



PREMIER UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

A Project Report On
**Development and Implementation of a Secure Bidding System: A Software
Development Approach**

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TABLE OF CONTENTS

TITLE PAGE	i
TABLE OF CONTENTS	iv
LIST OF FIGURES	v
LIST OF TABLES	1
1 Introduction	2
1.1 Background	2
1.1.1 Growth of Online Bidding	2
1.1.2 Need for Automation	2
1.2 Scope of the Project	2
1.2.1 Target Users	3
1.2.2 System Features	3
2 Problem Statement	3
2.1 Challenges in Traditional Bidding	3
2.1.1 Lack of Accessibility	3
2.1.2 Delays in Bid Processing	4
2.2 Transparency and Security Issues	4
2.2.1 Opaque Bid Evaluation Process	4
2.2.2 Security Risks	4
2.3 Need for a Modern Bidding System	4
2.3.1 Global Accessibility	4
2.3.2 Efficient Bid Management	5
3 Objectives	5
3.1 Primary Objectives	5
3.1.1 Enhanced User Experience	5
3.1.2 Security and Transparency	5
3.2 Secondary Objectives	5
3.2.1 Support for Multiple Auction Types	6
3.2.2 Real-Time Bid Processing	6
3.2.3 Reporting and Analytics	6
4 Methodology	7
4.1 Requirement Identification	7

4.1.1	Study of Existing System / Literature Review	8
4.1.2	Requirement Analysis	8
4.2	Feasibility Study	8
4.2.1	Technical Feasibility	8
4.2.2	Operational Feasibility	8
4.2.3	Economic Feasibility	9
4.2.4	Schedule	9
4.3	High-Level Design of the System	9
4.3.1	Methodology of the Proposed System	10
4.3.2	Flow Charts / Working Mechanism of the Proposed System	10
4.3.3	Description of Algorithms	11
4.4	Bid Submission Algorithm Prototype	11
4.4.1	Purpose	11
4.4.2	Process	11
4.4.3	Contribution to Solving the Problem	12
4.5	Bid Evaluation Algorithm	12
4.5.1	Purpose	12
4.5.2	Process	12
4.5.3	Contribution to Solving the Problem	12
4.6	User Authentication Algorithm	13
4.6.1	Purpose	13
4.6.2	Process	13
4.6.3	Contribution to Solving the Problem	13
4.7	Bid History and Reporting Algorithm	13
4.7.1	Purpose	14
4.7.2	Process	14
4.7.3	Contribution to Solving the Problem	14
5	Database Design	15
5.1	Database Schema	15
5.1.1	User Table	15
5.1.2	Bid Table	16
5.1.3	Relationships	17
5.2	Database Functionality	17
5.2.1	Bid Submission	17
5.2.2	Bid Evaluation	17
5.2.3	User Management	17
5.2.4	Reporting and History	18
5.3	Normalization	18

5.4	Conclusion	18
6	Expected Output	19
6.1	Addressing the Problem Statement	19
6.2	Meeting the Objectives	19
6.3	Potential Impact and Benefits	19
6.4	Deliverables	20
6.5	Conclusion	20

List of Figures

4.1	Flowchart	7
4.2	Gantt Chart demonstrating schedule feasibility	9
4.3	Flowchart	10

List of Tables

4.1	Cost Estimation for the Bidding System	9
5.1	User Table Schema	15
5.2	Bid Table Schema	16

1. Introduction

In the modern era of digital transformation, online bidding platforms have gained significant importance for auctions, procurement, and contracts. This project aims to develop a comprehensive bidding system that simplifies and automates the bidding process while ensuring fairness, security, and ease of use for all participants.

1.1. Background

The increasing demand for efficient, transparent, and accessible bidding platforms has led to the development of numerous systems that cater to diverse bidding scenarios. Traditional systems, however, face several limitations, including delays in bid evaluation, restricted access to bidders, and a lack of real-time updates.

1.1.1. Growth of Online Bidding

With the advent of e-commerce and digital platforms, online bidding has become a powerful tool for businesses and individuals alike. The shift from manual processes to digital systems has significantly reduced time and effort, while providing global access to auctions and procurement.

1.1.2. Need for Automation

Manual bidding processes often suffer from inefficiencies such as slow bid evaluations and limited transparency. Automating these processes not only accelerates the bidding cycle but also ensures a level playing field for all participants by reducing human error and bias.

