Szeged University
Faculty of Natural Sciences and Information Science
Department of Economic- and Social Geography

# The influence of infocommunication technology on geographical thinking

Theses of the Ph.D. dissertation

Written by
Róbert Sinka

Supervisor:
Dr. Bálint Csatári
honorary associate professor

Szeged
2011

# I. CHOICE OF TOPIC, RESEARCH AIMS

Mankind reached a highly exciting stage of its biological and social-evolutional anthropogenesis at the beginning of the 21st century. Although the changes started earlier (in the middle, the second half of the 20th century), the last decade might serve as the milestone of the processes affecting, moving and reorganizing the social-economic deep structures which can in a brief and concise expression be simply defined as a *global information society*.

Geography is a science with a history of several thousand years, its research aims and methods have always been closely related to the requirements and developmental stage of the given society. Following from this, the geographical study of the information society built on infocommunication technology (ICT) has become one of the newest target areas of geographers today with respect to both theoretical and applied research.

The development of information technology in the last few decades brought about unprecedented changes in scientific research as well as in everyday life. The communication and information handling technologies accelerating as a result of ICT affect us obviously more and more. Our daily routine is increasingly influenced, and often even replaced by a virtual space, which requires not only the direct technological linkage (hardware interface), but also surfaces in an indirect perceptual cognitive effort present in human thinking. *This perceptual cognitive effort is essentially identical with the thinking process by which we acquire and store information about our own geographical environment. „Effort" in this context means the difficulty applying our conceptual system originating from the physical space to a virtual space.* The perception, sensation and cognition of our environment thus extend to new areas (not always interpretable based on Newton's physics). After taking a closer look at the space forms that at first sight may seem to be indefinable and difficult to interpret, familiar elements can also be found that can be described with the help of a system of concepts easily interpretable even in geographical terms.

Since the turn of the millennium, the topic of a growing number of geographical research has centred round *a geographically oriented study of the information society*. The geography of the information society, as well as its new kind of methodology, terminology and typology are taking form. Geographers are trying to define the processes and phenomena in both the physical and the virtual space, and to describe the relation of geography to the information society, as a research area. The fact, however, is to be taken into consideration that when studying today's spatial and social dynamics, the interdisciplinary state of geography is more significant and needed than ever. At present in Hungary, the geographically oriented study of the information society is if not entirely neglected, but leastways mirroring the field of interest of a rather restricted professional circle. Nevertheless, the professional discourse has begun, however it is most frequently sociological, philosophical and technological approaches that are presented even in the slowly accelerating international literature. (Castells M. 1996, Tadao U. 1963, Fritz M. 1962, Bell D. 1976) In these papers geographical orientation is presented only indirectly, essentially as a subsidiary science, it is typically attempts embedded in the conceptual system of the given branch of science trying to define the description of the new environment that can be found. For a reasonable interpretation, however, *geographers* proved to be necessary (cp. papers by Bakis, Kellerman, Inkinen, Paradiso, Kanalas, Nagy G., Mészáros, Csatári., Jakobi). The fact is nevertheless noteworthy that references to our geographical knowledge, thinking, the new forms of spatial cognition can be found as early as the initial – although still technologically based – geographically oriented studies, and traces of attempts at synthetizing the set of problems can be observed. (Corey and Wilson 2006; Graham and Marvin 1996, 2001; Kellerman 1993, 2002, 2006, 2009; Mészáros 2003; Sinka 2005, 2008; Jakobi 2007)

Cséfalvay Zoltán presents a figure entitled "Forradalomról forradalomra" (From revolution to revolution) in one of his books, which illustrates *the development of geography* from 1945 to 1990 (Cséfalvay 1990, p. 57.). One of the most significant aims of the paper is to try to review, summarize and complement the changes of the two decades following the "revolutions" outlined. According to my hypothesis, the era

marked with a question-mark here, is embodied in the information age, entailing also *the change of geographical thinking.* Not only has the infocommunication technology providing the economic background of the information society become a determinant factor of economic-business processes, it also has slowly got into the most hidden corners, most basic processes of society, reorganizing our environment. Following the conclusion of Cséfalvay and others (Castells 1999, Z. Karvalics 2002, Pintér 2004), social reorganization has always entailed changes in thinking. In coherence with this, the information society is a social form built on the technology of modern era in which it is the set of means of the information and communication technology that is to a considerable amount of degree responsible for the environmental conditions defining and influencing social arrangement, transfer of knowledge, essentially thinking.

