Chapter 2

Literature Review

2.1 Introduction

This chapter covers the literature review of asset, Islamic asset, asset management, object-oriented software engineering and object-oriented software engineering development activities. The purpose of literature review is to get more understanding on Personal Islamic Asset management System using Object-oriented Approach. It includes the comparison of other similar existing systems which was initiated by others. This chapter also discusses about the differences between Islamic asset management and conventional asset management.

2.2 Asset

2.2.1 Definition of Asset

Asset can be defined as property and items that have commercial value owned by a person or business. The primary classifications of assets are: current assets, long-term assets, prepaid and deferred assets, and intangible assets. [16]
Current assets are cash and other liquid instruments, including accounts receivable that can be converted to cash within one year at maximum. Long-term assets are plants, equipment, real estate and other capital assets, and net of depreciation. Prepaid and deferred assets include expenditures for future costs or expenses, such as insurance, interest or rent, that are set up as assets to be amortized over an applicable period. Intangible assets are assets with a determined value, but which may not be scalable, such as goodwill, patents, copyrights, and brand name recognition.

2.2.2 Definition of Islamic Asset

Islamic asset can be defined as:

- Any valuable entity that can be owned or kept by someone such as land, plant, pottery, house and clothes. [22]
- Anything that is not owned or kept by anybody such as animals, tree in the jungle and minerals. [22]
- *Ulama*’ defines that Islamic asset as every valuable entity and if anyone destroys it they have to pay the compensation. [22]

*Ulama*’ has been divided Islamic asset into four divisions according to the Islamic law as follows [22]:

- Asset that cannot be used is divided into two types which are valuable asset (*mutaqawwim*) and invaluable asset (*ghayr mutaqawwim*).
- Asset that is static and dynamic is known as ‘*iqar* and *manqul*.
- Asset that have similarities whether in physical or value is known as *mithliy* and asset, which does not have the similarities, is known as *hathliy*.
- Asset that has the static composition is known as *ist’mali* and the asset that does not have static composition is known as *istihlaki*. 
2.2.3 Types of Islamic Asset

From the Islamic point of view, assets can be classified into valuable assets, invaluable assets, static assets and dynamic assets. Valuable asset is every asset that is kept by someone and syara' [20] allow the usage of it. Valuable assets comprise of static and dynamic assets. An invaluable asset is an asset that is, not to be kept by anybody, such as fishes in the sea, birds on the air and minerals inside the earth.

The purposes of dividing asset into valuable and invaluable asset are [20]:

- The valuable asset is valid for all types of business such as hire purchase, hibah, loans as well as set up a company.
- The invaluable asset is not valid for business.
- Those who make any damage on the valuable asset is compulsory to pay its compensate.
- If the is any damage on the invaluable asset it is not compulsory to pay its’ compensate.

A static asset is an asset that is cannot be moved from its location like building and houses. A dynamic asset is the asset that can be moved or restructured whether its value or its physical such as money and business properties.

The benefits of dividing assets into static and dynamic, according to the fiqh laws are as follows:

- Static assets are controlled under as-syuq’ah laws.
- Dynamic assets are controlled under mortgage laws. According to this law, some who need money he/she can sell their property to somebody with promise that he/she will buy back the property that has been sold.
• The trustee of orphans cannot sell the static asset owns by the orphan unless with the excuse which is allow by the syarak’ such as paying the debts that is important to the orphan but have to get the permission from the judge of qadhi.

• Every rights regarding to the neighborhood is only related to the static asset.

2.2.3.1 Zakat

From literature point of view, zakat can be defined as bless, virtuous, development and goodness. It is called zakat because it can expand the asset, which its zakat has been paid. According to syara’, zakat is a portion of asset that compulsory to be given to the right people. The thorough definition of zakat is the compulsory submitting a portion of the asset to the people who have the right to receive it through amil for the God sake [21].

Zakat is the third Islamic Pillar, which had been obligated in the second year of hijrah to the Muslim. At that time zakat payment has been made through basic food based on location like dates and wheat. For our country, zakat payments are made with money or rice, whichever is easier.

There is two types of zakat which is Zakat Fitrah and Zakat on properties. Zakat Fitrah means of 'purifying' the act of fasting (which is the fourth pillar of Islam) in the month of Ramadhan as we might have unconsciously committed certain sins while performing the fast. Also, the proceeds will help to lighten the burden of the poor and other needy groups. Zakat Fitrah is compulsory to all Muslims. It is compulsory that the item to be given away as Zakat Fitrah is the staple food of that country. In many countries in Asia, the staple food is rice. Hence, the amount to be given is 1cubic measure which is
equivalent to 2.3 kilograms. For practical purposes, the monetary equivalent of that amount is allowed to be used as Zakat Fitrah.