1.2. Scope of the Project

This project focuses on developing a user-friendly and secure bidding system that addresses the shortcomings of traditional systems. The system will incorporate advanced features like real-time bid tracking, secure authentication, and a transparent bidding process, aiming to meet the needs of modern digital environments.

1.2.1. Target Users

The system is designed for a wide range of users, including businesses, government agencies, and individual bidders, enabling them to participate in auctions or submit procurement bids from anywhere around the world.

1.2.2. System Features

The key features of the bidding system include:

- Real-time bid submission and updates.
- Secure user authentication and data encryption.
- Transparent auction process with audit trail.
- Support for various auction types, including open and sealed bids.

2. Problem Statement

The traditional approach to conducting bids in auctions and procurements presents several challenges, including inefficiencies, limited accessibility, and lack of transparency. The aim of this project is to address these issues by developing an automated bidding system that meets the needs of modern businesses and individuals.

2.1. Challenges in Traditional Bidding

Traditional bidding methods, whether manual or semi-digital, face multiple obstacles, hindering the overall efficiency and fairness of the process. These challenges are summarized as follows:

2.1.1. Lack of Accessibility

Many traditional bidding systems are not accessible to a global audience. Bidders are often required to be physically present, or they face restricted access due to geographic or time

zone limitations. This reduces the competitiveness and inclusivity of the bidding process.

2.1.2. Delays in Bid Processing

In traditional systems, the process of bid submission, evaluation, and selection is often time-consuming, leading to delays in decision-making. This inefficiency can result in missed opportunities and higher operational costs for both bidders and auctioneers.

2.2. Transparency and Security Issues

Another major issue with traditional bidding systems is the lack of transparency and security in bid handling, which undermines trust and fairness.

2.2.1. Opaque Bid Evaluation Process

The evaluation process in many traditional systems is often opaque, leaving bidders unaware of how their offers are ranked or considered. This lack of transparency leads to dissatisfaction and a loss of trust in the system.

2.2.2. Security Risks

Traditional bidding platforms often lack the necessary security measures, making them vulnerable to data breaches, tampering, or manipulation. This compromises the integrity of the entire bidding process.

2.3. Need for a Modern Bidding System

The current environment demands a modern, automated solution that overcomes these challenges by providing a transparent, accessible, and secure platform for bids.

2.3.1. Global Accessibility

A modern bidding system should ensure that users from across the globe can participate in auctions or submit bids regardless of their location or time zone, thereby maximizing participation.

2.3.2. Efficient Bid Management

The system must facilitate real-time bid submissions, immediate evaluations, and rapid feedback to all participants. This would eliminate delays and streamline the entire bidding process.

3. Objectives

The primary objective of this project is to design and implement an automated bidding system that addresses the inefficiencies and challenges found in traditional bidding platforms. The system aims to provide a user-friendly, secure, and transparent environment for conducting bids in various auction formats.

3.1. Primary Objectives

The following are the primary objectives of the bidding system development:

3.1.1. Enhanced User Experience

The system will provide an intuitive interface that allows both bidders and auctioneers to interact seamlessly. The design will focus on usability, ensuring that users can easily submit bids, track their progress, and receive notifications.

3.1.2. Security and Transparency

The system will implement state-of-the-art security measures to protect user data and bids. Additionally, transparency will be maintained throughout the bidding process to ensure fairness and accountability.

3.2. Secondary Objectives

In addition to the primary objectives, the project also aims to achieve the following:

3.2.1. Support for Multiple Auction Types

The system will support various auction types, including sealed bids, open bids, and reverse auctions. This flexibility will allow it to cater to a wide range of users and use cases.

3.2.2. Real-Time Bid Processing

The system will process bids in real-time, providing instant feedback to users regarding their bid status. This will enhance the efficiency of the bidding process and allow for high-concurrency events without delays.

3.2.3. Reporting and Analytics

The system will include a comprehensive reporting feature that allows auctioneers to review bid data, analyze performance, and generate insights. This will help in making informed decisions for future auctions.

4. Methodology

The development of the bidding system follows a structured and iterative process to ensure the delivery of a reliable, scalable, and user-friendly platform. The methodology covers all phases, from requirement identification to the deployment and maintenance of the system.

