Decision-making in Hyperconnected Urban Last-mile Logistics

PhD Research Proposal

Abstract

Hyperconnectivity, which is an emerging paradigm enabled by the Physical Internet (PI), will change the current way of delivering goods in the last-mile logistics network. Despite the fact that there is no clear definition of this phenomenon and that it is entangled with PI, the concept allows for large-scale collaboration through shared assets, information, procedures, and standards, as well as flow alignment. Due to these characteristics, hyperconnectivity reduces the separation of individual companies and enables them to collaborate in their delivery operations. Additionally, as firms collaborate, their individualistic autonomy is expected to be reduced. This immense collaboration and standardisation will change the way decisions are taken by an individual firm.

Several studies on hyperconnectivity show promising benefits compared to the current logistics system. However, in the literature, there are many studies on this novel PI paradigm with several naive behavioural assumptions. For example, LSPs will be eager to join the network (Sohrabi et al., 2016), inventory levels stay the same throughout the year (Sohrabi et al., 2016), and customers do not have a preference among retailers (Kim et al., 2021). Given these behavioural assumptions regarding hyperconnectivity, it is difficult to assess the impact of hyperconnected networks on last-mile logistics performance.

Therefore, this research studies decision-making characteristics towards hyperconnectivity in urban last-mile logistics, aiming to advance the assessment of impacts on the system's performance. The literature on city logistics has already highlighted some existing and new decisions that may have an impact on hyperconnected logistics. We will systematically review the literature to conceptualise these decisions and choices of various stakeholders and their interrelations in hyperconnected logistics network. In order for conceptual models to be quantified, it is needed to use statistically rigorous methods where the analysis of relations among different perspectives is also considered. Hence, we will apply Q-analysis to explore the dominant perspectives of different stakeholders towards hyperconnectivity by conducting interviews and a ranking survey. Furthermore, trust appears to be an indispensable and central behavioural concern for new systems (Akhmedova et al., 2021). Therefore, we propose to elaborate the effect of trust in the case of crowdshipping delivery services. Finally, there is a need to model and test changes in the system's performance in hyperconnected logistics networks. We will apply Agent Based Modelling (ABM) to model the behaviour of stakeholders in a hyperconnected network in the context of urban logistics. In an ABM setting, impacts on city-wide indicators like total vehicle kilometres and emissions can be assessed. In addition, different fleet compositions can be tested to evaluate the impact of hyperconnected networks on last-mile logistics operations. These studies will provide new insights in the aspect of decision-making in hyperconnected urban last-mile logistics.