The payment of Zakat Fitrah can be done from the first day of the month of Ramadan. However, it is encouraged, as it is the Sunnah (practice) of the Prophet of Islam that it be paid on the eve of Shawal (the month following Ramadan) until before the Eid ul-Fitr prayers. After this period any payment is considered as charity. As Zakat is an act of worship, it is compulsory to have the conscious intention when performing it.

For the Zakat on Properties, it is compulsory to give Zakat on the following types of property [7]:

- Saving eg: Money in bank’s account.
- Income eg: Monthly or yearly income.
- Employee Provident Fund (EPF).
- Gold and Silver.
- Business eg: Yearly profit of the business.
- Share (goods to be traded).

The recipient of zakat are as follows [7]:

- **The Fuqaraa:** These people may have money, but it is not sufficient for their basic needs. Others have stated that these people have nothing. Allah says,

  *If they are Fuqara a (poor), Allah will enrich them out of His Bounty.*

  *Surah An-Nur, Ayyah 32*
• **The Maskeen:** These people do not have anything, so they are in need of asking others for food and clothing. Such have the right to ask and receive zakat. Others hold that these are those who may have some their basic needs. Allah says,

   \textit{But he has made no effort to pass on the path that is steep. And what will make you know the path that is steep? (It is) freeing a neck (slave), or giving food in a day of hunger to an orphan near of kin, or to a miskeen afflicted with misery.}

   \textit{Surah Al-Balad, Ayyah 11-16.}

• **Zakat Collectors:** These are persons that the authority employs to collect the zakat. The authority gives them a fee for their work, which includes, collecting, recording, guarding, dividing and distributing the zakat.

• **Wayfarer:** The wayfarer is the traveler stranded in a foreign land and is in need of money to achieve his objective or return to his own country. This person can receive zakat, if the purpose for traveling were lawful. If the purpose were unlawful, then he should not receive any moneys from zakat because it would help him in his sins. Allah warns us,

   \textit{Help one another in righteousness and piety, but do not one another in sins and transgression.}

   \textit{Surah Al-Ma’idah, Ayyah 2.}

• **The Debtors:** Debtors are those people burdened by debts because of personal needs or social necessity; such as the person who borrows to spend on himself and his family. This person is given zakat if he does not have enough money beyond his basic needs to repay his debt. However, for the one who borrows money for a social necessity; such as spending on an orphan, reconciling
between Muslims, or renovating a mosque or school; then he may be given zakat to repay his debt. This holds true even if he is wealthy according to sound opinion of the jurists.

- **Attracting hearts:** Zakat is also to be paid to attract the hearts of those who have been inclined towards Islam or to prevent the harm of non-Muslims residing within the Muslim state. Scholars have agreed that this type of zakat should be considered whenever there is a need for it. We often see people who embrace Islam become detached from their families and are sometimes deprived of a source of income. These people have the right to receive zakat to protect them from harm and to make their faith firm.

### 2.2.3.2 Fidiah

Fidiah is a fine for anyone who is not fasting during the month of Ramadan for some reason and fails to substitute it until the next Ramadan. There are several reasons that permit people breaking their fast: [25]

- Mussafir
- Illness
- Weakness and old age
- Unconsciousness
- Insanity
- Menses and nifaas
- Pregnancy
- Breast feeding
- Risk of life
The person who is eligible to receive fidiah is the same as the person who is eligible to receive the zakat.

2.2.3.3 Heritage

Heritage can be defined as all the asset has been left by dead person when their death has been proofed. Heritage can be classified into two types that are dynamic and static heritage asset. The heritage asset is categorized based on its value; Small Heritage Asset for below RM600, 000 and Big Heritage Asset for above RM600, 000. Static asset is the unmovable assets likes land, house and building, whereas dynamic assets are the movable asset like money, share, and business properties. The law of heritage asset distribution is known as Faraid Law [18].

The heir who is eligible to inherit the heritage asset is categorizes into three groups as follows:

- **Ashabul Furud** is the heirs who inherit the asset based on Faraid’s law that is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$ and $\frac{2}{3}$.

- **Asabah Nasabiah** is the heirs who do not inherit the asset as fixed to them but they can take the balance of the asset after the asset has been distributed to Ashabul Furud.

- **Dhawil Arham** is the heir who does not in Ashabul Furud or Asabah Nasabiah group.

The heir is eligible to inherit the asset are both male and female. There are ten categories of male who can inherit the heritage asset based on hereditary and marriage:

- Son
- Grandson and below.
• Father.
• Grandfather (from father side) and above.
• Siblings.
• Nephew.
• Uncle (from father side)
• Husband
• Male cousin (from father side)
• Men who release the slave.

