

# Management of Data Integrity and Consistency in E-Commerce Backends

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## Abstract

In the world of e-commerce, maintaining data integrity and consistency is essential for providing customers with accurate and reliable information. However, managing data integrity and character in e-commerce backends can be challenging due to data duplication, inconsistency, loss, and unauthorized access. This research paper aims to examine the current challenges in managing data integrity and consistency in e-commerce backends and to identify the most effective techniques for overcoming these challenges. Through this analysis, the paper aims to provide e-commerce companies with a better understanding of how to manage data integrity and consistency in their backends, and it offers practical insights into the best practices and techniques that can be used to achieve this goal.

**Keywords:** *E-commerce, Data integrity, Consistency, Backend, Data validation, Access control.*

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## 1. Introduction:

The internet is a highly dynamic environment that is continuously changing (Zhu et al., 2020). Supply chains, e-commerce, and virtual enterprises have replaced traditional manufacturing and service environments to create more physically distributed enterprise environments (Anthony & Abbas, 2021). As a result, the internet has emerged as a critical resource for modern business, and many companies are developing online identities. A "highly pervasive innovation that is driving significant changes in the conventional ways of doing business" is e-commerce (Amin et al., 2016). Customers are responding to e-commerce with remarkable consistency. Examples include Flipkart, Amazon, OLX, Myntra, and other significant e-commerce websites. Various activities, including online transactions, inventory management, databases containing customer/user information and product information, etc., are carried out through e-commerce websites. However, the issue of e-commerce database management at the backend or the websites being hacked by hackers is also significantly rising. For instance, more than two lakh systems were compromised in nearly 150 countries using ransomware attacks (Asan, 2022). This led to the leakage of crucial data and information, which also caused a significant loss. In this context, it would be interesting to learn about the research and development work that has been done on this database management (Shukla et al., 2022).

Data integrity also includes security and legal compliance, such as GDPR. Design-phase procedures, norms, and standards preserve it. No matter how long or frequently a database is accessed, data integrity ensures that data is full, correct, and dependable. Data integrity is crucial to preventing data loss and leaks. First, make sure internal users are properly managing data to protect it from harmful outsiders. You may avoid danger by validating and inspecting sensitive data.

Data integrity in SQL databases means uniquely identifying table rows so data may be retrieved individually. Column constraints (rules) enable this. Data restrictions prevent erroneous data entry into database base tables, preserving data integrity.

## Detail Background of E-Commerce

E-commerce lets small and large businesses make transactions faster online. Electronic commerce can be business-to-business, consumer-to-consumer, or business-to-business. E-commerce's rise can be attributed to its huge benefits to both parties. As depicted in Fig. 1, an online store's backend is the server-side technology that supports its front-end operations. Inventory management, payment processing, customer administration, order management, reporting and analytics, and system integration are essential (Yu & Duan, 2021). E-commerce businesses depend on the backend for

infrastructure, operations, and data protection.

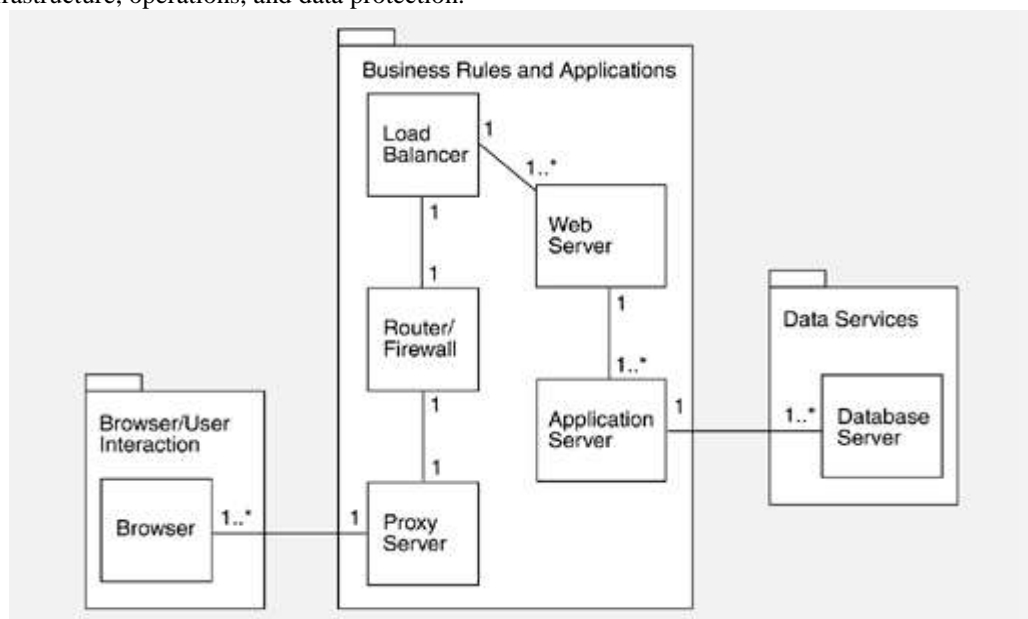


Fig. 1 E-commerce System Architecture

### Review of Literature

E-commerce backends can have scalability, security, integration, performance, dependability, and data management issues (Sultana, 2019). The backend infrastructure of an e-commerce organization must be reliable, secure, and ready to meet expanding needs. E-commerce relies on transaction and data security, according to Singh (2014). Malaysian e-commerce users believed security was the biggest barrier. The author explained why consumers are wary about online shopping. He said E-Commerce users needed to know their communications and data were secure from illegal access or modification to feel comfortable utilizing the internet consistently. Vashi et al. (2017) say cyber incursions could make business internet use difficult. Choi & Mai (2018) found that e-commerce security would remain a top concern. To reduce these concerns, suppliers must invest more in secure installations. To avoid hackers invading their privacy, users should employ powerful firewalls. Furthermore, Encryption can also ease concerns about transferring sensitive data online.

