

Building Human-Centered Systems

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INTRODUCTION

Within the current socio-economic paradigm, in which engineering systems are key for the sustainable development (Moses, 2003), the region is considered the place of *untraded interdependencies*, meaning "...conventions, informal rules, and habitats that coordinate economic actors under conditions of uncertainty. These assets are a central form of scarcity in contemporary capitalism, and hence a central form of geographical differentiation" (Storper, 1998) and economic growth. The actors include "firms, organizations and institutions [that] interact in the generation, diffusion and use of new—and economically useful—knowledge in the production process" (Fischer, Diez, & Snickars, 2001). Some of these interactions are based on information and communication technologies (ICT) in terms of digitally-enabled knowledge networks, which have been developed through ill-defined *communities of practice* (CoPs).

In fact, Internet and other media were initially believed to neutralize the centripetal forces of metropolization, maybe even to start a global process of deurbanization (Jonscher, 1999), but (as a matter of fact) physical proximity is playing a critical role on technical change and economic development (Castells, 2001). As a consequence, regional systems of innovation are increasingly important in the global society (Gibson et al., 2003) and cities do provide energized places for contacts, ideas and creativity where tacit and explicit knowledge can be exchanged effectively through face-to-face communication. Opportunities for knowledge spillovers through social interaction are increasingly provided in urban environments, facilitating learning and increasing human capital (O'Sullivan, 2003).

Although we are still in a very early and limited stage of what Mitchell (1995) called "cities of bits", it is clear that it has become a "commonplace" to discuss the diffusion of knowledge, and the "knowledge-driven economy" in general, in close association with the introduction and use of ICT (Mansell & Steinmueller, 2000). Following recent analysis for U.S. regions, ICT are "both in and of themselves the products of innovation, as well as critical tools that create interfaces, linkage and knowledge net-

works between the main players in an innovation system" (McKnight, Vongpivat, & Selian, 2003). They are, nonetheless, embedded in a human context that calls for the design of human-centred systems, in terms of recognizing the importance of social and cultural shaping forces while developing, and exploiting technological systems (Cooley, 2000).

In this context, *what challenges are facing the diffusion and adoption of ICT at regional level? And what types of engineering systems may contribute for the mobilization of the information society in diversified environments, including catching-up regions?* These questions have motivated the work behind the present article, which has considered the development of case studies in selected Portuguese cities and regions engaged in building digital networks.

In previous articles, we have considered the development of the information systems oriented towards building networked places and argued that knowledge networks have the potential to attract and mobilize people in the information society and make public administration and markets more effective (Heitor & Moutinho, 2004a, 2004b). This helps promote learning trajectories for the inclusive development of society, requiring, nonetheless, effective infrastructures, incentives and adequate institutional frameworks across time and space (Conceição, Heitor, & Veloso, 2003). The analysis builds on the need to continuously adapt regional trajectories, both social and technological, and foster the necessary learning capacity of increasingly diversified local communities, referring to social capital as a relational infrastructure for collective action (Conceição, Heitor, & Lundvall, 2003), and creation and diffusion of knowledge.

Our previous conclusions derived from observations in different Portuguese urban areas with the ultimate goal of increasing regional competitiveness, by promoting public awareness and participation in decision-making processes. We have argued that the territory is a basic infrastructure that justifies and invites for the construction of several layers of information about cities and regions where people live, visit or do business. In addition, digital city schemes should also encourage the global legibility of the information architecture of the

territory and promote broad and informed participation in the decision-making process of the future in its entire influence area and not only within city limits (Tanabe, van den Besselaar, & Ishida, 2002).

The remainder of this article attempts to frame these aspects from the perspective of human-centred technical systems. We begin by examining some aspects of the mobilization of the information society and ICT adoption and diffusion at a regional level, making use of case studies in Portugal. Then we will continue by discussing the social and cultural shaping of information technologies. Finally, we conclude by briefly presenting a summary of our most important conclusions in terms of necessary social and technological conditions for the establishment of networked spaces.

