INDUSTRY 4.0 TECHNOLOGIES FOR REVERSE LOGISTICS: INTEGRATED BAYESIAN-BWM AND COBRA METHOD

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Highlights of this study

- Introduces a novel integration of the *Bayesian-Best-Worst Method* (Bayesian-BWM) with *COmprehensive-distance Based RAnking* (COBRA) for ranking alternatives.
- The Bayesian-BWM-COBRA method, based on 16 criteria identifies and evaluates ten different Industry 4.0 technologies employed for *Reverse Logistics* (RL).
- IoT is ranked highest for RL, followed by cloud computing and e/mobile marketplaces; autonomous vehicles rank lowest.
- Explores last-mile delivery scenarios, stakeholder-driven evaluations, and expanding COBRA for broader applications, hybrid models and fuzzy or interval environments.

ABSTRACT

The logistics sector is vital in the supply chain, ensuring freight transport is fast, flexible, safe, cost-effective, efficient, and environmentally sustainable. The circular economy (CE) emphasizes maintaining the highest utility and value of goods, components, and materials, highlighting the role of effective reverse logistics (RL) processes. Traditional RL methods often fall short in modern supply chains, necessitating Industry 4.0 technologies to enhance efficiency. This study assesses the applicability of various Industry 4.0 technologies in the RL sector, identifying the most suitable options. A novel "multicriteria decision-making (MCDM)" model was developed, combining the Bayesian Best-Worst Method (BWM) for criteria weights with the "Comprehensive Distance-Based Ranking (COBRA)" method for ranking technologies. The ranking of the proposed method is compared with other prominent MCDM methods to validate this innovative approach. Findings revealed that the most applicable technologies are the "Internet of Things (IoT)", cloud computing, and electronic-mobile marketplaces. These advancements are expected to significantly influence RL processes and CE systems, contributing to positive environmental and economic outcomes.

Keywords: Circular Economy; Reverse Logistics; Industry 4.0; MCDM; Bayesian-BWM; COBRA

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