Modelling and Analysis of the Effects of Different Levels of Automation on Warehousing Performance

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Over the last decade, the challenges with managing warehouse operations have been exacerbated by the pressure for decreasing order lead times, increased variety of operations within the warehouse, and the need for better visibility. With the advent of new technologies including robotics, artificial intelligence, and devices that make use of the Internet of Things, warehouses have adopted different levels (and types) of automation to perform the intralogistics operations to overcome these challenges. Despite the recent abundance of studies in the literature that employ quantitative modelling to address decision making problems around these operations, such studies assume a given level of automation and base their findings on this critical assumption.

The aim of this study is to investigate and understand the different approaches to employing automation (both physical and digital) within a warehouse and assess the effects of using these varying approaches on warehousing performance, such as on cost, timeliness and flexibility of operations. The assessment will involve the formulation of mathematical models, including integer and dynamic programming to optimise and integrate the operational decisions of storage assignment, order batching and picker routing, as well as the development of novel solution approaches using heuristics or metaheuristics to tackle these decisions.

The successful candidate is expected to study the operations of and collect data from various warehouses which have already adopted or planning to adopt different automation technologies, and to use these to develop quantitative models and solution approaches. In this regard, a profound knowledge and experience with warehouse operations and technologies, as well as with different operational research tools and analytical techniques is required. The successful candidate will join the Centre for Smart Warehousing and Logistics Systems and benefit from a strong network of academics and practitioners in the area.