MOBILIZING THE INFORMATION SOCIETY THROUGH DIGITAL CITIES

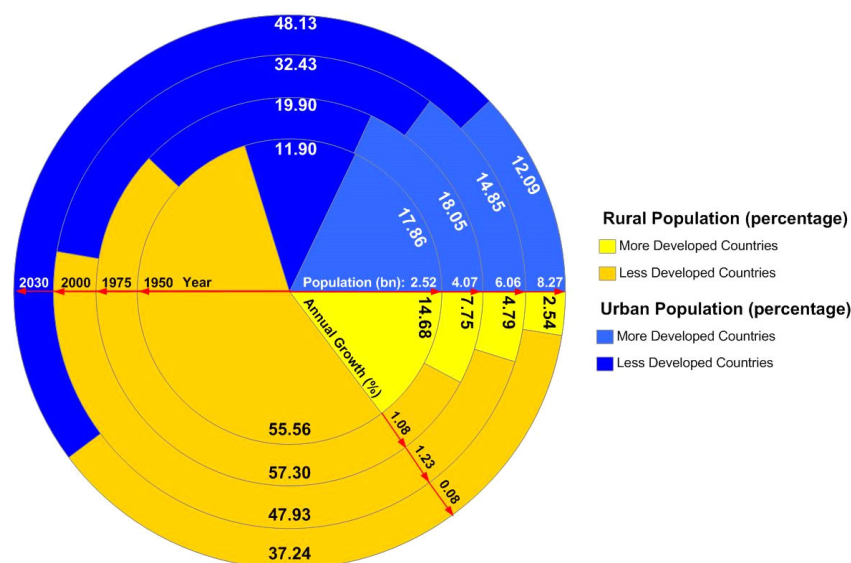
For the first time in human history, the urban population is matching the rural population (United Nations, 2002) (see Figure 1). While in 1950, 29.76% of the world population lived in urban areas, this value rose noticeably to 37.95% in 1975, 47.28% in 2000, and is expected to reach 60.22% in 2030. The total urban population will actually grow more than six-fold from 0.74 billion in 1950 to 4.98 billion in 2030, when about four-fifths of city dwellers will reside in less-developed regions. In fact, most of the expected world population increase from 2000 to 2030, which is expected to amount 2.21 billion new inhabitants, will be concentrated in urban areas, namely on less-

developed regions, where it will exceed 2 billion new residents. For the same period, the average annual growth rate of 1.85% for population in urban areas will almost double the annual rate for the total population of the world (1.04%). Seventeen megacities, exceeding 10 million inhabitants each, can be found in the world today.

The image of the city has evolved accordingly, from socially coherent and spatially circumscribed entities to complex juxtaposition of boundless urban processes (Amin & Thrift, 2002). In his seminal book, Peter Hall renders some theoretical visions of the urban phenomenon starting with the influential ideas of Ebenezer Howard (Garden Cities) and Patrick Guedes (Regional City) at the turn of the 19th century and developing contemporary views, including: Corbusier's cities of towers; autonomous communities; automobile suburbs; institutionalized land-use planning and its counterpart; and the city as a machine of wealth creation (Hall, 2002). But at the end of the 20th century, a new paradigm has emerged with Castells' "Informational City" (Castells, 1991). As pointed out by Susser (2002), "the restructuring of capitalism involved, first the concentration of knowledge as the source of profit and, secondly, the export of production to increase profitability", requiring "a flexible organization of manufacturing and greatly increased subcontracting, so that, as a consequence, horizontal, loosely connected networks directed by elite experts at the centre replaced the vertical integration of the industrial era."

While these visions enhance one or another aspect of the urban daily life, most agree that cities are characterized by dense and heterogeneous singularities of people and buildings in a specific place, or as proposed by Spiro

Figure 1. Evolution of world's urban and rural populations (Source: United Nations, 2002)



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