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Level 5 autonomy: The new face of disruption in road transport

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A B S T R A C T

By 2020, the EU road transport sector is poised to deploy a host of advanced Intelligent Transport Systems (ITS), including connected and autonomous vehicles (AVs), that are expected to significantly 'disrupt' the automotive sector. This vision of the future is fuelling a virtual 'arms race' among automakers (OEMs), who are forging unconventional alliances and investing heavily in R&D, in anticipation of a radically changed industry. Car travel seems set to undergo a paradigm shift, evolving from a privately-owned asset into mobility as a service; a metamorphosis that will have significant implications for policymakers and industry stakeholders alike. This paper therefore seeks to address existing gaps in knowledge, by using primary qualitative interview data from industry experts and policymakers to examine the early-stages of the AV transition within the EU automotive industry. This paper also assesses the major policy challenges that face industry regulators tasked with underwriting this radical and dynamic transition to autonomous driving. This paper's focus is on the sociotechnical transition to AVs, which contributes to better understandings about the future role and regulation of Intelligent Transport Systems in society.

1. Introduction

The focus of this paper is the autonomous vehicle (AV), which is more precisely, a 'connected *and* autonomous' vehicle that integrates connectivity *with* autonomy, which are distinct, yet related technologies, and should be treated as such (GOV.UK, 2015). Automation of the driving task has long been an engineering endeavour, dating back to 1920's (Milwaukee Sentinel, 1926), but significant advances in technology have only now made its practical implementation a legitimate possibility. The full benefits of automation however, are only realized when the vehicle is also capable of being aware of other vehicles (vehicle to vehicle connectivity; V2V) and its physical surroundings (vehicle to infrastructure; V2I). Not only do V2V and V2I provide the AV with additional data for more efficient operation, but connectivity also acts as a redundancy system if the AV ever loses its 'over-the-air' signal (Dey et al., 2016). In such a scenario, it would retain its ability to make sense of its surroundings thanks to connectivity. As one senior official from the UK's Centre for Connected and Autonomous Vehicles (CCAV) put it:

> Autonomous vehicles on their own operate quite well, but putting several autonomous vehicles together begins to cause certain issues, therefore collaborative communication [i.e. connectivity] between them has been one way to solve some of those problems.

In 2014, SAE International, the multinational automotive standardisation body, published a classification system based on six increasing levels of autonomy (SAE, 2016), ranging from Level 0 which represents no autonomous driving function to Level 5, where no human intervention is required. It is useful to understand this scale, as industry insiders often use it to reference technological milestones within a given timeframes (e.g. Level 5 autonomy by 2030). See Fig. 1 based on a SMMT/KPMG report (SMMT, 2015).

In general, industry developers believe that driverless vehicles are still quite an abstract or far-off concept (Spickermann et al., 2014) to society at large, and perceive the advances being made in autonomous technology to be occurring in somewhat of an industry 'bubble'. The average industry expectation, however, is that Level 4 autonomy will be widely available in 3–5 years (Etherington, 2017), and for this reason, stakeholders from Transport Systems Catapult (TSC)[1] in particular, continually advocate the need for much wider public awareness. With the aim of contributing to public awareness, this paper presents autonomous driving in the EU as an immediate sociotechnical concern, which has arguably caught policymakers flat-footed, forcing them to reconsider the laws governing the sector much sooner than anticipated (Parliament.uk, 2017a, 2017b). This paper therefore seeks to answer the following research questions: (1) What are the expected disruptive effects of a sociotechnical transition to AVs? (2) What are the major legal concerns surrounding this technology? Given that we are in the

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[1] The Transport Systems Catapult is one of eleven elite technology and innovation centres established and overseen by the UK's innovation agency, Innovate UK (TSC, 2017).

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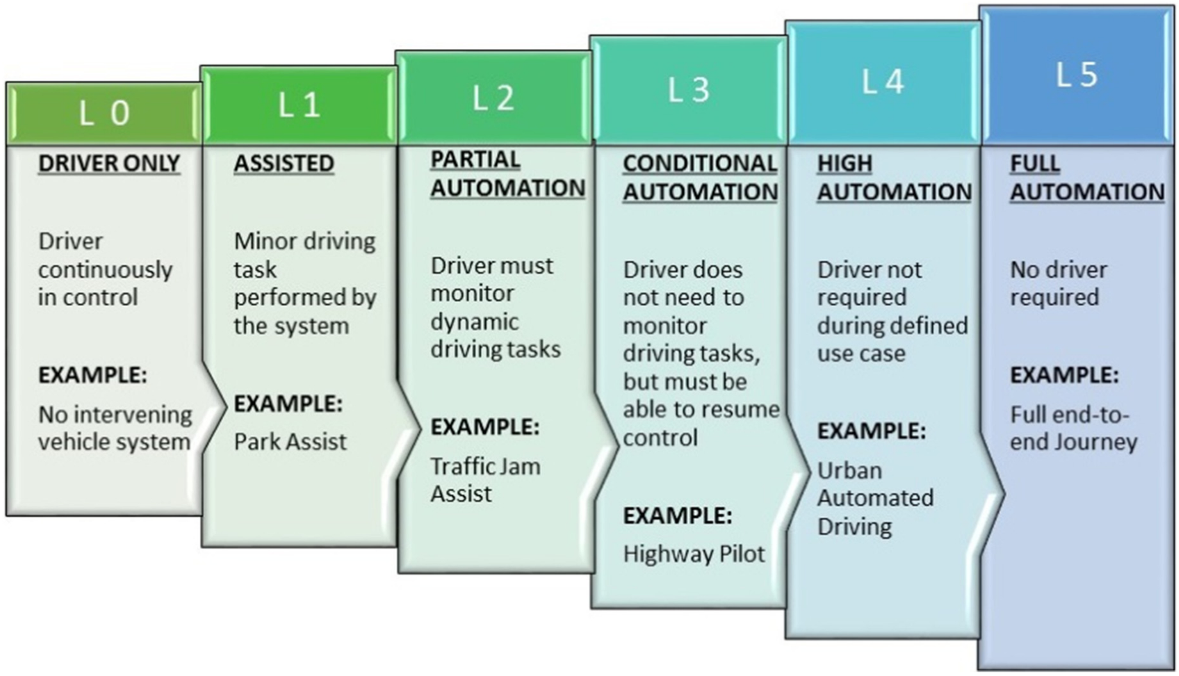