**Thesis**: *Modern infocommunication technology influences geographical thinking. By the end of the 20th century, the social formation surpassing the postindustrial social form is a society (based on information- dominance) with cybernetics as the new paradigm interlacing its social-economic space.*

*According to Batty, in the 90s, "network paradigm" appears, which is replaced by "computing paradigm" in the late 20th century* (Batty 1997, p. 344.). The major aim of this paper is to unfold *and study* the elements of this effect mechanism from an environmental perception aspect, as well as *to justify the changes in geographic thinking and the birth of the new paradigm. According to my hypothesis, the social form based on the technology of modern era in which it is the set of means of the ICT that is to a considerable amount of degree responsible for the environmental conditions defining and influencing social arrangement, transfer of knowledge, essentially thinking. Cybernetics organizes and operates the new paradigm, regulates and controls the global society as a whole, determining the economic – social – educational – cultural processes within it based on its own logic.* The signs of this effect have been continuously described in papers by geographers for more than a decade, mostly in those of its joint disciplines which use geographic concepts and terminology, but which are not essentially centred round the dynamics of

spatiality (philosophy, pedagogy, psychology, sociology, information-sciences, computer science, social sciences, linguistics etc.), and explain it with their peculiar space concepts, *space* interpretations.

**Thesis:** T*he information society space is always built on and is inseparable from the elements of the real space, and it is describable by a metaphorical system of concepts and symbols identical with or similar to it. This space is simultaneously present in the physical and virtual medium, it creates a special hybrid construction of space.*

*Geographically it is especially* important to define the space in which the effects of today's technological devices can directly emerge. For the definition, I wish to outline the geographical concepts and essential system of concepts of the spatiality of the information society. *During their research, some researchers introduced different typologies. It can be discovered in source-books that various systems of interpretation and standardization were established even in nearly identical research areas. These various approaches were published with various interpretations and readings and these, so-called* typological readings serve as the methodological base of the domain of variability of each effect mechanism, the real or virtual space units in which the processes to be described take place. Reviewing the significant papers both in Hungarian (Mészáros 2000, 2003, Sinka 2004, 2005, 2009, Jakobi 2007) and in international (Batty 1997, Dodge and Kitchin 2001, Corey and Wilson 2006, Castells 1989, 200, Inkinen 2003, Kellerman 2002, 2007, 2009) literature makes it possible to define a special, unique, yet well-founded system of concepts.

*Geographically, t*he concept groups that are hardly distinct from one another might as well form one single series, the best modelling of which is *the quasi-plastic topology of the human manipulation space, which is in each case centred around man, and the morphology, scale of the space depend on the intensity of human activity (manipulation skills). The degree of intensity will primarily be determined by the devices used during the practical application of the geographical environment. In the case of a low-degree intensity (use of devices), the limit of the manipulation space can be defined in the immediate vicinity of man, while with a high-degree intensity*

*(for instance when using infocommunication technology), the manipulation space extends and takes a much larger scale. Depending on the technological advancement and on the application period of certain devices, the shape of the manipulation space defining the human activity space is a constantly changing, plastic configuration. The plastic nature of morphology can be hindered or facilitated by a number of (economic, social, technological, human) factors, therefore the hybrid space of the information society can most precisely be characterized by a quasi-plastic topology (under conditions given at a certain place and at a certain point of time in the geographical space).*

**Thesis:** Collecting, understanding and acquiring geographical information increasingly depend on what kind of basic information handling technologies one is familiar with.

*The information about geographical environment are stored in the form of internal representations, which help us recognize objects and store attributes related to certain environmental objects (entities). These internal representations are used to create the schemata with the help of which our spatial activity can be performed like a routine. The condition for the schemata to be created is the existence of an internal representation, i.e. of an empirical experience that can help us store the environmental information together with its related attributes.*

*My research finding have verified that t*he inner representation of our environment, the emergence of representation schemas depend on what kind of abilities we possess to adopt the schemes, and to what extent our computational skills are developed. This skill, different for everyone, is at our disposal on evolutional basis. It is the speed and the way we process the environmental information that makes the difference, *and also what quantity of empirical space representations are collected in our lifetime.* At the evolutional stage, it is the method and techniques of processing rather than the biological or technological aspect that is the source of differentiation.

