



Spontaneous emergence versus technology management in sustainable mobility transitions: Electric bicycles in China



Peter Wells*, Xiao Lin

Cardiff Business School, Cardiff University, CF10 3EU, UK

ARTICLE INFO

Article history:

Received 14 October 2013

Received in revised form 6 May 2015

Accepted 27 May 2015

Keywords:

Electric bicycles

China

Beijing

Socio-technical change

Transport policy

New energy vehicles

ABSTRACT

This paper describes and seeks to understand the scale of the electric bicycle (electric two-wheeler) market in China, and to begin to explain its emergence with a view to outlining the prospects for learning from this case for applications in other countries around the world. Drawing on secondary data from Chinese government sources, electric bicycle industry websites, Chinese media sites and other sources, this exploratory paper positions the development of the electric bicycle market as occurring largely in the absence of positive policy intervention – in stark contrast to the nurturing afforded the electric car sector world-wide. The paper develops a multi-scalar perspective of transitions theory in an institutional setting, with examples drawn from Beijing and Fuzhou, to explain the processes of change outside of the traditional reference context of technology policy and management. It is concluded that transitions theory has a greater flexibility and adaptability as an explanatory framework than previously shown, but empirically the electric two-wheeler is a weakly-embedded alternative to mainstream automobility.

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1. Introduction

'Mainstream' electric car technology has received widespread governmental support world-wide in the form of R&D subsidies, investment subsidies for production capacity, incentives and preferential treatment to encourage purchase and use, and related support for infrastructure developments (Brand et al., 2013) as well as much research to understand how consumer acceptance can be increased (Petschnig et al., 2014; Lopes et al., 2014). Despite a plethora of interventions, support and experimentation it is reasonable to conclude that the prevailing automobility paradigm remains virtually intact (Wells and Nieuwenhuis, 2012; Steinhilber et al., 2013). In China, on 28th June 2012, the State Council issued 'Energy saving and new energy automobile industry development planning (2012–2020)' (State Council, 2012). In this plan, energy-saving automobiles are referred to as the vehicles with internal-combustion engines as the main power system and having fuel consumption superior to the target values for the next stage; while new energy automobiles mainly include battery electric, plug-in hybrid electric and fuel cell vehicles. The plan aims to promote the development of electric vehicles and the transition to a new energy automobile industry. This plan strongly supports the development of new energy vehicles rather than electric bicycles or other electric two-wheel modes of transport. By the end of 2012 in China, government departments had purchased 10,000 new energy vehicles, but only a few were purchased as private cars (Zeng, 2013). By contrast, in the same year, an estimated 29.3 million electric two-wheelers were purchased by consumers to achieve personal mobility (Gunther, 2013).

* Corresponding author. Tel.: +44 (0)2920 875717; fax: +44 (0)2920 874416.

E-mail address: wellspe@cardiff.ac.uk (P. Wells).

It is striking that in China the electric two-wheeler market has grown very strongly from almost nothing to being a substantial activity in a little over ten years (Weinert et al., 2007) without overt policy support. China in 2013 was both the largest producer and largest market for electric bicycles and other electric two-wheelers in the world (Harrop, 2013), yet this market has received none of the attention, protection and support given to 'new energy vehicles' in China (Kimble and Wang, 2013); and in some cities the authorities have actively sought to discourage the use of (electric) bicycles (Weinert et al., 2007). As we show below, government policy has been significant for the electric two-wheel market, but in different ways.

This paper therefore seeks to address, in an exploratory case study, the urgent need to understand how and why the electric two-wheel market has emerged in China, and the prospects for learning from the market for applications in other countries around the world. That is, the paper seeks to identify preliminary causes of the emergence of the electric two-wheel market. Drawing on secondary data this paper seeks to chart the development of the electric two-wheel market in a policy vacuum. While there has been attempts to understand this growth from various perspectives (Weinert et al., 2008), this paper links the multi-level perspective of socio-technical transitions from Geels (2002; 2005), Kemp and others (Smith et al., 2005; Kemp et al., 2007, 2011) with a multi-scalar framework in order to use transitions theory to explain the process of change outside of the traditional reference context of technology policy and management.