Fig. 1. Defined levels of automation based on a SMMT/KPMG (2015).

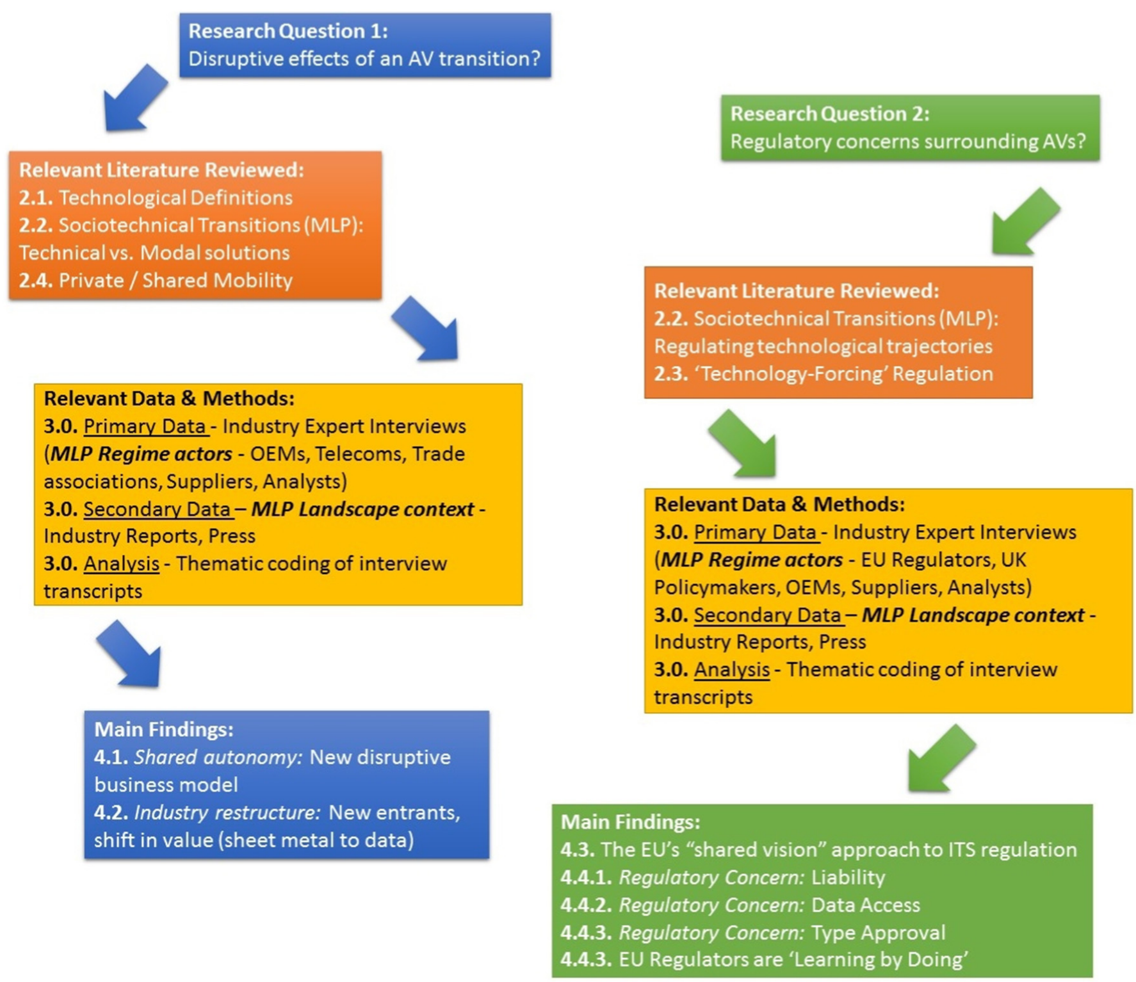

Fig. 2. This figure is a visual representation of this paper's research framework, which illustrates the relevant academic literature, data, methods and main findings associated with research questions 1 and 2 respectively. This visual aid allows for the easy identification of this paper's key research components.