*From a geographical point of view, the chronological and spatial dynamics of the processes of the effect space of the information society is decisively*

*determined by the development stage of the technology, which requires unique methods in each case. The smallest unit of society, the individual and groups of different size are to have a given methodology at a given development stage. The basic methods are not considerably different, technological innovations, however, change the speed of information processing, require the characters to acquire the methodology belonging to the new devices, thus in this context, the method of information reception is dominant.*

**Thesis:** *Information handling techniques depend on technological development only indirectly. Devices in themselves do not improve the perception techniques of an individual, but in the course of learning processes, they create competencies facilitating the receipt of information from the (real and virtual) geographical environment. This is an assimilation process, during which individually varied competence-sets are created depending on that kind of competencies an entity is able to adapt. The final result is knowledge aggregated from the geographical environment.*

*This hypothesis is intended to emphasise the relation of the method of handling information about the geographical environment to technology. The direct link between an individual information handling technique and ICT is determined by the quality and quantity of the metacognitive attributes of the entity. With metacognition I wish to refer to the knowledge available about our knowledge, which is stored in our long term memory, and is primarily used to control the operation of our own knowledge. Consequently, an entity is to have the knowledge which enables it to judge if its own competence set includes the elements with which it can make adequate decisions in space. The success of its decisions will therefore be determined by the quality and quantity of its metacognitive attributes.*

Foregrounding the metacognitive characteristics is a clear sign of the revaluation of knowledge. The organization, network architecture, spatial arrangement and topology of physical and virtual knowledge networks act as a vehicle and processor of knowledge at each level of network elements. The topology of ICT-based networks is robust, has good error allowance ability, and is similar to the human

evolutional solutions at several points. Evolution, however, is not an engineer, *it proceeded step by step, arriving at perfectly working solutions in each case.*

Cognition, including the spatial perception of our environment, shows a strong interdependency with the development and development stage of learning skills. This dependency improved during our evolution step by step, it can also be said that we could perceive our environment just as quickly as quick a motion we were capable of. In my opinion, remarkable changes have been triggered by transport networks advancing with giant strides since the industrial revolution, direct references to which can be found for instance in Erdősi (2005). From then on advancement has not stopped, more and more technological devices have been trying to supplement, improve, and occasionally nowadays even replace our senses.

## II. RESEARCH METHODS AND FINDINGS

*Overview*: The improvement of human thinking is a result of several thousand years of development. Compared to the slow steps of evolutional development, however, today we can witness changes that we could not even hope for in the last decades. It seems, nevertheless, it is not *change* itself that is essential but its speed, dynamism and global effect mechanism. Geographical concepts that can be considered traditional are to be reinterpreted and geographers are pressed to create and define the appropriate concepts in the changed social environment. Space-time relations, environment, locality, the neighbourhood principle, typology, geographical scales and units, the devices and methods of measurement and mapping, the internal and external forms of space representation all receive a new interpretation. Rephrasing all concepts might not, but reconsidering them will by all means be necessary.

*The essential research aim* is to enumerate the leading directions of change, trends, and in a narrower sense to study the real or expected effects of modern technology influencing, modifying the perception and cognition of our environment.

*Concepts, definitions*: After setting the initial hypotheses, the necessary concepts had to be collected. In the course of subsequent work, the initial concepts were modified and made more precise, hence the concepts had to be reconsidered and redefined in several stages.

*Related research*: The research can organically be integrated into the directions of analysis published so far related to geographical research, within this the information society. Present research is organically related to a number of streams studying the information society from geographical and social scientific aspects, it relies on their findings up to now. *It is coherently and consistently related to works on technology (Kanalas 2003a, 2003b, Nagy 2001, 2002, 2004, Nagy és Kanalas 2009), sociology (Pintér 2003, 2004, Csotó és Székely 2009), social philosophy (Z. Karvalics 1999, 2002) philosophy (Farkas 2002, Varga 2003.), culture anthropology (Rab 2007) and some synthetic writings (Sinka 2004, 2009b, 2009c, Mészáros 2000, 2003, Csatári 2003 in. Kanalas 2003b, Kellerman 2002b, 2007, 2009b).*

*Data collection methods*: Due to the basically theoretical nature of the research, data collection primarily relies on literature source collection. The collection range was determined by antecedent reading as well as the professional communities that had already studied the given subject in greater detail. As my primary sources I considered the research findings and publications of the researchers at the Hungarian *Information Society Education and Research Centre (Információs Társadalom Oktató és Kutatóközpont* - ITOK), of the commission of the International Geographical Union (IGU), and of the members of the *Geography of the Global Information Society Commission*. The source studies carried out by Hungarian researchers also belong here who are engaged in the topic.