4.1. Requirement Identification

The purpose of this section is to identify and gather the necessary requirements for the development of the bidding system. Requirements are based on user needs, functional specifications, and non-functional aspects like security, scalability, and performance.

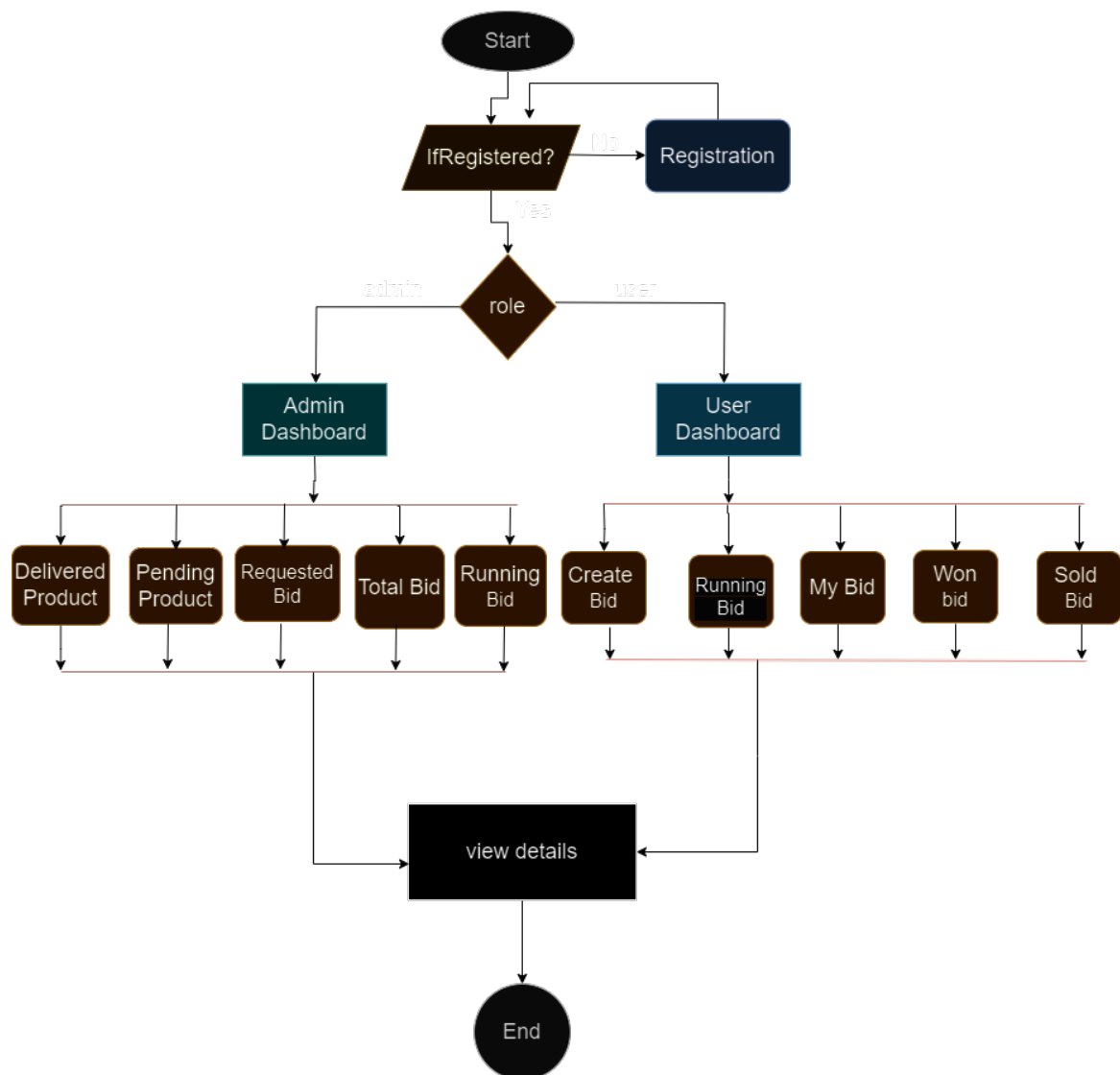


Figure 4.1: Flowchart

4.1.1. Study of Existing System / Literature Review

A detailed study of current bidding systems is carried out to understand the limitations and strengths of available solutions. This review focuses on existing platforms, their core functionalities, performance under heavy load, and user interfaces. Several research papers and market analysis reports are examined to provide insight into areas for improvement in the proposed system.

