

# Database Schema Review Report

## Overview

This review highlights key issues found in the current database schema and provides recommendations based on database normalization principles, data integrity, auditability, and scalability. The assessment is structured around standard design principles and common industry patterns.

### 1. Naming Conventions and Domain Modeling

Issue: Table names are inconsistent and not aligned with business entities.

Impact: Poor readability, maintainability, and domain misalignment.

Recommendation: Adopt consistent, singular, and domain-driven table names (e.g., Quote, Customer, QuoteVersion).

### 2. Normalization and 3NF Violations

Issue 1: Status values and similar attributes are stored as plain text, leading to data redundancy.

Issue 2: In quote versioning, quote\_id is repeated across rows with different versions but without a normalized versioning strategy.

Violation: Third Normal Form (3NF) - due to transitive dependencies where non-key attributes depend on non-primary key columns.

Recommendation: Normalize status/lookup fields into separate reference tables. Separate Quote from QuoteVersion to properly model versioning. Ensure non-key attributes depend on the full primary key.

### 3. Lack of Soft Delete Capability

Issue: No support for logical deletion.

Impact: Inability to track deleted records or restore them if needed.

Recommendation: Implement a RowStatusId (FK to a RowStatus table) or IsDeleted flag to support soft delete and lifecycle management.

### 4. Auditability Gaps

Issue: Schema lacks standard auditing columns like CreatedBy, CreatedOn, UpdatedBy, UpdatedOn.

Impact: No traceability for data changes or user actions.

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Recommendation: Include standard audit trail fields on all transactional and reference tables.

## 5. Improper Data Types

Issue: Overuse of BIGINT (int8) for columns where smaller types like SMALLINT (int2) or INTEGER (int4) would suffice.

Impact: Unnecessary memory/storage usage and potential performance penalties.

Recommendation: Use smallest appropriate data type for each field.

## 6. Oversized Text Fields

Issue: Fields like VARCHAR(500) are used where much smaller limits (e.g., VARCHAR(50)) would suffice.

Impact: Poor space efficiency and lack of alignment with business rules.

Recommendation: Define column lengths based on actual data constraints and validation logic.

## 7. Foreign Key & Integrity Constraints Missing

Issue: Key relationships (e.g., status, quote, customer) are not enforced via foreign keys.

Impact: Risk of orphaned records and data integrity issues.

Recommendation: Define all expected FK constraints between tables to ensure referential integrity.

## Recommended Schema for Quote Versioning

Tables:

- Quote: quote\_id (PK), customer\_id (FK), created\_by, created\_on, row\_status\_id, etc.
- QuoteVersion: quote\_version\_id (PK), quote\_id (FK), version\_number, quote\_amount, status\_id, is\_latest, etc.
- Customer: customer\_id (PK), customer\_name, ...
- Status / RowStatus: status\_id / row\_status\_id (PK), label

## Summary of Issues & Fixes

Area | Issue | Recommendation

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Naming | Inconsistent, non-domain names | Use singular, domain-aligned names

Normalization | 3NF violations, redundant text fields | Use FK lookups, normalize quote versions

Soft Deletes | No logical deletion | Add RowStatusId or IsDeleted

Audit Trail | Missing CreatedBy, UpdatedBy, etc. | Add standard auditing columns

Data Types | Overuse of BIGINT | Use smallest necessary numeric types

Column Sizing | Oversized VARCHAR fields | Define limits based on expected data

Foreign Keys | Missing relationships | Add FK constraints for integrity