THE IMPACT OF VIRTUAL MOBILITY ON TRAVEL BEHAVIOUR: AN OVERVIEW

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KEYWORDS

Internet use, mobility, travel behaviour, modal shift.

ABSTRACT

The access to and use of the Internet has increased enormously over the last years, hence providing more and more people virtual access to goods, people, services and opportunities. People perform a lot of activities in this virtual world, thus creating virtual mobility.
Transport planners studied the impact of Internet use on travel behaviour for at least the same time. Most of these researches focus on commuter and shopping trips. This paper describes an overview of research results in order to get a clear view on the relation between Internet use and travel behaviour, and on the possibilities of the Internet to change travel behaviour.

THE INTERNET AND TRAVEL BEHAVIOUR: THEORETICAL BACKGROUND

Internet access and use in Western countries has increased enormously in a short space of time. Telecommunications and the Internet in particular offer a wide range of possibilities for people to conduct activities virtually, without travelling to the activity places.

The effect of technology and more specifically ICT on travel behaviour has been examined in different studies. Most of these works draw their conclusions upon the historic relation between telecommunications and travel, not upon empirical data (Lyons and Kenyon 2003). While the first studies suggested that ICT developments will make cities obsolete, or that telecommunications might eliminate all travel (Douma et al. 2003), the discussions nowadays have been broadened.

Salomon (Salomon 1986) identified four hypothetical possible effects of ICT on activities associated with trip-making.

- *Substitution*: one part of the travel demand is replaced by ICT. Physical trips to conduct activities are no longer necessary, given the use of ICT to perform these activities. The best example here is telecommuting, where the commuter trip itself is skipped.
- *Modification*: travel demand changes by using ICT. Travel is altered either by a shift in timing, routing, linking and trip chaining or travel mode. In the case of telecommuting people can shift the starting point of their trips to of-peak hours.
- *Generation*: ICT increases the travel demand, the use of telecommunications stimulates travel. The Internet makes it easier to conduct long distance virtual activities, thus enhancing the need to perform these activities in physical space too.
- *Neutrality*: refers to those instances in which ICT has no foreseeable effect on household travel behaviour.

Most of the research focuses on telecommuting, few studies investigate e-shopping. The literature on non-work commute or leisure impacts is rare and mostly hypothetical and theoretical (Douma et al. 2003; Farag et al. 2003). For this reason this paper will be limited to telecommuting and e-shopping.

Comparing the results of different surveys is difficult as their characteristics and methodologies differ too. If the research questions are similar, differences can still occur in sample size, sample strategy, content of the survey instrument. We will not give a detailed overview of each survey design, but we will highlight some of the results.

ICT-USE AND TRAVEL BEHAVIOUR

In 2003 the first wave of a German panel survey on ICT-use and travel behaviour was carried out (Nobis and Lenz 2003). A descriptive analysis of two extreme groups was one of the first results. The 'heavy ICT users' i.e. people who use cell phones and computers with Internet access present in their homes multiple times per week, were compared with the group of non-ICT users. The latter group includes all people whose household owns neither a cell phone nor a computer with Internet access and therefore cannot use any of these devices at home. Heavy users and non-users showed clear differences in socio-demographic features, but also with respect to their mobility.

Non-ICT users travel fewer kilometres per year. In a disproportionately high number of cases, they drive only up to 5,000 km per year, or indicate that they do not drive at all. The car availability of households with heavy ICT use correlates with their higher driving frequency. Heavy ICT users are more likely to live in households with two or more cars. Non-users live most often in households with no or one car. With regard to their attitudes heavy ICT users have a much greater affinity for cars (Nobis and Lenz).

Table 1: Information on Mobility

		Heavy ICT users	Non - ICT users
Distance driven per year	Up to 5,000 km	49.8%	50.2%
	5,001-10,000 km	71.7%	28.3%
	10,001-15,000 km	84.8%	15.2%
	15,001-20,000 km	95.8%	4.2%
	20,001-30,000 km	96.2%	3.8%
	Over 30,000 km	97.4%	2.6%
	I don't drive	44.1%	55.9%
Numbers of cars in the household	No car	19.6%	80.4%
	One car	61.4%	38.6%
	Two cars	90.0%	9.1%
	Three or more cars	94.0%	6.0%
Item: I need a car in order to be flexible	Top Two: correct	77.7%	22.3%
	Partially	53.7%	46.3%
	Bottom Two: incorrect	33.2%	66.8%
Item: By using a car, I can save a lot of time	Top Two: correct	77.4%	22.6%
	Partially	63.7%	36.3%
	Bottom Two: incorrect	27.6%	72.4%
Item: I cannot imagine life without a car	Top Two: correct	77.1%	22.9%
	Partially	68.8%	31.2%
	Bottom Two: incorrect	51.4%	48.6%

(Nobis and Lenz 2003)

The authors conclude that high ICT users show above-average mobility. A more detailed analysis of data and new waves of the panel survey may produce results that differentiate more and reveal causalities as well (Nobis and Lenz 2003).

