In the contemporary global market, managers have had to come up with crucial policies regarding the production and ordering of goods while bearing in mind the severely unpredictable nature of demand. However, it should be clear that the policies previously mentioned often fail to factor in the randomness of the market, in turn, resulting in ineffective solutions or increased costs alongside lower service levels (Chopra & Meindl, 2016). The above-mentioned traces the need for a shift in the way decision-making processes are designed, because of the volatility of customer demand.

Similarly, TRIZ (Theory of Inventive Problem Solving) and robust optimization are methodologies that have been very useful in resolving some of the aforementioned issues. In its essence, an inventive principle of “equipotentiality” from TRIZ is a means through which more sophisticated decision-making processes can be simplified into mathematical equations for optimal solutions to be reached (Altshuller, 1999). Utilizing robust optimization when designing decision-making models is functional in that it allows for the fitting of multiple scenarios regarding demand while choosing robust strategies that allow a balanced solution, expecting the unexpected (Ben-Tal & Nemirovski, 1999).

In addition, machine learning approaches strengthen these models by utilizing the past to evaluate data with the intent of forecasting future demand trends. This not only increases the forecasting accuracy but also ensures the desired level of adaptability to different market dynamics (Hyndman & Athanasopoulos, 2018). The combination of these methods incurs a major breakthrough in the ability to make decisions in the presence of inadequate information, offering a much better way to achieve efficient optimization of supply chain management processes in manufacturing, retail, and logistic industries.

With the changing nature of the market accompanied by growing uncertainty, the need for such a decision-making framework is more relevant than ever. This study proposes a novel TRIZ-based robust optimization framework that is augmented with machine learning and has been validated through numerical experiments. It aims to contribute to this field. The results advocate the claim that such an innovative approach assists in improving efficiency over conventional methods, enabling managers to enhance their inventory turnover and service levels.

The structure of the paper is as follows. In section 2, some literature reviews about the TRIZ method and the difficulties when facing demand uncertainty will be done. The methodology of this study will be presented in section 3. Some numerical experiments will be constructed in section 4 to evaluate the performance of the proposed model.

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