

## Model-view-controller approach for e-Zakah

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### ABSTRACT

Zakah (alms) has a strategic position in terms of Islamic value and terms of the development of the welfare of the people. In the current digital era, the use of technology can facilitate zakah worship more easily, quickly, efficiently, and secure. This study aims to analyze and design electronic zakah (e-Zakah) structurally and systematically using the Model-View-Controller (MVC) approach. MVC is an approach or pattern of object-oriented analysis and design for software development that widely used today. MVC is implemented in the analysis and design modelling using Unified Modeling Language (UML) for e-Zakah. Based on the traceability result of analysis and design of e-Zakah, it can be concluded that the e-Zakah analysis and design model has been met all of zakah concept, user and software requirements, and all of models can be traced to each other. Therefore, e-Zakah analysis and design model in this study is ready to be built as a software.

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## 1. INTRODUCTION

In the digital and internet of things era, Information System such as e-Commerce, e-Banking, e-Counseling and in this study that propose e-Zakah become an important and interesting thing to develop. IS which are a combination of information technology and human activities that use computerized technology [1], can be used to support decision making [2], manage the organized data [3], that built based on user requirements [4], capable of solving complex data [5], and IS have a high degree of flexibility that allows to be developed into better systems [6]. Based on much previous research, IS has advantages such as accurate [7], precise support decision [8], good data accessibility [9], efficient processing time [10], more economical [11], improve productivity [12], present data and information well [13], widely used [14], improve user understanding [10], and as media to save data [15].

e-Zakah deserves to be developed as a strategic effort of zakah marketing [16]. Currently, in Indonesia, e-Zakah has not independent yet, it still joins e-Commerce (such as Elevenia.com) or e-Banking (such as BNI/ Bank Negara Indonesia Mobile Banking and BRI/ Bank Rakyat Indonesia Mobile Banking). e-Zakah will provide convenience for muzakki (the person who carry out zakah) in paying zakah. Besides that, e-Zakah also has many advantages, among others: providing convenience to muzakki in paying zakah, compared to manual payments in offices (Amil Zakah Institution); making zakah closer to the community, because the zakah payment system is easy and commonly used by the community; the performance of Amil Zakah (committees who manage zakah), looks more professional, the impact is public trust in the performance of amil is higher; between amil Zakah Institution branches and zakah mobile counters can now be connected in one online network; between amil zakah institution and zakah mobile counters can now be

connected each other in one online networks. However, the lack of e-Zakah still needs to be considered, these deficiencies are risks and consequences that must be borne in the development of the e-Zakah system. The attitude of community prudence is needed in the use of this e-Zakah facility. In addition, cooperation from various related parties is also needed, in addition to building a perfect e-Zakah network system but also to anticipate the risks that will occur.

To anticipate the various weaknesses of e-Zakah, detailed system analysis and design is needed so that all of user and system requirements are reached. Not many previous studies that discuss about optimization of zakah using technology, one of study that related is about predicting the usage of e-Zakah in Selangor, Malaysia using unified theory of acceptance and use of technology model [17], but the research did not explain how to develop the e-Zakah based on software engineering, only examine the extent of utilization of an online e-Zakah. Therefore, this study presents the analysis and design model structurally and systematically for e-Zakah using UML that implemented MVC pattern. The result of this study is an analysis and design model that ready to implement into e-Zakah software, either in web-based, mobile-based, or desktop. It In the next session, it is described the methodology that used in this study, result and discussion that contains the analysis of zakah including the calculation of zakah, user and e-Zakah requirements analysis, and analysis and design modeling for e-Zakah. Then, the last session describes the conclusion of this study.

## 2. RESEARCH METHOD

The methodology used in this study is described with the flowchart in Figure 1. Begin from understanding the concept of zakah, among others: the definitions, who is obliged to pay zakah, who is entitled to receive zakah, what properties that can be shared as zakah, and also how is the calculation and distribution of zakah. Then, from the concept will be analyzed as requirement elicitation process which is collect the detail information about the needs of user (muzaki), needs of recipient zakah, needs of amil zakah, and requirement of the system. All of the requirements in the analysis phase is modelled using UML, and also in the design phase.

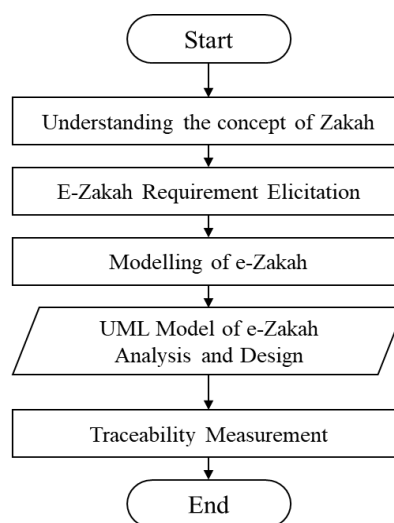


Figure 1. Flowchart of e-Zakah Analysis and Design

The analysis and design model for e-Zakah, besides using UML, it also uses MVC approach or pattern, that classifies the object as the model, view, and controller [18-19]. Model is an object collection which functions to store data and object information, view or boundary is an object collection that used for an object accessed by the user as an interface, while the controller is the object collection that connects between model and view. Therefore, models and views are not allowed to interact directly, must go through the controller. The analysis and design model of e-Zakah in this study can be used for whatever software development life cycle (SDLC) or software development method. Either the conventional SDLC such as Waterfall, Prototype, Iterative, Spiral, or so on [20-22]. The recommendation SDLC that can be used is the Rational Unified Process (RUP) that uses UML as a model [20], [23-24].

