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A Review of Business Analytics Methods

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Peer Review Information	Abstract
<p><i>Submission: 21 Jan 2022</i></p> <p><i>Revision: 16 Feb 2022</i></p> <p><i>Acceptance: 05 March 2022</i></p> <p>Keywords</p> <p><i>Business Analytics, Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Data- Driven Decision Making, Big Data</i></p>	<p>Business Analytics (BA) has become an essential discipline for organizations seeking to improve decision-making, operational efficiency, and competitive advantage. By systematically analyzing data using statistical, computational, and machine learning techniques, business analytics enables organizations to transform raw data into actionable insights. This review paper examines the major business analytics methods, including descriptive, diagnostic, predictive, and prescriptive analytics. It synthesizes existing literature to analyze their applications, tools, and impact on organizational performance. A comparative analysis highlights differences among analytics approaches, while the discussion addresses challenges, technological advancements, and future trends. The review concludes by emphasizing the strategic importance of integrated business analytics methods in data-driven organizations.</p>

Introduction

In today's highly competitive and data-intensive business environment, organizations generate vast amounts of data from internal operations, customer interactions, digital platforms, and external sources. The challenge is no longer data availability but the ability to analyze and interpret data effectively. Business Analytics (BA) has emerged as a critical capability that enables organizations to convert data into insights that support strategic, tactical, and operational decision-making.

Business analytics refers to the systematic use of data, statistical analysis, quantitative methods, and predictive models to drive informed business decisions. It integrates concepts from statistics, information systems, operations research, and computer science. Organizations across industries—including finance, healthcare, retail, manufacturing, and logistics—use analytics to optimize processes, understand customer behavior, manage risks, and improve performance.

Historically, business decision-making relied heavily on managerial intuition and experience. While these remain valuable, they are increasingly complemented or replaced by data-driven approaches. Early forms of analytics focused on descriptive reporting, such as financial statements and operational reports. These methods provided insights into what had happened but offered limited support for forecasting or optimization. As computing power and data storage capabilities increased, analytics methods evolved to include predictive and prescriptive techniques.

Technological advancements have played a pivotal role in the growth of business analytics. The emergence of big data technologies, cloud computing, artificial intelligence (AI), and machine learning has significantly expanded the scope and complexity of analytics applications. Modern analytics systems can process structured and unstructured data in real time, enabling organizations to respond rapidly to changing conditions.

Another major driver of business analytics adoption is the increasing complexity of business environments. Globalization, dynamic markets, and heightened competition require organizations to make faster and more accurate decisions. Business analytics supports this need by providing evidence-based insights, reducing uncertainty, and improving forecasting accuracy. Despite its benefits, implementing business analytics presents several challenges. Organizations often struggle with data quality issues, lack of skilled analysts, resistance to change, and integration of analytics into decision-making processes. Moreover, ethical concerns related to data privacy, algorithmic bias, and transparency are gaining prominence. Given the growing importance of business analytics, a substantial body of academic and practitioner-oriented literature has emerged. However, this literature is dispersed across multiple disciplines and analytical approaches. This review aims to synthesize existing research on business analytics methods, compare key approaches, and identify challenges and future research directions.

Literature Review

The literature on business analytics broadly categorizes analytics methods into four main types: descriptive, diagnostic, predictive, and prescriptive analytics.

1. Descriptive Analytics

Descriptive analytics focuses on summarizing historical data to understand past performance. Common techniques include data aggregation, reporting, dashboards, and data visualization. Studies emphasize that descriptive analytics provides foundational insights but does not explain causes or predict future outcomes.

2. Diagnostic Analytics

Diagnostic analytics seeks to explain why certain events or outcomes occurred. Techniques such as drill-down analysis, correlation analysis, and root cause analysis are commonly used. The literature highlights diagnostic analytics as a bridge between descriptive and predictive analytics.

3. Predictive Analytics

Predictive analytics uses statistical models and machine learning techniques to forecast future outcomes. Methods such as regression analysis, time-series forecasting, classification, and clustering are widely discussed. Research demonstrates that predictive analytics improves forecasting accuracy and risk assessment.

4. Prescriptive Analytics

Prescriptive analytics goes beyond prediction by recommending optimal actions. Techniques such as optimization models, simulation, and decision analysis are central to this approach. The

literature emphasizes prescriptive analytics as the most advanced and strategically valuable form of analytics.

5. Tools and Technologies

Studies also examine the role of analytics tools such as R, Python, SAS, Tableau, Power BI, and cloud-based analytics platforms. Integration of AI and big data technologies is identified as a key trend.

Comparative Table and Analysis

Analytic s Type	Primar y Purpos e	Key Techniqu es	Decision Support Level
Descripti ve	What happene d?	Reporting, dashboard s	Operatio nal
Diagnosti c	Why did it happen?	Root cause analysis	Tactical
Predictiv e	What will happen?	Regressio n, ML models	Tactical & Strategic
Prescripti ve	What should be done?	Optimizati on, simulation	Strategic

Analysis

The comparison shows a progression from basic reporting to advanced decision optimization. While descriptive and diagnostic analytics provide valuable insights, predictive and prescriptive analytics offer greater strategic value by enabling forecasting and optimization. Organizations that integrate multiple analytics methods achieve more comprehensive decision support.

The comparative analysis of business analytics methods reveals a clear evolution in how organizations use data to support decision-making. Business analytics methods can be viewed as a continuum, ranging from descriptive approaches that explain past events to prescriptive approaches that recommend optimal actions. Each method differs in purpose, complexity, technological requirements, and strategic value.

