagy, says „...the relations of spatial elements are not determined by the synchronic neighbouring..., but by the overbuilding”.

This dynamic approach makes suitable this model to be the base of description of structures unrelated to fixed networks. The use and the wide-spreading of mobile phones in the nineties seems to overwrite irrevocable spaces, created by fixed lines and their connection points' network.

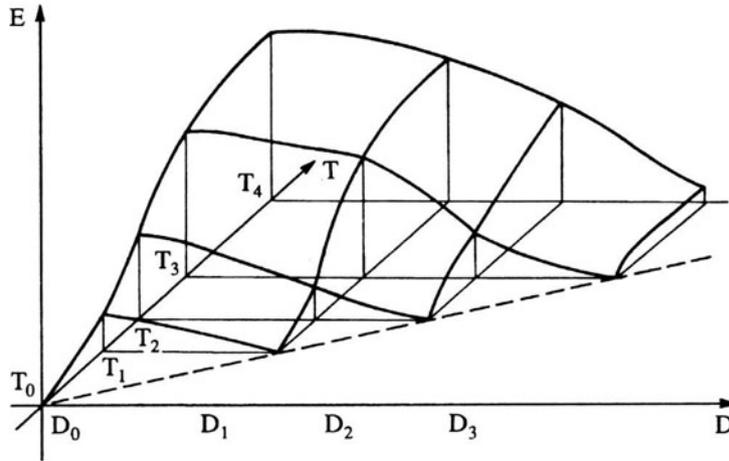
At the same time, the discovering and emphasizing the role of processes of spatial diffusion lead to create an extremely wide-ranging applicable theoretic construction.

The spatial moves could be arranged into three categories. These are:

- spatial flow
- spatial growth
- spatial diffusion

The different spatial flows and growth are contributing to developing more spatial disproportion than spatial diffusion, but the role of this one is even much stronger contributing to the appearance of now phenomena at the new places.

Elaborating of general theory of spatial diffusion leads to involve even more viewpoints into the geographical researches. A very important element of this model is the description of types of innovation's spatial diffusion. According to this description the diffusion may be characterized as epidemic or hierarchic.



The model of spatial diffusion (Source: Nemes Nagy J., 1998, 231.p.)

„While the epidemic type of diffusion can be characterized as a transitional type between social and natural processes of diffusion, the hierarchic diffusion is the social systems own .”, Nemes Nagy says.

Its common peculiarity is that in both cases there is a diffusion between connected neighbours, but the hierarchical diffusion is a process that takes place at „inner” social space. In spite of this it is not entirely unrelated to outer, geographical space, because „...it’s going down by the levels of settlements’ hierarchy.”

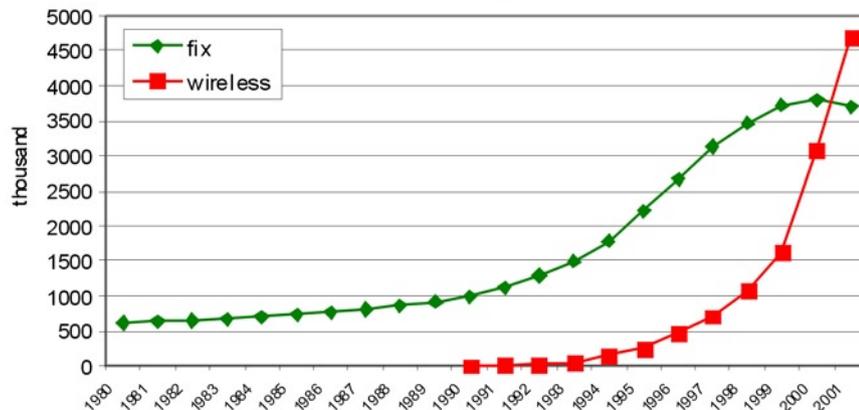
The direction and speed of diffusion of innovations explains very well the spatial structure of economic development, but it also gives a lot of important information necessary for the elaboration of the marketing-strategies.

