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Implementation of the user-centered design (UCD) method for designing web marketplace of qurban cattle sales in Indonesia

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ARTICLE INFO

Article history:

Received 7 February 2020

Revised 12 June 2020

Accepted 15 June 2020

Published 2 July 2020

Keywords:

designing web marketplace
user-centered design
user experience design
user interface design
usability testing

IEEE style in citing this article:

E. Rahmawati,
"Implementation of the user-centered design (UCD) method for designing web marketplace of qurban cattle sales in Indonesia," *Register: Jurnal Ilmiah Teknologi Sistem Informasi*, vol. 6, no. 2, pp. 96-108, 2020.

ABSTRACT

This study aims to create a user interface design for the designing web marketplace of qurban cattle sales in East Java, Indonesia. The word qurban referred as the qurban animal slaughtered during the Eid al-Adha, especially the cow. The qurban web market can help breeders and customers in the process of selling cattle directly without limited territory. This is because the process of selling qurban cows is still done traditionally by ordering directly by phone and coming directly to the cattle pen for the selection of qurban animals desired by consumers. To deal with these problems, an alternative solution is needed that can create a Web Marketplace interface design that is designed using the User-Centered Design (UCD) method, focusing on the user's primary needs. This method was chosen because it focuses on the user's goals, characteristics, and workflow in the design process. How the system can be understood and used by users is a top priority in this web design and involves users in designing the marketplace web interface. Therefore it is very suitable for designing a website that is simple and easy to use. The design of the web marketplace of qurban cattle sales has four main features which are promotion of qurban cattle, online qurban cattle bookigs (direct purchases or livestock care services), payment confirmation, and qurban cattle contributions for collective purchases or in groups. The results of the System Usability Scale (SUS) test distributed to 30 respondents obtained a value of 79.3 which indicates that the qurban web marketplace design can be accepted by users and can be classified as good design.

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1. Introduction

The Indonesian Ministry of Agriculture estimates that the demand of qurban animals has increased by around 5%-10% from the previous year. The word qurban referred here as the qurban animal slaughtered during the Eid al-Adha, especially the cow. Sales of cattle and all of their products are still mostly done in markets close to livestock production areas. So the market reach is limited to the area [1]. Some conventional breeders still do promotions by placing advertisements on the side of the road, word of mouth or buyers come directly to the breeders' cages to be able to choose quality qurban animals. This conventional promotion method still causes many problems including qurban animal products sold which are not following the advertisements, sales without clear information, and only pursue profit.

Marketing can be done conventionally or using digital technology following the current culture of society [2]. Both of these methods can increase the profits of breeders as well as to increase the market reach of the breeder. With the development of marketing using digital technology following the current culture of society, it was considered more effective in terms of disseminating information about a business in all fields, including marketing a livestock company in Garut, West Java which focused in livestock such as PT. Lembu Besar Sejahtera (LBS), cattle sales in East Nusa Tenggara (NTT),

and several farmer partners in East Java, Indonesia. Online marketplace are more likely to serve an industry with underlying technology's potential applications [3, 4].

Fulfilling the needs of qurban animals only occurs when approaching the Eid al-Adha event. The increasing needs of the community have an impact on the treatment process cattle in large numbers, so few breeders have a storage partner that can take care of the cows nearby until it is ready to be slaughtered with following a predetermined standard. However, there are obstacles when buyers want to buy qurban cattle in groups. Sellers also have responsibility to find the customers who wanted to buy the cattle in groups. If it does not succeed in getting a customer, then the possibility of qurban cattle doesn't sell and the breeder will suffer losses. As a result, breeders do not have a competitive advantage and are unable to compete with the market [5].

The business process still carried out conventionally and the results cannot be maximized. This is because the market reach and prices of livestock only apply to that region. The qurban cattle sales process has the potential to be further developed by implementing information system solutions. Therefore, this research proposes making the user interface design as the first step for built marketplace-based information system solution as an online sales medium for livestock. In addition, there is a need to improve up to date publication of market information to enable users to get reliable prices via web and mobile phones [6].

To deal with these problems, an alternative solution is needed that can create a web marketplace interface design using the User-Centered Design (UCD) method, focusing on the user's primary needs. The design of the web marketplace of qurban cattle sales has four main features there are promotion of qurban cattle, online qurban cattle bookings (direct purchases or livestock care services), payment confirmation, and qurban contributions for collective purchases or in groups. The design of this application helps the programmer to understand the User Interface (UI) needs and help the sellers of cattle herds to sell qurban cows directly to end buyers in the surrounding area.

