

**CENTRALIZED CRYPTO EXCHANGES (CEX)
WEBSITE**

GAN HING LONG

UNIVERSITI TUNKU ABDUL RAHMAN

CENTRALIZED CRYPTO EXCHANGES (CEX) WEBSITE

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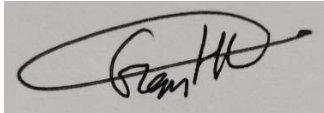
**A project report submitted in partial fulfilment of the
requirements for the award of Bachelor of Software
Engineering with Honours**

**Lee Kong Chian Faculty of Engineering and Science
Universiti Tunku Abdul Rahman**

September 2023

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

Signature : 

Name : Gan Hing Long

ID No. : 1901718

Date : 30/9/2023

APPROVAL FOR SUBMISSION

I certify that this project report entitled “**CENTRALIZED CRYPTO EXCHANGES (CEX) WEBSITE**” was prepared by **GAN HING LONG** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Software Engineering with Honours at Universiti Tunku Abdul Rahman.

Approved by,

Signature : *Mohammad Babrdel Bonab*

Supervisor : Mohammad Babrdel Bonab

Date : 3/10/2023

Signature : _____

Co-Supervisor : _____

Date : _____

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ABSTRACT

Digital assets such as cryptocurrencies are becoming a trend in the trading scene in these recent years. The more well-known cryptocurrencies among traders are Bitcoin, Ethereum, Ethereum 2, BNB, XRP, and Dogecoin. As a result, it is not surprising that websites dedicated to offering trading services for cryptocurrencies have appeared. Centralized cryptocurrency exchanges (CEX) websites are the name given to these types of websites. The best place for people to buy or sell bitcoins is on CEX websites. Unfortunately, these websites nevertheless show some limitations that will turn away visitors. One of these problems is the long period of waiting time for transactions to be completed. This may happen due to the high volume of trading activities in the websites. Besides, Malaysian users also faced problems with the availability of CEX websites in the country and the lack of accessibility of Malaysian Ringgit in existing CEX websites. To overcome the weakness present in existing CEX websites, this project dedicated itself to develop an improved website that will use MYR as main fiat currency for trading and made available for Malaysian to use. Laravel framework will be used in this project for the development of the CEX website. Iterative methodology is used in this project to ensure continuous improvement of the project can be achieved. By following this methodology, a high-quality CEX website can be developed. The outcome of this project is increasing the interest of Malaysian to use CEX website since MYR is made available in the developed website.

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LIST OF SYMBOLS / ABBREVIATIONS

BNB	binance coin
BTC	bitcoin
CEX	centralized cryptocurrency exchange
CNY	Chinese yuan
DEX	decentralized cryptocurrency exchange
DOGE	dogecoin
ETH	ethereum
ETH2	ethereum 2
EUR	the euro
GBP	British pound sterling
MVC	model-view-controller
MYR	Malaysian Ringgit
SGD	Singapore dollar
USD	United State dollar

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

According to CFI Team (2023), Centralized cryptocurrency exchanges, or CEX websites, are online platforms that allow users to buy, sell, and trade digital assets, cryptocurrencies, or NFTs using fiat currency or other cryptocurrencies. These exchanges are owned and operated by a central, private authority, which manages the exchange of digital assets and the storage of user funds. Examples of well-known centralized cryptocurrency exchanges include Binance, Coinbase, and Kraken. Centralized cryptocurrency exchanges serve as an intermediary between buyers and sellers and generate revenue through commissions and transaction fees. A CEX can be compared to a stock exchange, but it deals in digital assets.

According to Babypips (n.d.), Centralized Crypto Exchange websites play three major roles as an intermediary between buyers and sellers. The three roles are order matching, clearing counterparty and custodian. The first role is order matching. Buyers and sellers trade assets on a cryptocurrency exchange. This indicates that you purchase cryptocurrency from another exchange user rather than the exchange itself. Those who wish to buy cryptocurrency can do so on the exchange, as well as those who want to sell their cryptocurrency. Buyers and sellers are matched by the exchange. The exchange will match the orders of these two parties if a buyer wants to purchase bitcoin (BTC) for \$20,000 and a seller wants to sell bitcoin for the same amount.

Next, the exchange also plays the role of a central clearing counterparty. All matched orders are against the exchange as whole rather than directly amongst users. As neither the buyer nor the seller will be aware of the other's identity, this preserves both sides' anonymity. Additionally, the CEX manages the entire transaction process and makes sure that all obligations between the buyer and seller are fulfilled and the transaction actually closes as the central clearing counterparty. For instance, if you paid \$20,000 for 1 bitcoin (BTC), the exchange will make sure you have \$20,000 (USD), transfer the USD to the seller's account, and then send the freshly acquired BTC to your account. You cannot simply take the bitcoin and vanish, and the vendor cannot simply take your dollars, vanish, and keep their bitcoin.

Thirdly, the exchange also serves as the custodian for any money or cryptocurrency that you have in your account. You can deposit fiat money like dollars or euros on some exchanges, but only cryptocurrencies like bitcoin (BTC) or ether (ETH) are accepted on other exchanges. Whether it is fiat or crypto, once deposited, they are under the custody of the exchange. This means that you are now putting your confidence in the exchange in the same manner that you would put your trust in a bank vault to hold your money.

