Key research themes on ICT and sustainable urban mobility

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ABSTRACT

Information and communication technologies (ICTs) are hypothesized to replace or change the use of the transport system by facilitating new or different activities. This article offers a review of more than 40 years of research regarding the relationship between ICTs and urban mobility. We discuss the expectations for the changes in travel demand, travel patterns, and the urban form as a result of the development and introduction of ICTs. Much of the interest in the relationships between ICTs and mobility is premised on the expectation of substitution effects, but empirical findings often suggest more complex effects than direct substitution. Although research on single types of travel activity may sometimes indicate simple substitution effects, examination of the broader impacts may also reveal travel generation effects as well. As such, ICTs do not simply substitute mobility patterns but change them. A growing body of research focuses on changing mobility patterns (in terms of time and space), changes in the experience of travel and changes in the perceptions of travel costs due to the interaction between old and new technologies for overcoming distance. ICTs are gradually becoming embedded within the transport system, enabling flexibility, multitasking, and an increase in human activities.

1. Introduction

For more than 40 years researchers and intellectuals have been hypothesizing about and trying to predict the effects of ICTs on city and human spatial behavior. As a rule, technological developments are strongly associated with human progress in general and urban development in particular. Technological developments have had, and still have, a major impact on the way our society has evolved and they are likely to continue playing this critical role.

Technology is considered, to a great degree, as a problem solver and, in many cases, has developed in order to cope with human challenges. In that respect, the transport system is a family of technologies aiming at overcoming distance. But along with the achievements of modern transport systems and the ever-growing distances they enable, they have also created new challenges and problems. The negative externalities of transportation systems include those resulting from the energy used to move traffic over space, the effects of the infrastructure needed to facilitate movement, and the indirect effects resulting from transport impacts on land use and development patterns. In addition, the transport system is responsible for fatalities, injuries, and economic costs of road accidents. The many negative effects of the transport system have motivated researchers, developers, and policymakers to look for alternative technologies to overcome distance. Against this background, information and communication technologies (ICTs) are considered as potential technologies that can replace or change the current distance-overcomer technology and reduce the negative impact of current technology without harming human activity.

As both transportation technologies and ICTs facilitate remote activities, the relationships between transport and telecommunications have received much attention (e.g., Andreev, Salomon, and Pliskin 2010; Hepworth & Ducatel, 1992; Mokhtarian, 1991; Mokhtarian & Salomon, 1997; Nilles, 1988; Salomon, 1986). Both technologies belong to a class of “friction-reducing technologies” or “spatial technologies” (Coulclelis, 1994) and have a network structure. These similarities have led scholars to measure accessibility not just with respect to mobility (physical transport) but to combine mobility options and the spatial structure, along with accessibility via ICT modes (Shen, 1998), and integrate and incorporate transport planning and ICT policy in urban policy to enhance accessibility (Coulclelis 2000; Horan & Jordan, 1998). These similarities are also evident in the similar terms that are used for both technologies, such as highways and information highways, ports, traffic, navigation, and congestion.

The expectations that the new technologies (ICTs) would gradually replace the old technologies (transportation) led to the hypothesis that ICT networks would play the same role in the 21st century that streets and highways played in the 20th century (Grant & Bergquist, 2000). Just as the car has affected the shape of urban areas, there is an expectation that ICT will