The UCD method has been widely used to overcome User Interface and User Experience or UI/UX design problems in various fields. Such as, to design and develop health care [7, 8], designing devices for elderly people based on computers [9, 10], combining Human-Computer Interaction (HCI) design and the concept of entrepreneurial business ideas in parallel [11], designing and developing computer games for motor-impaired users [12], for the design and implementation of health SMS (Short Message Service) and treatment in cattle in livestock in Mandera City, Kenya [13]. In addition, the application of the Graphical User Interface (GUI) for various Internet of Things (IoT) projects also requires a UI/UX design process to be able to obtain the results of the requirement analysis and user profiles appropriately [14].

2. Method

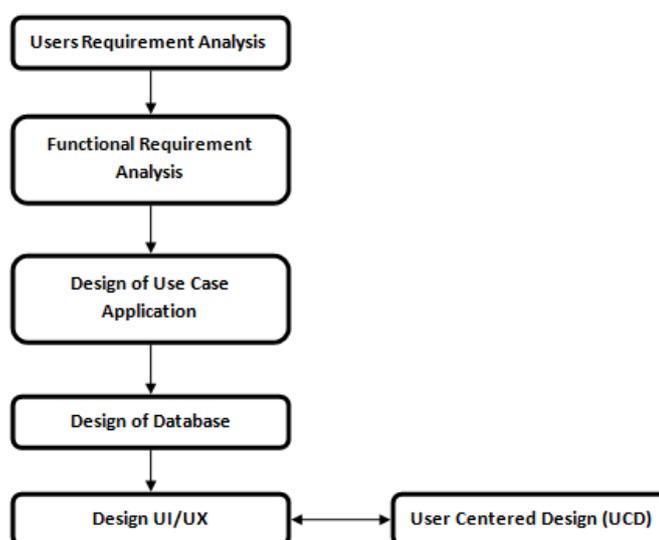


Figure 1. Research method

Research stages of UCD methods applied in this research can be seen in Figure 1. The study started with survey and analysis process conducted to breeders in Mojokerto managed by UD. Mustiko Al-Amin.

The business owner has an online website www.sapiqurban.info, and has been operating from 2014 until the beginning of 2018. However, the website is currently inaccessible because the owner wants to redesign their Website according to user needs. In order to market their products the owner used Facebook, Telephone and directly come to cattle pen in Mojokerto [15].

This step supplemented by interviews and requests for opinions from cattle breeders and customers of qurban cattle, especially cows in Ngawi Regency, Mojokerto Regency, and Surabaya in East Java, Indonesia. At this stage of the research method, 5 stages must be carried out, which are user requirement analysis, functional requirement analysis, application use case design, database design, and design UI/UX.

2.1. User requirement analysis

Users who will use the qurban web marketplace consist of sellers, buyers, animal husbandry services, and web admin as the main manager of the web marketplace. User selection is based on the following characteristics:

- a. For sellers, buyers, and livestock care services, which are consist of men from Mojokerto, Ngawi, and Surabaya, because the majority of sellers, buyers, and livestock care services are mostly done by men. The interviewee age ranged between 40 and 60 year old the percentage of the number of users taken for the sample is 30% Sellers, 40% Buyers, and 20% Livestock Retention Services from a total of 30 respondents selected. On average, breeders and livestock care services have been traditionally operating qurban cattle sales for more than 10 years.
- b. We chose mixture of male and female as web admin because it is more common and has the ability to operate computers and understands web management in the Information Technology (IT) field. The admin ranged from 25-35 year old originating from the city of Surabaya which is 10% of the total 30 respondents selected.

Table 1. User requirements

| No | Users | Data Requirement/Information |
|----|----------------------------------|---|
| 1. | Website admin | <ul style="list-style-type: none"> • Master data of breeders (qurban cattle sellers) • Master data of customers (qurban cattle buyer) • Master data of farmer partners (animal care services) • Master data of regional and qurban cattle • Periodic reports on individual or collective / group sale of qurban cattle • periodic reports on animal delivery by direct send or animal care services system • User access rights settings • Periodic reports of payment and confirmation, can be done by cash or bank transfer |
| 2. | Breeders (qurban cattle sellers) | <ul style="list-style-type: none"> • Qurban cattle catalog • List of farmer partners • List transactions of individual or collective / group sale of qurban cattle • List of animal delivery by direct send or animal care services system • Payment confirmation of qurban cattle • Delivery status of qurban cattle |
| 3. | Customers (qurban cattle buyer) | <ul style="list-style-type: none"> • Qurban cattle catalog • List of breeders (qurban cattle sellers) • History of qurban cattle sales • Payment confirmation of qurban cattle • Delivery status of qurban cattle |
| 4. | Farmer partners | <ul style="list-style-type: none"> • Approval confirmation of animal care services • List of customers (qurban cattle buyer) • List of breeders (qurban cattle sellers) • History of sales transaction with animal care services system |

The user requirement analysis phase of designing web marketplace of qurban cattle sales can be seen in Table 1. User identification divided into 4 roles that have each function in the system for designing web marketplace of qurban cattle sales.