In an American study by Douma (Douma et al. 2003) the type of Internet connection was taken into account during analysis. The diary participants with a broadband connection (cable, DSL) made significantly fewer trips than those with dial-up or no connection. However, other factors, such as trip distance or number of shopping trips did not vary significantly.

TELECOMMUTING

Mokhtarian (Douma et al. 2003) has attempted to assemble the substantive findings to date by examining current knowledge in forecasting the demand for telecommuting and the resulting transportation impacts. From the result it was clear that telecommuting does affect trips, it also showed that these effects are not uniform and in some cases the results have been contradictory. Some studies have found that telecommuters reduce their number of travels on telecommute days, on non-telecommute days or on net travel, while others put forward evidence of travel stimulation or generation, sometimes only on non-telecommute days, or for non-work trips (Douma et al. 2003; AVV 2003).

The research of Douma (Douma et al. 2003) focuses on both telecommuting and e-shopping. In the case of telecommuting they found that e-workers take the advantage of ICT to modify their commutes, without impacting their workday. The use of telecommuting as a direct substitute for the work commute was rare in their sample.

E-SHOPPING

Handy and Yantis (Handy and Yantis 1997; Douma et al. 2003) conducted a household survey to examine in detail the potential substitutability of three different types of activities: movie watching, non-grocery shopping and banking. They found that the travel implications of home shopping were not straightforward and concluded that home shopping has not reduced shopping travel to any significant degree, since certain qualities of the physical trip were not duplicable by the ICT facilitated in-home version.

Casa and colleagues (Douma et al. 2003; Farag et al. 2002 ; Farag et al. 2003) compared in their study the travel behaviour of e-shoppers with non-e-shoppers. After controlling for socio-demographics, the results showed that Internet shoppers made more trips in general, as well as more shopping trips in particular. The authors concluded that on-line shopping has not substituted for store shopping trips, and that e-shopping is used as an additional shopping method which does not change trip making behaviour, but does change shopping behaviour.

The survey conducted in the Twin Cities Metropolitan Area agrees with this conclusion (Douma et al 2003). E-shopping broadens the range of shopping activities from home. Direct substitution appears less frequent and seems to have little impact in this sample. People use the Internet to modify their shopping behaviour, by either browsing for products before leaving home, or by using the Internet to make their trip more efficient. Here again, the type of Internet connection makes a difference: broadband users were more likely to use the Internet to generate a trip than dial up users (Douma et al 2003).

A comparative research between US data and Dutch data adds some more variables that influence travel behaviour (Farag et al. 2003). In the Dutch case it was found that online buyers have less travel time to shop for non-daily goods than non-online buyers, while in the US case no difference was found. The authors search the explanation in the difference in lifestyle between urban and suburban residents. Another finding was the fact that people who like to shop in-store are more inclined to like online shopping. This indicates that people who like e-shopping will probably continue to visit stores and therefore it seems unlikely that substitution in-store shopping will occur. Shopping via the Internet is mainly a complementary mode for in-store shopping (Farag et al. 2003).

For daily shopping as well as for non-daily shopping they found that the number of shopping trips increases if people buy frequently online. Further research to investigate the

causality between in-store and online shopping is difficult since there are no data available about in-store shopping prior to e-shopping (Farag et al. 2003).

Srinivasan and Reddy (Srinivasan and Reddy 2003) modelled the relationship between Internet communication and travel activities. Their main conclusion is that the relationship is multi-directional and multi-dimensional in nature. Internet use is correlated positively with larger trip frequency, but also with shorter travel durations.

Also Choo and Mokhtarian (Choo and Mokhtarian 2003) come to the conclusion that travel demand increases as telecommunications demand increases, but the largest portion of the effects in each direction are indirect rather than direct.

WHAT WILL THE FUTURE BRING?

It may be clear that the relationship between travel behaviour and ICT or Internet use is a complex one. The further research goes into detail, the more variables are added to explain this relation. Measuring travel behaviour is already difficult and so is Internet use. A study of the combination of the two is not obvious.

The more the view on mobility is rather narrow: the focus has been set on commuter and shopping trips, which just count for 39% of the total amount of trips in the Flanders region (Zwerts and Nuyts 2002). A lot of further research is necessary to measure the effects of Internet use on other kinds of trips.

Technology is going fast. The explosion of ICT in just a few years may be repeated with other devices as well. Longitudinal research offers here the opportunity to get more detailed information on both sides of the relation.

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