The categories of female who can inherit the heritage asset based on hereditary and marriage is as follows:
• Daughter.
• Granddaughter and below.
• Mother.
• Grandmother and above.
• Female siblings.
• Wife or wives.
• Women who release the slave.

From Islamic point of view, it is compulsory to divide the heritage asset to its heir evenly. This law is clearly stated in Al-Qur’an and has been fixed by syara’ and cannot be changed by the people easily.
2.2.3.4 Waqaf

Waqaf means the donation of personal property to public. One of the ways to upgrade our worship to Allah is by donating a portion of our properties for the God sake. This is because Waqaf is the specialty given to us by Allah, which is not be given to the previous nation. Islam encourages people to use their property for the good reasons [13].

\[ You\ shall\ never\ attain\ good\ unless\ you\ spend\ your\ favorite\ things;\ and\ Allah\ knows\ whatever\ you\ spend. \]

\[ Surah\ Ali-Imran,\ Ayyah\ 92. \]

Waqaf is not just a donation but it will benefit the person who donates as well as the community. The merit of waqaf is continuous as long as the item is still can be used. Because of the merit of waqaf is special and continuous, Syara’ put several rules to the waqaf properties [12].

- The property must be profitable.
- The property must have the long-term benefit.
- The property is donated for specific reason.
- Only for the good deeds.
- The property must be 100% owned by the person who wants to make the donation.
2.3 Asset Management

2.3.1 Definition of Asset Management

Asset Management is a strategic decision-making investment process to enhance productivity and provide alternative solutions for effective utilization of government as well as individual assets. Asset management provides a disciplined approach to cost analysis, a method for analyzing allocation trade-offs between initiatives, tools and information for optimizing returns on investments already made, better and consistent information for reporting to stakeholders like Congress. [26]

2.3.2 Conventional Asset Management

Conventional asset management can be defined as the management of the physical assets of an individual or company in order to maximize return. Typically it is managed through stocks, bonds or cash equivalents. For professional investors, they manage their assets according to specific stated objectives or investment styles.

Asset Management maximizes the performance of fixed, physical or capital assets that have a direct and significant impact on achieving corporate objectives. In conventional asset management, the asset is managed based on the conventional law.

2.3.3 Islamic Asset Management

Islamic asset management can be defined as a systematic planning and control of a physical resource throughout its life. This may include the specification, design, and construction of the asset, its operation, maintenance and modification while in use, and
its disposal when no longer required. The systematic planning and control of physical resources must follow the Islamic law as stated in Al-Quran and *sunnah*.

From the Islamic point of view, assets are gifts from Allah to the people, so that people have to manage it according to the laws fixed by the *syara’* because the ultimate owner of these asset is Allah s.w.t. However, we have to understand the concept of asset and the way to manage it thoroughly.

“Have you not seen that Allah has made subservient for you whatever is in the heavens and in the earth and had bestowed upon you in full His graces open and hidden? And among people, there are some who contest about Allah without knowledge and with no wisdom and without a luminous Book.”

*Surah Luqman, Ayyah 20*

From the ayyah above, it shows that Islam put asset as one of natural needs in human life. To fulfill this, Islam has fixed its system and law which, proofed works efficiently. This thesis focuses on four categories of Islamic asset management that is Zakat, Fidiah, heritage and wakaf.

### 2.3.3.1 Zakat

There are two types of zakat, which are Zakat on Properties and Zakat Fitrah. The way of calculating the Zakat on the Properties is different from one asset to another. The amount of zakat due on these types of wealth is 2.5% of their total values. However, this rate is different for other types of wealth such as agricultural products, livestock and natural resources. For Zakat Fitrah the amount to be given is 1 cubic measure that is equivalent to 2.3 kilograms of staple food of that country or the equivalent value of money. Zakat must be distributed among the classes of Muslims for the purposes
enumerated with the intention of fulfilling the obligation of zakat and to whether the recipient has made the absolute owner in his or her sole right of what is given to him or her. The moral this institution conveys is that we must not be selfish and get too fond of worldly possessions, but must always be ready and willing to help our brethren by all means at our disposal.

For example someone has a saving of RM 25000.00 in conventional account with 8% of interest that due for zakat. The total amount of his saving must be minus the bank’s interest first, then the balance has to be multiplied by 2.5%. As a result, the zakat amount is 2.5% of the saving after minus the bank’s interest.

2.3.3.2 Fidiah

In Malaysia, Fidiah is paid using rice or money. The amount of the rice is about ¾ kilogram per day or equivalent of cash and the amount is accumulated. The amount of rice or money with equivalent value will accumulate until she replaces her fast.

