13 Interrelationships of Internet Technologies and Transport Behaviour

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Introduction

The widespread introduction and uptake of information technologies (IT) including Internet, apps, and social media platforms has significant and complex implications for transportation and mobilities. This chapter discusses how IT influences mobility patterns, and how different IT innovations foster or substitute transport demand, concluding that IT may currently increase transport demand. The chapter highlights the complexity of interrelationships, and discusses three changes in transport demand growth in more detail, including the importance of apps for shared or public forms of mobility in urban contexts; competitive mobilities involving the use of social media; and automotive cultures fostered through the Internet. Trends and developments are discussed with regard to their implications for low carbon mobility transitions.

IT-transport interrelationships

Over the past decade, the Internet, social media, and specifically apps have come to be increasingly interwoven with our daily lives. The scale and growth in IT use and its implications for transport systems may be illustrated based on the example of Uber, a peer-to-peer taxi service founded in 2009. The platform originally organised private transport services by citizens using their own cars, charging lower prices than traditional taxi services. After six years, the company had expanded to 70 countries in the world, and was valued in January 2016 at US$62 billion (Newcomer, 2015). Not only did the company organise close to an estimated one million rides per day at this point, providing employment to tens of thousands of drivers, it also caused fundamental disruptions in taxi markets in those countries were the app was introduced. In the context of this chapter, the key question is, however, whether this fundamental change in the provision of transport services

supports low carbon transport futures. Are convenient and quick ride-sharing services a means of reducing traffic, as they make car-ownership redundant? Does Uber's offer of shared rides between multiple people (Uberpool) lead to a significant reduction in transport volumes (and hence emissions), as it increases the load factor of cars? Or does Uber lead to growth in traffic, because the reduced cost of personalised transport services makes these more attractive, perhaps also increasing the demand in luxurious car rides offered by the company? The purpose of this chapter is to discuss these issues, based on a general overview of IT-transport interrelationships and a more detailed consideration of three IT innovations with potentially significant repercussions for the decline or growth of transport demand.

As shown in Figure 13.1, the importance of IT innovations in the context of low carbon mobilities essentially addresses two dimensions: a) the choice of transport modes, which may be more sustainable (bicycle, bus, train/tram/subway) or less sustainable (motorcycle, car, aircraft); and b) overall transport demand, i.e. the distances travelled by individuals (which may increase or decline). Theoretically, a third dimension, i.e. the carbon intensity of the fuels used, is also of relevance, but this complexity is considered in the respective transport mode's carbon intensity (Figure 13.1). Importantly, transport mode choice and transport demand are interdependent, as they influence each other: someone favouring a bicycle over a car is likely to cover shorter distances on average, given that the maximum range for bicycling is shorter than for transport powered by combustion engines. Whether a given change in IT results in the growth or decline of emissions of greenhouse gases is thus an outcome of overall distances covered by a traffic participant, multiplied by the weighted average of the carbon intensity of the transport modes used.

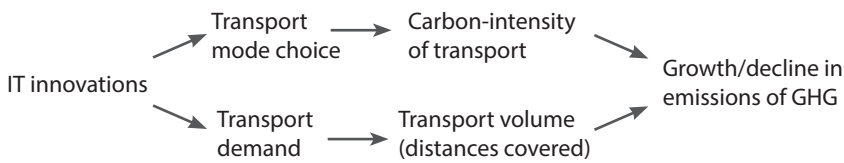

Figure 13.1: Interrelationships of IT and emissions of greenhouse gases from transport. Source: Author.

Notably, the role of IT in these interrelationships is potentially self-reinforcing or neutralising: for example, a person may choose to bicycle to work more often rather than to take the car, and as result, the overall distance travelled may also decline (as bicycling is more time consuming, and likely to involve shorter 'detours' – drive somewhere for lunch, picking up the laundry – than those made by car). As both carbon intensity and transport volume decline, the overall impact is even more favourable from a sustainability viewpoint, leading to a more significant decline in emissions. In comparison, someone changing from bicycle to car may contribute to growing emissions both because of the transport mode change and the greater distances travelled. Mode change effects can neutralise each other when less carbon intense transport is used, but transport volumes increase. This is

known, for instance, in the case of purchases of smaller and less-energy consuming cars, which are driven considerably more: Studies of such 'rebound effects' indicate that about one fifth of potential savings are eroded by additional driving (Stapleton *et al*., 2016). A very notable change in transport behaviour is also apparent in Generation Y and Z (those born after 1990), as these generations are less interested in driving licences (i.e., opportunities to drive themselves; Delbosc & Currie, 2014 , see Chapter 3), but potentially considerably more 'aeromobile' than previous generations (Gössling & Stavrinidi, 2016).

