

Knowledge Society and Geography: a theoretical approach

Jorge Ricardo da Costa Ferreira

e-Geo – Centro de Estudos de Geografia e Planeamento Regional,
Faculdade de Ciências Sociais e Humanas,
Universidade Nova de Lisboa. [jr.ferreira@fcs.h.unl.pt]

Abstract

The transition process between information and knowledge is faster and so the inputs that influence social and political practises. The dissemination of information is now determinant in terms of territorial competitiveness and both public and private sector take large benefits when the *data-information-knowledge* value chain repeats itself trough space and time. Mankind depends nowadays on the creation and diffusion of good and reliable information. Speed is also important and the greater the speed, the faster the opportunities for global markets. Information must be an input for knowledge and obviously for decision. So, the power of information is unquestionable.

This paper focuses on concepts like information, knowledge and other, more geographical and tries to explain how territories change from real to virtual. Knowledge society appears on an evolucional context in which information dissemination is wider and technological potential overwrites traditional notions of Geography.

To understand the mutations over the territories, the causes and the consequences emerges the Geography of the Knowledge Society, a new discipline inside Geography with a special concern about modern society and socio-economical developing models.

Key-words:

Information;
Knowledge;
Geography;
Geography of Knowledge Society;
Information Dissemination.

Resumo

O processo de transição entre informação e conhecimento é rápido, a par dos *inputs* que influenciam todas as práticas sociais e políticas. A disseminação da informação é hoje determinante em termos de competitividade territorial e os benefícios para os sectores público e privado são enormes quando a cadeia de valor dado-informação-conhecimento se repete no espaço e no tempo. A humanidade depende hoje da criação e difusão de informação rigorosa. No entanto a velocidade da sua difusão é também determinante e quanto mais elevada ela for, maiores são as oportunidades num mercado que é global. A informação deverá ser um *input* para o conhecimento e, obviamente, para a decisão. Por isso o poder da informação é inquestionável.

Este artigo analisa conceitos como informação, conhecimento e outros, mais geográficos, como lugar e espaço; e de que forma pode a sua dinâmica influenciar o território, que deixa de ser (apenas) real para passar a ser, também, virtual. A Sociedade do Conhecimento surge num contexto evolucional, onde a disseminação da informação é cada vez mais significativa e o elevado potencial tecnológico extravasa as noções (mais) tradicionais da Geografia. Para ajudar a compreender as mutações observadas no território, explicando as suas causas e conseqüências surge a *Geografia da Sociedade do Conhecimento*, um ramo da Geografia vocacionado para a análise do desenvolvimento sócio-económico da sociedade moderna.

Palavras-chave:

Informação;
Conhecimento;
Geografia;
Geografia da Sociedade do Conhecimento;
Disseminação da Informação.

I. Information and Knowledge: Evolution and Dynamics

The value assigned to information is quite different, both directly and indirectly and sometimes consider it a simple commodity to be traded in a global market it's not an easy task. Although there's information which can be free, there's other that would never exist without a commercial transaction. Possessing it can bring large benefits and not possessing it a lot of disadvantages. Information is a key element in the taking of decisions and the more information there is the greater will be its importance. Shannon and Weaver define information as "...that which reduces uncertainty..." (1948: 379-423), which is debatable, given that numerous questions may be raised, increasing uncertainty in relation to other considerations/issues. Bell defined information as "...data processing in its widest sense..." (1979: 168). A more simple way of explaining a concept which is surrounded by numerous meanings. For Mason *et al*, Man must exist for there to be information, since he represents the form by which "...one mind manages to influence another..." (1995: 35). To some extent this interpretation is related to perception and to human reasoning. Davis and Ohlsen defined it as "...data gathered and processed in such a way that it becomes useful to a receiver, and is valuable for analysing actions or taking decisions..." (1985: 200). These authors confer added value to information since they only consider it as such if its use benefits knowledge and decision.

According to Kempe (1986) and Junclausen (1988), "...information is everything that is incorporated in symbols and signals..." the origins of communication, symbology or semiology representing and adding new knowledge. But information in the generally

accepted sense of the word embraces not only processed data but all the other categories: fact, explanation, theory, law, method, technique, the tools and even the problem itself; besides this, according to Vickery and Vickery (1987), information "...is everything that modifies the state of knowledge of the researcher or of any other receiver...", it can also be considered, according to Bawden (1997: 74-79) "...as an intermediate state that exists between data and knowledge..."; this definition is important, because it refers to a hierarchy of concepts. Hill refers to information as "...only one of the *input* categories that enters our brain when we reason (...) not everything that we observe is registered as information. The human mind possesses the capacity of not treating everything that is seen as information, but only that which is relevant. We touch door locks every day to open them, but we do not consider each touch as information, although should the touching of a lock be somewhat different from the other, we notice this alteration..." (1999: 16).

Information can also be defined as a category of concepts that the mind absorbs, consciously registers, to which a certain meaning can be attributed and that normally modifies the state of knowledge. Information that is considered new may be encountered through the senses or absorbed in the form of scientific experiment, and/or simulation of situations or through experimentation. However, new information will always be the product of already existing information onto which work is added.

For Stonier, information can exist even without Man, since it's "...an intrinsic component of the universe existing independently from

human beings or other forms of intelligence who perceive or use it...” (1990: 21). This definition is contrary to that of Mason, since it separates information from the human being.

The Mathematical Theory of Communication or Theory of Communication (Shannon, 1948) set down the theoretical and mathematical bases of the quantification and reproduction of information. The problem of communication was, according to Shannon, the exact or approximate reproduction at one point of a message (information) that was selected at some other point and through a channel.

The information, should remain unaltered as it travels through the whole communication system and is composed of 5 elements:

- The *transmitting source or transmitter*, which produces the message to be communicated;
- The *transmitter*, which transforms the message into a signal;
- The *channel*, the means used to transmit the signal from the transmitter to the receiver and which could be a simple wire, an optic fibre cable, a radio wave;
- The receiver, the element that carries out the reverse operation to that of the transmitter, reconstructing the message from the signal received;
- The destination, person or element that the message is intended for.

Information theory was one of the major intellectual advances of the 20th century and had an important and significant influence in mathematics, in particular on the theory of probability. One of the most outstanding facts of the theory is that, although over 60 years have passed since its creation, the schemes of coding used in the communication systems

of the NASA probes sent to explore deep space continue to be based on the coding and decoding theories of Shannon.