Moreover, it also can be used Agile Methodology, such as Scrum, Xtream Programming (XP), and so on [25-28]. To maintain the quality of analysis and design model of e-Zakah, it is also measured the traceability between requirement and model, and between model to each other. This traceability measurement makes sure that all of the requirement is reached and the connectivity between model is according to expectations [9], [29-30]. Reliability of e-Zakah in this article, it is used: analytical, logical, conceptual, and operational verification by an expert [31].

### 3. RESULTS AND ANALYSIS

#### 3.1. The Concept of Zakah

In the Holy Qur'an, the letter At-Taubah verse 34, Az-Zariyat verse 19, and Al-Ma'un verse 1-2, states that *zakah* is compulsory worship and the third principle of the pillars of Islam. In addition to the Qur'an, there are several narrations of hadith which are used as the basis for obligatory *zakah*, among others: "Allah obliges them (the Yemenis) to *zakah* on their wealth, *zakah* is taken from rich people and distributed to the poor" [32]. Even the Prophet said that issuing *zakah* is sacred and purifying, connecting relationship with relatives, neighbors, beggars, and respecting the rights of the poor [33]. There are three actors that are related directly in the *zakah* worship, among others *muzzaki*, *mustahiq*, and *amil*. *Muzzaki* is a person who gives *zakah*, *mustahiq* is a person who receives *zakah*, and *amil* is a person or institution that manage and distribute the property of *zakah*. In carrying out *zakah*, there are terms and conditions that must be fulfilled relating to *muzzaki*, *mustahiq*, and property that can be given as *zakah*.

#### 3.2. Types and Calculation of Zakah

There are several types of *zakah*, and each type has a different calculation. The types and calculation of *zakah* are among others:

##### 3.2.1 Zakah Fitr (Al-Fitr)

Zakah Al-Fitr is a charity that is fulfilled by every Muslim, male or female in order to purify the soul (*zakah al-nafs*). Every individual, whether adult or not, is obliged to pay *zakah* fitr, whose implementation is at the same time or after the fasting month of Ramadan. In Indonesia, *zakah* fitr is measured by 2.5 kg of rice [34].

##### 3.2.2 Zakah Mal

Zakah mal is *zakah* of wealth, it means *zakah* issued from wealth or the source of wealth itself. The wealth that for *zakah* mal are among others:

- a. Gold and Silver. The main requirement for gold and silver *zakah* is to reach *nisab* and have passed one year. Based on the hadith narrated by Abu Dawud, the *nisab* of gold *zakah* is twenty *misqal* or twenty dinars while the *nisab* of silver *zakah* is two hundred dirhams. Twenty *misqals* or two dinars, according to Yusuf Qardhawi, are 85 grams of gold, two hundred dirhams equal to 595 grams of silver [35]. So, for gold and silver *zakah* which are reached the *nisab*, it is compulsory *zakah* 2.5% of savings gold and silver that owned.
- b. Plants and Fruits. *Nisab* of plants and fruit from an agricultural product, such as paddy farming is minimal 653 kg, while if the agricultural products are in the form of fruits, vegetables, and flowers so that all agricultural wealth is converted to the value of the local staple food agriculture. For the agriculture that uses rainwater, river water, and springs as sources of irrigation, if the managed rice fields are rainfed rice fields and other types of irrigation that do not need to buy water, then the amount of *zakah* from agricultural produce is 10% of all crops. But, if the agriculture that requires buying irrigation water so that their fields can grow, for this type of agriculture the amount of agricultural *zakah* that must be spent is 5% of all crops [36].
- c. Commercial property. *Nisab* of commercial property as specified in gold and silver were taken from the sale price. Thus the *zakah* is 2.5% [37]. Most of the scholars argued that the assets of commerce were obligatory in *zakah*, so the *zakah* rate of 2.5% from *nisab* was 20 dinars or worth with 85 gr of gold.
- d. Cattle: describes in Table 1
- e. *Rikaz* (found items) and mining goods. Regarding assets that must be given for *zakah* from hidden assets or treasure or found items or *rikaz*, the *zakah* is one fifth or 20%, with the note that the property that is found on land that has no owner.

##### 3.2.3 Zakah of Profession

Professional *zakah* is not yet familiar in the classical Islamic scholarship. Therefore, the results of the profession are categorized as the type of obligatory property of *zakah* based on analogy on the similarity

(syabbah) of the characteristics of the existing zakah property, namely [38]: (1) the model of earning income (profession) is similar to harvest (agricultural produce), so this property can be attributed to agricultural zakah based on nisab (653 kg of dry milled rice or equivalent to 522 kg of rice) and the time of zakah (each harvest); (2) the model of assets received as income in the form of money, so that this type of property can be attributed to the zakah of assets (savings or wealth) based on the level of zakah that must be paid (2.5%). Thus, if a person's professional results have fulfilled the requirements of zakah, he is obliged to pay his zakah.