For example someone failed to fast six days during Ramadan, if she failed to replace it until the next Ramadan she has to pay 4.5 kilogram of rice. But if she failed again to replace until next following Ramadan, she has to pay 9 kilogram. If she wants to pay using money, the amount of money is equivalent the value of rice.

2.3.3.3 Heritage

In Malaysia, Amanah Raya Berhad plays its role as the heritage asset administrator. Amanah Raya Berhad will manage all assets including the money in saving account,
employee provident fund (EPF), retirement allowance, compensation and so on. Amanah Raya Berhad also have to identify the heir of the asset, their portion and method of distribution.

The very first step in heritage asset management is to appoint the asset administrator. This will make the process easier and faster. As the asset administrator, Amanah Raya Berhad have the power to manage the heritage asset based on statutory power. Amanah Raya Berhad will apply an administrative letter from the high court and land department. Amanah Raya Berhad will distribute the assets based on faraid of wills letter. Amanah Raya Berhad bound with the law to make sure that the future of the heir is safe and guaranteed. Besides that, Amanah Raya Berhad also has other services like will writing, will keeping as well as will implementation. Wills are important law documents to assure the distribution of heritage asset.

For example, if someone died and left 1 wife, 2 sons and 1 daughter, the allocation of heritage according to *Faraid’s* law is as 2.1 below:

<table>
<thead>
<tr>
<th>Heir</th>
<th>Heritage Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wife</td>
<td>1/8</td>
</tr>
<tr>
<td>Son</td>
<td>Two portions from the remaining asset</td>
</tr>
<tr>
<td>Daughter</td>
<td>One portion from the remaining asset</td>
</tr>
</tbody>
</table>
2.3.3.4 Waqaf

Waqaf has been implemented by the Prophet Mohammad p.b.u.h. and his companions. The Waqaf properties have been used to build the mosque and Islamic school. Nowadays, in Malaysia, Jabatan Agama Islam controls the waqaf properties. In Islam, Waqaf has the high value and is viewed in three dimensions. Firstly, it gives multiple merit to the people who waqaf their property. Secondly, it helps the poor people. Thirdly, it upgrades the image of Islam. In these development era and rapid growth of economic, the Islamic institution like waqaf must be driven to grow together. This proved that Islam is dynamic and progressive, suitable with the recent situation.

2.3.4 Differentiation between Conventional and Islamic Asset Management

Recently, there are two types of asset management, which are conventional and Islamic asset management. They are different in terms of implementation and rules. Conventional asset management manages asset based on the conventional law but Islamic asset management manages asset based on the syara’ and rules as stated in Al-Quran and Hadith. In the conventional method, all types of funds are invested but in the Islamic method it only invest in Islamic fund. The interest rate of conventional asset management is based on the current market but for Islamic the rate is fixed. In conventional, it can make money from money for example interest from credit card. On the other hand, in Islamic asset management it cannot making money from money but must go through on intermediate step of it being used for the purchase goods and services. Conventional allows the predetermined payment above the actual amount of principal and also supports uncertainty, risk and speculation transaction which is prohibited in Islamic asset management.
2.3.5 Conventional Asset Management System

Conventional asset management system is a system that manages asset in conventional way. Conventional asset management systems have evolved from maintenance management systems. Maintenance management systems use work orders for preventive and corrective maintenance, equipment recording and tracking, replacement parts inventory, and maintenance labor scheduling. The goal of asset management is to optimize asset use and manage all maintenance efforts involved in making assets as reliable, accurate, and efficient as possible. Conventional asset management system usually focuses on physical or capital asset such as financial, bond and stocks management.

2.3.6 Personal Islamic Asset Management System

Personal Islamic Asset Management System is a system that manages personal asset based on Islamic rules and syara’. The system will process the data entered by the user (eg: asset value to calculate zakat), to enhance productivity and provide alternative solutions for effective utilization of Islamic assets.

Features of Personal Islamic Asset management System is constructed based on Al-Quran and Sunnah. Some of the features in Personal Islamic Asset Management System are online record, online calculator, online archive and online counter. Online records of the registered user can be retrieved online but it requires user ID and password. Online calculator is used to calculate the zakat, fidiah and heritage amount based on its calculation. Online archives are related articles that can be viewed online.
Online counter is the online directory where user can browse the information of the zakat, fidiah, waqaf and heritage counter.

2.3.6.1 Existing Personal Islamic Asset Management System

The research on the existing system that is related to Personal Islamic Asset Management System has been done. There are several Personal Islamic Asset Management System such as e-zakat, dompetdhuafa, thezakat, ARB and Faraid System.

