12 Innovations to Transform Personal Mobility

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Introduction

After decades of expanding automobility – the practices, landscapes, institutions, knowledges and cultural representations centred on the privately owned car – across the global North, a new era has dawned. Use and private ownership of the car seem to have peaked (Goodwin & Van Dender, 2013) and a renaissance of urban rail and cycling is taking place. Some commentators have announced the end of automobile dependence (Newman & Kenworthy, 2015), but others are more cautious. The latter point out the numerous path dependencies in terms of land use, policy and governance, finance, expertise and embodied sensations and emotions that trap the western world into continued reliance on the private car (Dennis & Urry, 2009; Kent, 2015); and the fact that car ownership, driving licensing and car use are increasing rapidly elsewhere and more than ever before at the global scale (Schwanen, 2015a).

The geographical complexities of peak car and the renaissance of rail and bike suggest both the importance of, and need for, innovation in the mobility of people, goods and information. The causes for peak car are varied, complex and hotly debated in the academic literature but innovations – novel technologies, institutional arrangements and user practices, such as public transport smartcards, urban light rail, car sharing and all kinds of cycling training schemes – should be listed as relevant factors. At the same time, the relentless global expansion of automobility implies that new innovations will have to emerge and existing ones diffused more widely if CO_2 emissions from transport, air quality problems, obesity levels and all kinds of social inequalities are to be reduced significantly. It is for these reasons that I will examine innovation processes more closely, discussing specifically how innovations in personal mobility in urban areas can be understood.

In this chapter, I argue that innovation processes in personal mobility are social and geographical in nature and therefore require the bringing together of thinking

from innovation studies, such as the work on socio-technical transitions, with theorising from geography and urban studies. I will first introduce the thinking on socio-technical transitions and then explore geographers' responses to this approach. Throughout I will selectively refer to my own empirical research into innovation processes in personal mobility in several UK cities – Oxford, Brighton, Liverpool and London. This research relies on document analysis; interviews with local entrepreneurs, policymakers, politicians and activists; and limited mobile ethnography (Schwanen, 2015b). It recognises that 'innovation' is a polysemic, value-laden term and uses the deliberatively broad description of a configuration of heterogeneous elements – technical artefacts, designs, practices of consumption, business models, etcetera – that is new(ish) to an arbitrarily defined area. Thus, electric vehicle charging infrastructure can be as much an innovation as, say, personalised travel planning offered by local government or a smartphone application to encourage low carbon mobility in a specific city.

Understanding innovation

Innovation has long remained a black box in transport and mobility studies. Insofar as new technologies, institutional arrangements and user practices were considered, the emphasis was usually on predicting the (potential) impacts they might have on transport systems, congestion, economic growth, CO_2 emissions, air quality, obesity, etcetera. This orientation reflects that the historical *raison d'être* of academic transport research lay in offering decision support to policymakers and other stakeholders in the transport sector. However, since the late 1990s innovation processes have gradually been unpacked by innovation scholars for whom transport is one domain among others in which sustainability transitions are both needed and gradually unfolding.

These scholars have tended to draw on two theoretical frameworks – the innovation systems (IS) and the socio-technical transitions (STT) approaches. Both approaches suggest that innovation is a systemic process involving many different actors rather than a single individual or company; they differ in how that systemic process is understood. The IS approach examines '*all important economic, social, political, organisational, and other factors that influence the development, diffusion, and use of innovations*' (Edquist, 1997: 14) in order to derive policy recommendations (Markard *et al*., 2015). The focus is typically on technological innovations, such as alternative fuels in the transport context (e.g. Suurs *et al*., 2010). Because of its technology focus, the framework is less suitable to understanding other types of innovations in urban mobility. The remainder of this chapter therefore concentrates on the STT approach, which has been used to study a wide range of innovations. Examples include electric and hydrogen vehicles, park and ride schemes, travel information provision and car sharing (Hoogma *et al*., 2002; Nykvist & Whitmarsh, 2008; Geels *et al*., 2012; Schwanen, 2015b).

