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Reject or embrace? Messengers and electric cargo bikes

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Abstract

One of many approaches to react to the challenges faced by urban freight can be the introduction of electric cargo bikes as an environmentally friendly mode of transport for courier deliveries. Since this market consists of highly decentralized decision-making structures, it is important to characterize the individuals involved and their perceptions in order to estimate market potentials and identify barriers to market uptake. To achieve this goal, we use information from a nationwide survey to draw a picture of the messengers involved as well as to model a binary decision of innovation rejection. The results indicate a group of people close to the general population but with certain particularities regarding gender, education and work style. Their attitudes towards technology are rather positive but their actual adoption of electric cargo bikes shows a much more heterogeneous pattern based on socio-demographics, job circumstances and personal characteristics.

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1. Introduction

Like every other area of passenger and goods transport, urban freight is facing the challenges of ever-growing demand and increasing scrutiny towards its negative externalities. Local and climate emissions, noise and safety are becoming the focus of a search for improvements and alternatives to “achieve essentially CO2-free city logistics in major urban centers by 2030”, as formulated by the European Commission Whitepaper (EC, 2011). In order to achieve these goals, cities need to push forward their transformation exploring new ways of organizing goods transport as well as wholly new transportation modes.

One possible contributor to more effective and environmentally friendly city logistics schemes is the use of cargo bikes for the last mile of deliveries (Holguin-Veras et al., 2014; Browne et al., 2011; Lenz & Riehle, 2012), often enhanced by electrically assisted drivetrains. Cargo bikes possess many advantages for commercial use, like low

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operating cost, less driver fatigue, higher payload, and environmental benefits (Transport for London, 2009), rendering them especially suitable for courier logistics with a high share of small-scale short distance shipments in metropolitan centers or when embedded in innovative logistics systems such as micro-consolidation centers (demonstrated in London by Leonardi et al., 2012) or mobile depots (e.g. in Brussels as shown by Verlinde et al., 2014). In Paris, an increasing number of innovative companies are starting to use cargo bikes for short-distance deliveries (Dablanc, 2011), resulting in strong growth of this currently niche market (Koning and Conway, 2014). The exact market size remains unclear, mostly due to incomplete statistics about two- or three-wheelers used for freight transport. Among the 3.8 million bicycles sold yearly in Germany, the number of electric cargo bikes can only be estimated around a 4-digit number (ZIV, 2013).

In order to explain the current market situation as well as to estimate its future potential, several assessments (Verlinde et al., 2014; Maes, 2015) have shown a repeating pattern: Cargo bikes prove to be a reliable and climate-friendly alternative to LCVs, but are little embraced by companies due to their unfavorable economics. While a total welfare approach including externalities would yield a positive net worth of electrification, a business economics perspective without including externalities shows up the well-known challenge of electric drivetrains, as their higher investment and setup expenses is not offset by the lower variable cost per kilometer. Hence, other motivations appear to be complementary in the decision to adopt electric vehicles.

This adoption process has been the focus of interest in many studies concerning electric vehicles in general. Most studies concentrate on private passenger cars (a comprehensive overview is given by Plötz et al., 2014), while commercial transport is under-represented (Globisch et al., 2013). Wolf and Seebauer (2014) investigated the adoption of electric bicycles by private households, employing the meta-theory UTAUT (unified theory of acceptance and use of technology, introduced by Venkatesh et al. (2003) for IT diffusion), which brings together 8 previous adoption theories, including the Theory of Planned Behavior (Ajzen, 1991), the Technology Acceptance Model (Davis, 1993) and the Diffusion of Innovations Theory (Rogers, 2003).

Regarding freight transport, Roumboutsos et al. (2014) apply a Systems of Innovation approach to estimate the potential of electric vehicles in city logistics and highlight the importance of well-organized local political actors and their networks. Laugesen (2013) compiled the results of 60 freight-oriented electric vehicle demonstration projects in the Baltic states. Cargo bikes are rarely the main focus of these urban freight demonstration projects, but sometimes accompanying modules (e.g. retail deliveries by cargo tricycle in Hasselt, Belgium and postal deliveries in Brussels, Belgium). Van Duin et al. (2013) focus on the simulation of electrification effects in city logistics. They apply a Fleet Size and Mix Vehicle Routing Problem with Time Windows (FSMVRPTW), finding that electric vehicles are generally capable of improving efficiency while strongly reducing externalities. Furthermore, the perspectives of different stakeholders (such as drivers, shift managers and dispatchers, customers or neighbors to costumers) are important for the assessment of innovations in courier and parcel logistics (Ehrler and Hebes, 2012).

Commercial fleets are seen as crucial for alternative vehicle uptake, as single decision-makers can impact the procurement not only of their own vehicle (as in private car markets) but large fleets comprising of many vehicles (Globisch et al., 2013). Sierzchula (2014) identified the interest in innovative vehicle technology as the main EV-adoption motivation for fleet managers, with only secondary complements seen in lowering environmental impact, receiving government grants and improving the company's public image.

As introduced by Nesbitt and Sperling (2014), fleet decision-making processes can be distinguished alongside two main dimensions: formalization and centralization. Formalization refers to the level of rules and procedures guiding the decision process. Centralization refers to the number and independence of decision-makers involved. Based on these dimensions, the authors derive four main structures of fleet decision-making: Hierarchic (high formalization and centralization), bureaucratic (high formalization, low centralization), autocratic (low formalization, high centralization) and democratic (low formalization and centralization). In Germany, a common form of operating a courier logistics company is without employed drivers, but with freelance messengers who are contracted on a commission basis, operate their own vehicles (normally bicycles, cars, or vans). Consequently, vehicle procurement and use decisions are made in a decentralized fashion by a heterogeneous group of individual messengers (Gruber et al., 2014) and the common definition of a firm's vehicle fleet might only be applied with caution. If done so, it would be attributed to the democratic fleet decision-making category, which according to Nesbitt and Sperling (2014) was the least common type but seen as an interesting case for alternative fuel vehicles.