### 2. Methods & Material:

This analysis relies on IEEE articles and related periodicals.

#### Here are few more eCommerce data integrity challenges :

#### 1. Multiple Data Sources

Suppliers, vendors, and the intranet supply eCommerce product data. Gartner reported that three-fourths of analytics solutions employed ten or more external data sources in 2019 (Lo et al.). Businesses must check data consistency and incorporate it into a central hub.

#### 2. Interacting Applications

Many APIs enrich product data in e-commerce stores. Several tools examine product data. Business and IT teams regularly fight. They buy powerful software because they can't communicate. Multitasking is costly.

#### 3. Manual data pulls

Data retrieval takes time. It disturbs business. Excel data copy-and-paste errors cost JP Morgan Chase \$2 billion in the 2012 London Whale event (David, 2017). Manual data functions may cause more difficulties than they solve unless your data flow is totally automated.

4. Uneven Reports

Data inconsistency causes irregular reporting. Manual reports can conflict with authors, audiences, release deadlines, and disconnected information. Multi-departmental reporting norms also inhibit cross-functional coordination.

5. Spreadsheet Dependencies

Excel was productivity software. Unfortunately, it works for sophisticated process management. Excel cannot analyze billion-dollar data sets. It impedes teamwork.

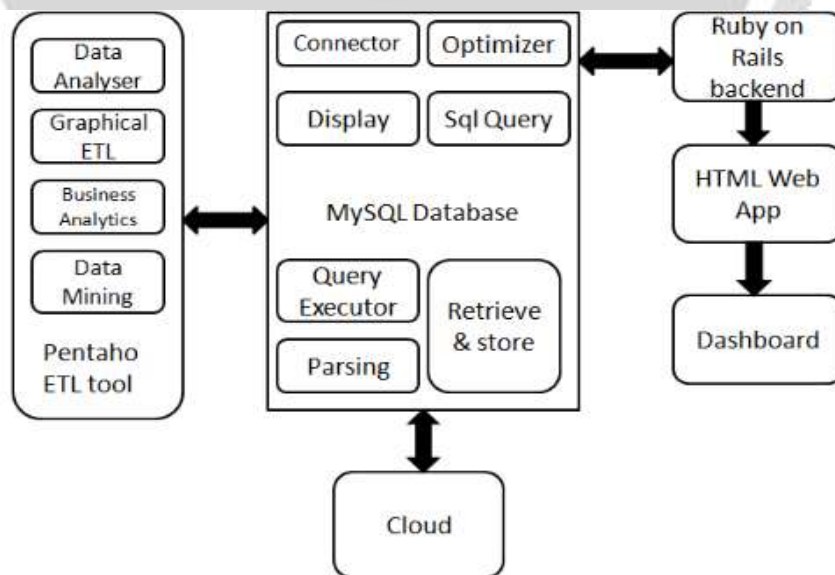
6. Poor Procedures

Manufacturers, suppliers, brands, retailers, and third-party sellers can distort product data. Inaccurate product data from information corporations worsens it. Inaccuracies increase as data crosses hands, making product content managers and customers burst.

**E-commerce Data Management Model**

E-commerce data's logical model divides it by user perspective. This model divides all e-commerce data kinds by functions and expressions. Data warehousing categorizes it as extract, transform, and load (ETL). Several sources provide analysis data. ETL first extracts data from these sources. To avoid data loss or corruption and disrupt the analysis, delete the data. After gathering the appropriate data, convert it.

Data transformation includes cleansing and transforming it. Cleaning involves removing duplicates, missing data, and normalizing values. Next, transform functions, rules, or lookup tables format the data. Combining data from many sources, building aggregates, surrogate keys, categorizing the data, extracting inventive intended values, and employing advanced validation criteria are required for conversion. After extracting and transforming data, load it.



**Fig. 2. Detailed Architecture of the Model**

Ready-to-use ETL tools abound. These ETL solutions optimize the ETL process by connecting to common data sources such as databases, flat files, mainframe systems, xml, etc. They enable data transformation across data sources without error. Pentaho is a tool. The Linux server has Pentaho Business Intelligence Server Edition and JDK/JRE. After installation, a local web browser can access Pentaho. Pentaho connects MySQL to port 3306. After connecting, joins and SQL queries can retrieve and save needed data.

### 3. Result & Discussion:

E-commerce platforms need data management. Managing data integrity and consistency in e-commerce backends is difficult for various reasons. E-commerce backends struggle with data duplication. In an e-commerce platform with different data sources and systems, data can be duplicated and erroneous. Two people updating product information in two systems may result in contradicting information. Inconsistent data compromises data integrity. User or system changes might make data unpredictable over time. E-commerce enterprises may make bad data-driven decisions. E-commerce backends lose data too. It can lose data. Big data, cloud computing, and other cutting-edge technologies promote e-commerce data management (Lo et al., 2019; Vashi et al., 2017; Yu & Duan, 2021). Big data technologies can collect and analyze data to improve e-commerce operations in real time.

### 4. Conclusion:

E-commerce backend data integrity and consistency demand technical and administrative solutions. Database transactions, unique constraints, referential integrity, data validation, version control, backup and recovery, and access control solve data duplication, inconsistency, loss, and illegal access. Thus, data integrity and consistency enable e-commerce organizations make informed judgments, avoid legal concerns, enhance productivity, and compete with the market.

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