Irreductionally Real Information Infrastructures: Practices beyond Universals

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This contribution was double-blind reviewed as extended abstract.

1 Introduction

The Internet was designed to be nuclear war and future-proof. Probably unexpectedly, these two issues supported each other. Indeed, the need to create a decentralized large digital network made it open-ended the way we have come to know the internet through the last years. The changes are also relevant to specific developments of spatial data infrastructures and their future. Our focus is on the practical and empirical aspects of the internet and related infrastructures, as they have become part of our present and future prospects.

The original standards of the internet, from the 1960s and 1970s, are open-ended and supported the development of future ideas, products, and services that its inventors knew they could not even imagine at their point in time. In other words, the internet standards and the infrastructure arrangements are robust and flexible enough to allow future, unknown and unpredictable developments which change societies in unplanned ways. We have seen that with location privacy issues, online mapping, etc. Geographic information practices continue to adapt and transform internet-based services. Recently, in 2011, a Senior European Commission Scientific Officer claimed that "through the last decade, most of information technology innovations were captured by our radar only after they were already proven and successful". Therefore the research problem we tackle here is: How come that information infrastructures (II) involving the internet seem settled and universal when in fact the differences between concepts, new technologies, and practices define the challenges we face? How can a conceptual re-thinking of infrastructures to go beyond 19th and 20th century industrial age infrastructures aid our engagement with new and future spatial technologies?

These are central issues: because of the unprecedented outreach of IT in every facet of life, research considering II has explanatory power about social changes beyond technologies themselves. In the ongoing changes, Spatial Data Infrastructures (SDI), a type of II developed to support geospatial information needs, requires as much as other II the extension of theoretical concepts beyond conventional boundaries of formal organizations, usually based in industrialized economies. Actually, our stance implies that organizations are seen analytically as reifications, and empirically as obstacle to organizing processes (CZARNIAWSKA 2008).

Jekel, T., Car, A., Strobl, J. & Griesebner, G. (Eds.) (2013): GI_Forum 2013. Creating the GISociety.

2 Information Systems vs. Information Infrastructures

There are fundamental differences between information systems (IS) and II that are worth considering. IS are task-oriented, stand-alone artefacts, whose context of use is usually within the boundaries of formal organizations. Conversely, II are multipurpose, open-ended and facilitate loose configurations of activities and dynamic alliances of actors. Their outreach and long term evolution (take telephony as a self-explanatory instance) implies that they do not have a finite life cycle as IS. Rather, II are in continuous evolution depending on the variety of usages they get embedded in and the new ones that they enact. In other words, we suggest looking at activities on information infrastructures rather than only IT within organizations. To use an analogy, to understand electricity (a well-developed, established and pervasive infrastructure) we should look at it as whole, rather than at individual organizations' use of it and their bills.

The openness of II challenges the existing organization of societies and the power structures that regulate them formally and informally. For instance, the use of GPS today is impossible to understand and regulate on the base of principles of command and control that informed "old" GIS applications. Information infrastructural practices and corresponding social activities transcend any single society and relate them in ways that existing theories fail to capture.

3 Overflow and Irreductionist Paradigm

Drawing on aspects of the broad variety of approaches frequently grouped under the label of Actor-Network Theory, technologies are conceptualized as heterogeneous networks or assemblages encompassing both human and non-human actors to the extent they perform together. Relying on a LATOUR's (2005) analogy "To distinguish a priori 'material' and 'social' ties before linking them together again makes about as much sense as to account for the dynamic of a battle by imagining a group of soldiers and officers stark naked with a huge heap of paraphernalia-tanks, rifles, paperwork, uniforms-and then claim that 'of course there exist some (dialectical) relation between the two".

According to this empirically sensitive stance, technology increases its reach not because it diffuses, but because it gets translated and transformed while being embedded into new settings and practices (for instance, CZARNIAWSKA & SEVON 2005). For CALLON et al. (1998) the translation of technologies happens through entanglement and disentanglement, i.e. creation of frames within which practices are performed and successive overflow beyond those frames. Thus, technologies circulate by being embedded then cut-off and embedded again into new activities. CALLON (1998), borrow the concept of frame from GOFFMAN (1986), as a metaphor for the bracketing of relationships in specific situations (as in a theatrical performance or in taking a photography). The process of framings and overflows capture II different dynamic from more static and confined IS.

Our current conceptual radar is not optimum for two reasons. First and foremost, our radar is mostly focused on organizations conceived as stable structures (especially big private and public ones), whereas II spread and facilitate development of new practices in and from the most unexpected contexts. Secondly, due to recent developments of globalization, also

brought about by advances in IT, our radar needs to extend far beyond industrialized societies and formal organizations.

Therefore, the development of II has to be put in relation to the variety of social contexts they span and are shaped by. Following the 'irreductionist' approach (ASDAL & MOSER 2012), a key theoretical impulse is the refutation of the concept of context as the totalizing external container to consider action, which might have been suitable for IS. Following Benjamin, we inverse the analytical stance and consider context as network dependent (HAYES & WESTRUP 2011); thought of as a dialectical envelope to analyze how activities make sense of present in relationships to object and interactions from the past.