Table 1. Nisab of Cattle Zakah [35], [39]

No.	Cattle	Nisab	Zakah Obligation
1	Camel	5	1 goat 2 years old, or 1 sheep 1 year old
		10	2 goats 2 years old, or 2 sheep old 1 year
		15	3 goats old 2 years, or 3 sheep old 1 year
		20	4 goats 2 years old, or 4 sheep 1 year old
		25	1 female camel 1 year old
		36	1 female camel 2 years old
		46	1 female camel 3 years old
		61	1 female camel 4 years old
		76	2 female camels 2 years old
		91	2 female camels 3 years old
		121	3 female camels 2 years old
2	Cow	30	1 cow 1 year old
		40	1 cow 2 year old
3	Goat	40	1 goat 2 years old, or 1 sheep 1 year old
		121	2 goats 2 years old, or 2 sheeps 1 year old
		201	3 goats 2 years old, or 3 sheeps 1 year old
		400	4 goats 2 years old, or 4 sheeps 1 year old

3.2.4 E-zakah requirements analysis

According with the concept of *zakah*, we find all of *e-Zakah* functional requirements in the Table 2 and non-functional requirements in Table 3. Then, the requirement analysis of *e-Zakah* is modeled by use case diagram in Figure 2 with list of use case code number in Table 4. In general, requirements is gotten from the needs of stakeholders (*muzzaki*, *mustahiq*, *amil*, and administrator) and from business process of *zakah*, begin from identifying the personal data of *muzzaki*, *mustahiq*, and *amil*, then and ensure they fulfill the mandatory and legal requirements for *zakah*, especially for *muzzaki* and *mustahiq*. Because not to zakat distributed to people who are not right. Arter identifying the stakeholders, then conduct the business process of *zakah*, what is the type of *zakah* that will be chosen, whether the property that will be zakat has fulfilled the conditions of the provisions, the *haul* and the *nisab*. If all of the requirements have been met, then the system will automatically calculate how much zakat must be issued by *muzzaki*. Then, the system will offer several payment options both online and offline. *Amil* must ensure the distribution of zakat to *mustahiq* goes well. The flow of zakat from *muzzaki* to *mustahiq* is all managed in the system, as well as the history of revenues and expenditures of *zakah*. Class Diagram of E-Zakah as shown in Figure 3.

Table 2. E-Zakah Functional Requirements Analysis

ID Req.	Description of Requirement
FR-Z-01	<i>e-Zakah</i> provides the information about the concept and type of <i>zakah</i> as a knowledge for the community.
FR-Z-02	<i>e-Zakah</i> provides registration form for <i>muzzaki</i> who has not been registered yet. For <i>amil</i> data will be inputted by administrator, while for <i>mustahiq</i> data will be inputted by <i>amil</i> to maintain data validity.
FR-Z-03	<i>e-Zakah</i> provides log in form for <i>muzzaki</i> , <i>amil</i> , and administrator
FR-Z-04	<i>e-Zakah</i> shows the types of <i>zakah</i> which can be selected, among others: <i>zakah fitrah</i> , <i>zakah mal</i> (gold and silver), <i>zakah mal</i> (plants and fruits), <i>zakah mal</i> (cattle), <i>zakah mal</i> (commercial property), <i>zakah mal</i> ( <i>rikaz</i> ), and <i>zakah</i> of profession.
FR-Z-05	<i>e-Zakah</i> provides <i>zakah</i> form based on the type of <i>zakah</i> . The form is divided with two conditional, first if <i>muzzaki</i> has known the term and condition of <i>zakah</i> , he can input the nominal or the amount of <i>zakah</i> directly. Second, if <i>muzzaki</i> has not known yet about how many assets that must be given for <i>zakah</i> , then in the form there is also a form to identify whether the zakat property has fulfilled <i>haul</i> and <i>nisab</i> .
FR-Z-06	<i>e-Zakah</i> able to calculate the nominal or the amount of <i>zakah</i> based on the types of <i>zakah</i> .
FR-Z-07	<i>e-Zakah</i> provides payment facilities both online and offline (if <i>muzzaki</i> wants to deliver directly to the <i>zakah</i> institution).
FR-Z-08	<i>e-Zakah</i> send a payment notification to <i>amil</i> and show the detail of payment history.
FR-Z-09	<i>e-Zakah</i> provides fuction for verifying <i>zakah</i> payment from <i>muzzaki</i> .
FR-Z-10	<i>e-Zakah</i> able to send notification and the proof of payment to <i>muzzaki</i> 's email directly after <i>amil</i> has verified the <i>zakah</i> payment.
FR-Z-11	<i>e-Zakah</i> provides the form and fuction to support <i>amil</i> in distributing <i>zakah</i> for <i>mustahiq</i> .

ID Req.	Description of Requirement
FR-Z-12	e-Zakah provides report form that contain <i>muzzaki</i> and <i>mustahiq</i> profile for <i>amil</i> .
FR-Z-13	e-Zakah provides the facility for <i>amil</i> to manage <i>muzzaki</i> and <i>mustahiq</i> data.
FR-Z-14	e-Zakah provides the report history of revenues and expenditures of <i>zakah</i> from <i>muzzaki</i> to <i>mustahiq</i> .
FR-Z-15	e-Zakah provides control panel for administrator manage all of activities and data during <i>zakah</i> process.