*Statistic data*: The other big type of data collection is the collection, evaluation and comparison of statistic data. The primary range of statistic data – since it is a theoretical study – came mainly from primary sources, including research data also published by myself. From among the secondary data bases the statistic data base of KSH, the research reports and data tables of ITTK, the research reports and data

tables of WIP and the data base of Eurostat were made use of. (Ad hoc) sources different from these are indicated at the point where they are used.

*Quantitative analysis*: Quantitative analysis of the sources and date to be processed. The quantitative definition of research sources and data is indispensable for determining the research limits: in space, in time, with respect to a set of problems. According to my preliminary hypothesis, the set of problems I study is characteristically the result of *the social-technological processes of the last decade after the turn of the millennium*. In a wider sense – mainly due to the secondary references –, I had to reach back to a period of time longer than this, but only on good grounds. As early as determining data collection, I managed to define a research base the quantity of which is manageable, yet it can be considered a comprehensive and relevant source. I acted similarly in the case of database data.

*Qualitative analysis*: *Qualitative analysis of sources and data.* The primary aspect of qualitative analysis was the source, the secondary one being the possible utilization with respect to the topic studied. I did not apply or publish any data, analyses or measured data that do not guarantee clear relevance with respect to my thesis-analyses. I also fully ignored data with unjustifiable or merely estimated sources which would provide unbalanced empirical background. Regarding the qualitative analysis of primary sources – due to journals and books exclusively referred to –, I reclined upon the internal authentication of the publication source.

*Topic discussion*: The development of the dissertation includes the detailed analysis of the set of problems. Along the formulated theses, I try to reveal deeper interconnections by as segmented a study of the sub-set of problems as possible, to find the answers to explain the given phenomenon. It is true that – because of the excessive topicality of the chosen subject – it could easily be said that the topic cannot be studied due to the lack of sufficient overall view, the speediness of the processes is contradictory to this. The effects are easily perceptible, although the conceptual system is still forming, its framework is tangible.

# RESEARCH FINDINGS

*The dissertation is a theoretical paper about the effect of information technology on geographical thinking, about its more and more intensely unfolding phenomenon following the turn of the millennium. The review and analysis of source-books, and the uniform interpretation of the related pieces of contemporary literature on geography might provide a theoretical framework for further geographically oriented studies. Present subject might become one of the major modern era target areas of geographers studying social-economic phenomena always considering their interconnections and spatial dynamism. The comparison and readings of the discoverable sources might open up a door for the Hungarian representatives of geography towards an international geographic school, which is also exemplified in this dissertation in the way already outlined above. The significance of this is that Hungarian studies could be even more comparable to international papers, thus contributing to the extension of both Hungarian and international professional discourse not only statistically, but mentally as well.*

The research methods applied in the Hungarian and in the international literature of researching the information society, apart from a few exceptions, are difficult to compare. In some papers, however, convergence can be traced (Kanalas and Nagy 2009, Sinka 2007, 2009). In the course of the research, we managed to present the work of the Hungarian researchers in front of an international community. I had a chance to contribute to the preparation of the special edition of NETCOM published in 2009 as a guest editor (NETCOM, Vol. 23, 2009, No 1-2.). The thematic edition provided an opportunity for the Hungarian researchers of the information society and naturally for the Hungarian information society to introduce themselves at international level in the form of a study volume.

