ABSTRACT

This study focuses on the Container Loading Problem (CLP) faced by PT XYZ, a freight delivery service provider operating in the Greater Jakarta area (Jabodetabek). To serve 70 distribution points, PT XYZ utilizes 15 Colt Diesel Double (CDD) trucks. The company's average profit factor reaches less than 60% of overall operations. The main issue identified is the inefficient use of container loading space. This condition directly contributes to a decrease in the company's profit margin, excessive fleet usage, and high fixed transportation costs. Furthermore, the distribution process becomes more complicated due to the absence of a load planning system that considers the unloading sequence (multi-drop unloading order), leading to inefficiencies in both field labour and time.

To address this challenge, this study employs the Randomized Constructive Heuristic (RCH) method as an optimization approach for container loading configuration. This heuristic approach is chosen for its ability to generate near-optimal solutions in a short time and its flexibility in handling complex and dynamic distribution datasets. The RCH algorithm operates through four main phases: preprocessing, sorting and perturbation, constructive loading, and evaluation and selection. The preprocessing phase aims to group items with similar features to facilitate an organized loading process. The sorting and perturbation phase arranges items based on specific criteria such as size, weight, value, and unloading sequence, then randomizes the order to create solution diversity. The constructive loading phase systematically arranges the items by considering their ideal placement, while the evaluation and selection phase identifies the most effective loading configuration based on space utilization, load safety, and ease of unloading at distribution points.

This study was conducted by collecting primary data, including item dimensions, item weights, delivery distances, vehicle capacities, and the dimensions of the vehicles used. These data were processed through simulations and testing using relevant mathematical models. The validation results indicate that the implementation of the RCH algorithm can improve container space utilization, loading layout efficiency, and increase the company's profitability. A comparison of conditions before and after the implementation of the algorithm shows a significant improvement in profit margins, the number of items transported, as well as enhanced stability and balanced weight distribution within the container.

In addition to the technical aspects, this study emphasizes the importance of integrating the optimization system with supporting digital technologies. The implementation of these technologies is expected to provide real-time insights into load conditions and vehicle locations, thereby facilitating faster, more accurate, and more precise decision-making processes. This study also offers practical insights for PT XYZ in developing more effective operational policies and standard operating procedures (SOPs) in the future.

The findings of this study are expected to serve as a reference and best practice for other logistics companies facing similar challenges, particularly in improving the efficiency of multi-drop deliveries under varying space constraints. This study also recommends further development by integrating RCH with other optimization techniques, such as Vehicle Routing Problems (VRP) or genetic algorithms, to

create a more responsive distribution system that adapts to changing operational conditions and diverse customer needs. Therefore, this research aims to enhance overall supply chain efficiency, promote business sustainability, and provide academic value as a foundation for future research in the field of logistics and transportation.
Keywords: *Container Loading Problem, Randomized Constructive Heuristic, distribution optimization, transportation efficiency, multi-drop delivery, logistics management.*