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Data Analysis for Strategic Decision-Making in Industrial Operations

Yogita Kumari

School of Business, Galgotias university, India.

ABSTRACT :

Data analysis has become crucial for strategic decision-making in today's industrial environment. This study investigates the ways in which data-driven insights support cost savings, competitive advantage, and operational efficiency in the manufacturing and production sectors. The study looks at how businesses may use data to optimize resource allocation, streamline operations, and predict future trends by assessing the roles of descriptive, diagnostic, predictive, and prescriptive analytics. Analysis of decision-making trends and the difficulties in incorporating analytics into conventional industrial processes are done using primary and secondary data sources. The results offer useful suggestions for putting into practice efficient data methods inside operational frameworks.

KEYWORDS: Industrial analytics, strategic decision-making, operational efficiency, predictive modeling, process optimization, real-time data, data visualization, manufacturing intelligence.

I. INTRODUCTION

Today's industries work in a dynamic, fiercely competitive climate where productivity and creativity are critical. The process of making strategic decisions is changing as a result of the incorporation of data analysis into industrial processes. These days, businesses depend on real-time data to forecast results, make well-informed decisions, and uphold quality control throughout manufacturing lines.

Strategic decision-making is now a data-driven process that uses advanced analytics approaches, moving beyond experience and intuition. Data analytics is essential for increasing productivity and decreasing downtime in a variety of applications, including demand forecasting and process automation.

II. LITERATURE REVIEW

An increasing amount of research supports the significance of industrial analytics. Davenport & Harris (2017) highlight how analytics can change decision-making frameworks and have a strategic impact on operations. According to the McKinsey Global Institute (2022), real-time monitoring and predictive maintenance lower equipment failure rates and boost overall productivity.

With businesses using sensors and Internet of Things devices for ongoing data collecting, operations research has expanded to incorporate big data analytics (Porter & Heppelmann, 2015). While prescriptive analytics provides decision-makers with the best recommendations, diagnostic analytics aids in finding the underlying causes of inefficiency (Choi et al., 2020).

Nevertheless, issues like data silos, a lack of technological know-how, and reluctance to use digital tools continue to exist. For the implementation to be successful, these obstacles must be removed.

III. METHODOLOGY

This study uses a mixed-methods approach, integrating quantitative data analysis with qualitative observations. Through online questionnaires and interviews, a purposive sample of 60 experts from a range of industrial sectors—including manufacturing, logistics, and energy—was chosen.

Structured questionnaires centered on the use of analytics to operational decision-making were utilized to gather primary data. Journal articles, analytics reports from top consulting firms, and industry case studies were examples of secondary data.

Understanding how businesses employ analytics to make strategic decisions, the results of these implementations, and the challenges they encounter are the goals.

IV. DATA COLLECTION

A Google Form survey with Likert-scale questions about the frequency and efficacy of data usage in operations was used to collect primary data. Engineers, data analysts, and operations managers were among the participants.

Their opinions on the difficulties of implementing analytics and instances of successful implementations were gathered through open-ended questions. Further background on new developments in technology and industrial data analytics was supplied by secondary sources.

V. FINDINGS

1. Use of Analytics in Decision-Making
81.6% of respondents use analytics regularly for operational planning. The most common use cases were demand forecasting, production scheduling, and inventory control.

2. Benefits Observed
Organizations observed a 28% increase in efficiency and 19% reduction in unplanned downtime after implementing data-driven strategies.

3. Challenges in Adoption
Major barriers include lack of trained personnel (42.3%), poor data quality (37.6%), and resistance to change (31.5%).

4. Tools and Technologies
Popular tools included Power BI, Tableau, Python for data modeling, and ERP systems integrated with analytics modules.

5. Strategic Outcomes
65.4% reported improved cross-functional collaboration, while 54.7% noted better long-term forecasting accuracy.

6. Case Highlights
A logistics firm reduced fuel costs by 17% by using route optimization algorithms. A manufacturing unit minimized machine downtime through predictive maintenance powered by IoT sensors.

VI. RECOMMENDATIONS

Upskilling Employees: Regular training in data tools and analytical thinking is vital for analytics adoption.
Invest in Infrastructure: Companies must modernize their IT systems to support real-time analytics.
Data Governance: Establishing clear policies for data accuracy, security, and integration across departments ensures effective usage.
Customization of Dashboards: Visual analytics should be tailored to the needs of decision-makers for faster interpretation.
Cross-Functional Collaboration: Encourage departments to share insights for holistic problem-solving.

VII. LIMITATIONS

Despite its diversity, the 60 persons Sample size restricts more extensive generalization. The use of self-reported data could lead to bias. Long term performance measures after initial adoption are also not covered in this study.

VIII. CONCLUSION

The increasing significance of data analysis in industrial operations' strategic decision-making is supported by this study. Even though there have been notable advantages like increased productivity and preventative maintenance, implementation issues and cultural shifts still need to be resolved. In order to assess long-term performance effects and investigate AI-driven analytics at scale, future research should concentrate on longitudinal studies.

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