BOCA
BOLETIM DE CONJUNTURA

DATA ANALYTICS TRANSFORMS OPERATIONS INTO EFFICIENT MANAGERIAL DECISIONS

LA ANALÍTICA DE DATOS TRANSFORMA LAS OPERACIONES EN DECISIONES GERENCIALES EFICIENTES

A ANÁLISE DE DADOS TRANSFORMA AS OPERAÇÕES EM DECISÕES GERENCIAIS EFICIENTES

https://doi.org/10.56238/bocav25n79-041

Data de submissão: 16/05/2026 **Data de publicação:** 16/06/2026

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ABSTRACT

The transition from operational engineering to strategic management increasingly relies on analytical tools that transform continuous operational data into decision-oriented information. This narrative review examines how integrated data architectures, predictive and prescriptive analytics, operational monitoring, and organizational capabilities support decision-making in operations and logistics. The reviewed literature indicates that analytical methods can improve demand anticipation, route and inventory planning, bottleneck identification, and predictive maintenance, while implementation depends on data quality, technological infrastructure, security, governance, and analytical capabilities. The evidence also shows that data-driven decision-making should not be treated as a purely technological process: its effectiveness depends on the integration of quantitative methods with organizational processes and managerial judgment. Accordingly, the article discusses both the operational applications of analytics and the conditions required for their sustainable use in dynamic industrial and supply-chain environments.

Keywords: Data Analytics. Operations Management. Logistics. Decision-making. Predictive Analytics. Prescriptive Analytics.

RESUMO

A transição da engenharia operacional para a gestão estratégica depende cada vez mais de ferramentas analíticas que transformam dados operacionais contínuos em informações orientadas para a decisão. Esta revisão narrativa examina como arquiteturas de dados integradas, análises preditivas e prescritivas, monitoramento operacional e capacidades organizacionais apoiam a tomada de decisão em operações e logística. A literatura revisada indica que métodos analíticos podem melhorar a antecipação da demanda, planejamento de rotas e inventário, identificação de gargalos e manutenção preditiva, enquanto a implementação depende da qualidade dos dados, infraestrutura tecnológica, segurança, governança e capacidades analíticas. As evidências também mostram que a tomada de

decisão orientada por dados não deve ser tratada como um processo puramente tecnológico: sua efetividade depende da integração de métodos quantitativos com processos organizacionais e julgamento gerencial. Assim, o artigo discute tanto as aplicações operacionais da análise de dados quanto as condições necessárias para seu uso sustentável em ambientes industriais e de cadeia de suprimentos dinâmicos.

Palavras-chave: Análise de Dados. Gestão de Operações. Logística. Tomada de Decisão. Análise Preditiva. Análise Prescritiva.

RESUMEN

La transición de la ingeniería operacional a la gestión estratégica depende cada vez más de herramientas analíticas que transforman datos operacionales continuos en información orientada a la decisión. Esta revisión narrativa examina cómo las arquitecturas de datos integradas, los análisis predictivos y prescriptivos, el monitoreo operacional y las capacidades organizacionales apoyan la toma de decisiones en operaciones y logística. La literatura revisada indica que los métodos analíticos pueden mejorar la anticipación de la demanda, la planificación de rutas e inventario, la identificación de cuellos de botella y el mantenimiento predictivo, mientras que la implementación depende de la calidad de los datos, la infraestructura tecnológica, la seguridad, la gobernanza y las capacidades analíticas. Las evidencias también muestran que la toma de decisiones basada en datos no debe tratarse como un proceso puramente tecnológico: su efectividad depende de la integración de métodos cuantitativos con procesos organizacionales y juicio gerencial. En consecuencia, el artículo analiza tanto las aplicaciones operacionales de la analítica como las condiciones necesarias para su uso sostenible en entornos industriales y de cadena de suministro dinámicos.

Palabras clave: Analítica de Datos. Gestión de Operaciones. Logística. Toma de Decisiones. Análisis Predictivo. Análisis Prescriptivo.

1 INTRODUCTION

The transition from operational engineering to strategic management is increasingly supported by analytical tools capable of converting continuous data flows into information for managerial decision-making [1,2]. In operations and logistics, this transition involves more than collecting data: it requires integrated architectures, quantitative modeling, and organizational processes that allow information to be interpreted and incorporated into decisions [3-5].

This article examines how operational data analytics can support managerial decisions through data integration, predictive and prescriptive methods, continuous monitoring, and organizational governance. The discussion focuses on the relationship between analytical capabilities and operational applications while also considering implementation constraints identified in the literature.

