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Inventory Management and Operational Efficiency in an Electronic Company: A Basis for Workflow Framework

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Abstract—In today's competitive electronics manufacturing industry, efficient inventory management is essential for profitability and smooth operations. This study explores how structured inventory practices improve operational efficiency at KAP Company in Calamba, Laguna. The research focuses on six key practices—maintaining optimal stock levels, aligning inventory with demand, prioritizing critical items, removing bottlenecks, integrating supply chain processes, and eliminating waste—and evaluates their impact on reducing costs, speeding up production cycles, improving resource use, increasing throughput, and boosting productivity. Data from 87 employees directly involved in inventory and operations were analyzed to identify which practices most strongly drive efficiency. Results will guide the development of a practical workflow framework tailored to KAP Company, offering managers and decision-makers clear strategies to optimize inventory systems, strengthen cash flow, and achieve operational excellence. Beyond the company, the study provides valuable insights for the wider electronics manufacturing sector in the Philippines.

***Index Terms*—Always Better Control (Analysis) (ABC), Economic Order Quantity (EOQ), and Just-in-Time (JIT).**

1. The Problem and it's Setting

A. Introduction

Efficient inventory management is a vital driver of profitability and cash flow in modern manufacturing, where companies face increasing pressure to produce more with fewer resources, reduce costs, and deliver products quickly. Traditional manual methods were labor-intensive and error-prone, but automation has transformed inventory control by enabling real-time tracking, data-driven decisions, and accurate demand forecasting. For companies like KAP in the Philippines, automation is not just a technological upgrade but a strategic necessity, reducing excess stock, preventing costly shortages, and aligning with Industry 4.0 principles. Empirical evidence shows automation improves accuracy, reduces carrying costs, and minimizes stockouts, while also enhancing warehouse efficiency and scalability. Data analytics further strengthens inventory management by predicting demand, optimizing stock levels through techniques like ABC analysis and EOQ, and improving supplier accountability and logistics efficiency. Ultimately, integrating automation and analytics into inventory systems streamlines operations, reduces costs, and enhances profitability, making them essential for competitiveness and sustainable growth in today's manufacturing landscape.

2. Methodology

The study adopts a quantitative, correlational research design to investigate the relationship between inventory management and operational efficiency at KAP Company in Calamba, Laguna. Data was collected through surveys from 87 respondents (managers, supervisors, and staff directly involved in inventory and operations).

A. Research Design

The research design of this study is quantitative, correlational, and predictive. It examines the relationship between inventory management practices and operational efficiency at KAP Company. Using survey questionnaires administered to 87 managers, supervisors, and staff, the study measures six dimensions of inventory management — optimal stock levels, synchronization with demand, prioritization of critical items, removing bottlenecks, integrated supply chain practices, and waste elimination — and their corresponding effects on operational efficiency outcomes such as reduced costs, faster production cycles, resource efficiency, higher throughput, smooth operations, and productivity gains. Statistical tools including descriptive analysis, correlation, and multiple regression are employed to determine both the strength of relationships and the predictive power of inventory management practices on operational efficiency. This design allows the study to provide evidence-based insights and propose a workflow framework tailored to the operational context of KAP Company.

B. Population and Sampling

The population of this study consists of the 87 employees of KAP Company in Calamba, Laguna, who are directly involved in inventory and operations, including managers, supervisors, and staff. Since the total population is relatively small and accessible, the study employed a total population sampling

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technique, wherein all 87 individuals were included as respondents. This approach ensures that the data collected reflects the perspectives of the entire operational workforce, providing comprehensive insights into the relationship between inventory management practices and operational efficiency.

C. Data Extraction and Analysis

The study utilized a structured survey questionnaire as the primary tool for data extraction. The instrument was designed to measure the six dimensions of inventory management — optimal stock levels, synchronization with demand, prioritization of critical items, removing bottlenecks, integrated supply chain practices, and waste elimination — as well as the six dimensions of operational efficiency, namely reduced costs, faster production cycles, resource efficiency, higher throughput, smooth operations, and productivity gains. Responses were collected from the total population of 87 managers, supervisors, and staff directly involved in inventory and operations at KAP Company.

