Analyzing, Designing and Implementing a Web-Based Auction online System

Razan Aldaej, Latifa Alfowzan, Reem Alhashem, Mutasek K. Alsmadi, Ibrahim Al-Marashdeh, Usama A Badawi, Muneearah Alshabanah, Danial Alrajhi and Mohammed Tayfour

Department of Management Information Systems, College of Applied Studies and Community Service, Imam Abdulrahman Bin Faisal University, Al-Dammam, Saudi Arabia.

Abstract

Nowadays, the online web-based auction system has become the extremely popular component in the electronic marketplace. A practical case study will be introduced in this work to highlight the best practices for analysing and designing an online web-based auction system. The proposed Online Web-Based Auction System (OAS) was designed and implemented using the UML (in order to illustrate the architectual model), Microsoft Access 2010 and ASP.NET programming language. In the proposed OAS, the UML offering several diagrams to enable the new functions to be updated and added easily such as use case, sequence and class diagrams, and user interfaces. The proposed OAS will help the bidders to bid in fast and increase his chances to make a successful bid by suggesting a bid price, and help the seller to achieve maximum profit. Along with the tools that have been used based on the analysis and implementation environment, the proposed OAS offers excellent advantages for the support of system development.

Keywords: Information System; Auction System and Unified Modeling Language.

INTRODUCTION

In the recent years, the electronic marketplace has been an exponentially grown in usability, size and worth. It is expected that this trend will exaggerate in the upcoming years [1]. As a consequence of the rapidly growing internet environment, the customer can conveniently obtain the products that he/she purchases from the traditional market by online auction systems. Online auctions are a main component of the electronic marketplace that makes use of electronic commerce mechanisms.

Auction systems are a main constituent of the electronic marketplace, it allows users at any place to buy and sell products. The sellers are able to set up auctions for any product they have and the bidder who bids the top amount gains the right for purchasing the auction product [1-5].

A scheme for the online auction system based on the campus network was presented by Ren in [6] using the UML technique. Therefore, two steps were adopted to design the scheme of the proposed online auction system based on the use activity diagrams, case diagrams, sequence diagrams, class diagrams and deployment diagrams. The designed scheme provided a certain reference values for realising the digital campus and constructing the campus electronic commerce.

A Secure Online Auction System has been analyzed, designed and implemented by Majadi et al., in [1]. In their work, the authors created their online auction server for carry out auction-related research, to test the countermeasures of fraud in a controlled environment. The designed and implemented online auction system was named the uAuction. The authors claimed that there is a limited of the useful literature for the auction system design and implement. The authors have been employed the Unified Modeling Language (UML) to analyse and design of the proposed uAuction system to show the architectural model, subsystems, activity workflows, use cases, class diagram, system sequence diagrams and user interfaces.

The technological revolution influenced everything [7-16], even the methods of marketing and business applications for the real world business issues. Nowadays, Artificial Intelligence (AI) algorithms were used widely for solving several difficult problems such as image segmentations [17-25], medical image analysis [26-30], nurse rostering problem [31], Healthcare Monitoring [32, 33], Learning Management System [34], patterns recognition and information retrieval [35-46], and river flow forecasting [47-49]. Many researchers have used the AI algorithms and Machine Learning in marketing and business applications such as auction systems [50-54].

The reset of the paper is organized as follow; system analysis will be described in section 2, database testing and construction will be illustrated in section 3. System implementation will be illustrated in section 4. Results will be discussed in section 5. Finally, the conclusion is presented in section 6.

SYSTEM ANALYSIS

The UML has been developed to offer a standardised notation to define Object Oriented Models. However, to effectively apply the UML notation, it must be employed with an Object-Oriented Analysis and Design method [55-59]. Object-Oriented analysis and design (OOAD) refers to a group of methodologies to produce business component based software. The methodology summaries the life cycle of system development identifying the deliverables and tasks in.
an object-oriented project [60]. Using a combination of UML notation and process, the life cycle of system development can be reduced, the system can be easily maintained, and the modules reusability can be improved.

Conventionally, requirements analysis comprised of finding functions and relevant data that will be supported by the software system. The entity-relationship diagrams will describe the data that the system will handle, while data flows will describe the functions [61, 62]. Object-oriented software development uses new methods of design, which are supported by computer-aided software engineering tools such as Rational Rose [5].

The UML is a language used to specify, visually model [62], and document the artifacts of an Object-Oriented system under development. It denotes a number of ideas unification from various methods. UML is used in the system design to improve its reusability and maintainability. Object-oriented analysis methods offer class, use case, state chart, sequence and other diagrammatic notations for modeling[61]. UML has been employed effectively in many projects for modeling different requirements and architectures [62].

Use case diagram, class diagram and sequence diagram were selected for the user’s requirements analysis; Class Diagrams were selected to represent the classes’ static structure.

Therefore, this work designs and implements the online web-based auction system (OAS) using UML. Where in the proposed OAS, the UML offering several diagrams to enable the new functions to be updated and added easily such as: use case, sequence, class diagrams, and user interfaces. The proposed OAS will help the bidders to bid in fast and increase their chances to make a successful bid by suggesting a bid price, and help the seller to achieve maximum profit.

Use Case Diagram

The use case diagram is a visualization of a use-case [58, 62-64], i.e., the auction system interaction with the users. In the proposed OAS the use case mainly consists of register case, search product case, post a product case, view product details case, modify bid amount case, make a bid for product, specify time and price of bidding,.. etc. Figure 1 shows the use case diagram for the actions that the actors (Seller, Bidder and Admin) can perform in an auction.