2. History of wireless telecommunication in Hungary

The telecommunication has developed exceptionally in the nineties. During the socialism the development of the telecommunication was not a priority and the development was very slow. It was very harmful, but there were some advantages too: in the nineties, the application of the most advanced technologies was not held back by the expensive replacement of the lately built stages, than it was the case in some countries.

By the second half of the nineties, the fixed line-network was constructed totally – this was hopeless case during decades of socialism. This was very important aspect of foreign direct investments, the lag of periferial areas almost disappeared from this point of view. However, the expansion of mobile telephones was more dynamic than the fix ones.

The spreading of fixed line and the mobile telephones in Hungary



Source: Hungarian Statistical Office, KSH

In 2000 the growth halted and a slight decrease began in the field of main line numbers; the main reason for the decrease is the loss of residential main lines (disconnection and churns). On the other hand, the mobile market maintains its quick growth in Hungary and in June 2001 the number of mobile subscribers exceeded the number of connected fixed main lines. Naturally, there are certain limits on the comparison of the two values, since in terms of functionality the two products serves different purposes and different target groups. The personal nature of mobile telephone set makes them mostly tied to individuals, while the logical unit of utilization for fixed line telephone set is the household (basically for residential main lines), in which there is usually more than one owner for one telephone set. Although it is slowly decreasing, the fixed line telephone penetration of households is above their mobile telephone penetration level. The two fundamental penetration indicators converge at a much lower

penetration level than in the countries of West Europe, at a level of about 37-38%. (Overview...)

The main reason for that is probably the East European peculiarity that while in more developed countries the fixed line telephone penetration stood at 50% or above at the beginning of the mobile era, in Hungary this value was extremely low, thus mobile communications caught up with its fixed line rival much earlier than in the West. However, the structure of consumption is still radically different for fixed line and mobile telephones. The main reasons are the following:

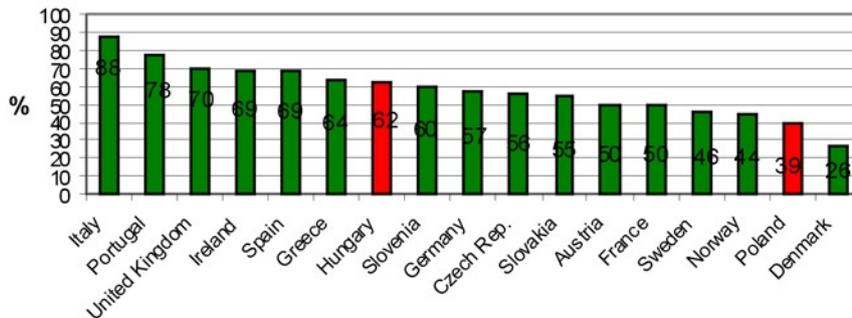
- The charges of fixed line service (especially the traffic charges) are mostly much favourable than the mobile charges,
- The reasons motivating mobile telephone usage may be different from the reasons motivating the use of fixed line telephone set (often the mobile telephone is only used for access with

- minimum originated traffic),
- Other consumer groups are using it (telephone usage by young people explodes, typically with low monthly traffic levels, which is naturally attributable to the prices of mobile services),
- The alternative usage options of mobile telephone (the popular and much cheaper SMS may be used to replace some of the voice traffic)
- Internet usage, which generally creates more traffic, is becoming more and more popular on the fixed line network.

Since the appearance of analogue radio-telephone system it took 9 years until reaching one million subscribers, while in the case of fixed lines it required 90 years. The market of mobile phones may develop until 2003-4, when the market may saturate. For example in the age group between 30 and 40, in particular in Budapest, the penetration rate is over 80 percentage.