Table 3. E-Zakah Non-Functional Requirements Analysis

ID Req.	Description of Requirement
NFR-Z-01	e-Zakah provides security system for user authentication with password encryption, at least md5.
NFR-Z-02	e-Zakah has availability 24 hours.
NFR-Z-03	e-Zakah has a back up data if the server that is used down.
NFR-Z-04	e-Zakah can generate all of report both data personal report and <i>zakah</i> activity report no more than five minutes of processing time.
NFR-Z-05	e-Zakah provides data security for <i>zakah</i> payment process.
NFR-Z-06	e-Zakah send the notification of each urgent <i>zakah</i> activity (such as payment process), both in system and personal email directly, no more than 5 minutes.

Table 4. E-Zakah Use Case Code Number

Use Case Code	Use Case Name	Use Case Code	Use Case Name
UC-Z-01	Information of <i>Zakah</i> Concept	UC-Z-16	Choose Online Payment
UC-Z-02	Registration	UC-Z-17	Upload Proof of Payment File
UC-Z-03	Choose Type of <i>Zakah</i>	UC-Z-18	Generate Payment Reference Number
UC-Z-04	Choose <i>Zakah</i> Fitrah	UC-Z-19	Receive Notification and Email of <i>Zakah</i> Payment
UC-Z-05	Choose <i>Zakah</i> Mal (Gold and Silver)	UC-Z-20	Manage <i>Mustahiq</i> , <i>Amil</i> , and <i>Muzzaki</i> Data
UC-Z-06	Choose <i>Zakah</i> Mal (Cattle)	UC-Z-21	Manage and Control <i>Zakah</i> Log Activities
UC-Z-07	Choose <i>Zakah</i> Mal (Plants and Fruits)	UC-Z-22	Generate Report of <i>Zakah</i> Log Activities
UC-Z-08	Choose <i>Zakah</i> Mal (Rikaz)	UC-Z-23	Maintain e- <i>Zakah</i> Information System
UC-Z-09	Choose <i>Zakah</i> Mal (Commercial Property)	UC-Z-24	Distribute <i>Zakah</i>
UC-Z-10	Choose <i>Zakah</i> of Profession	UC-Z-25	Get Payment Notification
UC-Z-11	Identifying Haul and Nisab of <i>Zakah</i> Property	UC-Z-26	Verify Payment Status
UC-Z-12	Calculate Nominal or Amount of <i>Zakah</i>	UC-Z-27	Generate <i>Zakah</i> Payment Receipt
UC-Z-13	Input Nominal or Amount of <i>Zakah</i> Directly	UC-Z-28	Manage <i>Muzzaki</i> and <i>Mustahiq</i> Data
UC-Z-14	Choose Payment Method	UC-Z-29	Generate Report of <i>Muzzaki</i> and <i>Mustahiq</i>
UC-Z-15	Choose Offline Payment	UC-Z-30	Generate Revenues and Expenditures Report of <i>Zakah</i>

### 3.3. E-zakah design

The design of e-*Zakah* in this study is modeled by class diagram, sequence diagram, and activity diagram. However, in this article only present class diagram with several attribute and method that can be developed based on the needs of implementation and the example of sequence diagram. Because, sequence diagram must be made for each use case, and It is very possible for a use case to have more than one sequence diagram that illustrates the alternative activities of a use case. Class diagram of e-*Zakah* is presented in Figure 3 with the code number for each class is shown in Table 5, while the example of sequence diagram is presented in Figure 4. Both class diagram and sequence diagram is modeled using MVC approach, which separate between model, view, and controller objects.

Table 5. E-Zakah Class Code Number

Class Code	Class Name	Class Code	Class Name
C-Z-01	LoginForm	C-Z-18	ManageDataController
C-Z-02	RegistrationForm	C-Z-19	<i>Zakah</i> TypeController
C-Z-03	<i>Zakah</i> InformationUI	C-Z-20	<i>Muzzaki</i> Model
C-Z-04	<i>Zakah</i> TypeUI	C-Z-21	<i>Mustahiq</i> Model
C-Z-05	PaymentForm	C-Z-22	<i>Amin</i> Model
C-Z-06	ReportUI	C-Z-23	AdministratorModel
C-Z-07	ControlPanelUI	C-Z-24	ReportModel
C-Z-08	CalculationBoundary	C-Z-25	LogActivityModel
C-Z-09	MainPage	C-Z-26	<i>Zakah</i> TypeModel
C-Z-10	LoginController	C-Z-27	<i>Zakah</i> FitrahModel
C-Z-11	ReportController	C-Z-28	<i>Zakah</i> MalGoldAndSilverModel
C-Z-12	<i>Zakah</i> CalculationController	C-Z-29	<i>Zakah</i> MalRikazModel

Class Code	Class Name	Class Code	Class Name
C-Z-13	PaymentController	C-Z-30	ZakahMalCattleModel
C-Z-14	NotificationController	C-Z-31	ZakahMalPlantsAndFruitsModel
C-Z-15	RegistrationController	C-Z-32	ZakahMalCommercialPropertyModel
C-Z-16	CPanelController	C-Z-33	ZakahOfProfessionModel
C-Z-17	LogActivityController		