Knowledge represents a higher state than that of information if one can imagine a hierarchy with its base as data. The latter may be defined as a series of observations, measurements or facts, in the form of numbers, words, sounds or images. The data have no meaning but constitute the raw material from which information is produced. Knowledge will be information processed from its perception to its understanding. Knowledge is, therefore, more than a simple accumulation of information; it is an element which generates knowledge. Bell defined knowledge as “...an organised statement of facts or ideas presenting a reasoned judgement or an experimental result which is transmitted through some communication medium in some systematic form...” (1979: 168). Knowledge can therefore be defined as the total sum of information stored along the generations.

When our knowledge is transmitted to someone else, what is communicated (during the act of transmission) becomes information and during the act of reception (when it is filtered by the receiver) it becomes knowledge once more. Looked at in this way highlights the dynamic of the concept, but more than this, its enrichment along the chain of communication.

According to Gregory “...facts are useful knowledge and what distinguishes them from knowledge is the lack of organisation” (1987: 410). A wider definition, put forward by Boisot considers that “...knowledge is constructed on the information extracted from the data...” (1995: 12).

Following an analysis of several authors, Ferrão defines two types of knowledge: tacit and codified. The former, "...corresponds to the kind of knowledge which is produced and accumulated in an implicit way as a natural consequence of the contacts, practices and know-how developed by individuals during their daily routines of work and leisure... (2002: 20)". The second is related to "...know-how on scientific and technological bases..." (2002: 20).

Bawden observed that "...Following the path *data-information-knowledge-wisdom*, we can observe that they are involved in a series of processes which give added value: evaluation, comparison, gathering, classification, etc..." (1997: 74). Consequently, knowledge can always be considered as an *output* integrated in a continuous cycle of 'informative refinements'. It can also be defined as, according to Oakeshott (1989: 59) almost as a mathematical formula in which [Knowledge = Information + Judgement/Opinion].

That is to say, judgement is that which, when added to information, produces knowledge. From this set of definitions, we can affirm that knowledge always implies the presence of the human being, which is not the case when we examine the different authors on the concept of information.

Knowledge is, on the whole, as dynamic as the fragments of information of which it is made up. But, in practice, knowledge changes more than information since "...the addition of a new piece of information may alter a series of knowledge already acquired (Hill, 1999: 28). According to the author, and taking into account the decrease the neurons in the human brain, the new information

acquired yesterday, reorganised all the information content of variables connected to it. The human mind is in constant change, for certain people in a growing phase (learning), for others, in a decreasing phase (loss of memory), but always changing. Knowledge is subject to modifications through the appearance of new evidence, new information, through the reconsideration of a fact.

The brain works all the information it receives, comparing, accepting, rejecting etc, until it reaches a stage of knowledge which it judges to be trustworthy and pertinent; therefore, only the individual person can decide on the passage of this fact into knowledge.

Information and knowledge are not synonymous although in day to day conversation they are referred to as such. Knowledge is constantly being modified by new information. We often come across information which is taken to be reliable, but which contradicts itself. Another pertinent aspect is connected to the way the information is transmitted (so as to influence decisions) putting its reliability into question or even in the way it is distributed (using a variety of forms of communication), and so, because of this, it does not have the same impact.

Information and knowledge define the boundaries of development but their quantification, qualification and analysis become increasingly difficult. The growing importance of the two concepts in modern society have added to the Lexus new expressions and terms, which we can emphasise, from among others the *Information Society* and through natural evolution the *Knowledge Society*.

II. Place, Space and Geographical Perception

The importance of the definition of place and space has always been indisputable. Over the centuries the physical expression of these concepts has been much debated, leading to, on the part of the scientific community a vast array of dissertations. Today, the same is happening as regards its virtual expression.

The use of these concepts in an effort to perceive the mutations of territory and space seem from the outset indispensable. In the first place, because they are related to geographic science and because, inherent in their reason for existing, is the fact that they refer to a specific place; secondly, because the words themselves, independently of the context in which they are found, are always connected to others such as position, distance, velocity, site, situation and, to a certain extent, they all appear to appeal to a geography or to a sense of orientation which is inherent to human beings and, consequently, to their society; thirdly, the need to clarify the concepts before declaring them to be associated to a “non-physical context”, in this case, virtual.

“Place” is a difficult concept to define and has given rise, by itself alone, to a wide field of analysis, with many approaches and perspectives from a variety of scientific quarters. According to Harvey “...Place has to be one of the most multi-layered and multi-purpose words in our language...” (1993: 4).

Walter, beginning with the concept of place, according to Plato, defined it as “...situation of experiences, forms, powers, sentiments and feelings...” (1988: 215). This definition implies a connection between the space and the one that occupies it and neither of the two can be changed without a corresponding modification

of the other. Massey (1993) suggests that places need also to be defined in relational terms, i.e., as moments in networks of social relationships; more than areas with defined boundaries. According to Castells “...It is a place whose form, function and meaning are contained within the boundaries of physical contiguity...” (2000: 453).

There are also other definitions of place that, from a more geographical or sociological perspective attempt to ‘territorialize’ the concept a little further. Kevin Lynch emphasises more the importance of the senses, “...a place affects us directly through our senses – through vision, hearing, touch and smell...” (1962: 9). Logan and Molotch (1987) argued that the attributes of a place were more the result of a social context than from the qualities of a certain piece of ground. Place is not only a material entity nor a ‘container’, it is a place of sentiments and experiences. In order to create a place, one would have to create ‘values’. Scientific methods do not offer clear analysis on questions of value. For Zukin, a sociologist allied to the field of economics “...Place is a territory (...) a concentration of people and economic activities (...) a cultural artefact of conflicts and social cohesions...” (1992: 12). And so one could interpret place according to a *multi-layer* approach in which all approaches complement one another.

The science of place, in spite of its complexity and a few uncertainties, is, however, a vast and inviting field of study. It is also essential in order to understand the degree of influence of information on today’s society, as well as the consequences that its use can exert on the dynamic of territories.

Interconnected with the concept of 'place' or almost always associated with it appears the concept of 'space'. Here too, there are many closely-related possibilities. Considered by Kellerman (1989) to be one of the primary notions of Geography, it would not make any sense to speak of it as if there were nothing to fill it "...Space, in fact, only came into existence with the objects that we now think of filling it...".