In light of these complexities, how does IT affect transport behaviour, and, importantly, does it on balance increase or decrease transport volumes and emissions of greenhouse gases? This question has been controversially discussed over the past three decades, beginning with Salomon's (1986) linking of telecommunication opportunities to transport demand growth. Various publications have subsequently discussed these relationships (e.g. Banister & Stead, 2004; van den Berg *et al*., 2013; Nobis & Lenz, 2009), though all authors concluded that the assessment of the outcomes of IT innovations was difficult. Yet, the consensus was that it was more likely that IT innovations increased overall transport demand. An important issue with these assessments is, perhaps, that authors investigating the implications of IT for transport behaviour have not been able to foresee the rapid change in available technologies that would occur in the future – most recently, this included apps – and the wide range of implications these technologies would have for transport behaviour (Gössling, 2016). There can be little doubt that each technological innovation has increased the degree of complexity with regard to IT's implications for transport demand: to assess the outcome of various technologies for low carbon transport futures has consequently become increasingly difficult.

This growing complexity of IT-transport interrelationships is illustrated in Figure 13.2, which shows that many of the digital devices and their functions now taken for granted by hundreds of millions of users were introduced only recently. The personal computer saw its mass-market breakthrough in the early 1990s. The mobile phone was introduced to larger markets in the mid-1990s, followed by transportable computers (notebooks), smartphones and tablets. Smartphones with touchscreens for direct finger use became known to mass-markets only in the late 2000s; this is, after the introduction of the iPhone and the platform Android for other phone brands. Even more recent were many software-based innovations. Web 2.0, the Internet characterised by interactivity and opportunities for users to generate content, was introduced in 2003. Social media were introduced soon after, with the most recent developments including mobile applications and chat services. This timeline illustrates the rapid changes in opportunities to use technologies – in particular the smart phone – and their even more rapid mass-market uptake as well as the difficulty in anticipating the outcome of these innovations for transport demand.

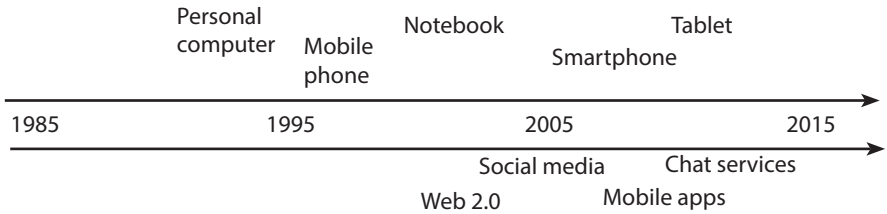

Figure 13.2: Approximate mass-market introduction of telecommunications innovations. Source: Author.

Implications of IT for transport mode choice and demand

In recent years, a wide range of IT innovations have become relevant for transport use. These have been summarised in Table 13.1, along with an assessment of their implications for transport mode choices (more/less sustainable) and transport demand (growing/declining). As indicated, IT is now relevant with regard to travel information, planning and routing; sharing; distance work; price comparison; safety; convenience; distribution of traffic; health; and mobilities (Gössling, 2016). These have interrelationships with transport mode choice and demand, with major changes often being introduced by individual IT sites or apps. For a more detailed discussion of the complexity of interdependencies see Gössling (2016).

A general analysis would suggest that IT innovations can work in two directions; that is, they can increase or reduce emissions. However, implications are not always comparable. As an example, convenience applications such as parking apps of different types are likely to increase emissions, as they make car driving more efficient. Depending on location, this may be a considerable advantage for drivers, as up to 8% of all traffic in urban contexts in the USA may be related to searches for parking space (Shoup, 2006). However, outside the USA, these apps may be less relevant. As another example, apps helping to monitor physical activity are likely to lead to more active lifestyles; yet their contribution to transport mode change (e.g. car to bicycle) or transport demand (number of kilometres cycled). In comparison to these examples, the most powerful changes are related to mobilities, which refer to demand changes linked to the very nature of travel motives. In other words, glamorisation of corporeal mobility (Cohen & Gössling, 2015), as well as travel visualisation on maps linked to competitive mobilities are of potentially great importance for transport volume growth, because they are interrelated with social status and personal identities, thus constituting mechanisms with potentially very important repercussions for transport demand growth. The following sections will discuss the three changes in more detail that are likely to have the greatest implications for transport mode change and transport demand growth, including the implications of IT for urban transport behaviour, competitive mobilities and car cultures. While the first of these has the potential to reduce transport emissions, the latter two are likely to increase emissions from transport systems.