
Abstract

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Topic: Impacts of the use of information and communication technologies (ICT) on traffic demand

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Nowadays, traffic jams are not uncommon, but part of everyday life on German or worldwide roads. Forecasts show that after the steady growth within the last few years, traffic will still increase further in the future, too. Even if the corresponding infrastructure is expanded constantly, the high growth in traffic leads increasingly to bottlenecks and therefore to problems. For the solution of these traffic problems, the expectation was often expressed in the past that modern information and communication technologies (ICT), such as mobile phone, computer and Internet, could make an important contribution to reduce traffic. In particular, politicians and media have repeatedly taken up this topic that the distribution of ICT use is associated with effects on traffic. To systematically describe the impact of the use of ICT and to formulate statements about potential effects on passenger and freight transport is the aim of this work.

The work is divided into a total of eight parts. After a short introduction, a chapter with basics follows. First, concepts are defined there and then developments in the areas of traffic and ICT are demonstrated. Not only in traffic can a steady growth be recorded but also the distribution of ICT has progressed far within the last few years. While in 2005, less than 20 per cent used the Internet all over the world, the value has already doubled within nine years. In industrialized countries, Internet use is even almost 80 per cent today.

Which ICT-based applications currently exist is analyzed in the following chapter. ICT applications can generally differ in traffic-related and non-traffic-related ones. Traffic-related ICT applications, such as parking guidance systems or road-control installations, are systems that affect traffic directly. Non-traffic-related ICT applications, however, were not specifically developed for traffic but may have an indirect impact on traffic. Examples of non-traffic-related ICT applications are telecommuting or online shopping. For clarity, the ICT applications are finally compiled and structured in a catalog. Moreover, this catalog shows the functions of the respective ICT applications. A distinction is made between the "inform", "communicate", "control/guide", "navigate" or "other" functions.

Especially for this work, non-traffic-related ICT applications are of interest because their traffic effects are not unique, but can be very diverse. The qualitative effects of non-traffic-related ICT applications and their effective relationships are presented in the fourth chapter with the aid of an effect wheel. The effect wheel consists of several levels. At the first level, direct and indirect effects of the corresponding application are presented, where only the first stage each of the traffic effect is considered. The mentioned effects are then assigned to an effect group at the next level. Here a distinction is made between the effect groups of traffic substitution, traffic shift and traffic induction. The third level indicates whether the effect influences the passenger or freight traffic. The travel purposes which the effect has influences on is shown at the next level. Finally, at the last level, the effects are basically distinguished again in necessary and possible effects. Necessary means that they always occur in connection with the non-traffic-related ICT application. As to the number of qualitative effects, the applications are very different. Telecommuting can be attributed most of them with a total number of nine qualitative effects. In contrast, online banking has comparatively few qualitative effects on traffic with only two effects.

The effects have also been questioned on the scientific side for some time. Since the 1980s, there have been numerous studies which deal with the issue of how far the use of ICT is linked to traffic impacts. The analysis of these international empirical studies and theoretical works is contained in the fifth chapter. In this case, the aim is to investigate whether the qualitative effects are proved or refuted by quantitative results from the studies. First, based on comprehensive literature research all studies and works, which have been found on the issue, are clearly represented in a table. Out of the nine non-traffic-related ICT applications, studies and works regarding four ICT applications could be found. These are telecommuting, online- or teleshopping, conference systems and online banking. Due to the large amount of studies and works found, the analysis was limited to the two non-traffic-related ICT applications telecommuting and online- or teleshopping. After analyzing each individual study and work, the key findings to telecommuting and online- or teleshopping are summarized again in a subsection, respectively. Which of the analyzed studies and works can eventually be used to make statements about the effects of telecommuting and online- or teleshopping, is determined by using various test criteria. Finally, for both telecommuting and online- or teleshopping four from initially 15 or 13 studies and works could be considered to be representative.

The representative studies and works related to telecommuting come to the conclusion that mileage is reduced due to telecommuting. However, based on the total population, the previous findings do not raise hopes of any considerable savings of mileage due to

telecommuting. With reference to the number of journeys the four representative studies even come to contradictory results. The results of the four studies and works on online- and teleshopping give reason to expect that in passenger traffic both the mileage and the number of journeys decline due to online- and teleshopping. In this respect, the amount of reduction is however not estimated to be significant either. In relation to freight traffic, online- and teleshopping implicate an increase, whereupon the percentage increase can be considered as rather marginal compared to the total freight traffic. As to the delivery of goods, this might look different locally. Particularly here, there is need for further research. Thus, overall, traffic effects are associated with telecommuting and online- or teleshopping, but the amount of reductions suggests that they do not significantly improve the current traffic problems.

Although the traffic impacts are estimated to be low according to the analysis of the studies and works, the sixth chapter briefly states how such impacts could be taken into account in traffic demand modeling if further studies lead to different results. A so-called ICT-rate, for example, could be included in a space aggregate model to reflect the impacts.

Prior to the conclusion of the work, a seventh chapter is inserted which demonstrates the need for further research. It is analyzed whether there is further need for research with regard to telecommuting and online- or teleshopping. Furthermore, the demand for research in relation to non-traffic-related ICT applications is pointed out, for which empirical studies and theoretical works are not available at present.