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The broadband impact on inland disadvantaged areas

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Abstract. This paper is a summary of the author's PhD thesis on the recent evolution of broadband. The study is based on a survey of the social and economic situation in inland disadvantaged or rural areas, and the significance of broadband connectivity. The thesis was: any territory invested with broadband is changing and developing within a new dimension. A number of different tools or approaches to the issue were thus adopted to methodologically select and evaluate the impact of broadband on inland disadvantaged areas. The main tools used were: Isard's Theory of Substitution, Lefebvre's The Production of Space, internet ethics and the Gartner Hype Cycle.
It is, therefore, possible to compare rural lands or territories with or without broadband by looking at their behaviours, considering, additionally, the bias induced by economical hype.

Key words. Broadband, internet, inland rural areas, impacts.

1. Introduction. Broadband has, for many years, been a key component of any current discussion on development. However, the issue still displays different levels of maturity, with dissimilarities existing both globally and across the western world, despite efforts made with declarations[1], the adoption of acts and a willingness to invest among private entrepreneurs and large asset management groups. Broadband is intended as the sum of a very fast digital infrastructure and the services delivered over that network. The concept of broadband encompasses several technical solu-

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[1] The EU has been addressing this issue for years, trying to monitor digitisation through the *Digital Agenda for Europe Scoreboard 2012* and several other documents. See https://ec.europa.eu/digital-single-market/sites/digital-agenda/files/KKAH12001ENN-PDFWEB_1.pdf.

tions, from data traffic on aerial/wireless phone cells, to optical fibre. It is not the purpose of this paper to discuss the best current technical solution, but rather whether optical fibre is the means for representing a permanent infrastructure to meet existing needs. It is of primary importance to highlight the synonymity between *infrastructure* and *permanent social asset*. In other words, with no infrastructure you will have no social development. From this we see our first contradiction: governments are indeed recognising the need for such telecommunication infrastructure, but they lack the money for it and, therefore, investment comes mostly from the private sector.

In the western world, about 10% of the market is identified as "white areas", namely territories or the percentage of the potential market with no commercial interest. The population density is too low to deploy investment and then hope for a positive or favourable return. The price of fibre to home per unit connected varies from € 50 for a city apartment, up to € 1200-3000 in the countryside. That 10% of the market defined as a failed market represents a political issue as well: why should citizens who pay taxes and, therefore, have rights, be set apart from the wider population, simply because they live in low density populated areas? The definition of this phenomenon is called the digital divide. Although it still affects a large sector of the population (broadband is still not available in some cities and suburbs), it is interesting to try to understand what impact broadband would have in disadvantaged inland areas The aim of this paper is to describe a possible approach to defining what to take into account in order to identify or describe such impacts.

It is worth introducing the concept of *digital fingerprint* as the result of a biological and cultural fingerprint (Chang Ting, Iseppi, Piccinini 2011) multiplied by "digits". It is a play on words, but in some way also represents a cross-product, whereby one vector (the original unique biological and cultural space) is multiplied by another vector (informatics) to produce a new multidimensional space, or cross-product, that takes the original matrix in a further, unknown, direction.

2. Existing techniques. A centre is intended to be a place or entity that delivers something. To be considered a centre, a place or entity needs infrastructure and services to offer. The larger the number of offered services, the bigger the centre. So, considering inland areas are places without services, it would be interesting to understand how broadband may deliver services and thus allow people living in these areas to feel as though they are living in a centre. It is very important to remember that the purpose of any society is to share problems and find a way to solve them. Thus, the first step to finding a solution is to share the problem via the community network; one should then hopefully receive help or an outcome. It has worked this way since the beginning of human society.

What are the main difficulties in

deploying a network? The issue need to be analysed in infrastructural, sociological and economical terms, from the global level to a local one.

"Agriculture is no longer the backbone of the rural economy" (OECD 2006, 39). A "key challenge for policy makers is to identify indicators that are capable of capturing in a fair manner the impacts of policies in a context where cause and effect are not always identifiable and where results may appear only in the medium to long term" (OECD 2006, 138).

In 2016, the OECD defined a new rural development paradigm based on eight components: governance, multiple sectors, infrastructure, urban-rural connections, inclusiveness, gender issues, demography, and sustainability. Although these eight components were identified for developing countries, it is desirable and possible to apply the same approach to less developed inland areas in the western world.

McLuhan (1960) stated that the global village is leading towards a concept of settlement polarisation: disadvantaged areas versus included areas. In other words, the city is no longer a place for interconnecting with others as meetings spots have moved to other media. This means that a FTTH lodgement in the middle of nowhere is more inclusive than any settlement lacking connectivity. In 1972, McLuhan wrote: "By involving all men in all men, by the electric extension of their own nervous systems, the new technology turns the figure of the primitive society into a universal ground that buries all previous figures" (McLuhan 1972, 25).

