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Applying a behavioural change model to the adoption of freight electric vehicles: lessons for effective instruments

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Extended abstract

Objectives and motivation

The adoption of electric mobility (e-mobility) is important to achieve the objectives as set in the “Roadmap to a single European transport area” (EC, 2011). In addition to the exclusion of ‘conventionally fuelled’ cars by 2050, the roadmap sets a specific ambition for city logistics, which should be essentially CO₂-free in major urban centres by 2030. Next to European CO₂ targets, cities adopt e-mobility as measure to reduce local air pollution. While vans and trucks represent approximately 10% in total national fleets (BOVAG, 2014), they are responsible for about 70% of the road transport related NO_x concentrations in cities (TNO, 2015). Cleaning logistics fleets is crucial to achieve the GHG emission reduction targets for transport and to improve the sustainability of cities.

Despite many incentive programs and improvements in the technology of electric freight vehicles (EFV), large scale implementation of EFV does not come off. The market share of electric vehicles among vans and trucks in the Netherlands is only 0,08% (BOVAG-RAI, 2014) and its growth in the last years is unpromising as compared to personal electric cars. So why does the logistics sector does not adopt this - highly needed - technology?

An increasing number of projects such as ENCLOSE, FREVUE and NSR E-Mobility focus on the uptake of freight electric vehicles in urban areas. The projects explore current challenges, demonstrate the viability of EFV in pilot studies and disseminate knowledge. The preconditions for large-scale uptake of EFV that are mentioned in these projects are related to:

- Presence and affordability of vehicles and charging infrastructure;
- Suitability of logistics operations;
- Policy scheme of public authorities.

Behavioural aspects seems to be left out of scope in these projects. ENCLOSE (2014) addresses ‘user acceptance’, but only as an issue within the early implementation phase, that is, among test drivers. FREVUE (2013) mentions the potential positive influence of EFV on the company’s image, which may imply a positive behavioural attitude towards EFV from an entrepreneurial perspective. Yet proof of this influence is lacking and more importantly, it is not known whether non-EFV companies commonly share or, are aware of this vision. Let alone, whether it motivates them to adopt e-mobility for their logistics operations.

Research on the preconditions for EFV uptake from a non-user’s behavioural perspective, is lacking. Simultaneously, policy makers introduce financial incentives, supportive measures and pilot projects, while not being aware of the behavioural status of the target group. The objective of this paper is to provide lessons for appropriate instruments, for each phase of behavioural change, to increase the effectiveness of government spending on the uptake of EFV.

General description

This paper is built upon a behavioural change model, developed by Marcel Balm (2000). The model of Balm was initially developed for physiotherapists, but is applicable for various types of change, as shown in this paper, where the model is applied to the adoption of electric vehicles in the logistics sector. The model describes 6 steps that people go through in the process of behavioural change: perceptiveness, understanding, wanting to, being able to, doing and persevering. The steps can be categorised in three phases: pre-adoption, preliminary adoption and long term adoption. While Balm (2000) argues that receptiveness is a prerequisite for the pre-adoption phase (i.e. understanding, wanting and being able), we argue that receptiveness is very much integrated in phase 1. Being open for change does not occur in itself, but is fostered by awareness, willingness and ability. We therefore do not consider receptiveness as separate step in the model. Below, the 5 steps that we distinguish are described. For our final paper, we further discuss and enhance our model with the Innovation Theory of Rogers (Rogers, 2003) and the AIDA-model (Strong, 1925).

Phase 1. Pre-adoption

- *Understanding*: users need to be aware of the new concept, and understand the requirements, benefits and risks
- *Wanting to*: the pros of the new concept need to be higher than the cons. From that moment, the user is willing to change.
- *Being able to*: the user needs to be able to change. This means that company is capable to adopt the concept.

Phase 2. Preliminary adoption

- *Doing*: the user gains experience with the concept, but this is not the yet. The user may face drawbacks

Phase 3. Long-term adoption

- *Persevering*: the concept becomes the company’s new habitat; drawbacks have been overcome.

The steps are applied to the concept of freight electric vehicles, where we define ‘users’ as companies in the logistics and transport sector. For each step, we explore 1) the required conditions for the behavioural change and 2) instruments that can support the change.

Results and conclusions

The result of this paper is a framework that distinguishes 5 steps of behavioural change, the preconditions for each step and appropriate supportive instruments. The paper presents effective and less effective policy instruments that have been applied in practice, and discusses how the effectiveness is related to the behavioural phase of the target group. It shows the gap that often exists between the applied instrument and the precondition that is firstly needed to change. For example, financial support, which is extensively offered by the municipality of Amsterdam, is not requested when companies *do not understand* and *do not want to* change. Participants of pilot studies that include unwilling or badly informed drivers, will most likely gain 'selective experience'. They are likely to emphasize the negative aspects more than the positive. Based on real cases from national and European demonstration projects, we give recommendations for the selection of an appropriate target group for pilot studies to increase effective 'doing'. Furthermore, we stress that accurate guidance is essential in 'persevering' the new behaviour and the relevance of communicating success stories. Finally, the paper stresses the importance of 'wanting to' for large scale uptake and discusses potential instruments that have not received a lot of attention so far.

Table 1 Framework: behavioural change model for the uptake of EFV

*	OBJECTIVE	PRECONDITIONS	INSTRUMENT
1	Understanding	<ul style="list-style-type: none"> • Being aware of benefits 	<ul style="list-style-type: none"> • Practical oriented fact finding and knowledge dissemination
	Wanting to	<ul style="list-style-type: none"> • Demand: either intrinsic motivation or driven by (public) customers. <i>and / or:</i> • Regulative pressure: restrictive and / or stimulating measures. 	<ul style="list-style-type: none"> • Create awareness of the benefits of clean delivery among transport clients and receivers. • Public procurement (i.e. being a launching customer, role model or investor). • Clean fleet recognition schemes. • Policies that restrict conventional vehicles or promote EFV (i.e. exemptions from fees or restrictions).
	Being able to	<ul style="list-style-type: none"> • Financial capable • Operational capable 	<ul style="list-style-type: none"> • Subsidies on purchase price. • Facilitate charging infrastructure. • Facilitate vehicle development. • Facilitate the development of suitable logistics concepts.
2	Doing	<ul style="list-style-type: none"> • Gain experience 	<ul style="list-style-type: none"> • Pilots, test drives and living labs.
3	Persevering	<ul style="list-style-type: none"> • Overcome adversity • Show and communicate success 	<ul style="list-style-type: none"> • Accurate guidance: manage complaints and resolve problems. • Facilitate exposure for success stories.

* 1 = pre-adoption; 2 = preliminary adoption; 3 = long term adoption

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