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Analysis of Service Efficiency of Parcel Locker in Last-mile Delivery: A Case Study in Norway

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Abstract

The rapid growth of e-commerce is challenging last-mile parcel delivery services. Traditionally, parcel delivery is done using vans which deliver individual parcels to customers' home ("home deliveries") or by trucks to collection points, often situated in grocery stores. An alternative last-mile delivery solution is to deliver parcels to lockers where customers can pick them up. "Home deliveries" are known to be an expensive part of the supply chain, and cost and service efficiency vary with (uncertainty about) customers being present at home. Stores have their opening times, while parcel lockers can provide 24/7 access and also have higher potential to achieve a more economic and environmental sustainable solution, compared to home deliveries. This paper evaluates the cost and emissions implications of alternative solutions for last-mile delivery. A case study proposes and analyzes alternative expansion plans for a parcel locker distribution network in Norway. Results indicate that using parcel lockers is beneficial and the usage of more parcel locker delivery can improve service efficiency in last-mile delivery as it creates both the economic and environmental savings compared to home deliveries. An extended parcel locker network seems to be able to provide the optimal future delivery model that can operate more cost-efficiently and more sustainably than the delivery model under the current situation.

Keywords

E-commerce logistics; Last-mile delivery; Parcel locker; Sustainable logistics

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Abstract

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1. Introduction

PostNord is one of the key third-party logistics service providers in Norway. As competition in the last-mile parcel delivery industry increases, PostNord seeks to stay ahead of its competitors and looks for innovative solutions to improve its current delivery model by reducing transportation costs and emissions. In the current home delivery model, drivers normally deliver one single parcel per stop to the doorsteps of end consumers. This delivery solution incurs relatively high transportation costs and makes last-mile parcel delivery inefficient. Drivers can further face waiting

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