2.2. Functional requirement analysis

The functional requirement analysis of web marketplace of qurban cattle sales are as follows:

- Data management of breeder masters/cattle sellers, farmer partners, and qurban cattle customers.
- Promotion of qurban cattle with qurban catalog.
- Recording of sales transactions in 2 ways, namely direct sales or sales inquiry system animal care services.
- Individual or collective/group qurban cattle sales transactions.
- Payment and confirmation, can be done by cash (coming directly to the breeder) or bank transfer.

From the functional requirement analysis phase we got nine functionalities which can be seen in Table 2. The requirement achieved from interviews and opinions of the interviewee. The interviewee are cattle breeder and customers from Mojokerto, Ngawi and Surabaya.

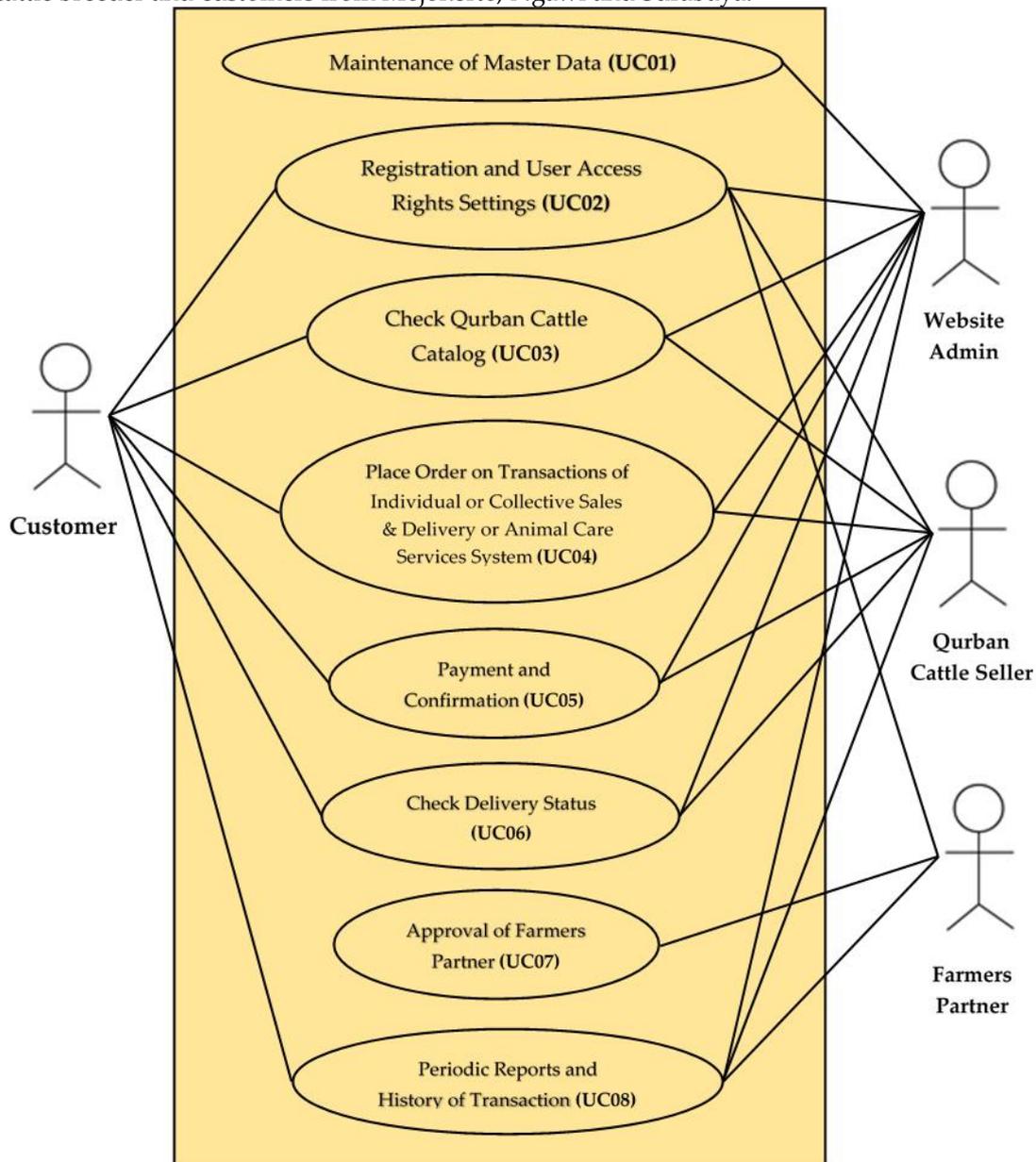


Figure 2. Use case design of designing web marketplace of qurban cattle sales

2.3. Application use case design

Author will use the UML (Unified Modeling Language) as the architectural design modelling language. Use case design obtained from business processes that occur in the field and based on the functional requirements of the system.