One of the important factors in the quick surge of mobile penetration in Eu-

Ratio of prepaid cards to all subscribers in some countries (June 2001)



Source: www.hif.hu

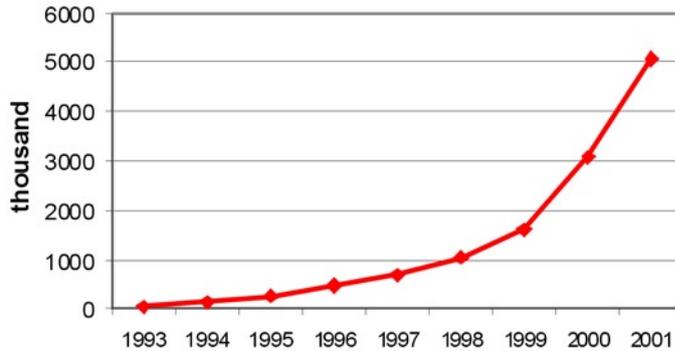
rope was the diffusion of prepaid cards. The SIM cards requiring no monthly subscription charge have reached the less affluent subscribers.

The ratio of prepaid cards does not show any significant relationship to the economic development of European countries, at the same time, it is safe to say that the ratio of prepaid cards is generally that the highest in southern countries and

decreases as we go to the North. (Overview...)

In Hungary the prepaid system started in 1997. Since then the two-thirds of the clients has prepaid for service. This system is popular for the young. By the age group of 15 and 19 the mobil penetration was 10 percentage in the end of 1999, and today it's over 40 percentage.

Number of mobile phone subscribers in Hungary



Source: Hungarian Statistical Office, KSH

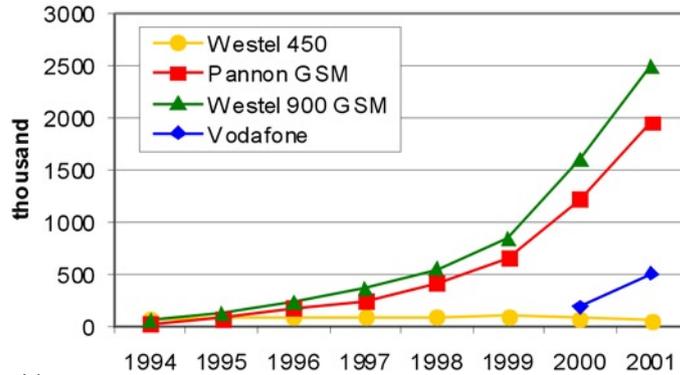
In the wireless telecommunication the boom is between 2000 and 2002 in Hungary. Since 1999 the number of subscribers has increased 4 million during 2 and half year, this is the 40 percentage of the population of Hungary.



Source: www.hif.hu

In 2000, the rate of growth was very fast, 5 percentage points by month (even, in December it was above 11 percentage to the previous month because of the Christmas). During one year, the number of subscribers has doubled, from 1,5 (one and a half) million to 3 million.

Subscribers of public mobile telephone services by providers

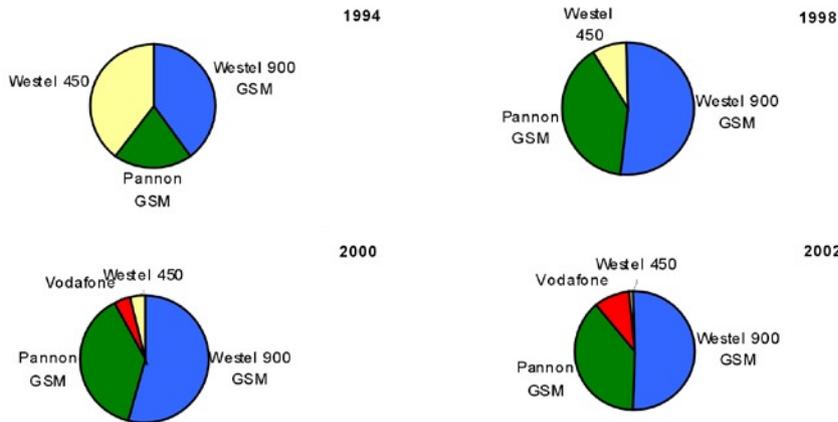


Source: providers

3. The Hungarian wireless-telecommunication market

There are four providers in Hungary: one in analogue system, three in digital (GSM) system. The analogue system is

