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Pioneering driverless electric vehicles in Europe: the City Automated Transport System (CATS)

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Abstract

The City Automated Transport System (CATS) was a collaborative FP7 European project that lasted from 2010 to 2014. Its objective was to evaluate the feasibility and acceptability of driverless electric vehicles in European cities. This contribution explains how the project was implemented by 11 teams in five countries, culminating with practical trials of driverless vehicles in Strasbourg, France; Ploiesti, Romania; and Lausanne, Switzerland. The Navya vehicles used were able to transport up to eight passengers, in an open vehicle where passengers could recline against lumbar support cushions. After extensive road testing in Strasbourg, the final demonstration took place at the EPFL campus in Lausanne, where around 1600 people were transported safely during 16 days of vehicle operation. Three vehicles were used, a fourth remaining on campus as a back-up. Although no driver was present, a student was available on board of each vehicle to respond to questions from the passengers and to handle the three points on the 1.8 km route where there was insufficient leeway for two vehicles to pass each other. Passenger reactions to the driverless vehicle concept were collected by questionnaire and were overwhelmingly positive. Caveats include limited access for people with disabilities and the risk that a regular service based on this new concept might compete with walking and cycling rather than with transport by car. Implications for the acceptability of driverless electric vehicles in Europe and elsewhere are discussed.

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1. Introduction

1.1. Background

Most automobiles are used only during short periods and remain unused for most of the day. Therefore, in a city with shared automated cars the total number of vehicles would be lower, freeing up urban space previously used for parking (Alessandrini et al. 2015). Autonomous vehicles may also bring about savings linked to vehicle safety, congestion and travel behaviour, in the range of US\$ 2000 to US\$ 4000 per vehicle and per year according to a recent US-based evaluation (Fagnant and Kockelman 2015). At a practical level, such systems could become efficient and cost-effective by minimizing travel time paths, combining requests for trips and optimizing the location of parking and recharging stations (Awasthi et al. 2011).

The City Automated Transport System (CATS) is a European FP7 project which lasted 5 years (2010-2014) and whose objective was the development and experimentation of an urban transport service based on a new generation of driverless vehicles. In practice, the service aims at covering the last mile between a public transport hub and people's workplaces, thus achieving a more efficient mobility profile in cities through a balanced use of small clean vehicles and mass transit options. The new transport system is inclusive in the sense of being adapted to the needs of people with slightly reduced mobility, senior citizens, young passengers and tourists. However, no specific provision was made for the vehicles to be accessible to wheelchairs, because the system was intended to operate at similar speeds and along similar paths to those used by people in wheelchairs.

Through mobility needs analyses, on-site demonstrations and showcases, the impact of the introduction of a driverless electric vehicle system was evaluated in three European cities: Strasbourg, France, Ploiesti, Romania and Formello, Italy. Later on in the project course, practical demonstrations were carried out in Strasbourg, Ploiesti and especially Lausanne, Switzerland. The impact on environment and especially on CO2 emissions, as well as the acceptance and the evaluation of market take-up of the system were investigated. The CATS project initially investigated a modular electric vehicle called Cristal, which was able to operate alone in a driverless format or in a convoy of several linked-up vehicles driven by a professional driver. Due to practical constraints, the CATS consortium finally opted for a different system called Navia/Navya, which was similar to Cristal in many ways but unable to operate as a convoy.

1.2. Origin and timeline of the project

The CATS project was set up in 2009 to answer FP7 call number SST.2008.3.1.1 entitled "New mobility concepts for passengers ensuring accessibility for all". The winning consortium brought together eleven partners in five countries (France, Israel, Italy, Romania and Switzerland), including transportation systems manufacturers, research institutes, services providers and end users. The project began on 1st January 2010 and its initial objective was to promote the Cristal system, designed and operated by the French company Lohr Industrie. The initial phases of the CATS project included a mobility needs analysis on three cities: Strasbourg, France, Ploiesti, Romania and Formello, Italy. After a detailed user needs analysis (data not shown), Strasbourg was selected as the most suitable for a public demonstration. Further research identified the Illkirch Innovation Park, which combines University buildings, laboratories and other businesses as the best location within the Strasbourg area. Detailed impact analyses on the environment – including CO2 emissions – were carried out, as well as an evaluation of the acceptance and market uptake of the Cristal system, whose infrastructure and operating principles were redesigned in accordance with city and citizen needs (data not shown). A discrete events model was created in order to simulate the functioning of the Cristal system (Mahari and de La Fortelle, 2011).

For economic reasons, Lohr Industrie abandoned the production of the Cristal prototype in 2013 and partially withdrew from the CATS consortium. In order to pursue the objectives of the project, a second innovative transport system was identified by the consortium: an innovative driverless vehicle, with a capacity of around 10 people, developed by French manufacturer Induct Technology and called Navia. The Navia system was chosen for its similarities with the Cristal system in terms of capacity and certain operation principles, although it could not circulate as a convoy. The entrance of Induct into the CATS consortium in late 2013 enabled the completion of the first phase of the demonstration in the first months of 2014, whereby three Navia vehicles navigated successfully

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