The same concept has been defined as: he who lives by digits, will die by digits. This introduces the issue of cyber security, or safety in the infosphere. The first (non kinetic) cyber attack occurred in Latvia in 2007, where a progressive computer attack was deployed, initially only blocking public administration bodies but then spreading to the health system and multiple bank accounts. This induced rioting against the government soon after, with casualties.

Europe and NATO deployed countermeasures (Geers 2011, 458) and gradually, across the western world, sensitivity around the issue increased. The last act to enter in force was in December 2018, which reinforced the mandate of ENISA, the European Union Agency for Network and Information.

In order to better define the framework we need to consider Wiener's relatively old idea that "society can only be understood through a study of the messages and communication facilities which belong to it; and that in the future development of these messages and communication facilities, messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever increasing part" (Wiener 1954, 15). Also, according to Turing, quoted by Floridi (2011), "we are not disconnected agents, but informational organisms (inforgs), sharing with biological and engineered agents the infosphere".

So, we are becoming one with machines around us, much like the

Internet. On the other hand, Keynes ([1931] 1972, 329) states that

> when the accumulation of wealth is no longer of high social importance, there will be great changes in the code of morals. We shall be able to rid ourselves of many of the pseudo-moral principles which have hag-ridden us for two hundred years, by which we have exalted some of the most distasteful of human qualities into the position of the highest virtues.

This is the phenomenon we are looking at: some young people spend their lives with a smartphone without sharing any of the values of previous generations.

Are we moving towards a peaceful future, just because of smartphones and broadband?

Kafka (2015) considered the increasing population and forecast that the population in urban areas could reach 6,3 billion by 2050. So, what about inland and rural areas? Perhaps it is time to think in terms of a "smart region" and not only a smart city.

The concept of a smart region can be developed through:
- smart government
- smart traffic and mobility
- smart use of energy (near zero energy buildings, in terms of domestic use)
- smart infrastructure for water, smart grids and other types of networks
- smart communications
- smart services
- smart productions.

There is no difference among smart regions and smart cities, as Internet allows one to have access to information and data, without discrimination between cities or rural areas. That is connectivism (Siemens 2005), which includes in itself the concentration of technology as part of our cognition and knowledge distribution. Much like bees share life inside the beehive in a fruitful and clever way, so humans are sharing more and more of their lives over the internet.

But is this an actual society, would such connection be real?

3. Our methodological contribution. Our methodological contribution comprises several analytical approaches working together.

First, one must take into account physical distances. Broadband and internet could lead to a substitution, as Isard (1956) defined it: the distances within cities (services) have to be paid by or with something, like fuel, in order to receive the services; alternatively, the fuel must be substituted with something else, like connectivity. "There may be substitution between: transport inputs on one raw material or output and transport inputs on a second raw material or output, transport outlays on one set of inputs and outputs and those on a second set of inputs and outputs, between transport outlays and labour outlays, or power outlays, or capital outlays, or tax outlays […]" (Isard 1969, 106).

Obviously, such substitution does not work for goods. However, it is not just a matter of money. In February 2008, the Presidency of the French Republic commissioned Stiglitz, Sten

and Fitoussi to carry out a study to measure economic performance and social progress, which resulted in the *Report by the Commission on the Measurement of Economic Performance and Social Progress*, which states that GDP cannot be related as such to quality of life. The authors adopted

1) the MEW - Measure of Economic Welfare (Nordhaus, Tobin 1972) as a sum of GDP, value of free time, value of non-paid work, followed by the subtraction of externalities; this is a "simple" indicator"

and the

2) IWEB - Index of Economic Well-Being (Osberg, Sharpe 1998), in which more elements are taken into account than in MEW, because consumption flows, available wealth, equity and social security are declined or composed of lower order values; from this, we obtain a composite indicator[2].

Secondly, we need to consider how the population interacts with the environment. Lefebvre's *La production de l'espace* (1974) summarises in its title the circularity of the theme it deals with[3]: space is produced and space enables production, or, in other words, production takes place within a space. Lefebvre focuses the development of his thesis on three concepts, which are at the basis of human experience in space and representation:

1) *spatial practice*: the spatial practice of a society secretes the space of that society (perception);
2) *representations of space*: conceptualized space, the space of scientists, planners, urbanists, technocratic subdividers and social engineers (planned);
3) *representational spaces*: space as directly experienced, lived, through the images and symbols accompanying it (living).

It is thus useful to adopt a broad approach for evaluating a space. A three-stage method (perception, planning, living) would be applied to rural areas in which broadband is to be deployed.

Another component of the method is the ethical approach, Internet Ethics[4], as Wiener already anticipated. Currently, the infosphere takes care of: privacy, national and personal security, propaganda, identity theft, health, welfare, political issues and religious beliefs. A further development is *information ethics*, as previous macroethics are no longer sufficiently exhaustive to match the ICTs bringing about significant changes in the current social context. In that way

information ethics becomes an expansion of ethical space towards:

1) a less anthropocentric concept of agent, which now includes also non-

[2] For more in-depth information on Osberg and Sharpe's Index of Economic Well-Being, see http://www.csls.ca/iwb.asp.