Table 2. Functional requirement

| No | Functional Requirement | Use Case Code |
|----|---|---------------|
| 1. | Data management of breeder masters, customers, farmer partners, regions, and website admins | UC01 |
| 2. | Registration and user access rights settings | UC02 |
| 3. | Check qurban cattle catalog | UC03 |
| 4. | Place order on transactions of individual or collective/group sale of qurban cattle | UC04 |
| 5. | Place order on animal delivery by direct send or animal care services system | UC04 |
| 6. | Payment and confirmation, can be done by cash or bank transfer | UC05 |
| 7. | Notification of delivery status for qurban cattle | UC06 |
| 8. | Approval of breeders partner for animal care services system | UC07 |
| 9. | Periodic reports and history of transaction qurban cattle sales | UC08 |

Figure 3 show the architectural design of the web qurban marketplace. This diagram show the architectural recommended for the system implementation which come first before the use case implementation.

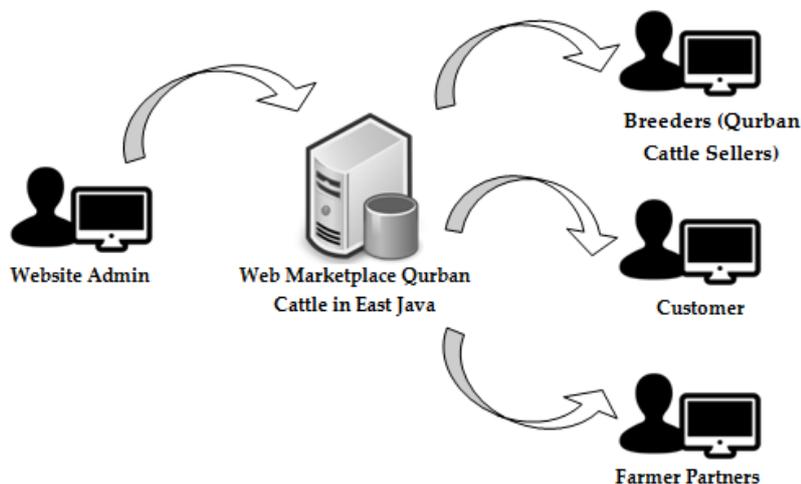


Figure 3. Architecture design of designing web marketplace qurban cattle sales in East Java

Based on Figure 3, we divide the user into 4 categories which are website admin, breeder, customer and farmer partner. Their responsibility can be seen in the Figure 2. Website admin must regulate user access rights, master data management, and get reports on all transactions periodically. For sellers, they will be involved in uploading a catalog of qurban cattle, sales transactions with buyers, shipping/delivery transactions, sending messages, and notifications for farmer partners for animal husbandry services, and receiving periodic transaction reports. Customers can make sales transactions, check shipping/delivery status, and payment transactions. For farmer partners, we will get a notification that there will be an animal care services and confirmation of approval from the farmer partner, whether it can still receive the daycare services or have been fully charged by other customers.

2.4. Database design

The database design for web marketplace of qurban cattle sales which consists of 9 tables including (1) Admin table, (2) Seller table, (3) Customer table, (4) Farmer partner table, (5) Sales transaction table, (6) Shipping/delivery table, (8) Animal care service table, dan (9) Collective table.

2.5. Design UI/UX

Website UI/UX design consist of, color, wording and proper language (copywriting), designing interaction (button, menus, icon, etc.) and designing Input/Output (I/O) interface [16]. As for the technical quality, it can be seen from the side of website operation, seller/buyer response, website security, website features, and website marketplace trial results. Interface Design uses the concept of UCD which will focus on user requirements [16, 17, 18]. This research focuses on UI/UX design due to

the desire of researchers to be able to convince users and get a detailed list of user requirements in transacting and interacting with qurban cattle sales information systems online. This is done with consideration that there are already other similar online qurban cattle sales applications.