For Leibniz (1898) 'space' does not exist by itself but as an element of relation between objects. Also Kant (1785), a philosopher who had a strong influence on geographic thinking addressed the concept, bringing into question certain aspects; one of the questions he put forward was: if certain spatiality is only attributed after being made aware of the objects that fill it, from where then did the idea of space originate? In reply, he affirmed that the notion of space was inherent to human beings, and being rational forms of being, we attribute to all objects and actions, not only a certain spatiality, but a temporality and a causality. Newton (1687), with an approach nearer to that of physics divided space into two kinds. Absolute space, which can exist by itself and with no relation to the exterior, remains always immovable. and relative space, with a movable dimension, which serves as an element of measurement of absolute spaces. For Gregory *et al* (1994) space has an extremely important geographical dimension which can imply physical or abstract dimensions.

However, social space has also received a series of attributes in the form of theoretical contributions, the importance of which is crucial for the creation of a much wider and pluri-disciplinary concept. Ullman (1970) addressed the idea of 'distance', a fundamental element in the analysis of new

patterns and spatial hierarchies; Ullman (1974) also theorised on its 'dimension'; Cosgrove (1984) on the landscape to which it is always associated. Kellerman (1989) went even deeper, stating that space was a 'resource'; Giddens (1990), Entrikin (1991) and Merrifield (1993) related it to 'place'; and Swyngedouw (1992), explained its 'productive role' in economic terms. To these contributions Harvey (1989a) added the 'social context' in the form of 'experiences', 'perception' and 'imagination' and Massey (1992), the importance of the 'scale of analysis'.

The manner in which one views space also depends on the evolution of the thinking or of the discipline which forms the working base. In Geography, space (by convention) is always referenced or rather georeferenced, to a specific locale (the place) and this, is specified according to a metric system. This system adopts a grid that forms a structure according to which two, or sometimes three coordinates (x,y,z) are necessary to indicate a localization. One only needs to think of a few technologies in order to increase the complexity of the concepts. Take for example the systems of geographical information in which a localisation has three coordinates and associated to these, there might be a whole variety of physical, landscape, social and economic attributes etc. Some authors, like Massey, consider the approximation of the two concepts, affirming that there is no distinction between place and space;"...people are everywhere, conceptualising and acting over different specialities (a global meaning of place). Places seen according to this perspective are open and porous..." (1994: 4-5).

The all too rapid evolution to which certain concepts and attributes of modern society are subjected to (such as scale, stance, country

and resources) leads to difficulties in the evolutionary perception of certain phenomena which arise throughout the territory. The rapid advance of technologies, the manner in which they interact with social questions and the way in which new geographical landscapes are produced whether one has in mind the geography of transport, of physical geography,

economic geography, rural or urban geography very often leads us to underestimate their impacts, ignoring the relational complexity which some technological and social contexts surround them in certain places. This dynamic implies completely different evolutions, arising usually from variable factors, or from similar inductive elements.

III. Information Technologies and the Virtual Space Phenomena

Information technologies changed the ways in which mankind thinks and reflects about space, time, mobility and communications. Broadband, grids, networks, nanotechnologies and processing capabilities are just a few “killer developments” that in a disruptive way, have influenced research in the last twenty years. Place is not only a physical entity with a cultural or human identity, it is also a social structure in which communication develops. Adams (1998) argued that places function according to networks of communication which include physical entities such as barriers, bodies and also computers, which support the networks of communication responsible for the transport of the signal fluxes. These elements help to form places like structures and identities more complex, resulting from their rapid development of the technologies of information.

Without ignoring the contributions mentioned above and complementing them with the analysis of new variables, there appears to exist a new kind of space, based on a Multimedia skin of digital networks, whose influence is felt socially culturally and economically. This space, which some call ‘electronic space’ is characterized by places with strong social and economic ties, characteristic of a growing globalization. One of the fundamental aspects

of this new approach is the greater dynamic involved, inherent to the rapid technological evolution and to the increase in speed and mobility, both in communications and telecommunications. “...In a globalized world, places may turn into traces of movement, speed and circulation...” (Thrift 1996: 289).

The question is a little more complex, since it relates the capacities of the place as receiver of information, while at the same time adds on to it a certain local identity “...Places are, not only receivers of external inputs and local processors of these inputs jointly with local ingredients, they serve further as producers of electronic information and virtual places, embedded to some degree within local social cultures...” (Kellerman 2002: 40). So, place is an element which suffers constant influences and redefines itself at any given moment.

Electronic space is defined, according to Wilson and Corey through “...technologies of information that influence interactions and productivity...” (2001: 1). These technologies are represented by computers, networks of communication, *media*, electronics and *Internet*. This (new) space, also defined by various authors as cyberspace, does not have, however, any relationship to physical space. Gibson (1984) in his book *Neuromancer*,

defined it as 'consensual hallucination or graphic representation of abstract data' and Bukatman (1993) as 'a method of conceiving that which is inconceivable'. Pile (2000) as 'a plurality of shocking and resonant metaphors the use of which is due to the recent growth of lexis connected to the *Internet*, the principle means of the expansion of cyberspace' or Ross (1991) who defined it as a cartographic fantasy of the powerful'. There are also more radical approaches, such as a theory of 'fractal universes' or of 'parallel universes' of Sterling (1977) and Benedikt (1991) associated with the *cyberpunk* movement, a subculture based on the concepts of cybernetics and *punk* where the frontier between the real and the virtual become blurred and the fictional representations of the present mix with those of the future.

These and other ideas or visions, imprecise, in advancing with new technologies are responsible for substituting a physical and tangible structure of things with another immaterial structure, abstaining from considering the factors of a social and human relationship nature, as a foundation for the definition of space, place and territory. They also seem to lack a foundation from the geographical point of view, since a series of inputs essential to the quantification of this phenomenon continue, themselves, to lack consensus as regards their form and use. Technological determinism is a constant in most of these kinds of approach. "...Due to the obsession of the 'cyber-evangelists' with 'transmittable' capabilities, abstracted from information technologies, the debates on technological determinism neglect the wealth of human life within the space and the place..."(Graham, 2000: 17). In fact technological determinism appears to lead us to forget the social context of spaces and places.

Given the dynamic of cyberspace, we are also confronted with an alteration in the notion of distance. This concept is approached in a variety of ways without, however, from the point of view of some authors, escaping from technological pessimism. In an article published in *The Economist* in 1995 (336: 7934) the topic 'death of distance' was raised. It has also been referred by Cairncross (1997) in his work of reference. This line of thinking raises the idea that distance ceases to have any importance when confronted with the role carried out by information and communication technologies. Its low cost together with its use by a large majority of the population, were taken as the two crucial elements for the development of the theoretical concept. However, its simplicity was at the same time its greatest weakness; reality shows that a large section of the world population continues to be a hostage of distance, which shows itself as a factor of social and economic exclusion. This theory was also widely held in the electronic pre-euphoria phase (observed in the USA and in Europe), being the beginning of a series of essays which addressed the announced death of physical or geographical space, through the action of the new information technologies.

