

A heuristic for the integrated order picking-vehicle routing problem in a B2C e-commerce context

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Business-to-consumer (B2C) e-commerce sales are increasing every year. Customers have high expectations regarding online purchases and their delivery. In order to satisfy these customer expectations excellent logistics performance is required. Both the internal warehouse logistic operations and the distribution operations need to be coordinated carefully. Since these operations are interrelated, their interdependence cannot be ignored to avoid suboptimal solutions and inefficient schedules and routes. Thus, instead of solving order picking problems and vehicle routing problems separately using an uncoordinated approach, these two supply chain functions should be integrated into a single optimization problem. The integrated order picking-vehicle routing problem (OP-VRP) considers simultaneously the requirements and constraints of both subproblems. The integrated problem determines picking lists and vehicle routes at a time. E-commerce companies often offer their customers the possibility to select a time frame in which they want to be delivered. Accordingly, time windows are taken into account the integrated OP-VRP. Integration can lead to cost savings and higher service levels. Since the two subproblems are hard to solve to optimality, the integrated problem can only be solved to optimality with an exact solution method for small-size instances. Therefore, a heuristic algorithm using local search operators is developed to obtain solutions in a small computational time.