The new phenomenon emerged in the decade after the turn of the millennium, primarily as a result of the spread of the internet services via telecommunication networks and of the increased penetration level of computers. From geographic aspect this is significant in as much as, in accordance with international studies, the study of

the phenomenon *(at the beginning dominantly from infrastructural, later from social geographical aspect) more and more frequently* appears in the Hungarian publications. *These* theoretical and empirical studies present infocommunication technology as a new organizer of spatial constructions. *The achievement of the dissertation is that* it has identified the framework of the research on the one hand, and has determined the paradigmatic directions to keep to on the other. *The social-economic space based on information-dominance of the information society is interlaced with the cybernetics paradigm.*

*According to the second thesis, the information society space can be determined as a special spatial formation the elements of which are simultaneously present in the physical and virtual medium, it creates a special hybrid construction of space.*

*In* the dissertation *I managed to define the limits of the theoretical and physical environment (milieu) of the information society.* The geographic space of the information society reaches as far as the limit of one's real and virtual space manipulating skills. This construction of space is the quasi-plastic space of the information society, *which is in each case centred around man, and the morphology, scale of the space depend on the intensity of human activity (manipulation skills). Depending on the technological advancement and on the application period of certain devices, the shape of the manipulation space defining the human activity space is a constantly changing, plastic configuration.*

*The analysis confirmed that the plastic nature of morphology can be hindered or facilitated by a number of (economic, social, technological, human) factors, therefore the hybrid space of the information society can most precisely be characterized by a quasi-plastic topology (under conditions given at a certain place and at a certain point of time in the geographical space). Namely, v*irtual spaces and connections generated by the infocommunication technology do not provide fixable locality, therefore, while physical activity takes place only in the case of physical proximity, localities granted by the infocommunication technology in the virtual space provide multi-dimensionality and multi-identity. While activity can be performed in

each dualist (hybrid) construction of space, the milieu of the paradigm is still not composed of constructions of space organized by clearly sequential processes, which is determined by the consecutive nature of space-time, but it is organized along a control-oriented logic that is based on the logic of network organization (and cybernetics), this is PDP. The parallel distributed information processing method (Parallel Distributed Processing) is similar to the environment perception techniques of computational technologies based on cerebration and the most advanced *artificial intelligence (AI)* solutions. When the acquisition of the method fails, the space of the information society remains an invisible space form both as a visual and as an activity space.

*The third thesis emphasised the difficulties of the collection, understanding and acquisition of geographical information by foregrounding individual information handling techniques, as the primary condition for a successful spatial activity.*

*It has been justified that* technical competence is *in principle* available for everybody (from the aspect of the physical set of means), *its existence, however*, strongly depends on *one's* social status. Empirical research findings show that the acquisition of ICT devices is not a question of income or qualifications but of interest and user competence. The fact that some people can perceive the information society, while others cannot does not *exclusively* depend on technology. The organization, motion dynamics of the information society and the users dimension are radically different from the physical space. Cognitive evolution is incapable of overcoming this with one step taken, it needs plenty of time for that. Time is measured by competence improvement, namely learning and not by some natural or artificial maturation, this is what makes knowledge competence significant. Research is *the cognitive process of geographical perception*, it drew a parallel between the spatial structure, the figures of the information society, the *manipulation* that can be performed in the space constructions and the social-economic *activity* space generated by it, furthermore, for dynamics it *put the blame on* the existence or the lack of information handling techniques.

*The fourth thesis emphasises that information handling techniques depend on technological development only indirectly, they themselves do not improve the spatial perception techniques of an individual, but, in the course of using them, they create competencies facilitating the receipt of information from the (real and virtual) geographical environment. The final result is individually different knowledge aggregated from the geographical environment.*

*Research findings have verified that i*nformation handling techniques do not essentially depend on technological advancement, because the information conveying technique of every social era operated in order to maintain the given social homeostasis *(may call it internal balance),* requires the necessary competencies. In the "architecture" of modern society based on information technology, these competencies require empirical competencies which can cause disorder even in the mental cognitive processes. The reason for cognitive dissonance is primarily the dual*/hybrid* construction of space, the problem due to alternating between the real and virtual spaces, over-dimensioning, the loss of the adaptation ability, which can be traced back to the lack of a virtual empirical space, as well as to the characteristic feature of the virtual space that makes multi-dimensioning and the multiplication of identities and localities possible. *An entity then, due to its imperfect information about the geographical space, over-dimensions itself, namely it multiplies its own identity. Over-dimensioning is essentially "over-venturing" the space that the given entity is able to cover, the available pieces of geographical information about which it is able to receive and adapt.*