Continuing along this line of thinking, Geography would pure and simply cease to make sense, as Brunn and Leinbach (1991) affirmed, due to the collapse of space and time. Created, therefore, was, according to Virilio (1993) a crisis in the notion of physical dimension, space, place, region and city and everything would be possible at any time and in any locale as Graham and Marvim (1996) affirmed. According to one of the greatest *gurus* of the digital era, Nicholas Negroponte, the fact of being in a certain locale will be completely indifferent, "...Digital living will, include less and less dependence upon being in a specific

place at a specific time and transmission of place itself will start to become possible. If I could really look out of the electronic window in my living room in Boston and see the Alps, hear the cowbells and smell (the digital) manure in the summer, in a way I am very much in Switzerland..." (1995: 165).

Apart from these theorizations, it is important to bear in mind that the reduction in the importance of distance in electronic space does not also imply a reduction or annulment of the same concept in physical, space, since it continues to exist in the form of conditioning access to the technologies. So, in both spaces continues to exist elements that function as boundaries and which, in spite of technological evolution, favour the distance factor and appear not to be losing their important. Examples such as the automobile and the highway, conditioning boundaries for the differentiation of distance in physical, space, may be equipped to computational power or to band width, in virtual or electronic space. The socio-economic conditioners are valid for both types of space.

With a more realistic approach and along a more geographical line of thought, Batty (1993), defined cyberspace as a new type of space which is invisible to our immediate senses, a space that might become more important than physical space itself and which, in turn, is founded on the latter, inside and in-between the material that constitutes geographical space itself. Robins argues that in spite of all the technological evolution, we continue to have a physical existence. "...Through the development of new technologies, we are, indeed, more and more open to experiences of de-realization and de-localization. But we continue to have physical and localised existences..." (1995: 153).

The variables which make up cyberspace relate almost always to variables or concepts which are part of or intervene in geographical space. This being the case, there is what one may call an analogy between the two spaces: an *Internet* address may be a *metropolis* (of innovation); broad band can be a *line of communication* or a *motorway* (of information); a satellite can be a *means of transport*; a *newsgroup* can be a community; an *Internet* page of a local council can be a *neighbourhood*; and info-exclusion, a phenomenon of the 'informational desertification' of the countryside. The use of metaphors is perhaps useful as a 'spatializing element' of technological phenomena which are beyond our comprehension.

Regions, for example, also have a fundamental importance for the study of cyberspace, in the same way as for physical space. Geographers define a region as an area of indeterminate size, onto which relationships of proximity between phenomena and people are established. The region can be, in cyberspace, a local network and the respective pages of information available, which have a similar use for a given group of users. For example, a network of a department within a university could be considered as a cyberspace region.

Cyberspace is beginning to influence many aspects of daily life, namely the action of Man on the territory. This action takes place on a variety of scales. In urban or regional terms one must recognize cities and regions not only as physical systems on a given global scale, but also as informational systems that transcend scales and distances in cyberspace.

There does not exist, therefore, just one cyberspace but a complex set of networks in which telecommunications and information

technologies interrelate with human actors in a web of socio-technological relationships. This perspective has obvious implications in the way we view space and time as well as reflections on the geographical structure of all territories. This dynamic implies a succession of consequences where it is difficult, says Warf, to determine who and which determines what. "...Telecommunications is one of the few topics in geography that richly illustrates the plasticity of space, the ways it can be stretched, deformed or compressed according to changing economic and political imperatives..." (1998: 255).

Cyberspace also suffers, furthermore, a strong influence of certain concepts from science fiction to which reference should also be made. It is almost obligatory to analyse the comparison between cyberspace and the 'Global Matrix', a new form of artificial life composed of *hardware*, *software* and electric impulses which travel along the nervous system and whose influence spreads all over the planet.

The Matrix, a concept whose origins remain connected to the technologies of communication, represents a spatial evolution of the process of connecting and/or connectivity on a global scale. For Imken (1999), the matrix is not only the pages of www, nor electronic-mail, nor simply information networks; the matrix represents all calls made by telephone, satellite connections, television and radio signals or mobile networks. The matrix includes and interconnects in a common virtual space, heterogeneity of electronic zones associated to the most diverse functionalities. According to this author, cyberspace is only a small fraction of the matrix which corresponds to a merely graphic surrounding.

Space and cyberspace therefore are interrelated to one another in numerous forms. Cyberspace is dependent on real space in terms of infrastructures since computers, telecommunications and other information technologies are not distributed in a homogeneous way throughout the territories. Physical space can no longer be independent of virtual space; the integration of information technologies in all the socio-economic sectors of society is so high that it has become impossible to work and live in actual society without having recourse to cyberspace. The relationship between the two types of space was analysed by Holloway and Valentine (2001) who identified the *Internet* as the most massified phenomenon, whether cultural, socially (from information technologies), confirming the connection between 'real space' and 'virtual space' " (Holloway and Valentine 2001: 153). According to Li (2001), the two types of space not only relate to one other, but redefine the role of Geography in the whole process."...Information systems redefine and do not eliminate geography (...) electronic space is embedded in and often intertwines with the physical space and place..." (Li *et al.* 2001: 701).

Starting from a series of contributions, a framework was developed to reduce the concept to a few characteristics and the respective differences observed between the two types of space - real and virtual, according to three elements that characterize them: organisation, dynamic and users.

Some of these characteristics through the geographical connotation which they present, deserve more attention. This is the case of 'contact' and of 'interaction', social phenomena which may influence, for example, phenomena such as mobility. Personal

contact is impossible to realise through the digital path; interaction is already within the reach of cyberspace and it is possible through technologies like virtual reality or even through a simple *web-cam*. When one speaks of the *Internet* and its influence on our daily lives, opinions diverge as regards such phenomena. For some, the digital surrounding oppresses human relationships. For others it is a factor of incentive. However, in either case there exists a dynamic. One can argue that cyberspace lessens/reduces mobility through the number of hours one can spend sat looking at the millions of topics available in cyberspace but for others,

you may say that the *Internet* can never reduce the mobility of the human being since it brings people together and from this point of view, people want to meet each other, demonstrating a greater desire and attitude for social relationships

The analysis of the relationships which exist between the two spaces helps to define and to characterize the various geographies of physical space and of cyberspace. These geographies can be as virtualized as the imagination of the author, but they can also be as real as the variables we must consider in the study of the Information Society.

