



Data Analytics in Cloud Computing

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ABSTRACT

In today's data-driven world, organizations are increasingly turning to data analytics to streamline cloud computing [1] and enhance their capabilities. Cloud platforms offer scalable, cost-efficient, and high-performance environments capable of processing and analyzing vast amounts of data in real time. By leveraging cloud databases and advanced analytics tools, businesses can uncover deeper insights, optimize operations, understand customer behavior, identify market trends, and make data-driven strategic decisions. Ultimately enabling organizations to transform raw data into actionable insights, gaining a competitive advantage and driving better business outcomes.

Keywords: Data Analytics, Big Data, Cloud Computing, Tableau, OLAP, Predictive Analytics

INTRODUCTION

The role of data and analytics [2] enables better decisions and improve decision outcomes. This applies to all types of decisions, including macro, micro, real-time, cyclical, strategic, tactical and operational. At the same time, D&A can unearth new questions, as well as innovative solutions and opportunities that business leaders had not yet considered. Progressive organizations use data in many ways and must often rely on data from outside their boundary of control for making smarter business decisions. Data-driven decision-making means using data to work out how to improve decision making processes. This leads to the idea of a decision model, which can include prescriptive analytical techniques that generate outputs that specify which actions to take. Other analytical models are descriptive, diagnostic or predictive. In data analytics, OLAP (Online Analytical Processing) plays a crucial role by enabling users to analyze large datasets across multiple dimensions, allowing them to quickly identify trends, and insights through interactive exploration of data efficiently.

CHALLENGES FOR DATA ANALYTICS

Data analytics can face many challenges, including data quality, security and data base design.

Data quality

Incomplete Data: Data may be missing information due incomplete data, or there may be duplicate records.

Outdated information: Data may be out of date or have inconsistent formatting.

Data sources: Data may come from multiple sources, which can lead to quality issues.

Data Security

Data breaches: Data breaches can be costly, and data analysts may need to manage sensitive data across multiple tools

Data access: Data may be difficult to access, or there may be insecurities about saving and transferring data.

Database Design:

An optimized database design is crucial for enhancing report performance and ensuring quicker data access on dashboards. It is essential to align the database design with Enterprise Data Warehouse (EDW) design considerations [3] to facilitate efficient data analysis and improve overall system performance.

IMPACT FOR DATA ANALYTICS

Data analytics significantly impacts businesses by enabling better decision-making through the extraction of valuable insights from data, leading to improved customer experiences, optimized operations, cost reduction, and the ability to identify trends and patterns that might otherwise go unnoticed, ultimately enhancing overall performance and competitiveness in the market.

Key impacts of data analytics are:

- A) Enhanced decision-making:**
Data analytics provides actionable insights that inform strategic choices, allowing businesses to make data-driven decisions rather than relying on intuition alone.
- B) Customer understanding:**
By analyzing customer data, businesses can gain a deeper understanding of customer needs and preferences, leading to personalized marketing campaigns and improved customer satisfaction.
- C) Operational efficiency:**
Identifying bottlenecks and inefficiencies in processes through data analysis enables businesses to optimize operations and streamline workflows, resulting in cost savings.
- D) Predictive capabilities:**
Advanced analytics techniques like predictive modelling allow businesses to anticipate future trends and proactively address potential issues.
- E) Fraud detection:**
Data analytics can be used to identify fraudulent activities by analyzing patterns in transaction data, protecting businesses from financial losses.
- F) Risk mitigation:**
By identifying potential risks early on, businesses can take preventative measures to mitigate their impact.
- G) Market analysis:**
Data analytics enables companies to analyze market trends and competitor behaviour, allowing them to adapt strategies accordingly.
- H) Personalized experiences:**
Leveraging customer data to create tailored experiences, such as product recommendations or targeted marketing campaigns.

DATA ANALYTICAL SOLUTIONS

Data analytics solutions help businesses use data to make decisions and solve problems. They can include tools for data visualization, predictive analytics, and business intelligence. There are multiple software's/Tools to build reports for accomplishing business needs. Below are some Data Analytical tools for reference.

- 1. Tableau:** A popular data visualization tool that helps data analysts create interactive dashboards to show data trends
- 2. Business Objects:** SAP Business Objects Analysis, edition for OLAP is a web-based tool that helps users analyze data to make business decisions.
- 3. Qlik:** Provides real-time data integration and analytics to help businesses use data for decision-making
- 4. Power BI:** A free data analytics platform that uses the Office interface to make it easy to learn
- 5. DB looker GCP:** A business intelligence and big data analytics platform that includes real-time business analytics, data modelling, and collaboration features on Cloud.
- 6. Python Programming:** To build OLAP reports using Python, we can leverage libraries like "OlaPy" which provides a dedicated OLAP engine within Python, allowing us to define dimensions, create cubes, and perform multidimensional analysis with MDX queries, enabling fast, interactive reporting on large datasets.

CASE STUDY: IMPLEMENTATION OF DATA ANALYTICS

Tableau can be integrated with multiple sources for building Reports. Sources includes but not limited to Excel, Sql Server, Text file but integrating on PREM Tableau with Cloud Technologies plays vital role. Using Cloud Databases is a challenging to over come this JDBC connection is used in Tableau to integrate with Cloud Databases [4]. Cloud databases are up to 5 times faster than on-premises databases due to scalability, and enhanced features like data encryption at rest significantly tightened data security.

In addition, the use of Identity and Access Management (IAM) roles and permissions helped to enforce access restrictions and ensured that sensitive data is only accessible to authorized users. Real-time data streaming, combined with scheduled data sources, has greatly improved data availability for business users. This integration enabled users to access up-to-date insights and make timely, informed decisions. As a result, business teams are able to work with the most relevant and accurate information, fostering more dynamic and responsive decision-making.

Apart from underlying Cloud Databases all the connections and the process to build the Dashboards/reports are intact. There are sample Dashboards/Reports available on Tableau public [5] and [6] for reference

Other Databases (JDBC)

URL:

Dialect:

Enter information to log on to the server:

Username:

Password:

Properties File:

Figure 1: Cloud Connectivity with Tableau

FUTURE TRENDS

Future trends in data analytics includes: increased use of artificial intelligence (AI) and machine learning (ML) for automated analysis, augmented analytics to make data insights accessible to broader audiences, data democratization to empower non-technical users, real-time stream analytics, cloud-native data platforms, emphasis on data governance and ethics, natural language processing (NLP) for analyzing unstructured text, and the integration of edge computing; all contributing to faster, more efficient, and accessible data-driven decision making.

- A) **AI-powered analytics:** AI and ML will be increasingly embedded in data analysis tools to automate tasks like data cleaning, transformation, and pattern recognition, allowing for more complex insights.
- B) **Cloud-native data platforms:** Utilizing cloud infrastructure to store and process large datasets, offering scalability and flexibility.
- C) **Data governance and ethics:** Implementing policies and procedures to ensure data quality, security, and responsible use of data.
- D) **Edge computing:** Processing data closer to its source, enabling faster analysis for real-time applications.

CONCLUSION

Regardless of the business domain or technology, data analytics plays a critical role in driving success. It acts as a catalyst for digital transformation by enabling faster, more accurate, and more relevant decision-making in complex and rapidly changing business environments. As organizations increasingly rely on data to inform their strategies, those who effectively leverage analytics gain a competitive edge, adapting quickly to market shifts and emerging trends. By embracing advanced analytics tools and techniques, individuals and organizations alike can uncover new opportunities and boost efficiency, ensuring sustained success while staying aligned with the latest technologies and trends.

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