pushed into the background against GSM system. Now, its part of the market is minimal. On the figure you can see, that the third provider, the Vodafone, which started in 1999 forged ahead, it has the 10 percentage of the market.



Source: providers, www.hif.hu

By 2000 the mobile service providers had ensured coverage for the entire country, in terms of both population and territory. The above charts show territorial coverage in middle of 2001. Having functioned as operators for several years, the coverage maps of Westel Mobile Ltd., Westel Radio Telephone Ltd. and Pannon GSM Ltd. are almost full up, while Vodafone, a company that started operating in 1999, is provisioning its own network on an ongoing basis – first, along the major transport lines.

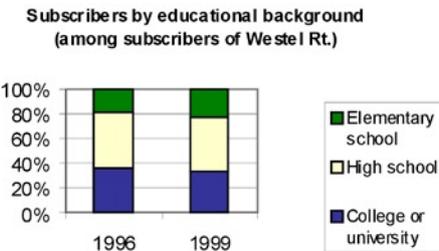
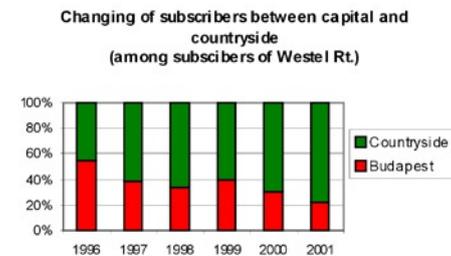
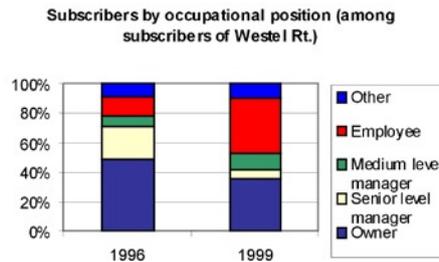
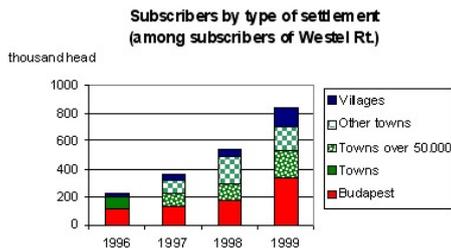
4. The spreading of innovation and the structure of subscribers

The innovation spreading was happened by hierarchy. On levels of settlement hierarchy you can see the dislocation from the capital to the countryside – today

the 80 percentage of subscribers are provincial. It's harmonic with the allocation of the population. Among thy types of settlement it is noticeable that the rate of inhabitants is in the smaller settlements increases. The mobile telephone becomes an ordinary thing, so the regional differences equalize.

Middle of the decade of 90, principally the owners and senior level managers used the mobile telephone. Today, its spread among peoples, who are in the lower occupational position (f.e. employees). At first it was used mainly in business, but for today, the role of private utilization has also become important.

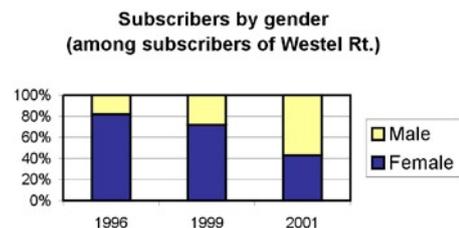
Earlier the rate of people with university or secondary school degrees had been higher among users of mobile phone than



Source: Westel

the average rate of the population. Later the usage of mobile telephone among lower educated people expanded. If we analyze the composition by gender, we can state that the majority of males who are overrepresented among higher educated people. In the meantime the rate of females has been increasing and now the rate is very closed to that of males.