IV. The Knowledge Society - Is information getting richer or is it just Geography?

One could define society as a set of interactions, that is to say, a set of fluxes, whose *inputs* are the images, the sounds, the attitudes and the information which flow through a space. These do not only represent an element of social organisation, they determine and dominate the economic, political and symbolic processes of life.

As factors such as demography, technology or globalization undergo alterations, concepts will acquire new *upgrades*; these are like alterations and their aim is to value (increase the value of) the positive aspects and counteract the negative. In this way, the speed in the transition of concepts is enormous, from the 'microelectronic revolution' to the 'age of information' from the 'information society' to the 'society of knowledge', passing through the 'learning society'.

The concept of the information society has its roots in the literature of *post-industrialism*, very popular in the 60s and 70s and which

predicted/prophesised the end of 'industrial capitalism' and the arrival of a 'society of services' or 'free time'. However, it was only at the beginning of the 80s that this concept was generally accepted.

Bell stated that the information society was developing within the context of post-industrialism, foreseeing the advent of a new frame of social reference based on telecommunications that "...might be decisive as regards the manner in which the economic and social changes are put into practice' the manner in which knowledge is created and obtained and the character of the work and the occupations that people undertake..." (1976: 14). For the above author, the information society had at its very beginning the undeniable influence of telecommunications which determined the social, economic, work and leisure context. The expression information society is also referred to in a Canadian Government report of 1982, as regards the ever increasing important

role of science in the productive process, the rise of professional, scientific and technical groups or what today we would designate as 'information technology'.

The actual digital revolution – which the *guru* of management Peter Druker (1993) considers as the 4th revolution (following the first which was the invention of writing, of the second which was the invention of the book in China and of the third, which was the invention of printing by Gutenberg) was only possible because of the advances in microelectronics, the multimedia, and biotechnology which accelerated the convergence between computers, telecommunications and the media. These technological transformations, fuelled by constant fluxes of innovation and confronted with another transformation - globalization – created the ideal scenario for the incubation of that which is now called the information society.

According to Lindley (2000), the expression information society refers to the proliferation of information, stimulated by the advantageous use of microelectronics and by the manifestations of its potential social and economic impact.

This author goes on to distinguish between the concept of the learning society, which he says includes the potential for the enlargement/growth and more in depth participation of the people learning for life and for work during the first years and continuing throughout life; and the concept of the society of knowledge which is to be distinguished from the society 'of learning' because of the way they interpret/perceive the structural change of the economy in the long term and the use of knowledge (that may play an important role in the creation and good use of wealth). It will also be the

interpretation that Man makes of the changes which take place in the workplace and also of the political cultural and global aspects of the technologies of information.

Some of the most significant changes which have occurred in 20th Century society are an integral part of the information society. In the concept of 'third wave', put forward by Alvin Toffler (1980), the first wave would be agricultural, the second industrial and the third the information society.

In general, the definitions of the information society demonstrate very clearly the economic and cultural aspects, expressed in some of the numerous definitions that can be found. "...In the information society, information is the most precious property..." (EC 1996: 7) – it shows the economic facet through the value inherent in any informational transaction; "...a society that possesses a trace of human or intellectual creativity instead of materialistic consumerism..." (Massuda 1980: 3) – appears to move towards a social facet, either through the importance given to human creativity (sometimes ignored and often associated with the 'Fordist' thinking, of the production line) or through the denial of unbridled consumerism. Castells connects these two facets, stating that the information society "... is based on an historic tension between the materialistic power of the processing of abstract information and the search for a cultural identity of society..." (2000: 21).

In searching for a conceptual evolution of the value chain "data-information-knowledge-wisdom, in the socio-economic and cultural context of modern society, we can affirm that there exists a transition from an information society to a society of knowledge. This change induced by the added value of information,

should catalyze an increase in the potential for dissemination, both of the information itself and the next level, knowledge.

This continuous cycle of informational enrichment also enables us to reach higher

levels of “knowing”, presenting a set of exciting possibilities, uncertainties, ideas and conflicts. Our priority is to understand its tendencies and examine the factors which we consider to be determinant in the analysis of future scenarios.

V. The Significance of Geography to the Society of Knowledge

The society of knowledge differs from traditional society in several aspects. It is however, in its geographic organisation that we can find the most alterations which, although almost unquestionable, are difficult to quantify. Already at the beginning of the 60s Gottmann (1961), in his paper on the ‘Megalopolis’ alerted us to the fact that new forces commanded by information were going to have a profound impact on the way space and localisation would be perceived. Research of a geographical nature, together with the conceptualizations of Gottmann, led to his being considered the ‘father of geography of the information age’.

The way in which place is perceived, space is organised, a community is built, is increasingly influenced by information technologies. “...The ability of land and place to define our identity is also changing with the replacement of the physical by the electronic. The landmarks of places, and the importance of proximity, remain important factors in our daily lives, but what can we expect from the erosion of physical space by electronic space?” (Wilson and Corey 2000: 1). However, in spite of the proximity and/or geographical distance becoming increasingly less, factors with a bearing on society, analogous to this geographical notion will continue to exist, whether it is on the *Internet*, or in the mind of their users.

Knowledge represents one of the strongest elements of human relation and it expresses itself through communication. And communication is the essence of communities. It's obvious, that when we analyse the variety of cultures and societies all over the world on different stages of development, the “community” can't be similar in all of them. In this new information society, the process of knowledge sharing is very fast. This dynamic seems to influence human relations, creating a much stronger community feeling. The definition and evolution of communities is highly influenced by places and this places will probably shape the communities of the future.

The Information Society and, through evolution, the Knowledge Society, impose new methodologies of analysis. The measurement and representation of the new informational accessibilities, the mapping out of new communities and the discovery of new patterns and models of localization seem to be the challenge of the moment. In physical and real space, the localization of a point is defined by two of three geographical coordinates, but in the virtual space of a network or in cyberspace, Geography is not able to define its localisation, since it does not possess a model capable of giving an answer to one of the simplest questions of Humanity – localization.