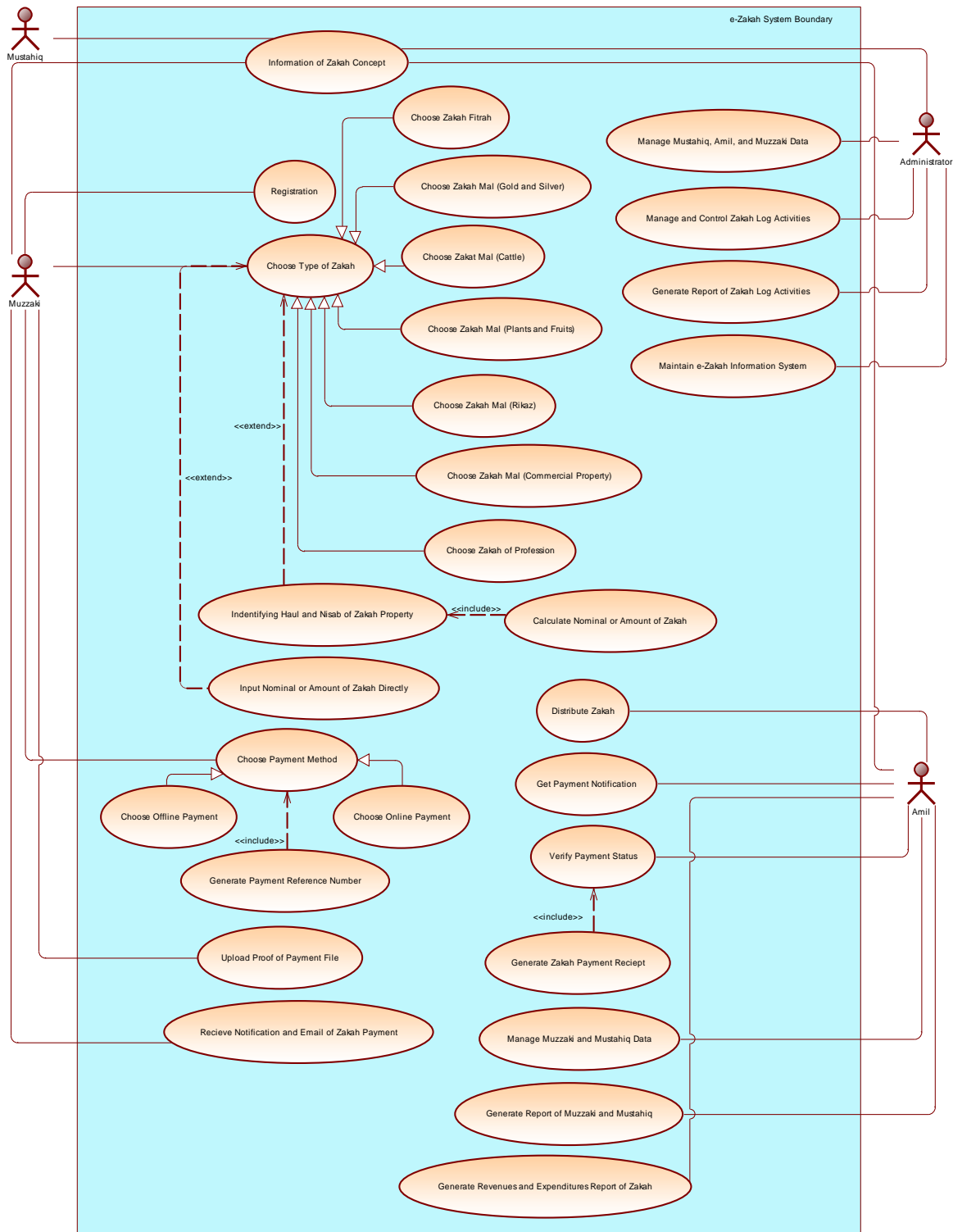


Figure 2. Use Case Diagram of E-Zakah

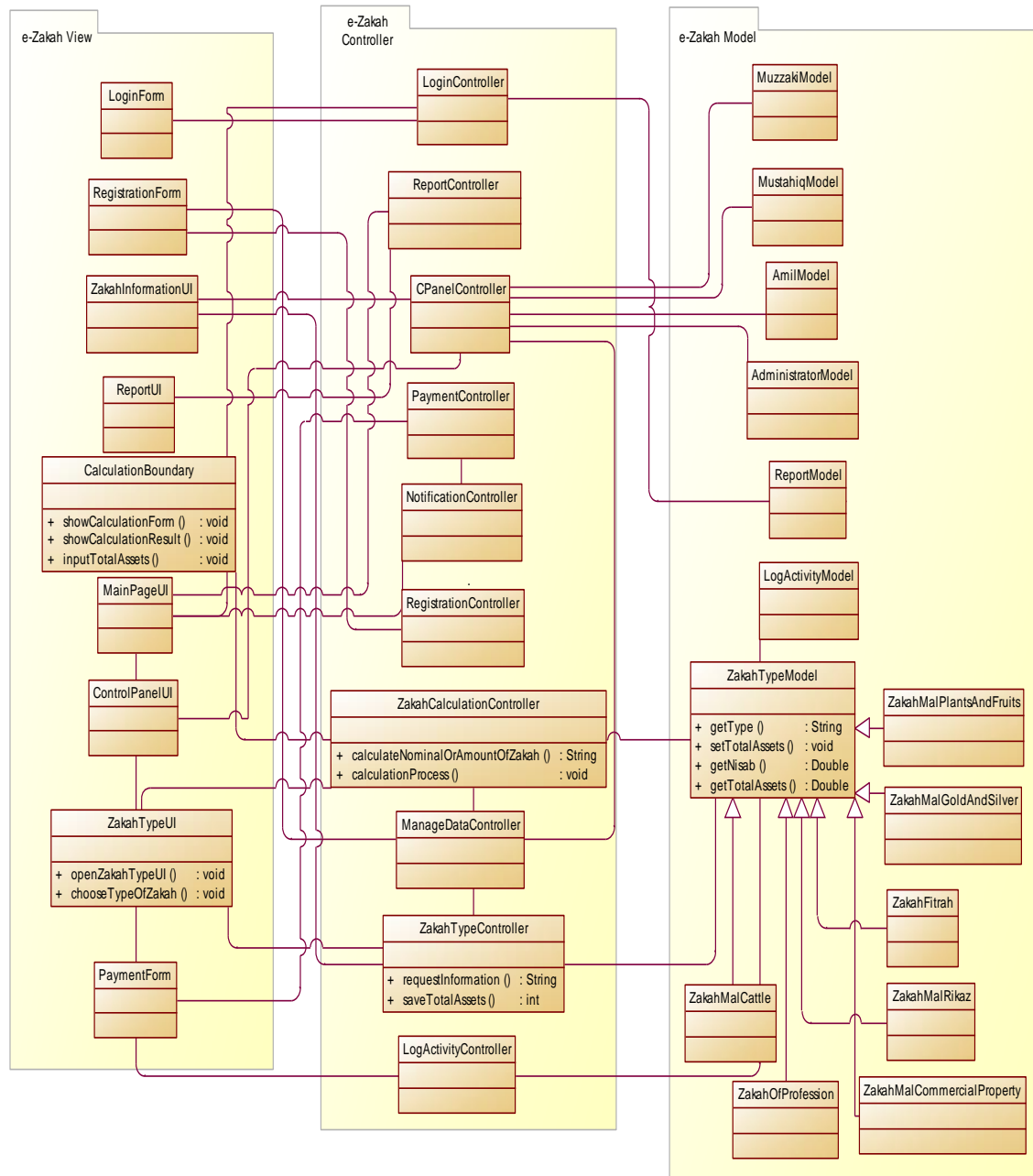


Figure 3. Class Diagram of E-Zakah

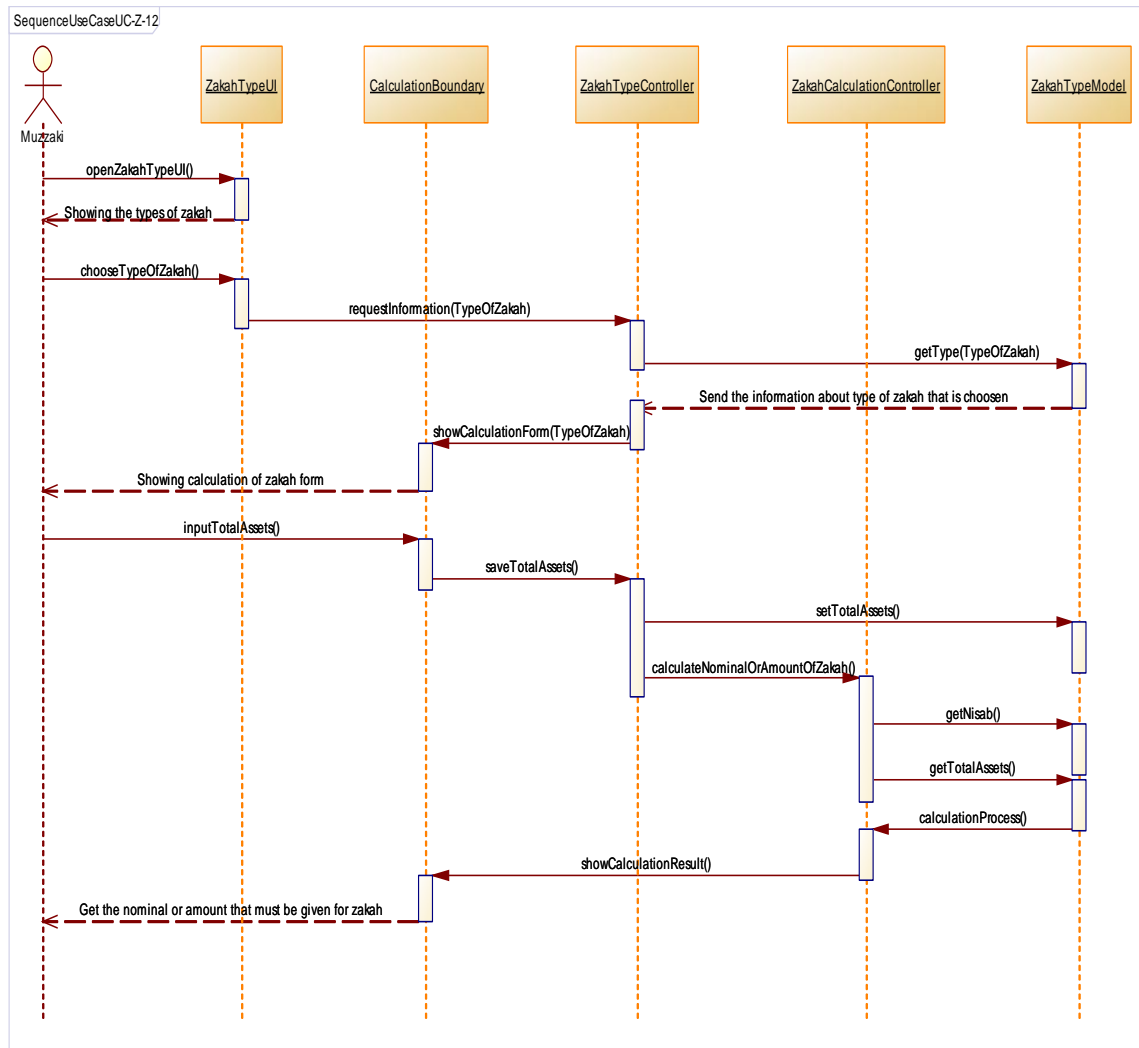


Figure 4. The Example of Sequence Diagram of E-Zakah

3.4. E-zakah user interface design

Figures 5-7 describes the example of user interface design for muzzaki in e-Zakah. Figure 5 presents the example of design user interface for information of zakah, Figures 6 and 7 present user interface for zakah mal gold and silver activity.