As technological *and social* interdependency becomes stronger, the empirical representations of the absolute physical space appear stronger and stronger, enhancing dependence with respect to space, identity and activity. *The process appears to be more and more emphatic today, its effects have been detected in several areas such as the study of work, online games or virtual worlds. The increasing use of virtual spaces is definitely the result of competencies acquired during the daily use of modern technology, which is due to the application of space formed copying a hybrid geographical environment and to the collection of information about it.*

*As a summary of the theses, and on the basis of the objective emphasised in the first thesis, it can be stated that t*he research *successfully* defined and described the interpretation framework of the new paradigm frame of geographical thinking: social milieu, cues, functionality and the determining paradigm *itself*.

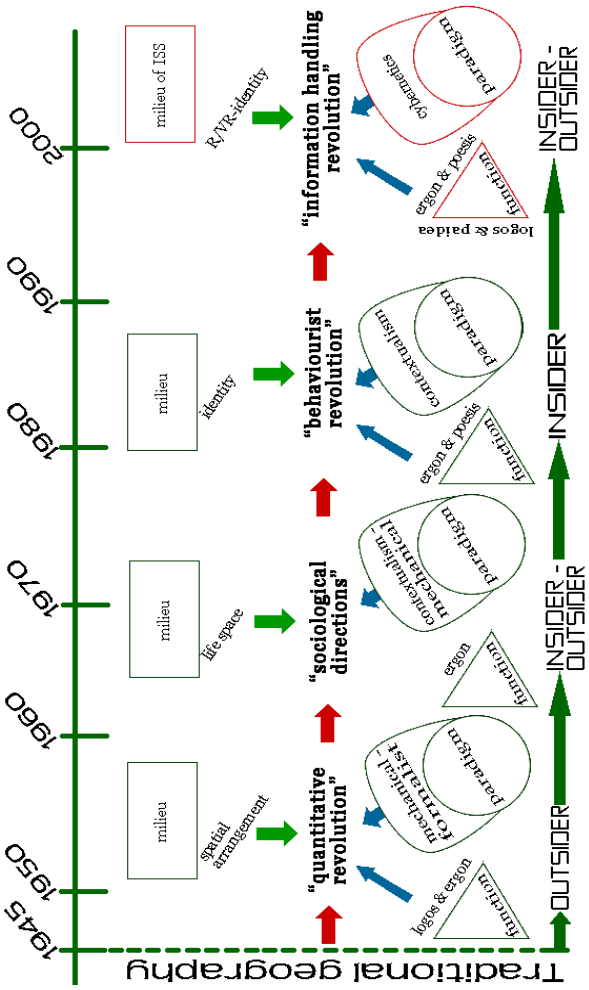
The figure summing the research findings presents a new paradigm *along a space – time – paradigm scale*, related to the previous scientific discourse, i.e. "the revolution of information handling". For the last fifty years of the history of development of geographic approach, laymen and professionals can gradually find one another. The mechanism triggering also the revival of common geography had already begun with the behaviourists, and it was organized into a network as the flow of information became faster.

The revival of anthropocentric perspectives can be categorized together with the relations studied by the research, and the multiplication of common geographical elements (in the media, publications, web applications) only one segment of this, which are accompanied by a more and more definite *means of communication* (narrative discourse), *treating also the causal relations of a theme*. The real and virtual milieu provided by cybernetics requires special *roles and* role pairs (ergon & poesis, logos & paidea). *Based on Hungarian and international typology, each role is discussed on the dissertation in detail. Ergon and poesis represent practical application, while logos and paidea represent a trend highlighting narrative, formal features for professional geographers.*

Each thesis presented in the dissertation is centred round this new *emergent phenomenon, as a* set of problems. At present, the information society is a determining, but not at all final stage of developmental phase of social evolution. The role and significance of the social format of the information era is indicated by designating the pattern of mental development of post-industrial societies, defining their interdependency from a technological aspect. From this the kind of technological-social mutuality, *in other words interdependence beneficial for both society and technology*, is born that emphasises the genetic parallels between infocommunication technologies and human thinking, the logic of cognitive

perception and network organization, in which the educational paradigm of connectivity is embodied in the form of methodology.

