E-commerce experienced tremendous growth over the past decade. Order volumes have increased rapidly, with an associated increase in competition between e-commerce companies. Furthermore, customers expect very short delivery times, sometimes within a couple of hours. In order to handle these increased order volumes with short delivery deadlines competitively, companies need to schedule their operations in an efficient manner.

Customer orders have to be picked in a warehouse first, followed by delivery to the customer's location. These two processes are traditionally handled sequentially. In the sequential approach, a predefined picking deadline is set for every order, based on a simple rule of thumb. Both order picking and delivery are then scheduled to respect these order deadlines. To improve the order handling process, order picking and delivery can be scheduled in an integrated manner. In the integrated approach, there is no predefined picking deadline, and order picking and delivery are scheduled at the same time. By removing the fixed picking deadline for all orders, and allocating the time for the order picking and delivery processes in an intelligent way for every order individually, large efficiency improvements are possible.

Although previous research already looked into the integration of order picking and delivery, the dynamic arrival of new orders has not been considered yet. Therefore, we propose multiple metaheuristic optimisation algorithms to solve this integrated order picking and delivery problem while accounting for dynamic order arrivals. The performance of the different algorithms is studied in a series of numerical experiments, leading to a better understanding of the integrated order picking and vehicle routing problem.