4.1.2. Requirement Analysis

This part focuses on analyzing the requirements gathered in the previous sections. The analysis covers functional and non-functional aspects, such as user account management, bidding processes, real-time updates, security features, and system scalability. Each requirement is classified as mandatory or optional to ensure a clear scope of development.

4.2. Feasibility Study

The feasibility study assesses whether the proposed bidding system is viable and can be successfully implemented.

4.2.1. Technical Feasibility

This subsection evaluates the technical capabilities required to develop the system. The study examines available technology stacks, database options, front-end and back-end frameworks, and hosting services. It ensures that the required tools and technologies are accessible and that the development team possesses the technical skills to build the system.

4.2.2. Operational Feasibility

Operational feasibility evaluates how well the proposed system will fit into the existing environment. This analysis involves assessing user familiarity with similar systems, ease of use, and integration with other services like payment gateways, email notifications, and customer support.

4.2.3. Economic Feasibility

Economic feasibility involves analyzing the cost-benefit structure of the project. A cost analysis is performed to determine the budget required for the development and operation of the bidding system. The following table shows the estimated costs.

Cost Element	Estimated Cost (in USD)
Development Team	15,000
Infrastructure (Servers, Databases)	5,000
Marketing	3,000
Maintenance	2,000
Total	25,000

Table 4.1: Cost Estimation for the Bidding System

4.2.4. Schedule

The Gantt chart below represents the project timeline, outlining key phases such as requirement analysis, design, development, testing, and deployment.

	Task	02-06-2024 to 06-06-2024	07-06-2024 to 15-07-2024	16-07-2024 to 11-09-2024
	Bidding System Build			
01	▪ Planning			
02	▪ Front-end design			
03	▪ Back-end design			

Figure 4.2: Gantt Chart demonstrating schedule feasibility

4.3. High-Level Design of the System

This section outlines the high-level design of the bidding system, including architecture, modules, and interaction between system components. The system is divided into modules such as User Management, Bid Management, Payment Processing, and Reporting. Each module interacts through well-defined APIs to maintain scalability and separation of concerns.

4.3.1. Methodology of the Proposed System

The proposed bidding system follows an Agile development methodology. The project is divided into sprints, each lasting two weeks, allowing for iterative development, continuous feedback, and adjustments as needed. The system is built using a modular approach to facilitate updates and integration with third-party services.

4.3.2. Flow Charts / Working Mechanism of the Proposed System

The following flowchart illustrates the workflow of the bidding system, starting from user registration to bid placement and auction completion. The system ensures that bids are processed in real-time, and users are notified of auction results via email or SMS.