- e-zakat is a portal that manages zakat in Malaysia [7]. e-zakat is owned by Pusat Zakat Selangor but controlled by Majlis Agama Islam Selangor. Its function is to manage the asset that is related to zakat such as give the information about zakat to public, help user to calculate zakat, distribute zakat and online payment. The portal also provide the service to check payment record online, view online magazine and article. The strength of e-zakat is the information about zakat is conveying to user via internet, the calculator calculate the zakat according to its category efficiently, has secure online payment and online publication. The limitation of this portal is it only focused on zakat and fidiah. e-zakat is the one and only portal that manages zakat in Malaysia.

- dompetdhuafa is a zakat portal that manages zakat in Indonesia [29]. It is one of several portals that manage zakat in Indonesia, but at researcher point of view, dompetdhuafa is the most comprehensive portal compared to others. The main features of dompetdhuafa are it has the efficient online calculator, online frequent ask question, e-community, online financial report and picking zakat services. The strength of dhompetdhuafa portal are it give good information about zakat, which is easy to understand, has interactive calculator and has an
online financial record. The limitation of dompetduafa is same as e-zakat, which is it only focused on zakat and fidiah management.

- thezakat is one of zakat portal that manage zakat at United State of America (USA) [14]. thezakat portal is controlled by the Zakat Foundation in USA. The main features of the portal are it has online payment, online calculator, online magazine and article, online testimonial and photo gallery. The strengths of thezakat are it provide the good information that is easy to understand, has the accurate online calculator, has secured online payment and online publication for user reference. The limitation of thezakat is it only focus on the management of zakat.

- ARB is the portal that manages heritage in Malaysia. ARB is owned by Amanah Raya Berhad [8]. The main features of the portal are it has the complete information about heritage, both in Islamic and conventional way, online wills form, online article and online forms. The limitation of ARB is it only focuses on heritage management and it do not have heritage calculator.

- Faraid system is an Islamic portal that manage heritage in Islamic way in Malaysia [3]. The mail features of the portal are it has complete information about faraid, how to distribute heritage in Islamic way, list of appropriate heirs, press archive and faraid calculator. The limitation of Faraid system is it only focuses on heritage management not the other assets.

Features are the characteristic of the system or attributes of a system, which may or may not confer a benefit. Strength is the advantage of the system, which will benefit the user whereas limitation is the restriction or principle that limits the extension of something. Table 2.1 summarizes the features, strengths and limitations of those systems.
Table 2.2: List of features, strength, limitations and development method of existing system.

<table>
<thead>
<tr>
<th>Features</th>
<th>e-zakat (Malaysia)</th>
<th>dompethuafa (Indonesia)</th>
<th>thezakat (America)</th>
<th>ARB (Malaysia)</th>
<th>Faraid System (Malaysia)</th>
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<tr>
<td>• Online Record</td>
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<td>• Online Payment</td>
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<td>• Online Calculator</td>
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<td>• Online Magazine &amp; Article</td>
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<td>• Online Frequent Ask Question</td>
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<td>• E-Community</td>
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<td>• Picking zakat services</td>
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<td>• Online financial report</td>
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<td>• Online Testimonial</td>
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<td>• Online Wills</td>
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<td>Strengths</td>
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<td>• Has interactive calculator</td>
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<td>• Updated financial report</td>
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<td>• Has picking zakat services</td>
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<table>
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<th>Limitations</th>
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<td>• Focus on zakat</td>
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<td>• Focus on fidiah</td>
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<td>• Focus on heritage</td>
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<td>• Focus on waqaf</td>
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As conclusion, the existing system of Asset Management System has its own strength and limitation. All of the system above provides the information about the zakat to give the clear view about zakat to the user. But those systems only focused on zakat and fidiah, not the other Islamic asset. All of the system has an interactive online zakat calculator to help user calculate the amount of zakat they have to pay. e-zakat from Malaysia and thezakat from America provide online payment services and online publication. Whereas, dompetdhuafa from Indonesia has picking zakat services and provide online updated financial report.

The development of Personal Islamic Asset Management System using Object-oriented Approach will be the one stop center for Islamic asset management as it will combine the management of zakat, fidiah, heritage and waqaf in one portal. One of the most appropriate methods of developing the system is object-oriented software engineering.

### 2.4 Object-oriented Software Engineering

From the research that had been done, researcher found that object-oriented software engineering approach is the best solution to develop Personal Islamic Asset Management System because it focused on concept of reuse, quality, iterative development and risk management [39].