Socio-technical transitions

The multi-level perspective (MLP) (Rip & Kemp, 1998; Geels, 2012) holds that innovations can only durably reconfigure existing mobility systems if developments in what are known as socio-technical niches, regimes and landscape are somehow aligned and reinforcing each other. A mobility system is understood here as a socio-technical system – a conglomerate of technologies, infrastructures, markets, regulation and policy, cultural values, user practices and various forms of knowledge that fulfil the societal function of transport. This system is held together and enacted by social practices that are conditioned by – and simultaneously reproduce – all kinds of rules, including cognitive routines, shared beliefs, social norms and conventions, regulations, industry standards, protocols, contracts and laws. Collectively these rules constitute the socio-technical regime. This regime is dynamically stable; innovations are usually incremental, led by incumbent actors and therefore with few implications for existing power relations. Typical examples include fuel economy improvements in the regime of automobility, which do little to challenge vested interests or its dominance in mobility provision, and are therefore relatively popular among incumbent actors like the car industry (Penna & Geels, 2015).

In contrast, more disruptive or radical forms of innovation that potentially challenge prevailing sets of rules need the protection of socio-technical niches – spaces in which actors at the fringe of the existing regime can experiment with innovations. In niches, innovations are shielded from regime pressures, nurtured and empowered (Smith & Raven, 2010). This is because, as the strategic niche management (SNM) and transition management (TM) literatures have demonstrated, it is in niches that the social networks supporting a given innovation are expanded; interests and expectations of various stakeholders are aligned through the articulation of collective visions; and learning about design, regulation and user experience takes place (Kemp *et al*., 1998, 2007; Schot & Geels, 2008). For Geels and Raven (2006), niche development entails the formation of local/global interactions. They submit that the embodied, local knowledge generated in individual experiments and R&D projects is aggregated into more formalised agendas, models and theories shared by a growing network of actors. This more global knowledge helps to shape and frame subsequent localised experiments, which extend and refine the more generic learning and network formation, thereby strengthening the niche's momentum.

All of this will enable diffusion and competition or symbiosis with the prevailing regime(s). Whether diffusion and regime change happens, in which ways and at what pace depends on the pressure the socio-technical landscape exerts on the existing regime. The landscape is here effectively a residual category that gathers all the wider contexts and developments over which regime actors have little influence, including anthropogenic climate change, economic crisis, demographic shifts and the rise of the Information Age. It is from the interactions between niches, regime and landscape that a transition emerges (Geels, 2012).

Concerns and refinements

As the dominant perspectives on socio-technical transitions, the MLP and SNM/TM have been criticised extensively (Smith *et al*., 2005; Shove & Walker, 2007, 2010; Genus & Coles, 2008; Lawhon & Murphy, 2012; Bulkeley *et al*., 2014; Affolderbach & Schulz, 2016). Providing an exhaustive overview is beyond this chapter; suffice it to say that the following concerns are most relevant for understanding innovation processes in urban mobility:

- Technological innovations, such as alternatively fuelled vehicles, are commonly privileged over innovations in the other elements that constitute socio-technical systems.
- Prevailing accounts of the activities needed to shield, nurture and empower niche-innovations have been considered technocratic and managerialist. The politics and power dynamics of innovation processes – and socio-technical transitions more widely – have remained underexposed and underconceptualised. Taking these arguments further, one might rather provokingly assert that the MLP and SNM are symptomatic of a wider 'post-political' condition according to which anthropogenic climate change can only be governed by accepting capitalism, the neoliberal logic of the market and expert management as given and by supplanting ideological contestation by consensus (Swyngedouw, 2010).
- Insufficient attention has been directed towards the social distribution of the effects of niche-innovations and socio-technical transitions: Who gains? Who loses? In what ways?
- The focus tends to be on actor networks and institutional structures rather than individual actors or small groups of individuals whose biographies, motivations and visions may play a key role in the emergence and early development of a particular innovation.
- The people who make use of socio-technical systems tend to be assigned rather passive subject positions: they are often imagined as (non-)adopters and (non-)users of innovations rather than as active and political subjects. Moreover, the heterogeneity in needs, preferences, capabilities and experiences of '(non-)users' is seldom recognised.
- The understandings of space (see below) and time on which STT thinking is premised can be developed further. Whilst imagining the world as in flux and intrinsically dynamic, SNM and the MLP are also committed to a linear understanding of time: the interest is both in the growth and diffusion of niche-innovations and in the transition from one socio-technical system to another.

STT scholars have responded generously to these – and other – concerns and gone to great lengths to address their critics. Most of the above points have been addressed in some way or other in STT research (Geels, 2011, 2014; Raven *et al*., 2012), although it is an open question whether the responses have satisfied those