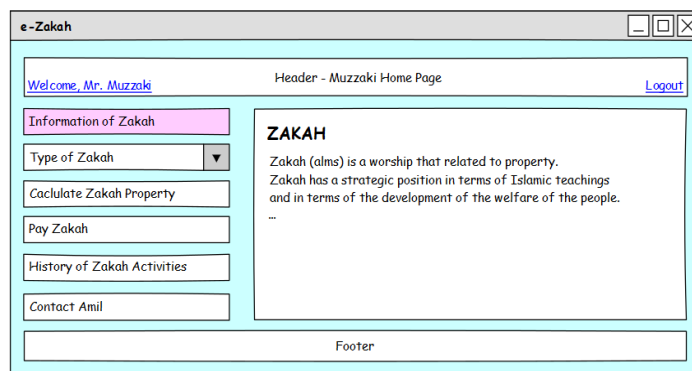


Figure 5. Information of Zakah Design User Interface



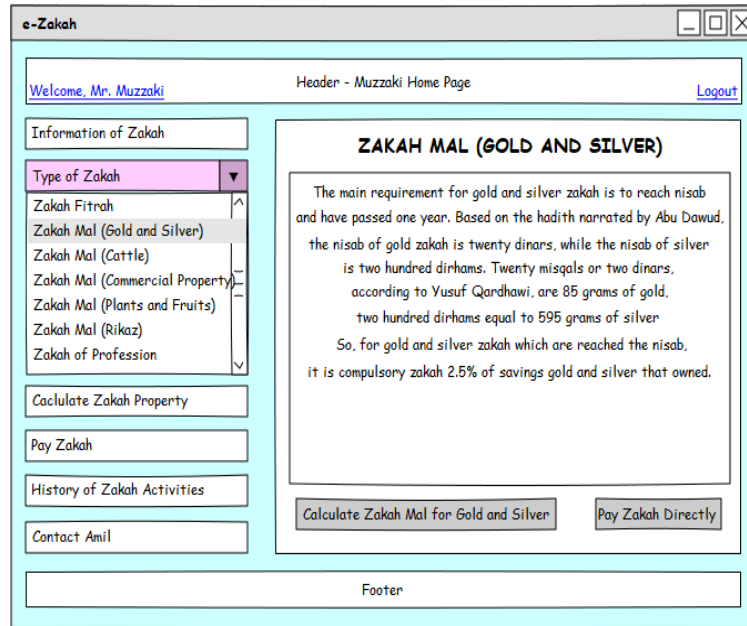


Figure 6. The Example of Sequence Diagram of E-Zakah

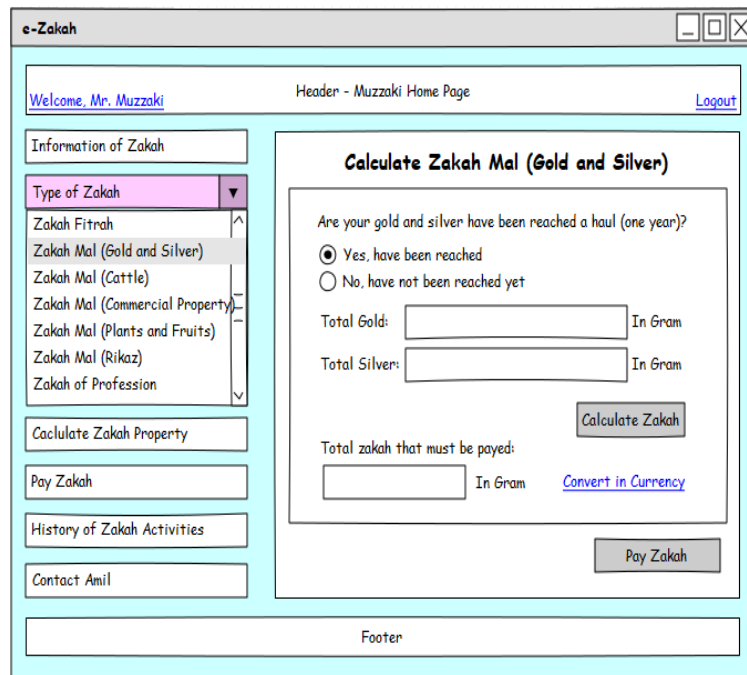


Figure 7. The Example of Sequence Diagram of E-Zakah

### 3.5. Traceability of E-Zakah Analysis and Design Model

The traceability for linkages between functional and non-functional requirements of the analysis and design models is done to ensure that all user and system requirements are met properly. Table 6 provides the result of traceability between functional and non-functional requirements with use case diagram as an analysis model and class diagram as a design model. From Table 6 can be concluded that all of the requirements are met.

Table 6. Traceability of E-Zakah Analysis and Design Model

Req. Code	Use Case Code	Class Code
FR-Z-01	UC-Z-01, UC-Z-03	C-Z-03, C-Z-09
FR-Z-02	UC-Z-02	C-Z-02, C-Z-09, C-Z-15, C-Z-20, C-Z-21, C-Z-22, C-Z-23
FR-Z-03	All of Use Case, except UC-Z-01 and UC-Z-02	C-Z-01, C-Z-09, C-Z-10, C-Z-17, C-Z-25
FR-Z-04	UC-Z-03, UC-Z-04, UC-Z-05, UC-Z-06, UC-Z-07, UC-Z-08, UC-Z-09, UC-Z-10	C-Z-04, , C-Z-09, C-Z-19, C-Z-26, C-Z-27, C-Z-28, C-Z-29, C-Z-30, C-Z-31, C-Z-32, C-Z-33
FR-Z-05	UC-Z-03, UC-Z-04, UC-Z-05, UC-Z-06, UC-Z-07, UC-Z-08, UC-Z-09, UC-Z-10, UC-Z-11, UC-Z-12, UC-Z-13	C-Z-04, C-Z-08, C-Z-09, C-Z-12, C-Z-26, C-Z-27, C-Z-28, C-Z-29, C-Z-30, C-Z-31, C-Z-32, C-Z-33
FR-Z-06	UC-Z-11, UC-Z-12, UC-Z-13	C-Z-08, C-Z-09, C-Z-12
FR-Z-07	UC-Z-14, UC-Z-15, UC-Z-16, UC-Z-18, UC-Z-19, UC-Z-25, UC-Z-26, UC-Z-27	C-Z-05, C-Z-09, C-Z-13
FR-Z-08	UC-Z-18, UC-Z-19	C-Z-09, C-Z-14
FR-Z-09	UC-Z-17, UC-Z-26	C-Z-09, C-Z-13
FR-Z-10	UC-Z-19, UC-Z-25, UC-Z-27	C-Z-09, C-Z-13, C-Z-14