The characteristic of object-oriented software engineering are as follows:

- Provides more realistic representation, which end user can more readily understand.
- Provides consistent approach which maps cleanly onto a physical design and implementation.
• Provides a framework that supports reuse and extensibility.
• Provides more consistent approach to system modeling.
• Provides reuse possibility from the class hierarchy views of the system.
• Able to model user interfaces of a system.

The further explanation of object-oriented software engineering will be in next topic.

2.4.1 Definition of Object-oriented Software Engineering

Object-oriented Software Engineering (OOSE) is a software design technique used for software design in object-oriented programming. Object-oriented software engineering was developed by Ivar Jacobson circa 1992. It is the first object-oriented design methodology to employ use case to drive software design. It also uses other design products similar to those used by Object Modeling Techniques (OMT) and Unified Modeling Language (UML) [27].

Software engineering is the profession that creates and maintains software applications by applying technologies and practices from computer science, project management, engineering, application domains, and other fields. Software engineering, like traditional engineering disciplines, deals with issues of cost and reliability. Some software applications contain millions of lines of code that are expected to perform properly in the face of changing conditions.

Object-oriented programming is a computer programming paradigm. The idea behind object-oriented programming is that a computer program is composed of a collection of individual units, or objects, as opposed to a traditional view in which a program is a list of instructions to the computer. Each object is capable of receiving messages,
processing data, and sending messages to other objects. Object-oriented programming is claimed to give more flexibility, easing changes to programs, and is widely popular in large scale software engineering.

### 2.4.2 Object-oriented Software Engineering Concepts

The concepts of Object-oriented Software Engineering can be described using the main terms and concepts. A project, whose purpose to develop a software system is composed of a number of activities. Each activity is in turn composed of a number of tasks. A task consumes resources and produces a WorkProduct. A WorkProduct can be a system, model or document. Resources are participants, time or equipment. Software engineering concept diagram is shown in figure 2.1.

![Software Engineering Concept Diagram](image-url)

**Figure 2.1:** Software Engineering Concept [28]
Developing software system requires the collaboration of many people with different background and interest. All the people involved in the project can be referred to as participants. A set of responsibilities in a project or system can be referred as a role. A role is associated with a set of task and is assigned to participant.

System is a collection of interconnected parts. Modeling is a way to deal with complexity by ignoring irrelevant details. Model is referring to any abstraction of the system.

Work product is an artifact that is produced during development such as a document or piece of software for other developer. The work product for internal consumption is known as Internal Work Product. The work product that must be delivered to client is known as Deliverable.

Activity is a set of tasks that is performed toward a specific purpose. Task represents an atomic unit of work that can be managed. Resources are assets that are used to accomplish work. Resources include time, equipment and labor.

### 2.4.3 Rational Unified Process (RUP)

One of the software engineering lifecycle methodology developed using Object-Oriented Software Engineering (OOSE) methodology is Rational Unified Process (RUP). The Rational Unified Process (RUP) is an iterative software development process created by the Rational Software Corporation. The RUP is not a single concrete prescriptive process, but rather an adaptable process framework. As such, RUP describes how to develop software effectively using proven techniques. While the RUP encompasses a large number of different activities, it is also intended to be tailored, in
the sense of selecting the development processes appropriate to a particular software project or development organization. The RUP is recognized as particularly applicable to larger software development teams working on large projects. Rational Software offers a product known as the Rational Unified Process Product that provides tools and technology for customizing and executing the process.

Rational Unified Process (RUP) begins when the creators and developers of software system focused on diagnosing the characteristics of different failed software projects. They also looked at the existing software engineering processes and their solutions for these symptoms. Project failure is caused by a combination of several symptoms, though each project fails in a unique way. The outcome of their study was a system of software best practices they named the Rational Unified Process. Since knowing these problems will not guarantee a successful software product unless the solutions are also considered, the Rational Unified Process Product (RUPP) was created.

Using the RUP, software product lifecycles are broken into individual development cycles. These cycles are further broken into their main components, called phases. In RUP, these phases are termed as inception, elaboration, construction and transition phase.

2.4.3.1 Inception Phase

In this phase the business case which includes business context, success factors and financial forecast is established. To complement the business case, a basic use case model, project plan, initial risk assessment and project description are generated. After these are completed, the project is checked against the following criteria:
- Stakeholder concurrence on scope definition and cost/schedule estimates.
- Requirements understanding as evidenced by the fidelity of the primary use cases.
- Credibility of the cost/schedule estimates, priorities, risks, and development process.
- Depth and breadth of any architectural prototype that was developed.
- Actual expenditures versus planned expenditures.

If the project does not pass this phase, it can either be cancelled, or can repeat this phase after being redesigned to better meet the criteria.