The framework designating the information handling revolution is built up from the milieu of the information society space, from the functionality based on the knowledge and action pairs, as well as from a cybernetics paradigm, along the points of view of a layman (insider) and a person representing professionalism (outsider), as indicated in the figure below.




*1. From revolution to revolution, the paradigms of geographical thinking from 1945 up to today (Cséfalvay 1990, Sinka 2008, 2009 – actualized by the author)*

Geography was founded more than 2000 years ago. Undoubtedly, its research fields and methods have been closely connected to the development level of the given societies. In the last few years the effects of ICT in building knowledge based society, especially, the geographical aspect of ICT became one of the major focuses of the academic research. The effects of technological developments, the benefits of applying ICT techniques have influenced our geographical knowledge and thinking as well.

The length of the paper did not allow a detailed discussion of the influence of certain ICT devices on geographical thinking. It rather searched for an answer to the question whether the process of perceiving, experiencing human space is in any connection with the basic techniques/schemes of conveying information. Does the development of human societies affect the way we see the world today? Are there milestones that the developmental stages of geographical thinking can be connected to? Is there a change of paradigm in geographical thinking or are we merely witnessing the rebirth of an old paradigm?

The historical overview might help us understand the stages of the development of geographical thinking from the traditional geographical approach up to the present. The changes during the progress "from revolution to revolution" could relatively easily be placed in the traditional geographical setting. The changes brought about by infocommunication technologies, however, created new categories of space unknown so far, to which the researchers also had to form the appropriate concepts of space. (cd. Works by Bakis and Roche 1997, Bakis 1995a, 2001, Bakis and Dupuy 1995b, Mészáros 2000, Sinka 2004 et al.) As Bakis (2001) phrases it: "The science of geography is far from being exhausted and is concerned not only *with* physical phenomena: it has begun to explore to the geographical space of the 21st century, i.e. the 'geocyberspace'."

Our traditional environment is being taken over by a new spatial form, the Information Society Space (ISS), also including the cyberspace created by the modern technologies (compare with Bakis's concept of 'geocyberspace'). The artificial space forms, space creations and the social groups emerging in the ISS are in each case built

on real spatial bases (Bakis & Roche, 1997). They are described with geographical metaphors and space categories also used in physical geography (Mészáros, 2000). Our common geographical concepts help us find our way in the virtual world of modern devices, meanwhile our new, virtual identity must also be created unnoticed. However, it is only those who know and apply the information devices and procedures created in order to maintain the social homeostasis that are capable of implementing their existing (physical) identity in the virtual space – i.e. capable of existing in a space more complex than the earlier one (Wiener, 1974). This basically requires the knowledge of the techniques of modern information handling.

Today, the vast majority of information, also including geographical information, is conveyed via ICT devices, and they very often precede physical perception. Bakis appropriately says that by using various media and telecommunication devices, the central role in establishing the rhythm and relations in society is growingly played by time rather than by distance. (Bakis and Roche, 1997)

# III. UTILIZATION OF RESEARCH FINDINGS

The dissertation is a theoretical paper about the effect of information technology on geographical thinking, about its more and more intensely unfolding phenomenon following the turn of the millennium. The review and analysis of source-books, and the uniform interpretation of the related pieces of contemporary literature on geography might provide a theoretical framework for further geographically oriented studies. Present subject might become one of the major modern era target areas of geographers studying social-economic phenomena always considering their interconnections and spatial dynamism. The comparison and readings of the discoverable sources might open up a door for the Hungarian representatives of geography towards an international geographic school, which is also exemplified in this dissertation in the way already outlined above. The significance of this is that Hungarian studies could be more comparable to international papers, thus contributing to the extension of both Hungarian and international professional discourse not only statistically, but mentally as well.

# IV. PAPERS PUBLISHED ON THE SUBJECT

SINKA RÓBERT (2004): Gondolatok az információs társadalom földrajzi diskurzusához. In. Abonyiné Palotás J. – Komarek L. (szerk.) 40 éves a Szegedi Tudományegyetem Gazdaság- és Társadalomföldrajz Tanszék, Szeged, pp. 193-198.