Being coherent with the framework and objectives outlined above, we set our focus by starting from actual practices and drop well-rooted assumptions like the analytical solidity of organizations. Practice based approaches (e.g. SCHATZKI et al. 2001; NICOLINI et al. 2003; CZARNIAWSKA 2008b) have departed from functionalist views on organizations and focus on the way organizing processes actually unfold. By considering organizations as an outcome of organizing processes rather than a pre-requisite, practice based studies provide concepts well suited to the continuous unfolding of II in use. In sum, following NICOLINI (2011), practices are both the empirical material that organizations are made of, and the site of knowledge. In the conclusion, we relate the practice emphasis to LATOUR's aphorism "Nothing is known – only realized" (1988, 159).

4 Practices, where Space Is Constructed as Information

After this theoretical overview, we consider how an irreductionist approach to study SDI practices approach can improve our understanding of this II. We consider two distinct SDI-based examples from diverse societies (USA and India) that illustrate the importance of networked activities in the flexible production of the II through organizational and individual dynamics that reflect changing configurations of the network.

SDI reflect in geography, especially public administrations and large organizations, what has been happening in other domains heavily affected by IT, i.e. the move from stand-alone and task-oriented information systems, to open-ended and widely interconnected information infrastructures in banks. Therefore, we propose SDI as an exemplary instance of how research on information infrastructures can benefit from an irreductionist practice approach. Research related to SDI commenced at the beginning of the 1990s, drawing on studies of Multi-Purpose Land Information Systems and similar developments in North America. Already then, it was clear that rather than addressing individual organizations, spatial data had to be considered in the context of inter-organizational relations, along which geodata was expected to be shared and used (NCGIA 1989, CALKINS et al. 1991; CALKINS & OBERMEYER 1991; NATIONAL RESEARCH COUNCIL 1990, 1993, 1994). At the close of that vibrant decade for the growth of geographic information systems (GIS) and SDI, GROOT & MCLAUGHLIN (2000) proposed a widely accepted definition of SDI, stressing its socio-technical character:

> The networked spatial databases and data handling facilities, the complex of institutional, organizational, technological, human, and economic resources which interact with one another and underpin the design, implementation and maintenance of mechanisms

facilitating the sharing, access to and responsible use of spatial data at an affordable cost for a specific application domain or enterprise.

Administrative and market processes received some mention in publications from the period, but they had yet not gained the foreground in most current analyses despite the accounts of some of the 'founding fathers'[1] who attributed SDI successes around the world to favorable political conditions, organizational issues, perceived economic benefits, rather than technology alone. Nonetheless, in most SDI publications technology is usually understood to be the driver of organizational change whereas implementation contexts are usually discussed in terms of suitability to receive SDI and exploit their potential accordingly[2].

5 Foci in SDI research

According to the irreductionist approach, our aim is to refocus the attention of research from design of SDI to the practice of them. SDI have become a fundamental part of the so called geographic information highway. Referring to activities of the previous decade, RAJABIFARD et al. (2003) wrote that SDI initiatives should be focused on specific social systems, on concrete human actors whose behavior is targeted – their beliefs, values, expectations, and other interests. In other words, design and development of SDI should be focused on 'real people using real systems to address real problems', as CARVER (2003) reminds us of eloquently. More recently, DE MAN (2011) addressed the practice of SDI by articulating the dilemmas originated from the realm of use. In spite of that, it is common to note that "each group looks in the pond to see their own reflection, ignoring the view from another location. Meanwhile, the growing stream of adopters spread out far away from the original ponds of disciplinary discourse" (HARVEY & CHRISMAN 1998). In facts, it is not unusual to find SDI conceived (designed, implemented, evaluated) as a self-contained, closed effort, aiming at a pre-set number of defined objectives through the employment of a pre-set amount of human and other resources following a pre-defined timeframe. A local toll-road, but with on- and off-ramps to the rest of the information highway.

What is particularly notable here is that SDI research has emphasized two moments: design and evaluation. The former is often characterized by a focus on technology and a normative stance, the latter mostly relies on quantitative methodologies. In SDI efforts, the design research and quantitative evaluation are mutually functional and form a coherent cycle of engineering and control. From the perspective of exploratory and explanatory research, they constitute a self-accountable closed cycle (or short circuit), as they reduce the unknown to the comparison of measurable impact against a priori defined expectations. Rather than explaining unexpected phenomena, which is characteristic of the transformations that II bring about, they look for correlations among pre-defined dimensions. The limitation is that innovation and development take often places in unexpected manners. Metaphorically, the lightbulb had not been invented trying to improve the candle: unpredictability cannot be captured by indicators defined a priori, as they would count only candles while people also moved to bulbs. In this sense, our study aims at opening up to a broader view that accounts

[1] Panel with John McLaughlin, Michael Brand, Peter Holland, Al Stevens, David Coleman at the 11th Global Spatial Data Infrastructure Conference held in Rotterdam in 2009.

[2] For example: 'SDI Convergence', GSDI 11 final publication (Van Loenen et al. 2009).

for how SDIs reality "exceed" the models used to construct them. We find it important to conclude that this does not imply a reproposition of "everything goes", but a more honest recognition of the limits of what designers and decision makers can actually control, and what other stakeholders and practices have to be recognized.

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