Table 3. Mockup map with the user's goals

| No | Users | Data Requirement/Information | User Goals | Mockup |
|----|----------------------------------|---|---|--|
| 1. | Website admin | <ul style="list-style-type: none"> Master data of breeders (qurban cattle sellers) Master data of customers (qurban cattle buyer) Master data of farmer partners (animal care services) Master data of regional and qurban cattle Periodic reports on individual or collective/group sale of qurban cattle Periodic reports on animal delivery by direct send or animal care services system User access rights settings Periodic reports of payment and confirmation, can be done by cash or bank transfer | <ol style="list-style-type: none"> Can register / initial registration Manage the qurban web marketplace easily, especially for master data on sellers, buyers, and livestock services Monitor and get reports on sales and payment transactions from customers periodically | <ul style="list-style-type: none"> Figure 4 Figure 5 Figure 7 |
| 2. | Breeders (qurban cattle sellers) | <ul style="list-style-type: none"> Qurban cattle catalog List of farmer partners List transactions of individual or collective / group sale of qurban cattle List of animal delivery by direct send or animal care services system Payment confirmation of qurban cattle Delivery status of qurban cattle | <ol style="list-style-type: none"> Make it easy for breeders to upload qurban animal data for sale Get up to date transaction and purchase transaction notifications from customers Monitor the delivery status of qurban animals to ensure that customers confirm the receipt of sacrificial animals well and on time | <ul style="list-style-type: none"> Figure 5 Figure 7 |
| 3. | Customers (qurban cattle buyer) | <ul style="list-style-type: none"> Qurban cattle catalog. List of breeders (qurban cattle sellers) History of qurban cattle sales. Payment confirmation of qurban cattle Delivery status of qurban cattle. | <ol style="list-style-type: none"> Get information about qurban animal catalog, especially for prices/promos and seller locations Make qurban animal purchases quickly and easily through direct online ordering and payment Can monitor the status of qurban animal delivery periodically through website notifications | <ul style="list-style-type: none"> Figure 5 Figure 6 Figure 7 |
| 4. | Farmer partners | <ul style="list-style-type: none"> Approval confirmation of animal care services List of customers (qurban cattle buyer) List of breeders (qurban cattle sellers) History of sales transaction with animal care services system. | <ol style="list-style-type: none"> Facilitate livestock care services to manage livestock until they are ready for slaughter Knowing the list of sellers and buyers through transaction history and notifications through the web marketplace | <ul style="list-style-type: none"> Figure 6 |

The stages of the designing UI interface use the UCD method which can be done in four phases

[19, 20], including:

- a. **Specify the context of use**, this phase conducted to identify the people who will use the web marketplace of qurban cattle sales and can be done by the interviewing target user. the users are the breeders, farmer partners, and customers of the web marketplace.
- b. **Specify requirements**, can be done by creating a table of user requirements as user goals and functional requirements of the web marketplace based on the result of user interview and user persona. The analysis process that had been carried out supplemented by interviews data and opinions requests data from cattle breeders and customers of qurban cattle, especially cows in Ngawi Regency, Mojokerto Regency, and Surabaya City, East Java.
- c. **Create design solutions**, designing a web marketplace user interface can be in the form of a mockup/wireframe/prototype of the web marketplace based on the element and criteria in the customer journey map. Table 3 is a mockup map with the user's goals based on an analysis of user requirements.
- d. **Evaluate designs**, can be done by distributing questionnaires in the form of usability testing and collecting suggestions and opinions from the prototype of the web marketplace.

Web marketplace of qurban cattle sales in east java interface designed implementing UCD principle. In this there were four phase of design which are: (1) Specify the use context. This step conducted using interview. The interviewee are breeders, farmer partners, and customers of the web marketplace. This step conducted in order to gather the user purpose when using this system; (2) Specifying the requirement. This step analyzing user requirement from user persona and customer journey map. Other source of requirements are from interview data and user opinion reques; (3) Develop design solution using storyboard for user and system requirements; and (4) Evaluate prototype design using usability test and gather people opinion and suggestion which will be explained in the last section.

3. Experiment and Results

3.1. Implementation

All pages are designed in green because these colors belong to the cool color group (cool for vision), contain a natural (natural), fresh, and stable impression, and are identical to grass and animal husbandry. On the homepage/main page, visitors will be given a choice of qurban cattle catalog (especially cows). To be able to make transactions, website visitors must register/register first. If not logged in, users can only search for products, or other promotion.



Figure 4. Design user interface of homepage of web marketplace

On the qurban catalog page, several types of qurban cows will be displayed according to the search criteria and categories of cows. the categories of cows can be sorted based on the price of livestock from the lowest to the highest, the weight of livestock, and the type of animal delivery (send directly or deposited in advance by utilizing animal care services). The interface design of the qurban cattle catalog page can be seen in Figure 5.



