



Research School for Operations  
Management and Logistics

**Performance analysis of automated warehousing systems**

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Order picking is the process of finding and extracting products from a storage location in a distribution center to fulfill customer orders. Picking has been recognized as one of the most challenging activities in terms of time, labor, and cost for most warehouses. E-Commerce companies are automating their warehouses at an increased pace to achieve high speed and flexibility in their picking operations. Recent advances in robotics offer a rich variety of warehouse automation technologies that may help realize these objectives. Consequently, warehouse managers are confronted with complex decisions on identifying and tailoring the right mix of warehouse automation technologies. In this project we aim to develop and apply stochastic modeling, simulation, optimization and control techniques to assess the performance of different types of warehouse automation concepts, including (but not limited to) (i) milkrun picking systems, where pickers travel on automated trolleys along the aisles to dynamically pick orders, (ii) collaborative picking which is a semi-automated picking concept where automated guided vehicles assist pickers, and (iii) mobile fulfillment systems where autonomous shuttles do the picking.