



Designing Distribution Centers for Supply Chains

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ABSTRACT

For a supply chain to thrive during these times of high competition, short product life-cycle, increasing fuel costs, and consolidating market it must cut costs without affecting service level. My overall research goal is to address this very aspect at both planning and execution stages of a supply chain by employing deterministic and stochastic operations research methodologies. In this presentation I will focus on a significant cost-contributing component of a supply chain, the distribution center (DC). As a node in a supply chain, a DC assists in consolidating shipments from upstream, performing value-added activities, and fulfilling customer orders from downstream. The motivation behind focusing on DCs is to help managers reduce DC operating cost — over 110 billion dollars across 600,000 DCs in the U.S. in 2007. Specifically, I will highlight the problem of configuring storage area that use picking vehicles for order picking in high bays. Contrary to the popular belief that ‘taller is better,’ we point out that this belief may not be true as the decision about the height of the storage area depends on several factors, in particular, vertical travel of the vehicle and blocking. To justify our claim, I will first present a travel-time model for a person-aboard picking vehicle considering both Tchebychev and rectilinear travel metrics. I will then present a cost-based optimization model to determine the optimal height of the storage area and illustrate its use through an example. Finally, I will highlight my current and future research efforts in other areas of supply chain, such as labor scheduling, transportation planning, and container loading.