### 2.4.3.2 Elaboration Phase

The Elaboration phase is where the project starts to take shape. In this phase the problem domain analysis is made and the architecture of the project gets its basic form. This phase must pass another lifecycle by meeting the following criteria:

- A use-case model in which the use-cases and the actors have been identified and most of the use-case descriptions are developed. The use-case model should be 80% complete.
- A description of the software architecture in a software system development process
- Architecture prototype, which can be executed.
- Business case and risk list which are revised.
A development plan for the overall project.

If the project cannot pass this milestone, there is still time for it to be cancelled or redesigned. After leaving this phase, the project transitions into a high-risk operation where changes are much more difficult and detrimental when made.

2.4.3.3 Construction Phase

In this phase the main focus goes to the development of components and other features of the system being developed. This is the phase when the bulk of the coding takes place. This phase produces the first external release of the software.

2.4.3.4 Transition Phase

In the transition phase the product has moved from the development organization to the end user. The activities of the phase include: Training of the end users and maintainers, Beta testing of the system to validate it against the end users expectations. The product is also checked against the quality level set in the Inception phase. If it does not meet this level, or the standards of the end-users, the entire cycle begins again.

2.4.4 Object-oriented Software Engineering Development Activities

Development activities deal with the complexity of the system by constructing and validating models of the application domain or the system. Development activities
include requirement elicitation, analysis, system design, object design implementation and testing.

During requirement elicitation, the client and developers define the purpose of the system. The result of this activity is a description of the system in terms of actors and use cases. Actors represent the external entities that interact with the system. Actor includes roles such as end user, other computers the system need to deal with and the environment. Use cases are general sequences of events that describe all possible actions between an actor and the system for given piece of functionality.

During analysis, developers aim to produce a model of the system that is correct, complete, consistent and unambiguous. Developers transform the use cases produced during requirement elicitation into an object model that completely describes the system. During this activity, developers discover ambiguities and inconsistencies in the use case model that they resolve with the client.

During system design, developers define the design goals of the project and decompose the system into smaller subsystems that can be realized by individual teams. Developers also select strategies for building the system, such as the hardware/software platform on which the system will run, the persistent data management strategy, the global control flow, the access control policy and the handling of boundary condition. The result of the system design is a clear description of each of these strategies, subsystem decomposition and deployment diagram representing the hardware/software mapping of the system.
During object design, developers define solution domain objects to bridge the gap between the analysis model and the hardware/software platform defined during system design. This includes precisely describing object and subsystem interfaces, selecting off the shelf components, restructuring the object model to attain design goals and optimizing the object model for performance.

During implementation, developers translate the solution domain model into source code. This includes implementing the attributes and methods of each object and integrating all the objects such that they function as a single system. The implementation activity spans the gap between the detailed object design model and a complete set of source code files that can be compiled.

During testing, developers find differences between the system and its models by executing the system with sample input data sets. During unit testing, developers compare the object design model with each object and subsystem.

2.4.4.1 UML

Unified Modeling Language (UML) is a non-proprietary, third generation modeling and specification language. However, the use of UML is not restricted to model software. It can be used for modeling hardware (engineering systems) and is commonly used for business process modeling, organizational structure, and systems engineering modeling. The UML is an open method used to specify, visualize, construct, and document the artifacts of an object-oriented software-intensive system under development. The UML represents a compilation of best engineering practices which have proven to be successful in modeling large, complex systems, especially at the architectural level.
UML is a notation that resulted from the unification of Object Modeling Technique (OMT) and object-oriented software engineering (OOSE). The goal of UML is to provide a standard notation that can be used by all object-oriented methods and to select and integrate the best elements of precursor notations.

UML uses the following concepts that are actor, activity, interface, package, class, statechart and event.

An actor is something or someone who supplies a stimulus to the system. It can also be thought of as something the system requires in order to function. In addition to actors there also exists primary actors. Primary Actors interact directly with a system to achieve their goals. Supporting actors may be humans or systems called in to support the Primary Actor.

An activity is a major task captured by a UML software design that must take place in order to fulfill an operation contract. Therefore, an activity can represent the invocation of an operation, a step in a business process, or an entire business process. Activities can be decomposed into sub-activities, until at the bottom where we find atomic Actions.

An interface defines the means of interaction between software components - this includes constants, data types, types of procedures, exception specifications and method signatures. In some instances, it may be useful to define variables as part of the interface.

It often also specifies the functionality of those procedures and methods, either by comments or by formal logical assertions. The concept of interface is the cornerstone of modular programming, a forerunner and a standard ingredient of object-oriented
programming. In object-oriented programming, an object's interface consists of a set of methods that the object will typically respond to.

