

AI-Enhanced Data Envelopment Analysis for Economic Impact in the Convention Industry: Navigating Operational Performance

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Abstract

This research develops a framework that integrates AI-enhanced Data Envelopment Analysis (DEA) to enhance operational performance and economic impact assessment in facility management for the convention industry. As facility managers face increasing pressure to demonstrate efficiency, sustainability, and strategic value, this study provides a methodology for data-driven decision-making. The study employs pyDEA, an open-source Python-based DEA tool, to benchmark operational efficiency. The enhancement with AI techniques enables dynamic, predictive analyses, moving beyond traditional static benchmarking. The methodology is applied in a detailed case study of the Convention Center in Utah, USA, using historical event data. A critical phase involved rigorous data cleaning and consolidation to create a reliable master dataset for analysis. The findings demonstrate how AI-enhanced DEA clarifies the relationships between facility management strategies—such as space management and resource allocation—and key outcomes, including economic sustainability and market segmentation. The analysis provides FM professionals with practical tools to identify best practices, uncover opportunities for improvement, and quantify their contribution to local and regional economic development. This work provides a structured analytical foundation and a blueprint for robust data management, empowering convention centers to make more informed, strategic decisions to navigate operational performance.