Source: Westel



The society of users of the mobile telephone is becoming continuously younger. The most dynamically growing group consists of people under 25, while people between 30 and 40 were the major users earlier.

Typically the qualified, middle-aged people, mostly males were the initial users of the GSM network, but now the mobile telephone is becoming an ordinary thing.

5. An outlook to Europe

	Czech Rep.	Estonia	Hungary	Poland	Ukraine
Population (million)	10,3	1,4	10,1	38,7	49
Subscribers (million)	4,6	0,55	3,1	6,98	0,8
Penetration (%)	45	39	31	18	2
GDP/head (USD) PPP	11700	5600	7800	7200	2200

	Austria	Finland	Sweden	Norway	Portugal	Greece	France
Population (million)	8,1	5,2	8,9	4,5	10,1	10,6	59,5
Subscribers (million)	6,3	3,9	6,3	3,1	6,67	6,1	29,86
Penetration (%)	78	76	72	71	60	58	50
GDP/head (USD) PPP	24600	22800	23000	27600	16500	14800	21900

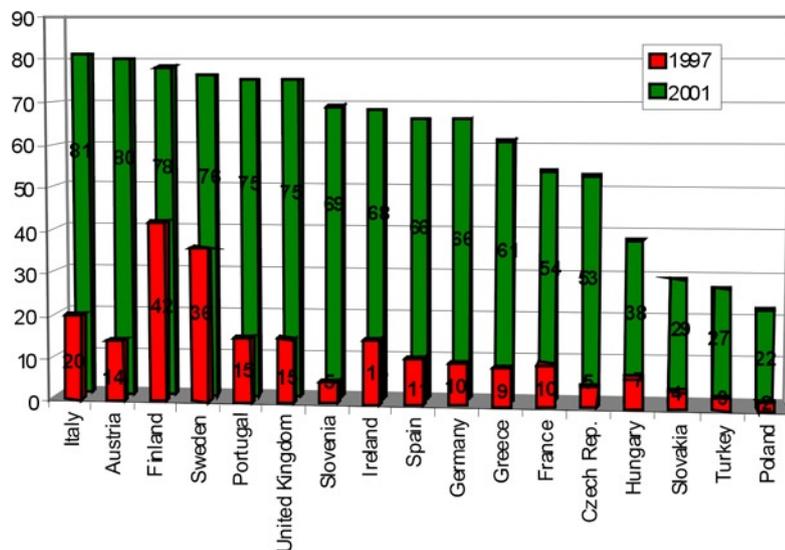
Source: www.hif.hu

In the European Union the highest penetration is in Austria and Scandinavia, the lowest is in France. High penetration is usually in those countries, where the GDP per head is also high, over 20 thousand dollars. The correlation between the stage of development and penetration is very strong (0.9). In Central Europe the

highest penetration is in Czech Republic, Estonia and Hungary, but these figures are significantly below the lowest level of the Union. The lowest penetration was in Ukraine. Although Poland is one of the

leaders of the region concerning the economic development, the country is behind with indicators of penetration of mobile telephones compared to those of similar developed countries.

Changing of mobile telephone penetration per 100 people



Source: www.hif.hu

In Europe, the using of mobile telephoning started soonest in Scandinavian countries. In 1997 the penetration was already between 30 and 40 percent, in other countries it was lower than 20 percent. At this time, in Central Europe only every twentieth people had mobile telephone. Since then it has been the mobile telecommunication boom. At that time the penetration was already over 66 percent in the Union. These figures were lower in Central Europe, except in Slovenia. In our region the highest penetration is in Czech

Republic, little bit lower in Hungary. In Poland every fifth people has a mobile.