Figure 5. Design user interface of qurban cattle catalog

On the qurban cattle detail page, some information related to qurban cattle prices, weights, the number of available stocks, the selection of types of purchases (individual or group), and the type of delivery (send directly or make use of livestock care services in advance). The interface design for qurban cattle details and qurban cattle sales can be seen in Figure 6.



Figure 6. Design user interface for detail information page of qurban cattle

User can use qurban cattle promo page when there is promo available for the user. User get the promotion in the form of discounts if the seller give that kind of promotion. User can use this promotion when buying individually or collectively. The interface design for the qurban cattle promo can be seen in Figure 7.



Figure 7. Design User Interface of Qurban Cattle Promo Page

User can see the payment calculation which obtained from the qurban cattle prices, total care cost and total shipping cost on the group payment and animal care services utilization page. the interface design of the qurban payment page for animal care services can be seen in Figure 8. For more details about the structure of the web marketplace can be seen in Figure 9.

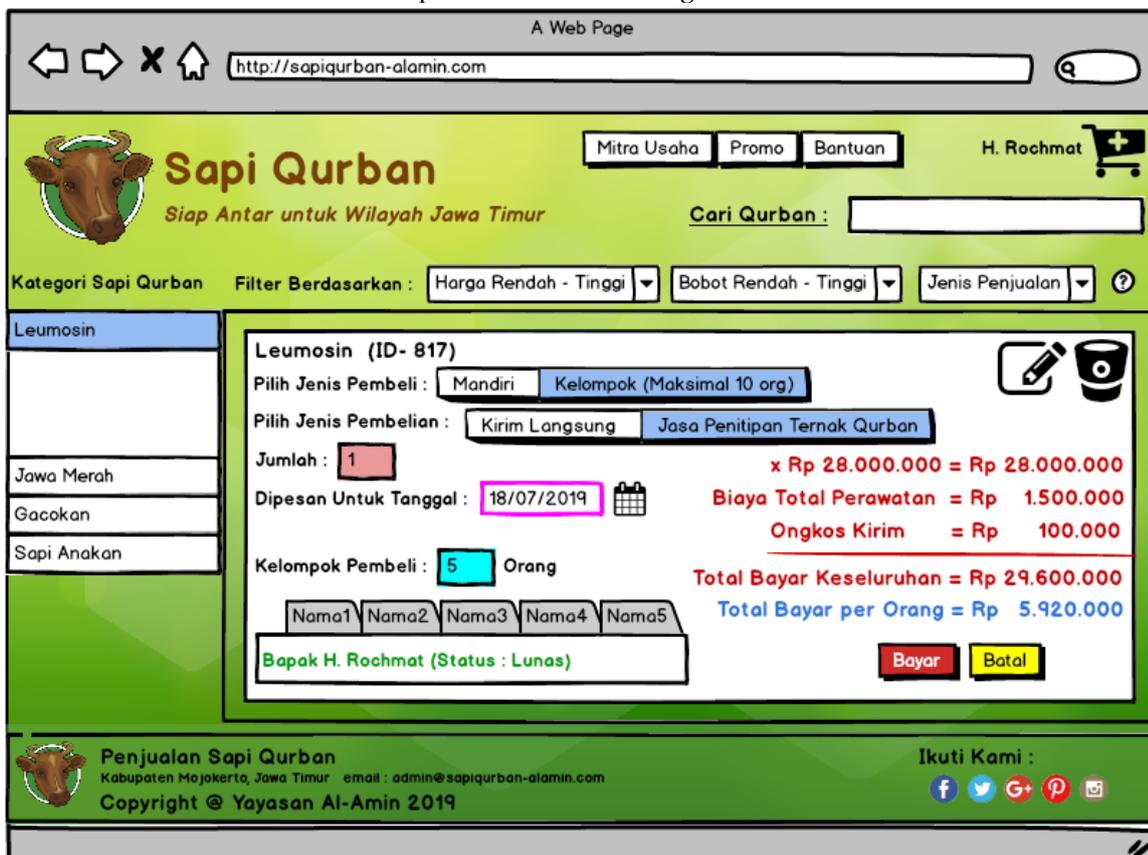


Figure 8. Design User Interface of Animal Care Service Page

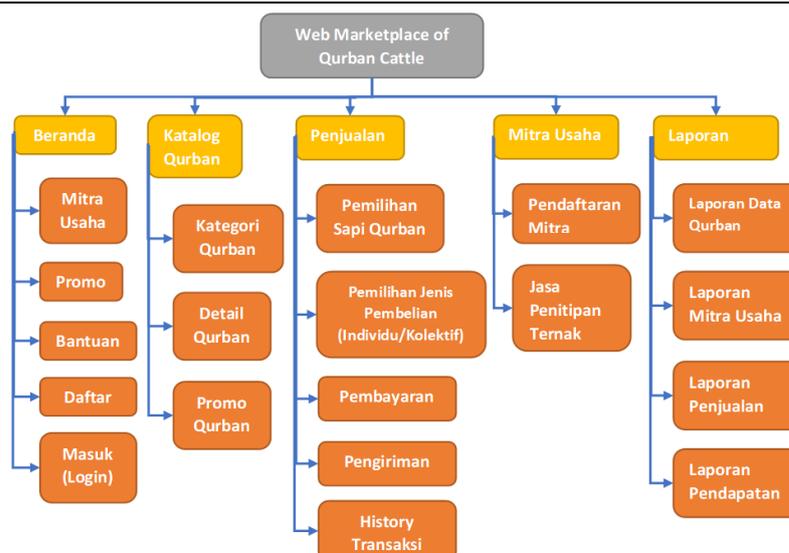


Figure 9. Site map of qurban web marketplace

3.2. Testing of designing web marketplace of qurban cattle sales

Testing phase focused on the level of user satisfaction and feature availability of web marketplace qurban cattle sales interface design. There are several UI/UX testing methods, such as UX questionnaire (UEQ) [21], usability metric for user experience (UMUX) [22], and standardized user experience percentile rank questionnaire (SUPR-Q) [23]. However, in this study we used system usability scale (SUS) because it have many advantages compared with other testing methodology as discussed by Lewis [24].

