

TO STUDY THE IMPACT OF BUSINESS ANALYTICS ON SUPPLY CHAIN PERFORMANCE IN THE MANUFACTURING SECTOR

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Abstract

This study aims to investigate the impact of business analytics on supply chain performance in the manufacturing sector. Business analytics is a rapidly evolving field that uses data, statistical and quantitative analysis, and predictive modeling techniques to identify patterns and insights that can improve decision-making and performance. Supply chain performance is a critical factor for manufacturing organizations, as it affects customer satisfaction, profitability, and competitive advantage. The study will use a case study-based research approach, for manufacturing firms that have implemented business analytics in their supply chain operations. The research findings are expected to provide insights into the benefits and challenges of business analytics in the manufacturing sector and its impact on supply chain performance.

Keywords: Business analytics, Supply chain performance, Manufacturing sector, Data Analysis, Predictive Modeling, Demand forecasting, Logistics, Performance Improvements, and Business Analytics tools

I - Introduction:

The supply chain is all about the logistics and the network flow that move around for the organizations. Whether you are the business owner of an expanding company or a new bird in the market, its success is dependent on the truth of how effective its supply chain is working throughout. In today's rapidly changing business environment, manufacturing organizations are facing intense pressure to improve their supply chain performance. This is due to increasing customer expectations, shorter product lifecycles, global competition, and the need to optimize costs. To address these challenges, manufacturing firms are increasingly adopting business analytics to enhance their supply chain performance. In the context of supply chain operations, business analytics can provide a range of benefits, including better demand forecasting, optimized inventory management, improved supplier management, and enhanced logistics and distribution.

The purpose of this study is to investigate the impact of business analytics on supply chain performance in the manufacturing sector. The study will explore the extent to which business analytics can improve supply chain performance, the benefits and challenges of implementing business analytics in supply chain operations, and the factors that influence the adoption and success of business analytics in the manufacturing sector. The study focuses on identifying the benefits of using business analytics tools and techniques in supply chain management processes and how they can help manufacturers improve efficiency, cost-effectiveness, and customer satisfaction.

The findings of this study will have significant implications for manufacturing organizations, as they seek to improve their supply chain performance and gain a competitive advantage. By understanding the impact of business analytics on supply chain performance, manufacturing firms can make informed decisions about the adoption of these technologies and strategies to enhance their operations.

II – Sector Analysis

A. A globally competitive manufacturing sector is India's greatest potential to drive economic growth and job creation this decade. Due to factors like power growth, long-term employment prospects, and skill routes for millions of people, India has a significant potential to engage in international markets. Several factors contribute to their potential. [1]. Revenue in Manufacturing is projected to amount to US\$1,101.00bn in 2023. An annual growth rate of -1.60% is expected (CAGR 2023-2025).[2]. The sector includes a diverse range of industries such as automotive, aerospace, electronics, and consumer goods.

B. Technological Advancements:

Technological advancements have played a significant role in the evolution of the manufacturing industry. The use of automation, Business analytics, robotics, and artificial intelligence has led to improvements in productivity, quality, and safety. 3D printing technology has also emerged as a game-changer in the industry, allowing manufacturers to produce complex and customized products with ease. The Internet of Things (IoT) is another technology that is transforming the manufacturing sector, enabling manufacturers to monitor and control production processes in real time. Business analytics can help manufacturing companies identify key performance indicators (KPIs) and trends, make data-driven decisions, and optimize their operations.

C. Some of the ways in which business analytics can be used in manufacturing include:

Predictive Maintenance:

Business analytics can help manufacturers optimize their maintenance processes by predicting equipment failure and scheduling maintenance activities accordingly. By analyzing historical data and identifying patterns, manufacturers can predict when a piece of equipment is likely to fail and take preventive measures to avoid unplanned downtime. This can lead to significant cost savings and improve the overall efficiency of the manufacturing process.

Supply Chain Optimization:

Business analytics can also help manufacturers optimize their supply chain by identifying bottlenecks and inefficiencies. By analyzing data from suppliers, transportation providers, and other sources, manufacturers can gain a better understanding of their supply chain and make data-driven decisions to improve efficiency and reduce costs. This can include optimizing inventory levels, improving delivery times, and identifying alternative suppliers.

Quality Control:

Business analytics can be used to improve quality control processes in manufacturing. By analyzing data from sensors, cameras, and other sources, manufacturers can identify defects and quality issues in real-time, enabling them to take corrective action quickly. This can lead to improved product quality and customer satisfaction.

Sales and Marketing:

Business analytics can also be used to improve sales and marketing efforts in the manufacturing industry. By analysing customer data and market trends, manufacturers can identify opportunities to improve their product offerings and target their marketing efforts more effectively. This can include identifying new markets, improving product design, and optimizing pricing strategies.

Energy Management:

Business analytics can be used to optimize energy consumption in the manufacturing industry. By analyzing energy usage data, manufacturers can identify opportunities to reduce energy consumption, improve efficiency, and lower costs. This can include optimizing production schedules, implementing energy-efficient technologies, and improving maintenance processes.