SINKA RÓBERT (2005) Tanítók az információs társadalomban, Informatika a felsőoktatásban Konferencia, Debrecen, 2005. augusztus 24-26. Konferencia kiadvány, ISBN 963 472 909 6, p. 102., online source: http://agrinf.agr.unideb.hu/if2005/dokumentumok/IF2005-Absztrakt-kotet.pdf; last reach: 2010.07.25.

SINKA, RÓBERT (2006): Accessibility and exclusion in the society of urban and rural areas: the geographical perspective of participation in digital communities in a Hungarian micro region (Jászság), In. Networks and Communication Studies, NETCOM The role of place in the information age: it use and knowledge creation – Maria Paradiso and Mark Wilson (ed.), Vol. 20, N° 1-2, 2006, pp. 57-67.

SINKA, RÓBERT (2006): Primary School Teachers in the Information Society,Journal of Universal Computer Science, vol. 12, no. 9 (2006), 1358-1372, submitted: 31/12/05, accepted: 12/5/06, appeared: 28/9/06, J.UCS;

SINKA, RÓBERT (2009): The formation of the Hungarian Information Society in the last ten years, NETCOM Vol. 23 (2009), No 1-2., pp. 7-20.

SINKA, RÓBERT (2009): The appearance of a new phenomenon in geographic thinking: the influence of ICT, NETCOM Vol. 23 (2009), No 1-2., pp. 111-124.

SINKA RÓBERT (2011): A konnektivizmus földrajza, Információs Társadalom folyóirat 2011/3. szám (11. évfolyam) – accepted for publication.

SINKA RÓBERT (2011): Hozzáférés és kirekesztés a városi és vidéki terekben – a jászsági kistérség lehetőségei az információs társadalomban, Földrajzi Közlemények 2011/3. szám – accepted for publication.

SUBJECT RELATED CONFERENCE PAPERS

SINKA, ROBERT (2005): Accessibility and exclusion in the society of urban and rural areas: the geographical perspective of participation in digital communities in a Hungarian micro region (Jászság), Digital Communities Conference 2005, Benevento – Naples, June 5-10 2005

SINKA RÓBERT (2006): Az információs társadalom adaptációjának földrajzi aspektusai a tanítóképzésben, III. Magyar Földrajzi Konferencia, Budapest, 2006. szeptember 6-7. – source: http://geography.hu/mfk2006/Absztraktkotet.pdf; last reach: 2010.09.10.

SINKA RÓBERT (2006): A Moodle, mint a digitális írástudás fejlesztésének eszköze a felsőoktatásban, MoodleMoot Konferencia 2006, Debrecen

SINKA RÓBERT (2006): Mit oktassunk: Moodle-t vagy informatikát?, MoodleMoot Konferencia 2006, Debrecen

SINKA RÓBERT (2007): Valós és virtuális földrajzi térkategóriák szerepe a földrajz oktatásában, MoodleMoot Konferencia 2007, Debrecen

SINKA, ROBERT (2007): 'Open source information society' in the Hungarian higher education, Conference paper – Digital Communities 2007, 08-12, July 2007. Tallinn, Estonia – Helsinki, Finland

SINKA, ROBERT - Papp, Gyula – Vágvölgyi, Csaba (2007): 'Open source information society from beginners to advanced' in the Hungarian education, The possible roles of Moodle in the Hungarian teacher training. Author manuscript, published in "Conference ICL2007, September 26 -28, 2007, Villach: Austria (2007), source: http://halshs.archives-ouvertes.fr/docs/00/25/71/54/PDF/271_Final_Paper.pdf; last reach: 2010.09.10.

SINKA, ROBERT (2008): The influence of the ICT on the geographical thinking, 31th International Geographical Congress, Tunis2008 August 12th – 15th, IGU Commission on Geography of Information Society

SINKA RÓBERT (2008): A tudatos e-learning fejlesztés recens határai, MoodleMoot Konferencia 2008, Debrecen

SINKA RÓBERT (2009): E-learning stratégia a gyakorlatban, MoodleMoot Konferencia 2009, Debrecen, source: http://www.slideshare.net/moodlekonf/sinka-rbert-elearning-stratgia-a-gyakorlatban; last reach: 2010.08.26.

SINKA RÓBERT (2010): E-szolgáltatások integrációja intézményi szinten, MoodleMoot Konferencia 2010, Szent István Egyetem, Gödöllő; last reach: 2010.07.23.