1. Descriptive vs. Diagnostic Analytics

Descriptive analytics represents the foundation of business analytics. It focuses on summarizing historical data using reports, dashboards, and visualizations. These methods answer the question “what happened?” and are widely adopted due to their simplicity and low technical requirements. However, descriptive analytics alone offers limited value for strategic decision-making, as it does not explain underlying causes.

Diagnostic analytics builds upon descriptive insights by identifying reasons behind observed outcomes. Techniques such as correlation analysis, drill-down reporting, and root cause analysis enable organizations to understand performance drivers. Compared to descriptive analytics, diagnostic analytics provides deeper insights and supports tactical decision-making. However, it remains largely retrospective and does not directly support future-oriented planning.

2. Predictive Analytics

Predictive analytics marks a significant shift from hindsight to foresight. By using statistical modeling, data mining, and machine learning techniques, predictive analytics estimates future outcomes based on historical and real-time data. Methods such as regression analysis, time-series forecasting, classification, and clustering are widely applied in areas such as sales forecasting, customer churn prediction, and risk assessment. Compared to descriptive and diagnostic analytics, predictive analytics requires higher-quality data, advanced computational resources, and specialized analytical skills. While implementation complexity is higher, predictive analytics offers greater strategic value by reducing uncertainty and enabling proactive decision-making.

3. Prescriptive Analytics

Prescriptive analytics represents the most advanced stage of business analytics. It combines predictive models with optimization, simulation, and decision analysis techniques to recommend specific actions. Prescriptive analytics answers the question “what should be done?” and supports strategic and operational optimization. Compared to other analytics methods, prescriptive analytics is more complex and resource-intensive. It often relies on advanced algorithms, real-time data integration, and scenario modeling. Despite these challenges, prescriptive analytics provides the highest potential value by directly linking analytics insights to decision execution.

Overall Implications

The analysis shows that no single analytics method is sufficient on its own. Descriptive and diagnostic analytics provide essential context and understanding, while predictive and prescriptive analytics enable forward-looking and optimized decisions. Organizations that integrate multiple analytics methods within a unified analytics framework are better positioned to achieve data-driven competitiveness.

Discussion

The review of business analytics methods highlights their growing importance in enhancing organizational decision-making and performance. One of the most important insights from the literature is that the value of business analytics lies not only in advanced algorithms but also in how analytics is embedded within organizational processes and culture.

A key issue discussed in the literature is the **integration of analytics methods**. Many organizations focus heavily on descriptive reporting while underutilizing predictive and prescriptive analytics. This imbalance limits the strategic impact of analytics initiatives. Organizations that successfully integrate multiple analytics approaches benefit from a more comprehensive understanding of business performance and future opportunities.

Technological advancements have significantly expanded the scope of business analytics. Big data platforms, cloud computing, artificial intelligence, and machine learning enable organizations to analyze large and complex datasets in real time. These technologies enhance forecasting accuracy, customer insights, and operational efficiency. However, they also increase dependence on skilled analysts and robust data governance frameworks.

Another important theme is the role of **organizational culture and leadership**. Analytics-driven organizations foster a culture that values evidence-based decision-making, experimentation, and continuous learning. Leadership commitment is essential for ensuring that analytics insights are used in decision-making rather than ignored in favor of intuition. Resistance to change remains a significant barrier, particularly in organizations with established decision-making traditions.

Data quality and availability are also critical challenges. Business analytics methods rely on accurate, consistent, and timely data. Poor data quality can undermine analytics outcomes and erode trust in analytics systems. Consequently, investments in data management, integration, and governance are essential prerequisites for successful analytics implementation.

Ethical considerations are gaining increasing attention in business analytics research. Issues related to data privacy, algorithmic bias, transparency, and accountability raise concerns about the responsible use of analytics. Organizations must adopt ethical guidelines and regulatory compliance mechanisms to ensure that analytics applications are fair, transparent, and socially responsible.

Overall, the discussion highlights that business analytics is not a purely technical endeavor. Its

success depends on the alignment of technology, people, processes, and organizational strategy.

Conclusion

Business analytics methods have become indispensable tools for organizations operating in data-intensive and highly competitive environments. This review has examined the major analytics approaches—descriptive, diagnostic, predictive, and prescriptive—and analyzed their role in supporting organizational decision-making. The findings demonstrate that business analytics represents a progression from understanding past performance to optimizing future actions.

One of the key conclusions of this review is that **advanced analytics methods provide the greatest value when built upon strong foundational analytics capabilities.**

Descriptive and diagnostic analytics remain essential for monitoring performance and understanding business dynamics. However, predictive and prescriptive analytics enable organizations to anticipate change, manage uncertainty, and optimize outcomes.

Despite the significant benefits of business analytics, organizations face several challenges in implementation. These include data quality issues, skills shortages, technological complexity, and ethical concerns. Addressing these challenges requires a holistic approach that combines technological investment with organizational development and governance frameworks.

From a managerial perspective, business analytics should be aligned with strategic objectives and integrated into everyday decision-making processes. Organizations that treat analytics as a strategic capability rather than a technical function are more likely to achieve sustainable competitive advantage. From a research perspective, there is a need for further studies on analytics adoption in different industries, the long-term impact of AI-driven analytics, and ethical governance mechanisms.

In conclusion, business analytics methods will continue to evolve alongside technological advancements and changing business environments. Organizations that effectively integrate analytics methods, foster data-driven cultures, and address ethical considerations will be better positioned to succeed in the future.

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