Comparison is unavoidable. In the same manner that sailors left on their voyages of Discoveries without a chart for their orientation so likewise the 'new discoverers' set out across the *Internet network*. The difference lies in only one aspect, and that is that 'we know where we want to get to, but we don't know in effect where the places we visit are located'. In the same way that the concept of localization, others such as distance, direction and the kind of transport, give rise to doubts and are in need of some theoretical foundation. Faced with these and other questions, there arise some fields of study which, taking geographical science as a starting point, make use of its concepts to try and explain that which sometimes evades the palpable and tangible understanding of our everyday lives.

During the first half of the 90s a number of works were published in which Geography was the central issue, although always complemented with a set of other variables the common denominator of which were information technologies. For example, Goddard (1990, 1992) edited a series of books on the 'geography of information' and regional and urban development; Hepworth (1990) and Li (1995) investigated the theme of the 'geography of computers' and 'information technologies'; Kellerman (1993), Graham and Marvin (1996) concentrated on the 'geography of telecommunications'; and Feldman (1994) wrote on the topic of the 'geography of innovation'. The appearance of the *Internet* as a phenomenon of the masses in the mid-90s, brought into being a range of bibliography on the questions of cyberspace in its various aspects: the 'geography of the *Internet*', 'cybergeography' or the 'geography of cyberspace' and 'virtual geography'. These new sub-topics, from the very outset different,

posses, following a more detailed analysis of the existing bibliography, a series of common presuppositions. Batty (1994, 1997), Crang *et al.* (1999), Dodge and Kitchin (2001) and Kellerman (2002) are some of the authors who have investigated the *Internet* network and its geography.

The society of knowledge remains however, an area yet to be explored, being fertile ground for theorizations. But some variables are too important to be left permanently in the theoretical field. They must be identified and materialized. Geography is the common 'mould' which can be used for this materialisation. A common science for identification of knowledge related to phenomena which manifests on the ground and considered fundamental for today's societal analysis.

The determination and the quantification of the changes that are taking place in geographical space, and consequently, in society, depend to a large extent on the capacity of the scientific community to find units of measurement and standardized informational variables which will complement technological analysis with a social and economic scope, the use of which will be consensual. This question does not only depend on Geography, but on a series of other disciplines. For example: on *Sociology*, through the study of the patterns and habits of modern societies and the implications of technologies on the quality of life of its citizens; on *Economy* and on its analysis of the role of innovation in the development and creation of wealth; on *Network Engineering* which analysis the fluxes of information and the complex connections established between the various scales of analysis among different networks; on the *Science of Cyberspace* which evaluates the importance of physical spaces in virtual space; and on *Cartography*,

which complements all those mentioned above, mapping out the places in relation to their informational importance (as generators and providers of knowledge).

Consequently, from among the traditional disciplines that have already taken their place in this process of research and analysis, we can emphasise/distinguish a geography of the new spaces which can be defined as “*the society of knowledge*”, a branch of Geography with a vocation for: (i) the analysis of the imbalances in the development of society, but according to a uniting perspective, determined by the complexity between the social, economic, cultural and technological variables; (ii) the

quantification and qualification of the potential of territories as disseminators of information; (iii) the identification of technologies with different levels of cover, the aim of which is the efficient dissemination to all the territorial scales; (iv) the analysis of the positive and negative aspects of the dissemination of information in the individual, in organisations and in society, analysing the new geographical structures of the Information Era.

The definition of *Geography of Knowledge Society* encompasses the stated objectives and will result from the evolution of the value chain which will be enriched, each time that information is transformed into knowledge.

VI. Conclusion

The knowledge society, as well as the technological and geographical context that surrounds it, induces/brings about strong influences on the organisation of the territory. The fluxes originating from a multiplicity of transmitters, which circulate through thousands of networks in the form of physical or merely virtual structures, alter human behaviour and, consequently, the manner in which the places and spaces in the analysis of the territory are structured.

The potential of information, used as knowledge and applied as provider/generator of human development (cultural, social, economic, environmental and technological) can be considered as one of the driving forces of modern societies.

The possession of information, as well as the capacity to produce, distribute and consume it, have become powerful elements in today's society. Given its capacity to substitute and/

or reduce the importance of various *inputs* (raw materials, work, space and capital), knowledge has become the main resource of the more advanced economies and as this increases its value increases. But fast information and mainly the Internet favour the spreading of numerous social weak ties and they appear to be the basis of a new generation of social interactions in this modern technological world.

The digital world involves new paradigms, *bytes* move instead of atoms, the information which flows through the networks can equally transport text just as it can voices, images or data or even our exact position on the planet earth to a precision of 1 metre. Therefore, the new information technologies have a strong influence on geographical science. But more than just understanding the technology, it is essential to know its use and its implications in the daily lives of Man with his territory.

The information society gives to each other the power to choose only things we want to see, ear or feel. We can shut down the computer or T.V. in the moment we're confronted with the discomfort of diversity. The information society is the one that we want it to be. The values are chosen by each individual and at the end, the net gives only the things we want, reflecting the individualism and restraining the relations in its most general sense.

The pessimist view shows that our instinct of community leads us to the community of "me", not the community of "we". Communities could be generational, social, political, economical, religious or geographical, but what distinguishes one community is the commitment.

The global community generated by this information society is a place where it will

be simultaneously easy to reach all mankind but also to stay isolate. The superficial communication with everybody could lead to an impact on anybody. Geography could be the prominent element in the strengthening of communities, could be the missing link and probably the major element in the battle against the selectivity and elitism of the information society.

What new models, new practices or organizational structures should be used in order to understand the spatial phenomena which are taking place in the new societies? Will the many 'emergent geographies' (concepts like 'geography of networks', 'virtual geography', 'geography of cyberspace' 'cyber geography' or 'geography of the *Internet*' - quoting only the most well-known) of this society be sufficient? Or may we unite them all in one calling it (simply) Geography of Knowledge Society?

References

- Adams, P 1998, Network topologies and virtual place. *Annals of the Association of American Geographers* 82, 35-117.
- Aydalot, P & Keeble, D 1988, *High Technology Industry and Innovative Environments: The European Experience*. London: Routledge.
- Batty, M 1997, Virtual Geography. *Futures* 29, 337-352.
- Batty, M 1993, The Geography of Cyberspace. *Environment and Planning B: Planning and Design* 20: 615-16.
- Batty, M & Barr, B 1994, The electronic frontier: Exploring and mapping cyberspace. *Futures* 26: 699-712.
- Bawden, D 1997, Information policy or knowledge policy? In Rowlands, I., editor, *Understanding Information Policy*, London: Bowker-Saur.
- Bell, D 1976, *The Coming of Post-Industrial Society: A venture in Social Forecasting*. New York: Basic Books.
- Bell, D 1979, The Social Framework of the Information Society. In Dertouzous, M & Moses, L, editors, *The Computer Age: A Twenty-Year View*, Cambridge: MIT Press.
- Benedikt, M 1991, *Cyberspace: First Steps*. Cambridge MA: MIT Press.