2 BACKGROUND

Operational analytics connects data generated by production, logistics, sensors, and corporate platforms with methods designed to describe current conditions, anticipate future behavior, and support decisions. The literature on operations management emphasizes that the value of analytics depends on linking data availability to models and decision processes rather than treating data accumulation as an end in itself [1,2,6].

Predictive approaches use statistical methods, regression, and machine-learning algorithms to identify patterns and anticipate operational variation, whereas prescriptive approaches use optimization and decision models to evaluate courses of action under constraints [4,7]. Descriptive dashboards and continuous visualization complement these methods by helping managers identify bottlenecks and monitor operational conditions [5,8].

At the same time, implementation is constrained by fragmented data, security risks, inconsistent information quality, and limited trust in corporate databases. These limitations can reduce the usefulness of mathematical and analytical models even when appropriate computational methods are available [3,4,9].

3 METHODOLOGY

This article adopts a narrative literature-review approach based exclusively on the references provided in the source document. The analysis organizes the available evidence around four recurring dimensions: integration of operational data, analytical methods applied to operations and logistics, operational monitoring and intelligent maintenance, and organizational governance and capabilities.

Because the cited studies address different industries, methods, and analytical applications, the review does not attempt to estimate a single quantitative effect of data analytics on operational performance. Instead, it synthesizes the principal mechanisms and implementation conditions described in the selected literature and avoids extending claims beyond the scope supported by those references.

4 RESULTS AND DISCUSSION

The reviewed literature indicates that integrating operational data can reduce the separation between shop-floor or logistics records and managerial analysis. The combination of data from IoT sensors and corporate platforms can support more timely operational intelligence and strategic decision-making [3,10]. Data-driven processes may also reduce excessive dependence on intuition by providing a more systematic analytical basis for decisions, although managerial judgment remains necessary for interpreting model outputs and organizational constraints [3,11,12].

Predictive analytics is particularly relevant where managers must anticipate demand variation, equipment behavior, or other operational changes. Machine-learning and regression techniques are presented in the reviewed sources as tools for forecasting and supporting the reduction of operational disruptions [4,13]. Prescriptive analytics extends this logic by using optimization methods to compare feasible decisions, including route planning and cost-related operational choices [4].

Continuous monitoring provides a complementary function. Descriptive dashboards and visualization tools can make bottlenecks in inventory and processing more visible, thereby supporting earlier managerial intervention [5,8]. Intelligent maintenance applications likewise use event processing and analytical support to anticipate failures and reduce

avoidable operational costs [13]. These applications illustrate that analytics can operate at different decision levels, from real-time monitoring to planning and optimization.

However, analytical capability alone does not ensure better decisions. Manufacturing IT infrastructure and analytical competencies are associated with decision quality and operational performance, while fragmented databases, security concerns, and low confidence in corporate information can undermine the application of mathematical models [3,4,9,14]. Consequently, governance, data quality, and multidisciplinary analytical literacy should be treated as implementation requirements rather than secondary considerations.

The literature therefore supports an integrated interpretation of data-driven operations management. Analytical methods can strengthen evidence-based management when data architectures, quantitative models, operational processes, and organizational capabilities are aligned. Their contribution is better understood as decision support under dynamic conditions than as an automatic replacement for managerial expertise [5,6].

Table 1

Analytical approaches and their applications in operations and logistics

Analytical approach	Tools and methods	Potential operational contribution
Predictive modeling	Machine-learning algorithms and regression	Anticipation of demand variations and support for reducing operational disruptions [4,13]
Prescriptive optimization	Linear programming and decision models	Route optimization and support for operational cost decisions [4]
Operational monitoring	Descriptive dashboards and continuous visualization	Identification of bottlenecks in inventory and processing [5,8]
Intelligent maintenance	Event processing and analytical support algorithms	Predictive identification of failures and support for cost reduction [13]

Source: Created by author based on the references reviewed.

5 CONCLUSION

Data analytics can support the transition from operational information to managerial decision-making by combining integrated data flows with predictive, prescriptive, and monitoring methods. The reviewed literature identifies applications in demand anticipation, logistics optimization, bottleneck detection, and intelligent maintenance, but it also indicates that the effectiveness of these applications depends on reliable data, technological infrastructure, security, governance, and analytical competencies.

Accordingly, data-driven operations management should be understood as an organizational capability rather than a standalone technological solution. The integration of analytical methods with managerial processes can strengthen evidence-based decisions and improve responsiveness in dynamic operational environments, while the quality of outcomes remains contingent on implementation context and the appropriate interpretation of analytical results.

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