The paper commences with a short account of socio-technical transition pathways and the issue of whether electric two-wheelers constitute an emergent niche to challenge the existing mobility regime. Thereafter the paper provides a brief outline of the methodological and definitional issues related to the study reported here before moving onto an historical account of the shifts in pathways that could be attributed to electric two-wheelers in China with attention paid to the rapidity of change and its spontaneous character. It is concluded that the balance of product advantages and disadvantages has provided an historical moment in which electric bicycles have flourished despite neglect from traditional policy interventions, but it is rather less certain that they are to be understood as an environmental alternative to the car. From the standpoint of theory, it is suggested that socio-technical transitions thinking has somewhat neglected the contribution of the policy measures intended to achieve an impact in one aspect but resulting in changes in another aspect.

2. Spontaneous emergence or purposive nurture: the perspective of multi-scalar transitions theory

Transitions theory is a way of understanding the permeation of socio-technical change across time and space. However, those working with sustainable production and consumption frameworks or theories of sustainable transitions tend to do so with a distinct policy orientation in which forms of governance intervention are anticipated to be fundamental to a successful migration away from currently unsustainable practices. The underlying assumption is that purposive policy interventions are necessary in order to stimulate and nurture new production–consumption modes, resulting in a concern for fiscal and other incentives, learning from socio-technical experimentation, consensus building, R&D support, infrastructure development, regulatory frameworks and other features (Beck et al., 2013; Small, 2012). Processes of change are held to be relatively ponderous and subject to much inertia. In contrast, as this paper seeks to show, the disruptions to embedded regimes identified by Marsden and Docherty (2013) as necessary triggers of socio-technical change have indeed occurred in the realm of electric bicycles in China, which offers more encouragement for positive change elsewhere.

It is interesting to note that while transitions theory has embedded within it a distinctly managerial and governance perspective, some of the initial examples used to establish this increasingly prevalent theoretical framework did not necessarily display purposive interventionism. Transitions theory emerged as a lens through which to explain historical socio-technical change, rather than as a policy instrument with which to guide prospective change, though continued elaboration and refinement along with some 'hybridisation' with other theoretical perspectives has shifted the focus of this school of thought (Geels, 2011). Hence, an extended moment of historical and spatial serendipity appears to be crucial in allowing technological innovations, entrepreneurial guile and consumer bravery to create the basis of a new socio-technical regime. The typology from Berkhout et al. (2004) offers a framework in which there are four potential transition pathways depending upon the degree of planned coordination involved and the extent to which external or internal resources are deployed. Spontaneous emergence in their typology is uncoordinated (i.e. market-generated) as opposed to a vision-driven centrally planned transition that is purposive in character. Geels and Schot (2007) offer a more nuanced interpretation of transition pathways in which outcomes are not assumed to be either 'planned' or 'unplanned', but are rather an emergent mixture of the two. The Geels and Schot (2007) framework thus identifies six possible theoretical pathways arising out of grounded analysis of actual cases (P0–P5 in the list below): Reproduction of the existing regime; the transformation pathway undertaken primarily by the regime actors; the de-alignment and re-alignment pathway triggered by significant landscape level changes; the technological substitution pathway in which niches are the main vector for change; the reconfiguration pathway in which symbiotic niche and regime interactions underwrite the transition process; and a sequence of transitions from transformation and reconfiguration to others of the above possible pathways.

P0. Reproduction process: If there is no external landscape pressure then the regime remains dynamically stable and self-reproducing.

P1. Transformation path: If there is moderate landscape pressure ('disruptive change') at a moment when niche-innovations have *not* yet been sufficiently developed, then regime actors will respond by modifying the direction of development paths and innovation activities.

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