- Boisot, M H 1995, *Information Space, A framework for learning in organizations, institutions and culture*. London and New York: Routledge.
- Brunn, S D & Leinbach, T R 1991, *Collapsing Space and Time: Geographic Aspects of Communication and Information*. London: Harper Collins Academic.
- Bukatman, S 1993, *Terminal identity: The virtual Subject in Postmodern science fiction*. In Crang, M. *et al, editors*, *Virtual Geographies - bodies, space and relations*. London and New York: Routledge.
- Cairncross, F 1997, *The Death of Distance: How the Communications Revolution will Change our lives*. Boston: Harvard Business School Press.
- Camagni, R 1991, *Innovation Networks: Spatial Perspectives*. London: Belhaven Press.
- Castells, M 2000, *The Rise of The Network Society, The Information Age: Economy, Society and Culture*. Volume I, Oxford: Blackwell Publishers.
- Castells, M 2002, *A Sociedade em Rede, A Era da Informação: Economia, Sociedade e Cultura*. Volume I, tradução Alexandra Lemos, Lisboa: Fundação Calouste Gulbenkian.
- Cloke, P & Johnston, R 2005, *Spaces of Geographical Thought: Deconstructing Human Geography's Binaries (Society and Space Series)*, London: Sage Publications.
- Cosgrove, D 1984, *Social Formation and Symbolic Landscape*. New Jersey: Barnes&Noble.
- Crang, M, Crang, P & May, J 1999, *Virtual Geographies - bodies, space and relations*. London and New York: Routledge.
- Davis, G B & Olson, M H 1985, *Management Information Systems: Conceptual Foundations, structure and development*. New York: McGraw-Hill.
- Dodge, M & Kitchin, R 2001, *Atlas of Cyberspace*. Harlow, England: Addison-Wesley.
- Drucker, P 1993, *Post-capitalism society*. Oxford: Butterworth-Heinemann.
- Entrikin, J N 1991, *The Betweenness of Place: Towards Geography of Modernity*. Baltimore: The Johns Hopkins University Press.
- Feather, J 2008, *The Information Society – a study of continuity and change*. Fifth edition. London: Facet Publishing.
- Feldman, M P 1994, *The Geography of Innovation*. Dordrecht: Kluwer.
- Ferrão, J 2002, *Portugal, três geografias em recombinação – Espacialidades, mapas cognitivos e identidades territoriais*. In *Lusotopie*. Centre national de la recherche scientifique - CNRS, l'Institut d'Etudes Politiques de Bordeaux, 151-158.
- Ferreira, J 2008, *Geography of the Information Society*. In Putnik, G. and Cunha, M. Eds. *Encyclopedia of Networked and Virtual Organizations*, Vol. II, G-Pr, 635-642. New York: IGI Global Publishing.
- Ferreira, J 2005, *A Geografia da Sociedade da Informação em Portugal*. Unpublished doctoral dissertation. Lisboa: Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa.
- Ferreira, J 2004, *Internet Geography: Spaces of Innovation*. In *ERSA Summer Institute of The European Regional Science Association*. Electronic publication/cd-rom, Split, Croatia.
- Ferreira, J 2003, *Internet Geography: New Spaces of Information*. In *Proceedings of the IADIS International Conference*, Portugal.
- Ferreira, J 2002, *As Tecnologias de Informação Geográfica na Sociedade da Informação*. In *Proceedings of ESIG 2002 - Encontro de Utilizadores de Informação Geográfica*. Electronic publication/cd-rom, Lisboa.

- Gibson, W 1984, *Neuromancer*. London: Harper and Collins.
- Giddens, A 1990, *The Consequences of Modernity*. Cambridge: Polity Press.
- Goddard, J 1990, Editor's preface. In Hepworth, M., editor, *Geography of the Information Economy*, New York: Guilford.
- Goddard, J 1992, New technology and the geography of the UK information economy. In Robins, K., editor, *Understanding information Business, Technology and Geography*, London: Belhaven.
- Gottmann, J 1961, *Megalopolis: The Urbanized Northeastern Seaboard of the United States*. New York: The Twentieth Century Fund.
- Graham, S 2000, The end of Geography or the explosion of place? Conceptualizing space, place and information technology. In Wilson, Mark I., Corey, Kenneth E., editors, *Information Tectonics: Space, Place and Technology in an Electronic Age*, New York: John Wiley and Sons.
- Graham, S & Marvin, S 1996, *Telecommunications and the City: Electronic Spaces, Urban Places*. London: Routledge.
- Gregory, D 1994, Introduction: Human Geography, social change and social science. In Gregory, D., editor, *Human Geography: Society, Space and Social Science*, London: Macmillan.
- Gregory, R 1987, *The Oxford Companion to the Mind*. Oxford: Oxford University Press.
- Harvey, D 1989a, *The Coming of Postmodernity*. Oxford: Blackwell.
- Harvey, D 1989b, *The Urbanization of Capital*. Oxford: Blackwell.
- Harvey, D 1993, From Space to Place and Back Again: Reflections on the Condition of Postmodernity. In Bird, J., editor, *Mapping the Futures: Local Cultures, Global Change*, London: Routledge, 4.
- Hepworth, M 1990, *Geography of the Information Economy*. New York: Guilford.
- Hesselbein, F *et al* (editors) 1998, *The Community of The Future*, The Drucker Foundation, Future Series, New York: Jossey Bass Publishers.
- Hill, M 1999, The Impact of The Information on Society - An examination of its nature, value and usage. London: Bowker Sauer.
- Holloway, S I & Valentine, G 2001, Placing cyberspace: Processes of Americanization in British children's use of the Internet. *Area* 33, 153-60.
- Ilchman, W F 1970, New time in old clocks: productivity, development and comparative public administration. In Waldo, D., editor, *Temporal Dimensions of Development Administration*, NC: Duke University Press.
- Imken, O 1999, The Convergence of Virtual and actual in the Global Matrix, Artificial life, Geo-economics and Psychogeography. In Crang, M., Crang, P., May, J., editors, *Virtual Geographies - bodies, space and relations*, London and New York: Routledge.
- Jungclaussen, H 1988, Informatik und Physik – Wechselbeziehungen und Wechselwerken. In Wissenschaft B., editor, *Beitreibung Inform – IZ Hochschulwesens an der TU Dresden* 2(2), 4-13.
- Kant, I 1785, *Foundations of the Metaphysics of Morals*, an essay.
- Kant, I 1976, *Foundations of the Metaphysics of Morals*. Indianapolis: Bobbs Merrill.
- Kellermann, A 1989, *Time, Space and Society: Geographical-Societal Perspectives*. Dordrecht: Kluwer.

