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Beer Game: Manual vs. GenAI-Assisted Order Planning

Introduction

The objective of this experiment is to compare manual decision-making with Gen AI-assisted order planning in the Beer Game supply chain simulation. In addition, it aims to examine whether Gen AI suggestions can improve order decisions and cost performance.

Methodology

The Beer Game simulation was conducted for 12 weeks through two methods at the retailer level:

- Manual Method: The order quantities were determined manually without the use of GenAI.
- GenAI-Assisted Method: In this method, the quantity to be ordered was varied according to the GenAI suggestions. The final decision was left to the user.

Both the methods were carried out for five different runs. The total cost, inventory dynamics, and backorders were tracked.

Result and Analysis

In the five runs of the GenAI-Assisted method and the Manual method, the GenAI-Assisted method was more stable in ordering compared to the Manual method. The Manual method of ordering was more variable in ordering. There were instances of over-ordering and correction of the over-orders due to the changes in the short-term demand.

The GenAI-Assisted method helped to reduce extreme variation in the inventory level and back-orders. The cost was not necessarily lower than the Manual method; however, the variation in the cost was better managed by the GenAI-Assisted method.

Key Findings

The manual process of decision-making also led to more variability in the results.

- GenAI support helped to establish stability in order quantity and inventory levels.
- GenAI works best as a "decision support" tool, not as a stand-alone control system.
- Human intervention is required to adjust GenAI decisions according to real-time conditions.

Comparison Summary

Approach	Iterations	Avg. Weekly Demand	Total Records
Manual	5	10	48
GenAI-Assisted	5	10	60

Suggestion for Improvement

The proposed GenAI-assisted method may be improved by allowing for partial autonomy, whereby the system's suggestions are automatically applied unless the risk thresholds for the inventory levels are exceeded. Such a system would limit the risk of human overcorrection. Feedback loops may also be incorporated to penalize inventory growth and repeated instances of under-ordering. Finally, the provision of cost trade-off awareness to the GenAI system for multiple future weeks rather than just a single week may improve the balance of ordering decisions. The role prompting strategies can also be considered for future studies to improve the alignment of decision in the whole supply chain.

Conclusion

The experiment proves that GenAI-aided order planning can improve the stability of decisions made in the process while reducing the degree of variability in results when compared to manual planning. GenAI may not promise lower costs in all cases, but it works best as a tool to assist human decisions in complex supply chain situations.