D. Data Analysis

The data analysis, descriptive statistics were employed to determine the current levels of inventory management and operational efficiency. Correlation analysis was conducted to examine the strength and direction of the relationship between the independent and dependent variables. Multiple regression analysis was further applied to test the predictive power of inventory management practices on operational efficiency outcomes such as cost reduction, production cycle time, and throughput. The results of these analyses provided the empirical basis for developing a workflow framework tailored to KAP Company's operational context.

E. Scope and Limitation

This study is limited to examining the relationship between inventory management and operational efficiency within KAP Company in Calamba, Laguna. It focuses only on the operational aspects of inventory management and does not include financial auditing, customer satisfaction, or external market conditions. The findings are based solely on self-reported data from managers, supervisors, and staff of KAP Company, making the results specific to its organizational context.

3. Results

A. Level of Inventory Management of KAP Company

KAP Company demonstrated a Highly Implemented level of inventory management practice across all six dimensions. Prioritization of Critical Items ranked highest, followed by Removing Bottlenecks, Integrated Supply Chain Practices, Waste Elimination, Synchronization with Demand, and Optimal Stock Levels. All six dimensions fell within the Highly Implemented range, with the strongest individual indicators observed in the management of lower-priority items through cost-effective controls and the identification of inventory constraints limiting production output.

B. Level of Operational Efficiency of KAP Company

The overall level of operational efficiency at KAP Company was assessed as Very High across all six dimensions. Reduced Costs ranked highest, followed by Smooth Operations, Productivity Gains, Faster Production Cycles, Higher Throughput, and Resource Efficiency. All dimensions fell within the Very High range, with the strongest individual indicators observed in the reduction of overall ordering costs, the coordination of inventory processes with production and logistics, and the improvement of machine utilization through better inventory availability

C. Significant Relationship Between Inventory Management and Operational Efficiency

Significant relationships were established between specific inventory management dimensions and operational efficiency outcomes through Spearman's rho correlation. Integrated Supply Chain Practices exhibited the broadest and strongest associations, correlating significantly with Waste Elimination, Resource Efficiency, Faster Production Cycles, Reduced Costs, Smooth Operations, and Higher Throughput. Waste Elimination similarly showed significant correlations with Resource Efficiency, Faster Production Cycles, Higher Throughput, and Reduced Costs. Synchronization with Demand was significantly correlated with Faster Production Cycles, while Optimal Stock Levels showed no statistically significant correlation with any operational efficiency dimension. The null hypothesis (H01) was therefore rejected for multiple dimension pairs, confirming that inventory management is significantly related to operational efficiency.

D. Predictive Impact of Inventory Management on Operational Efficiency

Multiple regression analysis revealed that inventory management significantly predicts three of the six operational efficiency dimensions: Reduced Costs, Faster Production Cycles, and Resource Efficiency. Across these three significant models, Integrated Supply Chain Practices emerged as the most consistent and statistically significant individual predictor, while Waste Elimination and Removing Bottlenecks contributed to specific outcomes. Inventory management did not significantly predict Higher Throughput, Smooth Operations, or Productivity Gains, suggesting that these outcomes are influenced by additional organizational and contextual factors beyond inventory practices. The null hypothesis (H02) was therefore partially rejected.

E. Proposed Workflow Framework for KAP Company

A Workflow Framework was developed in direct response to the empirical findings of the study, presented as a side-by-side comparison of KAP Company's Current Framework and the proposed Improved Framework. The Improved Framework retains the company's existing core production sequence but transforms the rework path through three embedded solutions: Root Cause Analysis to address underlying issues rather than symptoms, anchored in the Theory of Constraints; Inventory Buffer adjustment with updated safety stock to absorb supply variability, grounded in EOQ and JIT principles; and

Communicate Updates across Planners, Subcontractors, and Customers to operationalize Integrated Supply Chain Practices, the strongest empirical predictor of operational efficiency in the study. A closing Review & Improve Process step embeds Lean Operations and continuous-improvement principles, transforming the workflow from a reactive process into a closed-loop improvement system. The framework is aligned with the six theoretical foundations of inventory management examined in the study: EOQ, JIT, ABC Analysis, Theory of Constraints, SCM, and Lean Operations.