SUS using five level likert scale questionnaire as testing instrument. SUS measure system usability based on the user subjective perspective [25, 26]. Brooke the SUS inventor said that SUS have advantages compared with other methodologies [26]. The advantages are its ease of use and easy to read scale which using 0-100 scale [27]. SUS likert scale can be seen in the Table 4.

Table 4. Likert scale asesment

| Criteria | Point |
|-------------------------|-------|
| Strongly disagree (STS) | 1 |
| Disagree (TS) | 2 |
| Neutral (N) | 3 |
| Agree (S) | 4 |
| Strongly agree (SS) | 5 |

Table 5. SUS question [25, 28]

| No. | Question |
|-----|---|
| R1 | I think that I would like to use this system frequently |
| R2 | I found the system unnecessarily complex |
| R3 | I thought the system was easy to use |
| R4 | I think that I would need the support of a technical person to be able to use this system |
| R5 | I found the various functions in this system were well integrated |
| R6 | I thought there was too much inconsistency in this system |
| R7 | I would imagine that most people would learn to use this system very quickly |
| R8 | I found the system very cumbersome to use |
| R9 | I felt very confident using the system |
| R10 | I needed to learn a lot of things before I could get going with this system |

Questionnaires in Table 5 were distributed to 30 respondents consisting of a combination of qurban cattle sellers and buyers. The sample used was 30 respondents because according to Roscoe [29], the sample size that was suitable for the study ranged from 30-500 people.

Each item has a contribution score. The contribution score ranges from 1-5. For items 1, 3, 5, 7, and 9 the contribution score is the scale-1 position. While items 2, 4, 6, 8, and 10 the contribution score is 5 minus the scale position. Then multiply the total contribution score by 2.5 to get the overall score. Following the SUS calculation Equation (1)

$$\text{Score SUS} = ((R1-1)+(5-R2)+(R3-1)+(5-R4)+(R5-1)+(5-R6)+(R7-1)+(5-R8)+(R9-1)+(5-R10)) \times 2.5 \quad (1)$$

R1, R3, R5, R7, R9 are result for odd number question, while R2, R4, R6, R8, R10 are result for even number question.

The overall SUS score obtained from the average individual SUS score. The results of SUS test can be seen in Table 6.

