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Ensuring Secure Decision Making: A Review of Data Warehouse Security in Business Intelligence Systems

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Abstract: *Business Intelligence (BI) is considered to have a high impact on businesses. Research activity has risen in the last years. An important part of BI systems is a well performing implementation of the Extract, Transform, and Load (ETL) process. In typical BI projects, implementing the ETL process can be the task with the greatest effort. Business Intelligence (BI) systems play a vital role in supporting organizational decision making by transforming large volumes of data into meaningful insights. At the core of these systems, data warehouses integrate data from multiple heterogeneous sources, making them critical assets for strategic, tactical, and operational decisions. However, the centralized, historical, and high-value nature of data warehouses also makes them attractive targets for security breaches, insider misuse, and privacy violations. Ensuring robust data warehouse security is therefore essential for maintaining the reliability and trustworthiness of BI-driven decision making. This review paper provides a comprehensive analysis of existing research on data warehouse security within the context of business intelligence systems. It examines key security requirements, including access control, authentication, encryption, inference control, auditing, data integrity, and privacy preservation, as discussed in the literature. The paper further reviews common security threats and vulnerabilities affecting data warehouses and analyzes proposed security frameworks, models, and best practices designed to mitigate these risks. By synthesizing findings from prior studies, this review highlights current challenges, research gaps, and emerging trends in securing data warehouses for effective decision support. The paper aims to serve as a reference for researchers and practitioners seeking to design secure, trustworthy, and resilient BI systems that support informed decision making*

Keywords: Business Intelligence, Data Warehouse, Decision Making , ETL, Operational Data, Metadata

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