Minimising Last-Mile Delivery Cost and Vehicle Usage through an Optimised Delivery Network Considering Customer-Preferred Time Windows

G.Kasuri Abhilashani[1*], M.I.D. Ranathunga[2], A.N. Wijayanayake[3]

[1]*Department of Industrial Management, University of Kelaniya , Kelaniya, Sri Lanka,*
abhilash_im17002@stu.kln.ac.lk

[2]*Department of Industrial Management, University of Kelaniya , Kelaniya, Sri Lanka,*
isharadil26@gmail.com

[3]*Department of Industrial Management, University of Kelaniya , Kelaniya, Sri Lanka,*
anni@kln.ac.lk

In the dynamic and developing e-commerce era, last-mile delivery has emerged as one of the critical operations among all. The last-mile delivery in the e-commerce industry is facing high costs due to a going economic crisis which led to fuel and other operating cost increments. To overcome this situation, the e-commerce industry needs to optimise vehicle delivery routing based on time windows to minimize the overall cost. Despite numerous studies on last-mile delivery, there is a paucity of studies on last-mile delivery optimization considering the customer's anticipated time windows. Therefore, this study has been conducted with the objective of optimizing and minimizing transportation costs and vehicle usage in last-mile delivery operations while meeting some practical requirements such as a variety of package types, package compatibility on different types of vehicles, customer expected delivery time windows, and a heterogeneous fleet of vehicles. After a careful literature review, this paper introduces a mathematical model to optimize last-mile delivery. The proposed mathematical model was simulated in SupplyChainGuru® modelling and simulation software. The study concluded that the overall last- mile delivery cost is minimized by about 22% while reducing the number of vehicles on the route, failed delivery package count and utilising the maximum possible capacity of vehicles while also increasing customer satisfaction by giving consumers a chance to select customer preferred time windows for package delivery. This cluster-based delivery will improve the routing of the e-commerce logistic supply chain and will serve as a platform for extending the cluster-based delivery process to other industries as well.

Keywords: *vehicle routing problem with time windows, e-commerce, last-mile delivery, clustering*