III - Objectives of the Study:

1. To identify Business Analytics tools and techniques currently being used in Supply Chain Management in Manufacturing Sector.
2. To identify the key factors that influence the adoption of Business Analytics in SCM in the Manufacturing Sector.
3. To provide recommendations for Manufacturing companies looking to implement BA in their SCM practices.

IV - Research Methodology

This study adopts a systematic literature review methodology to analyze the impact of business analytics on supply chain performance in the manufacturing sector. The literature review was conducted using several academic databases such as JSTOR, ScienceDirect, and Google Scholar including renowned newspapers. The inclusion criteria for the selection of articles include peer-reviewed journals, conference proceedings, and articles published. An extensive literature review was done for the study on the basis of which a conclusion is found.

Scope of the study:

The scope of the study to investigate the impact of business analytics on supply chain performance in the manufacturing sector would involve the following:

- 1) The study will focus on the manufacturing sector, specifically on the supply chain process.
- 2) The study will include manufacturing companies that have implemented business analytics in their supply chain process and evaluate the outcomes of their efforts.

V - Literature Review

- 1) According to Emergen Research, the global big data analytics in the manufacturing market reached a market size of USD 1.11 billion in 2020 and is expected to register a CAGR of 33.1% during the forecast period. [3]

World's Prominent Companies Operating in Big Data Analytics in Manufacturing Market: Top 9 by Revenue are Microsoft Corporation, International Business Machines, (IBM) Corporation, Oracle Corporation, SAP SE, SAS Institute Inc., Fair Issac Corporation, TIBCO Software Inc., Alteryx Inc. and MicroStrategy Incorporated.

- 2) In a paper titled "The Impact of Business Analytics on Supply Chain Performance," Peter Trkman, Kevin McCormack, Marcos Paulo Valaderes de Oliveira, and Marcelo Bronzo Ladeira argue business analytics can improve the competitive advantage and performance of supply chains through the assurance of critical analysis of data gathered in vast quantities regularly that sophisticated business analytics provides.[4]

- 3) Lalit Das, Founder & CEO, 3SC said, "Data analytics is immensely helpful in improving the efficiency of the supply chain and logistic sector. Analytics uses data to make predictions that would help businesses take advantage of the widely available data for the benefit of the entire supply chain model. Data analysis further helps efficient decision-making and generates insights that would help upscale the logistics sector. Present in the form of predictive analysis, descriptive analysis, prescriptive analysis, and cognitive analytics, these cutting-edge tech solutions are transforming the dream of having an integrated end-to-end tech-enabled logistics sector into a reality." [5]

- 4) Sumit Sharma, Co-Founder, GoBOLT said "Big Data and Analytics are helping supply chain and logistics efficiency in more ways than one. In terms of optimizing the logistics and supply chain for customers and providing efficiencies to the system which can be self-sustaining and self-improving,

Big Data and AI are helping in smart vendor management, smart procurement, smart contracting, and track and trace. With the help of data analysis, customers can track any kind of movement from payment automation to recalculations and performance dashboards.” [6]

VI - Business Analytics In Supply Chain Management in Manufacturing Sector

A. Supplier Relationship Management - Supply chain and business analytics can provide valuable insights into the operations of a business. By analyzing data from the supply chain, businesses can identify areas for optimization and cost savings. A survey conducted among manufacturing companies in the fourth quarter of 2020 showed that 21 percent implemented the usage of big data analytics for their regular manufacturing activities. Business analytics mainly helped manufacturing companies improve supply chain management and enterprise resource planning. In the Industry 4.0 era, an adaptation of big data analytics would become increasingly common in all sectors of the manufacturing industry.[8]

B. Business Analytics tools used for supply chain performance improvement - Business analytics tools are widely used in supply chain management to improve operations and performance. Here are some examples of how these tools can be used to drive supply chain improvements.

a. Demand Forecasting: Predictive analytics tools can be used to forecast demand for products, which is essential for optimizing inventory levels and production schedules. By accurately forecasting demand, businesses can reduce stockouts, overstocks, and waste, which can result in cost savings and improved customer satisfaction.

b. Inventory Optimization: Business intelligence (BI) tools can be used to track inventory levels and identify patterns in demand and supply. By using this data to optimize inventory levels, businesses can reduce carrying costs and improve the accuracy of inventory management.

c. Transportation Optimization: Supply chain planning tools can be used to optimize transportation routes, modes of transport, and carrier selection. This can reduce transportation costs, improve delivery times, and enhance the overall efficiency of supply chain operations.

d. Risk Management: Simulation tools can be used to create virtual models of supply chain operations and test different scenarios to identify potential risks and opportunities. By simulating different scenarios, businesses can develop contingency plans and mitigate risks before they occur.

e. Real-time Monitoring: Real-time monitoring tools can be used to track key performance indicators (KPIs) such as order cycle time, delivery performance, and inventory levels. By monitoring these KPIs in real time, businesses can identify issues quickly and take corrective action before they escalate.

Thus, business analytics tools can help businesses optimize supply chain operations, reduce costs, and improve customer satisfaction. By using data-driven decision-making, businesses can drive continuous improvement in their supply chain management practices.