Table 6. Questionnaire calculation table

| Respondent | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | Score SUS |
|-------------------|----|----|----|----|----|----|----|----|----|-----|-----------|
| 1 | 4 | 1 | 4 | 2 | 5 | 1 | 4 | 3 | 4 | 3 | 77.5 |
| 2 | 5 | 2 | 4 | 2 | 5 | 1 | 4 | 2 | 4 | 2 | 82.5 |
| 3 | 5 | 2 | 4 | 3 | 4 | 1 | 3 | 2 | 4 | 3 | 72.5 |
| 4 | 4 | 1 | 4 | 1 | 4 | 1 | 4 | 1 | 4 | 2 | 85 |
| 5 | 3 | 1 | 4 | 1 | 4 | 2 | 3 | 2 | 3 | 3 | 70 |
| 6 | 4 | 2 | 5 | 1 | 5 | 1 | 4 | 1 | 3 | 2 | 85 |
| 7 | 4 | 3 | 5 | 3 | 5 | 2 | 3 | 2 | 4 | 2 | 72.5 |
| 8 | 5 | 3 | 3 | 2 | 3 | 1 | 4 | 1 | 3 | 2 | 72.5 |
| 9 | 5 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 77.5 |
| 10 | 5 | 2 | 4 | 2 | 3 | 2 | 3 | 1 | 3 | 1 | 75 |
| 11 | 2 | 2 | 4 | 2 | 4 | 2 | 4 | 1 | 4 | 3 | 70 |
| 12 | 3 | 1 | 4 | 3 | 5 | 1 | 5 | 1 | 4 | 3 | 80 |
| 13 | 4 | 2 | 5 | 3 | 5 | 1 | 5 | 2 | 5 | 2 | 85 |
| 14 | 4 | 1 | 4 | 2 | 5 | 3 | 4 | 1 | 3 | 2 | 77.5 |
| 15 | 4 | 2 | 5 | 3 | 5 | 2 | 5 | 2 | 4 | 1 | 82.5 |
| 16 | 4 | 1 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 77.5 |
| 17 | 5 | 3 | 5 | 2 | 5 | 1 | 3 | 1 | 3 | 1 | 82.5 |
| 18 | 4 | 3 | 5 | 2 | 4 | 1 | 4 | 3 | 4 | 2 | 75 |
| 19 | 5 | 2 | 5 | 1 | 5 | 2 | 3 | 3 | 4 | 2 | 80 |
| 20 | 4 | 1 | 4 | 3 | 4 | 1 | 4 | 2 | 4 | 1 | 80 |
| 21 | 5 | 1 | 4 | 3 | 5 | 2 | 5 | 2 | 4 | 2 | 82.5 |
| 22 | 5 | 1 | 3 | 2 | 4 | 1 | 4 | 3 | 4 | 2 | 77.5 |
| 23 | 4 | 3 | 4 | 1 | 4 | 1 | 5 | 2 | 4 | 2 | 80 |
| 24 | 3 | 2 | 3 | 1 | 4 | 1 | 5 | 3 | 3 | 1 | 75 |
| 25 | 5 | 2 | 4 | 1 | 5 | 2 | 5 | 2 | 4 | 2 | 85 |
| 26 | 5 | 2 | 5 | 2 | 4 | 2 | 4 | 1 | 4 | 2 | 82.5 |
| 27 | 4 | 2 | 5 | 2 | 5 | 1 | 5 | 1 | 4 | 1 | 90 |
| 28 | 4 | 1 | 5 | 2 | 4 | 2 | 4 | 1 | 3 | 1 | 82.5 |
| 29 | 4 | 1 | 4 | 2 | 5 | 1 | 5 | 2 | 4 | 2 | 85 |
| 30 | 4 | 2 | 4 | 1 | 4 | 2 | 4 | 1 | 4 | 2 | 80 |
| Score SUS Average | | | | | | | | | | | 79,3 |

A SUS score can indicate the level of user acceptance. Scores below 68 point show that the user have issues with the design that need to be researched and resolved, while scores higher than 68 indicate

The need for minor improvements to the design.

Table 7. Rating SUS score

| SUS Score | Letter Grade | Adjective Rating |
|---------------------|--------------|------------------|
| Above 80.3 | A | Excellent |
| Between 68 and 80.3 | B | Good |
| 68 | C | OK |
| Between 51 and 67 | D | Poor |
| Below 51 | F | Awful |

Table 7 is the result of SUS calculation which obtained 79.3 score points. The value indicates users can accept the interface design of the Web Marketplace of Qurban cattle Sales in East Java and considered having good UI/UX.

4. Conclusions

The purpose of this design is to help seller gain competitive advantages and expand the market reach of the seller using information system. The SUS evaluation results of the design prototype using UCD methods show that the user can accept the UI/UX design and the features provided in the prototype. The main constraint of this research is the interviewee experience in using information system. The interviewees, way too accustomed with conventional qurban cattle sells transaction. Therefore they fear that they can't meet their customer expectation because they cannot meet face to face. The result of SUS calculation of the proposed prototype is 79.3 which indicates that the qurban web marketplace design can be accepted by users and can be classified as good design. In the future, this prototype can be developed as an application that can help users to easily make transactions through the web marketplace of qurban cattle sales.

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