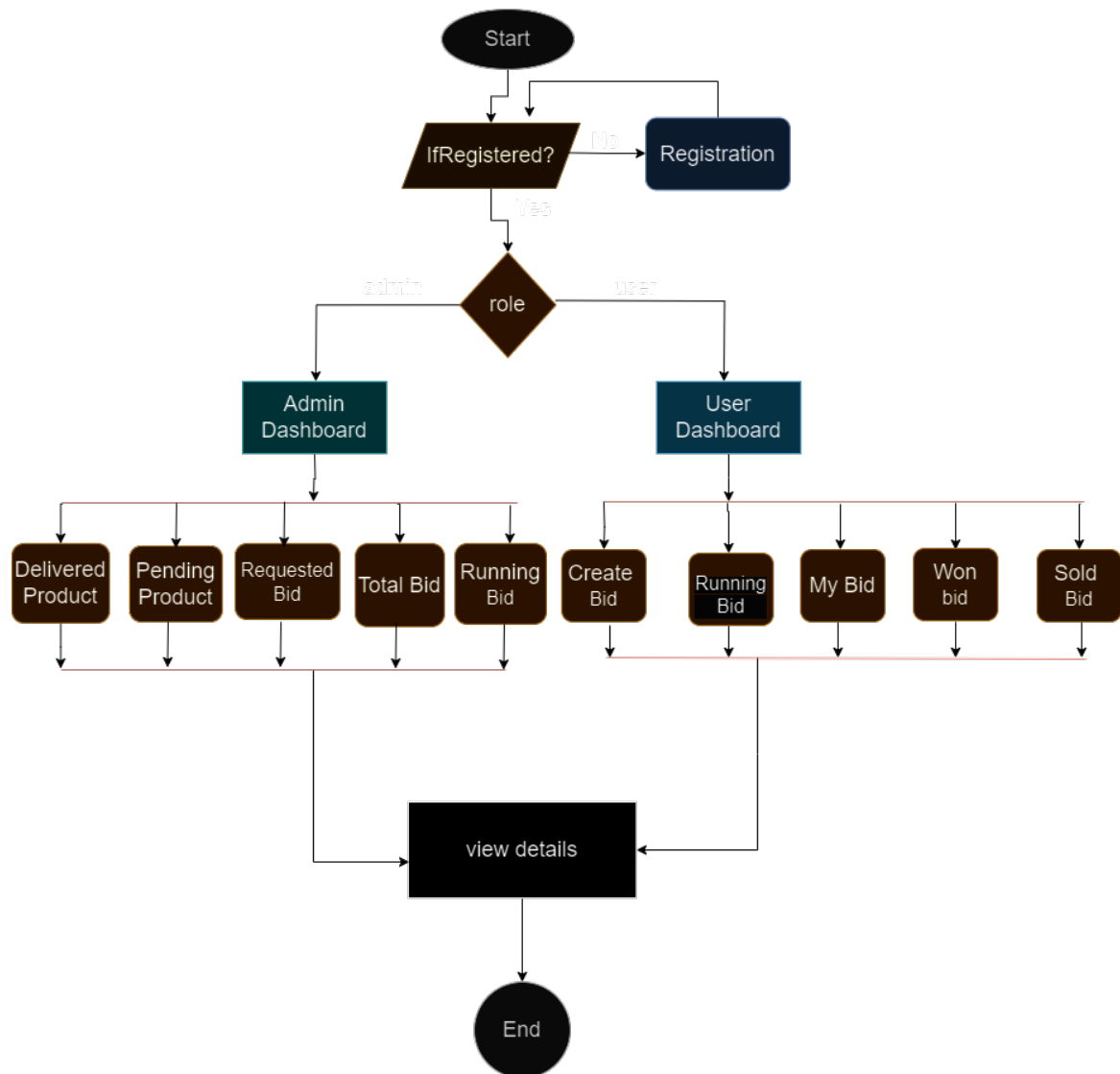


Figure 4.3: Flowchart

4.3.3. Description of Algorithms

In this section, we describe the algorithms that will be implemented in the bidding system software. These algorithms are crucial to ensuring the system functions efficiently and meets the requirements. Each algorithm has been designed to address specific challenges within the system.

4.4. Bid Submission Algorithm Prototype

The Bid Submission Algorithm is responsible for handling and validating bid submissions from users. It ensures that each bid is recorded accurately and complies with the defined bidding rules.

4.4.1. Purpose

The primary purpose of the Bid Submission Algorithm is to accept, validate, and store user bids. It checks whether the bids are placed within the allowable time frame and ensures that no duplicate or invalid bids are submitted. This algorithm is essential for maintaining the integrity of the bidding process.

4.4.2. Process

The algorithm follows these steps:

1. Accepts the user's bid input (bid amount, bidder details, item ID).
2. Verifies that the bid amount meets the minimum bid requirement.
3. Checks if the bidding period is still open for the selected item.
4. Ensures that the same bidder has not submitted multiple bids within a restricted time frame.
5. If all conditions are met, the bid is stored in the system database.
6. Sends a confirmation to the bidder once the bid is successfully submitted.

4.4.3. Contribution to Solving the Problem

By automating the validation and recording of bids, this algorithm ensures that only valid bids are considered. It prevents errors and manipulation in the bidding process, contributing to the system's reliability and fairness.

4.5. Bid Evaluation Algorithm

The Bid Evaluation Algorithm is designed to automatically evaluate and rank bids based on predefined criteria, such as the highest bid amount or earliest submission time.

4.5.1. Purpose

This algorithm ranks bids for each item and selects the winning bid. It ensures that the evaluation is fair and transparent by following the predefined criteria strictly.