4. Discussion

The findings show that KAP Company already has strong inventory management practices, which contribute to its very high operational efficiency. These practices help reduce costs, improve production flow, and maintain smooth operations.

However, the results also reveal that the direct impact of inventory management is generally weak, suggesting that the company may already be operating at a high level, leaving little room for measurable improvements. Among all factors, integrated supply chain practices stand out as the most important in driving efficiency, while waste elimination also plays a key role.

Some outcomes, like throughput and productivity, were not significantly affected by inventory management alone, indicating that other factors such as technology and workforce also influence performance.

Overall, the findings suggest that KAP Company should focus on better integration, faster response to issues, and continuous improvement to further enhance its operations.

5. Conclusion

Based on the findings summarized above, the following conclusions were drawn in direct response to the five research questions of the study. Conclusion 1 addresses the level of inventory management at KAP Company; Conclusion 2 addresses the level of operational efficiency; Conclusion 3 responds to the test of the relationship between inventory management and operational efficiency (H01); Conclusion 4 addresses the predictive impact of inventory management on operational efficiency (H02); and Conclusion 5 addresses the proposed Workflow Framework. Together, these conclusions provide an integrated, evidence-based response to the objectives of the study and serve as the foundation for the recommendations that follow.

1. KAP Company maintains a Highly Implemented level of inventory management across all six theoretical dimensions of EOQ, JIT, ABC Analysis, Theory of Constraints, SCM, and Lean Operations. The company excels in item prioritization and bottleneck identification, confirming the effective application of ABC Analysis and the Theory of Constraints. All dimensions fall within the Highly Implemented range, indicating consistent organizational commitment to structured inventory management practices.
2. KAP Company demonstrates a Very High level of operational efficiency across all six dimensions. Reduced Costs and Smooth Operations are the strongest outcomes, reflecting the organization's success in achieving cost discipline and workflow continuity through inventory management practices. All operational efficiency dimensions are interpreted as Very High, validating the empirical link between structured inventory management and superior operational performance at KAP Company.
3. The null hypothesis (H01) was rejected for multiple dimension pairs. Integrated Supply Chain Practices and Waste Elimination emerged as the primary inventory management dimensions with significant correlations across multiple operational efficiency outcomes. Integrated Supply Chain Practices showed the broadest influence, correlating significantly with Waste Elimination, Resource Efficiency, Reduced Costs, Faster Production Cycles, Smooth Operations, and Higher Throughput — confirming that supply chain coordination is a systemic driver of organizational efficiency at KAP Company. Waste Elimination similarly correlated significantly with Resource Efficiency, Faster Production Cycles, Higher Throughput, and Reduced Costs, affirming the value of lean thinking in operational improvement.
4. The null hypothesis (H02) was partially rejected. Inventory management significantly predicted three of the six operational efficiency dimensions: Reduced Costs, Faster Production Cycles, and Resource Efficiency. Integrated Supply Chain Practices was the most consistent and significant individual predictor, while Waste Elimination and Removing Bottlenecks contributed to specific efficiency outcomes. Inventory management did not significantly predict Higher Throughput, Smooth Operations, or Productivity Gains, indicating that these outcomes are influenced by a broader set of organizational and contextual factors beyond inventory management practices alone.
5. The proposed Workflow Framework provides a relevant, evidence-based response to the study's findings. By comparing KAP Company's Current Framework with an Improved Framework that embeds Root Cause Analysis, Inventory Buffer adjustment, Communicate Updates, and a closing Review & Improve Process into the existing rework path, the framework offers an actionable, theoretically grounded roadmap for sustained improvement in cost reduction, resource efficiency, production cycle times, and smooth operations. The framework directly addresses the statistically significant predictors identified in the regression analyses — particularly Integrated Supply Chain Practices, Removing Bottlenecks, and Waste Elimination — and provides a structured pathway for implementing evidence-based operational improvements aligned with the six theoretical foundations of inventory management examined in the study.

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