A package is a collection or grouping of related classes or classes with related functionality. An example of a package is the java.io package which contains or groups together all the classes in the java programming language that aid input and output of data/information, for instance the buffered reader class, which is basically used to accept user input from the keyboard, in the java programming environment.

A class consists of a collection of types of encapsulated instance variables and types of methods, possibly with implementation of those types together with a constructor function that can be used to create objects of the class. A class is a cohesive package that consists of a particular kind of compile-time metadata. A Class describes the rules by which objects behave; these objects are referred to as "instances" of that class. A class specifies the structure of data which each instance contains as well as the methods which manipulate the data of the object; such methods are sometimes described as “behaviour”.

Statechart are used to graphically represent finite state machines. State transition tables are another possible representation.

An event is something that takes place; an occurrence and arbitrary point in time. A significant occurrence or happening. A social gathering or activity. Individuals define an event's significance subjectively; people actively and retroactively compartmentalize their lives and history in terms of epochs delimited by events considered to be significant.
2.4.4.2 UML Diagram Types

UML has several diagram types according to its stage, which are use case diagram, class diagram, interaction diagram, collaboration diagram, statechart diagram, activity diagram and deployment diagram.

2.4.4.2.1 Use Case Diagram

Use Cases are used during requirements elicitation and analysis to represent the functionality of the system. Use cases focus on the behavior of the system from an external point of view. A use case describes a function provided by the system that yields a visible result for an actor. An actor describes any entity that interacts with the system. The identification of actors and use cases results in the definition of the boundary of the system, that is, in differentiating the task accomplished by the system and the task accomplished by its environment. The actors are outside the boundary of the system, whereas the use cases are inside the boundary of the system.

2.4.4.2.2 Class Diagram

Class diagrams are used to describe the structure of the system. Classes are abstractions that specify the common structure and behavior of a set of objects. Objects are instances of classes that are created, modified and destroyed during the execution of the system. An object has state that includes the values of its attributes and its links with other objects. Class diagram describe the system in term of objects, classes, attributes, operations and their associations.
2.4.4.2.3 Interaction Diagram

Interaction diagrams are used to formalize the dynamic behavior of the system and to visualize the communication among objects. They are useful for identifying additional objects that participate in the use cases. Objects that involved in a use case is called participating objects. An interaction diagram represents the interactions that take place among these objects.

2.4.4.2.4 Collaboration Diagram

A Collaboration diagram models the interactions between objects in terms of sequenced messages. Collaboration diagrams represent a combination of information taken from Class, Sequence, and Use Case Diagrams describing both the static structure and dynamic behavior of a system. Collaboration and sequence diagrams describe similar information, and as typically implemented, can be transformed into one another without difficulty. However, collaboration diagrams use the free-form arrangement of objects and links as used in Object diagrams. In order to maintain the ordering of messages in such a free-form diagram, messages are labeled with a chronological number and placed near the link the message is sent over. Reading a Collaboration diagram involves starting at message 1.0, and following the messages from object to object. In UML 2.0, the Collaboration diagram has been simplified and renamed the Communication diagram.
2.4.4.2.5 Statechart Diagram

Statechart diagrams describe the dynamic behavior of an individual object as a number of states and transitions between these states. A state represents a particular set of values for an object. Given a state, a transition represents a future state the object can move to and the conditions associated with the change of state.

2.4.4.2.6 Activity Diagram

Activity diagrams represent the business and operational workflows of a system. An Activity diagram is a variation of the state diagram where the "states" represent operations, and the transitions represent the activities that happen when the operation is complete. This activity diagram shows the actions that take place when completing a form. The user starts by filling out the form, then it is checked; the result of the check determines if the form has to be filled out again or if the activity is completed.

2.4.4.2.7 Deployment Diagram

Deployment diagrams serve to model the hardware used in system implementations and the associations between those components. The elements used in deployment diagrams are nodes, components and associations. This deployment diagram shows the hardware used in a small office network. The application server is connected to the database server and the database client is installed on the application server. The workstation is connected to the application server and to a printer.
2.5 Conclusion

During the past few years there has been a remarkable evolution in the world of Islamic Asset Management. This chapter focused on the need to develop a Personal Islamic Asset Management System using Object-oriented Approach. It discussed about assets, Islamic assets, asset management, object-oriented software engineering and object-oriented software engineering development activities. The functional requirement of the system is defined through literature review. The interview questions also have been constructed from the literature review. The additional functional requirement of the system will be defined from the interview. By applying the Rational Unified Process (RUP) model in system development, this chapter is in the inception phase of the process where it analyses the depth and breadth of any architectural prototype that was developed by literature review. The next chapter will focus on the data collection and analysis including the data gathering, sampling and analysis.