4.5.2. Process

The algorithm works as follows:

1. Retrieves all valid bids for the item from the database.
2. Sorts the bids based on the highest amount.
3. In case of multiple bids with the same amount, uses the earliest submission time as a tiebreaker.
4. Marks the top-ranked bid as the winning bid.
5. Notifies the winning bidder and updates the system to reflect the result.

4.5.3. Contribution to Solving the Problem

This algorithm ensures that the bidding process is both transparent and efficient. It automates the decision-making process, reducing the potential for human error and ensuring that the highest or best bid wins.

4.6. User Authentication Algorithm

This algorithm handles user authentication, ensuring that only authorized users can participate in the bidding process.

4.6.1. Purpose

The purpose of this algorithm is to authenticate users based on their credentials. It prevents unauthorized access to the system, safeguarding both user data and the integrity of the bidding process.

4.6.2. Process

The algorithm proceeds as follows:

1. Accepts user credentials (username and password).
2. Hashes the password for security.
3. Verifies the credentials against the system's database.
4. Grants access if the credentials are valid, or denies access otherwise.

4.6.3. Contribution to Solving the Problem

By securing access to the system, this algorithm ensures that only registered users can participate in the bidding process, thereby protecting the system from unauthorized access and potential fraud.

4.7. Bid History and Reporting Algorithm

This algorithm provides users with the ability to view their bid history and generate reports for analysis.

4.7.1. Purpose

The Bid History and Reporting Algorithm allows users to track their bidding activities and analyze their performance. This feature enhances user engagement and transparency.

4.7.2. Process

The algorithm works as follows:

1. Retrieves the user's bid history from the database.
2. Formats the data into a user-friendly interface.
3. Generates a report summarizing key metrics such as total bids placed, highest bid, and winning bids.

4.7.3. Contribution to Solving the Problem

By providing detailed bid history and reporting features, this algorithm increases user trust in the system. It allows users to make informed decisions and promotes transparency in the bidding process.

5. Database Design

In this section, we describe the database design for the bidding system. The database is crucial for managing bids, users, items, and other essential information. The design aims to ensure data integrity, efficiency, and scalability.

5.1. Database Schema

The database schema is organized into two main tables: 'user' and 'bid'. Below is an overview of these tables and their structures.

5.1.1. User Table

The user table stores information about registered users. Its schema is as follows:

Column Name	Data Type
id	INT (PRIMARY KEY)
role	VARCHAR(255)
name	VARCHAR(255)
phone_number	VARCHAR(255)
email	VARCHAR(255)
password	VARCHAR(255)

Table 5.1: User Table Schema

- **id**: Unique identifier for each user. This is the primary key of the table.
- **role**: Defines the role of the user in the system (e.g., admin, bidder). Stored as a string with a maximum length of 255 characters.
- **name**: Full name of the user. Stored as a string with a maximum length of 255 characters.
- **phone_number**: Contact phone number of the user. Stored as a string to accommodate various formats.
- **email**: Email address of the user. Stored as a string with a maximum length of 255 characters.
- **password**: Encrypted password for user authentication. Stored as a string with a maximum length of 255 characters.

5.1.2. Bid Table

The bid table records details about each bid. Its schema is as follows:

Column Name	Data Type
id	INT (PRIMARY KEY)
name	VARCHAR(255)
description	VARCHAR(255)
starting_price	VARCHAR(255)
ending_price	VARCHAR(255)
starting_date	DATE
ending_date	DATE
image	VARCHAR(255)
status	VARCHAR(255)
delivery_status	VARCHAR(255)
user_id	INT (FOREIGN KEY)
bidder_id	INT (FOREIGN KEY)

Table 5.2: Bid Table Schema

- **id**: Unique identifier for each bid. This is the primary key of the table.
- **name**: Name or title of the bid. Stored as a string with a maximum length of 255 characters.
- **description**: Detailed description of the bid. Stored as a string with a maximum length of 255 characters.
- **starting_price**: Initial price for the bid. Stored as a string to accommodate various price formats.
- **ending_price**: Final price for the bid. Stored as a string to accommodate various price formats.
- **starting_date**: Date when the bid starts. Stored in DATE format.
- **ending_date**: Date when the bid ends. Stored in DATE format.
- **image**: URL or path to an image related to the bid. Stored as a string with a maximum length of 255 characters.
- **status**: Current status of the bid (e.g., active, closed). Stored as a string with a maximum length of 255 characters.
- **delivery_status**: Status of the delivery (e.g., pending, completed). Stored as a string with a maximum length of 255 characters.

