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TRANSPORT RESEARCH AND INNOVATION MONITORING AND INFORMATION SYSTEM
D I G E S T

Issue 16
September 2020

Urban Freight Transport

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Reference: Miguel Jaller, Carlos Otero-Palencia, Anmol Pahwa. Automation, electrification, and shared mobility in urban freight: opportunities and challenges. Transportation Research Procedia, Volume 46, 2020, Pages 13-20. April 2020. The full article can be viewed here

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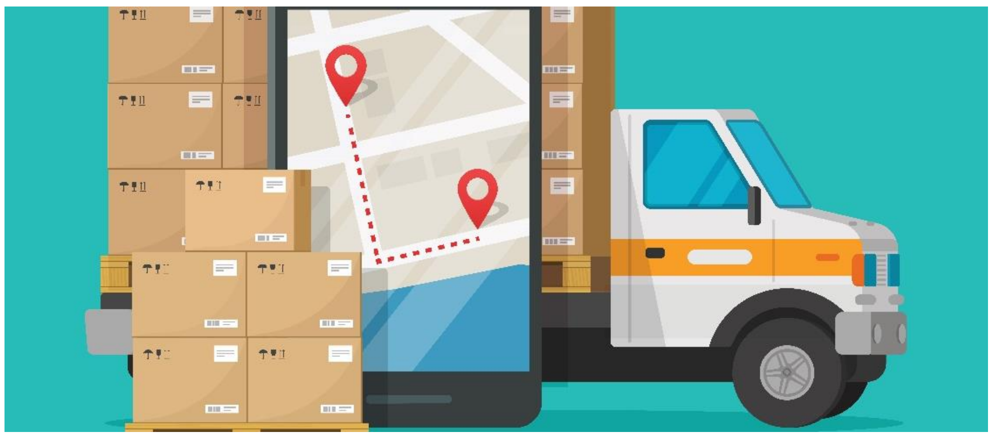
Automation, electrification and shared mobility in urban freight: opportunities and challenges



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This article is a summary of a paper exploring the opportunities and challenges for innovative technologies to change the urban freight system (UFS). Automation, electrification and shared mobility are the main drivers for this change, but are facing several barriers from regulation to practical challenges. Nonetheless, there are several pilots and applications proving the benefits of deploying these technologies in the UFS.

Everything that is consumed and used in cities relies on the UFS for delivery. The UFS is quite different to long-haul transport in that it operates in a much more complex environment, where businesses and customers might have specific requirements, and the operating conditions may be restricted. Furthermore, there can be a lack of parking, access to the final delivery point, readiness of the customer, access to storage, availability of fuelling or charging stations and restriction on sizes or weights of vehicles. These conditions can make the UFS complex, expensive and inefficient.

Electrification, automation and shared mobility are three key drivers for making the UFS and its last-mile operation more efficient, and reduces its costs and greenhouse gas (GHG) emissions. Compared to the investments in new technologies for long-haul and heavy-duty trucks, the UFS has not received much attention. The paper explores the opportunities and challenges to the three key drivers mentioned above, and assesses the market readiness of key technologies. The paper's approach was based on a systematic review of scientific literature, non-scientific or commercial literature, databases, commercial information and government reports.

Electrification is the most developed driver. Electrified last-mile alternatives, such as electric trucks, light electric vehicles and electric bikes are showing promising signs, and are cited most frequently in scientific literature on new technologies in the UFS. These vehicles have potential to reduce delivery times, emissions and even congestion.

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DIGEST

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Although there are some concerns about the lack of charging infrastructure, the vehicles have the advantage of being cheap, not requiring specific skills to operate and have a considerable level of market readiness.

Automation is already widespread in the logistics industry, such as in distribution centres and port terminals. However, the use of robots and automation in the final distribution process is still at an early stage. There are a few barriers that prevent the uptake of robots in the UFS. One example is the uncertainty about regulations, which is limiting the level of investment and development that companies want to commit to. A further barrier is the cargo risk that shippers would expose themselves to when shipping goods without surveillance by a driver.

Nonetheless, last-mile electrification and automation of the UFS are likely not far away. There are a variety of examples of current-day practices and tests that make use of these technologies. For example, in 2019, Amazon started using the its Scout robot to deliver parcels in Washington, United States of America (USA). However, these robots must be accompanied by workers. Amazon is also developing drones for delivering parcels in urban areas. In Germany and the Netherlands, DHL has started delivering parcels using electric cargo bikes and has a drone prototype, which was developed to deliver medicine and parcels to remote areas. A further example is Ocado in the United Kingdom that has started making deliveries with automated vehicles in London.

However, other initiatives have been restricted by regulatory barriers. For example, in the USA, drones may not fly more than about 3 km (2 miles) and must be in the direct line of sight of the operator. This renders the drone's autonomy redundant. To address these restrictions, operators are implementing contingency routes or landing spaces to allow the drones to be controlled in emergency situations. However, trying to define these 'emergency' situations and the correct response to them poses more questions, such as what type of cargo may be transported, what the volume limit should be, how drone cameras could ensure privacy, and what safety and cyber security standards should be in place.

A further issue is the conflict with other public infrastructure users. Some cities have banned the use of automatic devices on pavements because they may be unsafe in close proximity to people. Similarly, there is a debate about electric cargo bikes using bike lanes because the volume, weight and speed they travel at might present a hazard to other cyclists. In the case of electric vehicles or trucks, there is also a requirement for a driver to sit in the vehicle, even if it is navigating autonomously. This negates a large part of the benefits of automated driving.

To conclude, there are several barriers that need to be overcome before the widespread deployment of these technologies in the UFS. The practical uses must be identified – where are these technologies most effective in reducing costs and increasing the efficiency shipments in a safe manner? Scalability is also an issue that is being discussed. These technologies have to be integrated into the UFS in a city-specific form because not all applications that were proved to be effective in one city can be transferred to another. A further question is how these technologies would affect current workers in the UFS. Finally, the main difficulty will be to develop policies to regulate these technologies to ensure safety and acceptance.