	1990	2000	2010*
Fixed	490	905	1500
Mobile	7,5	490	2200

Source: www.hif.hu

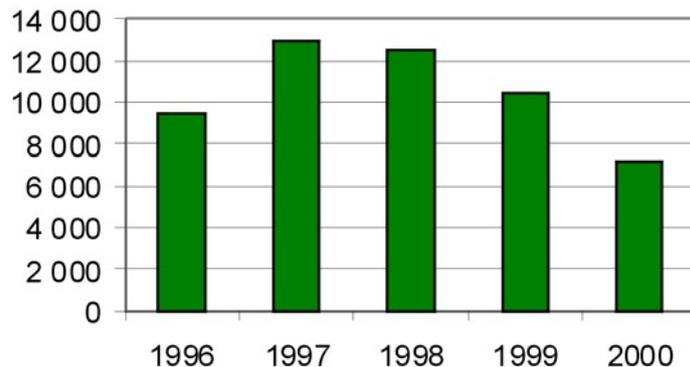
Telecommunication was the most dynamic sector in the last decade. The number of fixed line telephones duplicated in 10 years, and it is expected to increase

by two-thirds in the next decade. Meanwhile, the number of wireless telephones increased 66 times in last decade, in 2000 it was equal to the number of fixed line telephones in 1990. The development will continuously be dynamic, but in a lower degree. In this decade it may increase almost 4 times higher. By 2010 every third people on the world will have a mobile telephone. The number of mobile telephones will be one and a half times higher than that of fixed line telephones.

6. *Paging services*

Despite its popularity overseas, paging services in Hungary could stay in the upward tendency only until 1997. Two companies (Euróhívó Ltd. and Easycall) which were established in 1994 fused into Euróhívó Ltd. in 1999. The subscribers of Euróhívó Ltd. (the only company in the paging service sector) are continuously decreasing. (Overview...)

Subscribers of public pager services



Source: Hungarian Statistical Office, KSH

The nationwide coverage of this service is 82%. The pager service can't compete with the mobile service, which offers higher level services at similar prices. This is why the number of pager subscribers is declining. The pager can be used only for one way communication.

7. *Conclusions*

At first sight, the spatial science dealing with geographical space hardly can find

many connections with wireless telecommunication, except the case of mapping the territories not covered by mobile service providers. If this is true, the geography really stand at his own „last questions”, and it looks that it has no chance for answer them.

Analysing the basic situation, the general spatial structure of territorial development and the areas covered by mobile service providers at the first phases of

the process of coverage seems to be in close connection. The structural parallel is striking at the outer and inner peripheries. Explanation of this backwardness in case of inner spatial space, lays in insufficient demand, frequently reinforced by the geographical position and the character of surface. The reasons of insufficient demand are the social structure of the region, low density of population and the character of settlement.

Among networks services for meeting the demand for communication, the wireless communication represents a form that is independent from geographical distances and places. Mobile-telecommunication is very complex: it includes the wireless systems, and many additional services (e. g. beepers, pager services, global satellite services, etc.)

The modish phrase: „everywhere-every time” can suggest for targeted consumers the total destroying of influences of geographical space.

From the viewpoint of service providers the problem of space is even more complex. They can not disregard space,

spatial structures and their influence, because of their importance in developing and operating the technical background, and in the forming the most successful marketing-strategies.

The geographers – according the new trends of this science – are carrying on research work the influences of wireless communications on spatial structures.

It’s problematic that what kind of new spatial structures can the wireless telecommunication create.

If it can create new structures, we need to know, what is destroyed by them, what is substituted by them, and how they build up these new structures.

If it cannot create new structures, we need to know, what is its relation with well known, functional spatial systems, especially if it blunts or makes stronger the differences of spatial structures of development by its influences.

But there can be not doubt about the sad future of geography, if geographers will not find aspiration to answering these questions.

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(Footnotes)

¹ University of Budapest, ELTE, Departement of Social and Economic Geography