C. From the review of literature, it was found that the adoption of business analytics in supply chain management (SCM) in the manufacturing sector is influenced by several key factors, including:

a. Organizational Culture: The organizational culture of a manufacturing firm can significantly influence the adoption of business analytics in SCM. A company that values data-driven decision-making and has a culture of continuous improvement is more likely to adopt business analytics tools and techniques than one that does not.

b. Availability and Quality of Data: The availability and quality of data play a critical role in the adoption of business analytics in SCM. Manufacturing firms that have access to large volumes of high-quality data are more likely to adopt business analytics than those that do not.

c. Technology Infrastructure: The technology infrastructure of a manufacturing firm can also influence the adoption of business analytics in SCM. Firms that have invested in modern technology infrastructure, such as cloud computing and big data platforms, are more likely to adopt business analytics than those that rely on legacy systems.

- d. **Human Capital:** The availability and quality of human capital also play a critical role in the adoption of business analytics in SCM. Firms that have skilled employees with expertise in data analysis, statistics, and machine learning are more likely to adopt business analytics than those that do not.
- e. **Competitive Pressures:** Competitive pressures can also influence the adoption of business analytics in SCM. Firms that face intense competition are more likely to adopt business analytics to gain a competitive edge and improve their operations.
- f. **Regulatory Environment:** The regulatory environment can also influence the adoption of business analytics in SCM. Firms that operate in highly regulated industries may be required to adopt certain types of analytics tools and techniques to comply with regulatory requirements. Manufacturing firms that can effectively address these factors are more likely to successfully adopt business analytics and improve their supply chain operations.

VII - Recommendations

Implementing Business Analytics (BA) in Supply Chain Management (SCM) can bring significant benefits to Manufacturing companies, such as improved operational efficiency, cost reduction, better customer service, and increased competitiveness. Here are some recommendations for Manufacturing companies looking to implement BA in their SCM practices –

Define Clear Objectives: Before implementing BA in SCM, define clear objectives and goals. Identify the areas where BA can have the most significant impact, such as demand forecasting, inventory management, and logistics optimization. Having clear objectives and goals can help focus the BA implementation efforts and ensure that the benefits are realized.

Assess Data Quality and Availability: Assess the quality and availability of data required for BA. Identify data sources, data quality issues, and data integration requirements. Ensure that the data is accurate, complete, and up to date. Invest in data management capabilities to improve data quality and accessibility.

Build a Cross-Functional Team: Build a cross-functional team with expertise in BA, SCM, and IT. This team should be responsible for implementing and managing BA in SCM. The team should have a clear understanding of business requirements, data requirements, and technical requirements.

Invest in the Right Technology: Invest in the right technology to support BA in SCM. Consider cloud-based solutions that can scale with the business and support advanced analytics capabilities. Select technologies that are user-friendly and support collaboration among stakeholders.

Provide Training and Support: Provide training and support to employees on BA in SCM. Develop training programs to enhance data literacy and analytics skills among employees. Provide ongoing support to ensure that employees can effectively use BA tools and techniques.

Start Small and Iterate: Start with small BA projects in SCM and iterate as needed. This approach allows companies to identify and address issues early and avoid costly mistakes. Implement BA projects in a phased manner, starting with a pilot project before scaling up.

Monitor and Measure Performance: Monitor and measure the performance of BA in SCM. Develop metrics to track the impact of BA on supply chain performance. Continuously evaluate BA projects and adjust as needed to ensure that they are delivering the expected benefits.

Implementing BA in SCM requires a comprehensive approach that includes defining clear objectives, assessing data quality and availability, building a cross-functional team, investing in the right technology, providing training and support, starting small and iterating, and monitoring and measuring performance. By following these recommendations, manufacturing companies can successfully implement BA in their SCM practices and drive continuous improvement in their supply chain operations.

VIII – Conclusion

In conclusion, the impact of business analytics on supply chain performance in the manufacturing sector is significant. The study shows that businesses that use business analytics tools and techniques

in their supply chain operations are able to make data-driven decisions, optimize their operations, and improve their overall performance.

The study also reveals that business analytics tools such as predictive modeling, data visualization, and machine learning are increasingly being used in supply chain management to improve forecasting accuracy, optimize inventory levels, and enhance logistics operations. Additionally, the use of real-time data analytics helps businesses identify and respond to supply chain disruptions quickly, reducing downtime and increasing overall efficiency. Moreover, the study highlights that the adoption of business analytics in supply chain management is influenced by several factors, including organizational culture, data availability and quality, technology infrastructure, human capital, competitive pressures, and regulatory environment. Manufacturing firms that can effectively address these factors are more likely to successfully adopt business analytics and improve their supply chain operations.

Therefore, it is recommended that manufacturing companies should consider implementing business analytics in their supply chain management to improve their performance and competitiveness. The adoption of business analytics should be done in a strategic and comprehensive manner, with clear objectives, data quality and availability assessments, cross-functional teams, technology investments, training and support, iterative implementation, and performance monitoring and measurement. By doing so, manufacturing companies can leverage business analytics to drive continuous improvement and gain a competitive advantage in their supply chain operations.

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