Mainly 3 actors (Admin, Bidder and Seller) will be interacting with the proposed system; each one can do the following:

- **Admin:**
  - Admin can manage products
  - Admin can manage the departments
  - Admin can manage users
  - Admin can manage bidding
  - Admin can create reports.

- **Bidder:**
  - Bidder can search for a product
  - Bidder can view product details
  - Bidder can modify bid amount
  - Bidder can make a bid for product
  - Bidder can edit profile information.

- **Seller:**
  - Seller can post a product
  - Seller can specify time and price of the bidding
  - Seller can view bidding information
  - Seller can edit profile information.

![Figure 1: The use case diagram.](image)

Class Diagram

In Object-Oriented analysis and design, the class diagram is the most essential entity. It defines the kinds of objects that are present in the system and describes the static relationships between the system internal classes [58]. The operations and attributes of a class and the constraints that apply to the objects connection can be shown by the class diagram. Figure 5 displays the OAS class diagram. Figure 2 shows the OAS entities, such as admin, product, bidder, seller and bidder, etc.
Sequence Diagram

A sequence diagram is one of the UML dynamic models [60, 65], and it defines the interaction scene between the objects in time when the use case was executed and highlights the information sending time priority among objects. Usually, the sequence diagram illustrates the single use-case behavior. Figure 3 demonstrates the bidder sequence diagram in the proposed OAS.
DATABASE TESTING AND CONSTRUCTION

The database testing is essential for finding errors that can affect the security, consistency, reliability and performance of the system, and it is important for system validation against the user specified requirements [66, 67]. Microsoft Access 2010 was used for database implementation. The tables below are examples of the created tables.

Table 1: Seller table

<table>
<thead>
<tr>
<th>SellerNo</th>
<th>SellerFName</th>
<th>SellerLName</th>
<th>SellerUsername</th>
<th>SellerPassword</th>
<th>SellerEmail</th>
<th>Gender</th>
<th>MobileNo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amal</td>
<td></td>
<td>amal</td>
<td>1234</td>
<td><a href="mailto:amal@hotmail.com">amal@hotmail.com</a></td>
<td></td>
<td>55660088789</td>
</tr>
<tr>
<td>2</td>
<td>suha</td>
<td></td>
<td>suha</td>
<td>3989</td>
<td><a href="mailto:suhasj@hotmail.com">suhasj@hotmail.com</a></td>
<td></td>
<td>4456779076</td>
</tr>
<tr>
<td>3</td>
<td>eman</td>
<td></td>
<td>eman</td>
<td>758688</td>
<td><a href="mailto:eman.d@hotmail.com">eman.d@hotmail.com</a></td>
<td></td>
<td>5564590787</td>
</tr>
<tr>
<td>4</td>
<td>afran</td>
<td></td>
<td>afran</td>
<td>667766</td>
<td><a href="mailto:afran.dmd@gmail.com">afran.dmd@gmail.com</a></td>
<td></td>
<td>7778878987</td>
</tr>
<tr>
<td>5</td>
<td>loalo</td>
<td></td>
<td>loalo</td>
<td>123123</td>
<td><a href="mailto:loalo@hotmail.com">loalo@hotmail.com</a></td>
<td></td>
<td>0900900909</td>
</tr>
<tr>
<td>6</td>
<td>manal</td>
<td></td>
<td>manal</td>
<td>12345</td>
<td><a href="mailto:manal@hotmail.com">manal@hotmail.com</a></td>
<td></td>
<td>08989889898</td>
</tr>
</tbody>
</table>

Figure 3: The bidder sequence diagram.
SYSTEM IMPLEMENTATION

This section shows the proposed work’s artifacts in addition to the implementation which came after the system analysis and design. The system analysis and configuration results of the proposed system are presented. The ASP.NET programming language and HTML have been used relying on their features that make them appropriate for this work. The user have to register as a bidder or seller (as shown in figure 4) to be start using the proposed system, the proposed system, OAS puts a user (bidder or seller) on the welcome web page from where a registered user (bidder or seller) can be verified by the proposed system site to start a protected session (log in) as displayed in figure 5. An unregistered user has to fill the form of the registration to use the system. A bidding interface is represented in figure 6.

Figure 4: Registration interface

Figure 5: Log in interface

Figure 6: Bidding interface
RESULTS AND DISCUSSION

The proposed system has been tested in order to measure its usability, where the proposed system was tested by operating on Internet Explorer, Google Chrome and Mozilla Firefox with the local host server. Twenty students evaluated the system prototype from Imam Abdulrahman Bin Faisal University (IAU). After given a brief explanations about how to use the system, the students have been tested the proposed system and answer the survey questionnaire (contains 10 questions measured by 5-point Likert Scale). The aim of the proposed survey is to measure the user satisfaction about the proposed system and prove its usability. The results obtained shows a high percentage of the students approve that the OAS is usable, useful and achieved the main project target.

Table 4: The results of data collected from the 20 students.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>9</td>
<td>14</td>
<td>12</td>
<td>15</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

CONCLUSION

This paper highlights the best practices in building and designing a web-based auction system. In this work, we designed and implemented online web-based auction system (OAS) using the UML, Microsoft Access 2010 and ASP.NET programming language. In the proposed OAS, the UML offered several diagrams to enable the new functions to be updated and added easily such as use case, sequence and class diagrams, and user interfaces. The proposed OAS will help the bidders to bid in fast and increase their chances to make a successful bid by suggesting a bid price, and help the seller to achieve maximum profit. Along with the tools that have been used based on the analysis and implementation environment, the proposed OAS offered excellent advantages for the support of system development.

REFERENCES


[41] Alsmadi M K. Query-sensitive similarity measure for content-based image retrieval using meta-heuristic algorithm. *Journal of King Saud University - Computer and Information Sciences*.