- Kellermann, A 1993, *Telecommunications and Geography*. London: Belhaven.
- Kellermann, A 2002, *The Internet on Earth – A Geography of Information*. England: John Wiley & Sons.
- Kempe, V 1986, Information – Informationstechnik. In *Informati.. GI-Mitteilungen*, I, 8-24.
- Latour, B 1993, *We Have Never Been Modern*. London: Harvester and Wheatsheaf.
- Lefebvre, H 1974, *La Production de L'espace*. Paris: Anthropos.
- Leibniz, G W 1898, *Monadology and Other Philosophical Essays*.
- Leibniz, G W 1965, *Monadology and Other Philosophical Essays*. Indianapolis: Bobbs-Merrill.
- Li, F 1995, *The Geography of Business Information*. Chichester: Wiley.
- Li, F 2001, Between physical and electronic spaces: The implications for organizations in the networked economy. *Environment and Planning A* 33, 699-716.
- Lindley, R M 2000, Knowledge-Based Economies: The European Employment Debate in a New Context. In *Reports Prepared for the Portuguese Presidency of the European Union*, coordination by Maria João Rodrigues, *Action Line: Employment, Economic Reforms and Social Cohesion – For a Europe of Innovation and Knowledge*, Lisboa: Gabinete do Primeiro Ministro.
- Logan, J & Molotch, H L 1987, *Urban Fortunes: The Political Economy of Place*. Berkeley, California: University of California Press.
- Lynch, K 1962, *Site Planning*. Cambridge: MIT Press.
- Mason, R O, Mason, F M & Culnam, M 1995, *Ethics of Information Management*. London: Sage.
- Massey, D 1992, Politics and Space/time. *New Left Review* 196, 65-84.
- Massey, D 1993, Power-geometry and a Progressive Sense of Place. In Bird, J., editor, *Mapping the Futures: Local Cultures, Global Change*, London: Routledge.
- Massey, D 1994, *Space, Place and Gender*. Cambridge: Policy Press.
- Massuda, Y 1980, *The Information Society as Post-industrial Society*. Washington, DC: World Future Society.
- Merrifield, A 1993, Place and Space: A Lefebvrian reconciliation. *Transactions of the British Institute of Geographers* 18, 516-31.
- Negroponte, N 1995, *Being Digital*. New York: Alfred, A. Knopf Editors.
- Newton, I 1687, *Philosophiae Naturalis Principia Mathematica*.
- Newton, I 1934, *The Mathematical Principles of Natural Philosophy and His System of The World*. Berkeley CA: University of California Press.
- Oakeshott, M 1989, The voice of liberal learning. In Fuller, T., editor, *Michael Oakeshott on Education*, New Haven and London: Yale University Press.
- Pile, S 2000, Cybergeography. *50 years of Environment and Planning A* 26, 1815 -1823.
- Robins, K 1995, Cyberspace and the World We Live In. *Body and Society* 1 (3-4), 135-155.
- Ross, A 1991, Strange Weather: Culture, science and technology in the age of limits. In Crang, M., Crang, P., May, J., editors, *Virtual Geographies - bodies, space and relations*, London and New York: Routledge.
- Sarmiento, J 2004, *Representação, Imaginação e Espaço Virtual: Geografias de paisagens turísticas em West Cork e nos Açores*. Lisboa: Fundação Calouste Gulbenkian e Fundação para a Ciência e Tecnologia.

- Shannon, C E & Weaver, W 1948, A mathematical theory of communication. *Bell System Technical Journal* 27, 379–423.
- Sterling, B 1977, *Involution Ocean*. New York: A Jove/HBJ Books.
- Stonier, T 1990, *Information and the Internal Structure of the Universe: An Exploration into Information Physics*. Springer-Verlag.
- Swyngedouw, E A 1992, Territorial organization and the space/technology nexus. *Transactions of the British Institute of Geographers* 17, 417-33.
- Terceiro, J B 1996, *Sociedade Digit@l Do Homo Sapiens ao Homo Digitalis*. Lisboa: Relógio D'Água.
- Théry, G 1994, *Les Autoroutes de l'information, Rapport au Premier Ministre Paris*, La Documentation Française.
- Thrift, N 1996, *Inhuman Geographies: Landscapes of Speed, Light and Power*. In Thrift, N., editor, *Spatial Formations*, London: Sage.
- Toffler, A 1980, *The Third Wave*. New York: William Morrow.
- Ulman, E 1974, Space and/or time: opportunity for substitution and prediction. *Transactions of the British Institute of Geographers* 63, 135-39.
- Vickery, B C & Vickery, A 1987, *Information Science in Theory and Practise*. London: Butterworth.
- Virilio, P 1993, *The Third Interval: A Critical Transition*. In Andermatt-Conley, editor, *Rethinking Technologies*, London: University of Minnesota Press.
- Walter, E 1988, *Placeways*. Chapel Hill: University of North Carolina Press.
- Warf, B 1998, Reach Out and Touch Someone - AT&T Global Operations in the 1990. *Professional Geographer* 50 (2), 255-267.
- Wilson, M I & Corey, K E 2000, *Information Tectonics - Space, Place and Technology in an Electronic Age*. England: John Wiley & Sons.
- Zook, M A 2005, *The Geography of the Internet Industry: Venture Capital, Dot-coms and Local Knowledge*. Blackwell Publishers.
- Zook, M & Graham, M 2007, *The Creative Reconstruction of the Internet: Google and the Privatization of Cyberspace and DigiPlace*. *GeoForum*.
- Zook, M & Graham, M 2007, Mapping DigiPlace: Geo-coded Internet Data and the Perception of Place. *Environment and Planning B*, 466-482.
- Zukin, S 1992, *Landscapes of Power*. Berkeley, California: University of California Press.