FR-Z-11	UC-Z-21, UC-Z-24, UC-Z-28	C-Z-06, C-Z-09, C-Z-17, C-Z-20, C-Z-21, C-Z-22, C-Z-24, C-Z-25
FR-Z-12	UC-Z-19, UC-Z-22, UC-Z-29, UC-Z-30	C-Z-06, C-Z-09, C-Z-11, C-Z-16, C-Z-25, C-Z-24
FR-Z-13	UC-Z-28	C-Z-09, C-Z-18, C-Z-20, C-Z-21
FR-Z-14	UC-Z-30	C-Z-06, C-Z-09, C-Z-11, C-Z-24
FR-Z-15	UC-Z-20, UC-Z-22, UC-Z-23	C-Z-07, C-Z-09, C-Z-16, C-Z-17, C-Z-25
NFR-Z-01	All use cases and classes, except UC-Z-01 and UC-Z-02	
NFR-Z-02	All use case and classes	
NFR-Z-03	All of <i>zakah</i> activities	
NFR-Z-04	UC-Z-18, UC-Z-19, UC-Z-22, UC-Z-25, UC-Z-27, UC-Z-29, UC-Z-30	C-Z-06, C-Z-09, C-Z-11, C-Z-14, C-Z-24
FR-Z-20	All use case and classes	
FR-Z-21	UC-Z-19, UC-Z-25	C-Z-14

#### 4. CONCLUSION

In the technological era many studies could be digitized, one of which was the concept of *zakah*. This study resulted in making *e-Zakah* analysis and design using the MVC approach. The MVC approach made the objects easy to be grouped so that they could be meet the modularity quality and were easy to maintain. The *e-Zakah* analysis and design model which were made using UML had been met all user and system requirements. This result was proven by the results of traceability between functional requirements with the use case diagram as a system analysis model and class diagram as a system design model. Actually, this *e-Zakah* analysis and design model can still develop according to implementation requirements. However, because the model uses object-oriented analysis and design, it can be easily implemented using object-oriented programming that is currently widely used. For future research, the implementation and testing of the system both black box and white box can be conducted.

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