- **user_id:** Identifier of the user who created the bid. This is a foreign key referencing the 'id' in the 'user' table.
- **bidder_id:** Identifier of the user who placed the bid. This is a foreign key referencing the 'id' in the 'user' table.

5.1.3. Relationships

The relationships between the tables are as follows:

- The `user_id` column in the `bid` table is a foreign key that references the `id` column in the `user` table. This establishes which user created each bid.
- The `bidder_id` column in the `bid` table is also a foreign key that references the `id` column in the `user` table. This identifies which user placed each bid.

5.2. Database Functionality

5.2.1. Bid Submission

When a user submits a bid, the system records the bid details in the `bid` table. The system ensures that the bid amount is higher than the current highest bid for the item and that the bid is placed within the bidding period.

5.2.2. Bid Evaluation

To determine the winning bid, the system queries the `bid` table to find the highest bid for each item. It considers both the bid amount and the submission time to handle tie cases effectively.

5.2.3. User Management

The system manages user authentication by verifying credentials stored in the `user` table. Passwords are securely stored as hashed values to enhance security.

5.2.4. Reporting and History

The system generates reports and displays bid history by querying the bid table. This allows aggregation of data for each user or item to provide insights into bidding activities.

5.3. Normalization

To ensure data integrity and minimize redundancy, the database schema adheres to normalization principles up to the Third Normal Form (3NF). This involves:

- Ensuring each table contains only related data and has a primary key.
- Making sure non-key attributes are dependent on the primary key.
- Eliminating transitive dependencies between non-key attributes.

5.4. Conclusion

The designed database schema efficiently supports the core functionalities of the bidding system. It facilitates secure and efficient bid submission, evaluation, and user management, while adhering to normalization standards for data integrity and scalability.

6. Expected Output

The anticipated outcomes of the bidding system project will directly address the problem statement and meet the project's objectives. The primary expected output is the development of a secure and efficient online bidding platform that allows users to participate in auctions in real time, ensuring transparency and fairness.

6.1. Addressing the Problem Statement

The project aims to solve the inefficiencies and security concerns associated with traditional bidding systems. The expected output includes the successful implementation of features such as user authentication, secure bid placement, real-time bid updates, and automated auction closure. By providing a more streamlined and secure bidding process, the system will alleviate common challenges like bid tampering and delayed notifications, thus ensuring a reliable platform for both buyers and sellers.

6.2. Meeting the Objectives

Upon completion, the system will meet the following objectives:

- Provide a user-friendly interface for bidding and auction management.
- Ensure secure and transparent handling of user data and bids.
- Support real-time updates and notifications during auctions.
- Facilitate automated processes for starting and closing auctions, reducing manual intervention.

These features will fulfill the core objectives outlined in the project, leading to a more efficient and accessible bidding experience.

6.3. Potential Impact and Benefits

The successful completion of this project will have both practical and academic impacts:

- **Practical Applications:** The bidding system can be deployed in various sectors, including e-commerce, government tenders, and real estate auctions. Its flexibility allows for custom integration depending on industry needs.
- **Improved Efficiency:** Automation of the bidding process will reduce operational delays and errors, while real-time notifications will ensure timely participation and decision-making for users.
- **Security Enhancement:** The implementation of secure user authentication and encryption will mitigate risks of fraud and unauthorized access, ensuring data integrity.
- **Knowledge Contribution:** The development of this system contributes to the growing body of knowledge in software development for online platforms, particularly in areas such as real-time systems, security, and user interface design.

6.4. Deliverables

The project deliverables include:

- A fully functional bidding system application.
- Comprehensive documentation, including user manuals and technical specifications.
- Source code repository with proper version control.
- A final project report detailing the design, development, and evaluation of the system.

6.5. Conclusion

The anticipated outcomes of this project are designed to solve the identified problem and achieve the stated objectives. The successful deployment of the system will offer significant benefits in terms of security, efficiency, and transparency in the bidding process, making it a valuable tool for organizations and users alike.

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