[3] For a detailed description, see pages 38 and 39 of the English edition, *The Production of Space* (1991).

[4] For that purpose we studied the work of Professor Luciano Floridi at Oxford University.

human (artificial) and non-individual (distributed) entities; and
2) a less biologically biased concept of patient as a 'centre of ethical worth', which now includes not only human life or simply life, but any form of existence;
3) a conception of environment that includes both natural and artificial (synthetic, man-made) eco-systems (Floridi 2006).

Basically, there is a new way to consider the relationship between agent and patient, and the information process develops itself thorough new media, stimuli actions, operations, and functional procedures.

The final element of the method is, in a way, a warning or filter to consider topics along their economical development. It is the Gartner Hype cycle.

Gartner Hype Cycles provide a graphic representation of the maturity and adoption of technologies and applications, and how they are potentially relevant to solving real business problems and exploiting new opportunities. Gartner Hype Cycle methodology gives you a view of how a technology or application will evolve over time, providing a sound source of insight to manage its deployment within the context of your specific business goals[5].

This is important if one wants to avoid making mistakes, as not all ICTs are mature technology and, as thus, cannot (yet) provide permanent and reliable solutions for the population.

4. Results. What kind of measures can we take to assess the impact of broadband on inland disadvantaged areas? What kinds of impact can be expected? One approach could be Florida's *bohemian index*[6] and *creative class* concept (2002), which, although not actually able to measure them directly, can be linked to the impact and penetration of broadband, because «Just as the feudal aristocracy derived its identity and values from its hereditary control of land and people, and the bourgeoisie derived its identity and values from its role as merchants of goods, the Creative Class derives its identity and values from its role as purveyors of creativity» (Florida 2019[3], XIII).

When we see ourselves as "creative", our self-image affects the choices we make in every area of our lives.

The creative class is strictly bound to activities as professions of high economical value and this cannot be accomplished without broadband.

[5] For further information and to find a description of the Gartner Hype cycle, see http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp.

[6] The bohemian index is based on occupational data from the 1990s census public use microdata samples (5% sample). It includes the following occupations: authors (183); designers (182), musicians and composers (186); actors and directors (187); craft-artists, painters, sculptors, and artist printmakers (188); photographers (189); dancers (193). The index is basically a location quotient that measures the percentage of bohemians divided by the percent of population in a region compared to the total national population (Florida 2002, 59).

The type of technical solution adopted is of enormous importance, not only in terms of capital expenditure, but also in terms of operational expenditure and, consequently, the retail price of any service provided over the network. Currently the NGA, Next Generation Access, networks are based on optical fibre, as it is the only option providing long-term life service at very low operational cost. It is also a true infrastructure, as the broadcast does not depend on significant energy consumption, as is the case with wireless phone cells.

Still on the topic of energy, broadband allows the development of smart grids, an integrated control of the production, distribution and use of electrical energy. One should consider that in the very near future, even light bulbs could transmit data over the internet regarding their use or service. This is not only a matter of energy consumption, but also one of a citizen's privacy, as the energy consumption is located via IP address.

The integration of broadband into production shows (Czernich et al. 2009) an increase in local GDP between 0,5 and 1,5%, compared to nearby areas lacking connectivity. A benchmark is the Trentino case (north-east Italy), where local fibre deployment in the mountain valleys saw an average increase in GDP of 25% among micro and SME (Canzian et al. 2014, 2015). Regulatory intervention is required to avoid cherry picking in the deployment of infrastructure. For instance, as experience has shown, a selection of territories (such as the provision of fibre to small productive settlements) with no spread and ubiquitous infrastructure deployment, will lead to the definitive death of the excluded lands.

Luckily some local initiatives[7] are providing evidence of a will to be connected and the ability of a number of local politicians to merge social and economic interest in order to keep small communities alive. Fibre or broadband is a restorer of life in any settlement.

5. Conclusions. We can confirm that broadband or infrastructure deployment output can inject dynamism into even the furthest inland disadvantaged areas. Among cities and inland/rural areas, the digital divide is a social divide, as it impedes the development of any community. Globalisation is increasing competition between all types of society, irrespective of whether it is rural or urban.

It is an interesting perspective that broadband can offer unmatchable quality of life to current inland areas, with high-level services (health, welfare, economical), being delivered within a more humane and hopefully natural environment.

It is thus clear that, with wise state intervention, remote territories may have a future and even a better quality of life than that of cities.

[7] For further information and some examples, see: http://www.connectedfarm.com/features.html; http://www.oberhausen-donau.de/Gewerbe/Glasfaser-in-Oberhausen; https://itnorrbotten.se/en/startpage/.

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