Since the beginning of the cryptocurrency market, CEX websites have been a crucial part of it, giving people and organisations an effortless way to trade cryptocurrencies. Unfortunately, these platforms have also had a number of grave issues, including fraud, hacking risk, and high transaction fees. Despite these issues, centralized cryptocurrency exchanges continue to be widely used due to their convenience, reliability, user-friendliness, and trading features (CFI Team 2023). Many users appreciate the ability to trade cryptocurrencies quickly and easily, with a range of trading pairs and advanced features such as margin trading and order types. In recent years, there has been a growing demand for decentralized exchanges (DEXs) that offer greater security, transparency, and control over user assets. DEXs operate on a decentralized network, removing the need for a central authority and reducing the risk of hacks and fraud.

However, these platforms are still in their early stages and currently face challenges with liquidity, user experience, and regulatory compliance (Howel 2023). In general, the growth of the cryptocurrency business has been greatly aided by centralised cryptocurrency exchanges. Users should carefully examine the risks before using these platforms as their issues emphasise the need for increased security and transparency in the sector.

In the end, this research will go through the pros and cons of existing Centralized Cryptocurrency Exchange websites, so that an improved CEX website can be proposed and developed from the experience gained during the research. The CEX websites that are within the range of this research are Kraken, Coinbase, and CEX.io.

1.2 Importance of the Study

This research will identify and analyse the upside and downside of existing CEX websites such as Kraken, Coinbase, and CEX.io. In this research, an improved CEX website according to pros and cons of existing websites above will be proposed to allow straightforward and effortless interactions with proposed CEX website for cryptocurrency trading purposes.

1.3 Problem Statement

Since the emergence of digital assets, especially cryptocurrency, there is an emergence of crypto exchange in the market. Investors are getting more interested in investing in digital assets, more particularly cryptocurrencies. Examples of cryptocurrencies that are more popular among cryptocurrencies traders are Bitcoin, Ethereum, Ethereum 2, BNB, XRP, and Dogecoin. Thus, the emergence of websites specified in providing trading services surrounding cryptocurrencies are not to be surprised at. These sorts of websites are called Centralized cryptocurrency exchanges (CEX) websites. Ideally, CEX websites are a solution for people who want to buy or sell cryptocurrencies. Unfortunately, these websites still display some incapability that will drive the users away. One of these problems is the long period of waiting time for transactions to be completed. This may happen due to the high volume of trading activities in the websites. Besides, Malaysian users also faced problems with the availability of CEX websites in the country and the lack of accessibility of Malaysian Ringgit in existing CEX websites.

1.3.1 Availability of CEX Websites in Malaysia

Although cryptocurrency exchanges are getting increasingly common in the entire world and among investors, and according to Zai (2022), the use of cryptocurrencies climbed by almost 2,300% since the third quarter of 2019 and by 881% in 2021. Over 16,000 digital assets are currently in use. But still some Cryptocurrency Exchanges websites are not made available in Malaysia. Some of these websites are Binance and KuCoin. According to Jet-Lin (2022), the Securities Commission of Malaysia's (SC) Investor Alert List, which lists unlicensed websites, goods, businesses, or people, and this list includes Binance. The SC also encourages investors to avoid working with any businesses or people who are not authorised or licenced. The volume traded on the Binance exchange on April 13 reached US\$40.33 billion in total over the course of 24 hours, which is more than 50 times the volume traded on the Bursa Malaysia, which reached RM3,146.74 million (or US\$0.77 billion) by the time the market closed that day. This is a loss for Malaysians who want to trade in a high trading volume market such as Binance or KuCoin.

1.3.2 Support of Ringgit Malaysia as Currency in CEX Websites

The main fiat currencies used in exchange of cryptocurrency in the more popular CEX websites are United States Dollar (USD) and Euro (EUR). While many CEX websites does not support Malaysian Ringgit (MYR) in their websites for deposit or withdrawal uses. For example, Kraken and CEX.io do not support the use of MYR in their websites to perform trading activities. This will decrease the interest of Malaysian traders to use these well-known CEX platforms.

1.3.3 Issue When Facing High Volume of Transaction Activities

When there is a high volume of trading activities at one time, the CEX websites may crash or slow down due to it. This is a common issue in the cryptocurrency industry. For example, Binance and Coinbase Global Inc., the two biggest digital asset exchanges in the world, experienced service interruptions in the year 2021 (Leising and Bloomberg, 2021). When the websites crashed, users may not withdraw their funds, and this is worrying all of their users. This will further lower the traders' confidence in the cryptocurrency exchange market.

1.4 Aim and Objectives

1. To conduct literature review of existing CEX websites which are Kraken, Coinbase, and CEX.io to analyse their strengths and weaknesses.
2. To design a CEX website that supports the use of Malaysian ringgit as Fiat currency in trading of cryptocurrency.
3. To evaluate the developed CEX website on its performance in handling simultaneous requests from the website's users, so that it can deliver responses to the users within one minute.

1.5 Scope and Limitation of the Study

The CEX website should allow two roles of users to interact with the website which is normal user and administrator. The users in this case are anyone who wants to use this website to perform cryptocurrency exchanges. The administrator should be able to add in new cryptocurrencies or remove cryptocurrencies from the website. The administrator should be able to receive customer support requests from the users. These customer support requests are captured by the website when users fill out a customer support request form that is provided on the website.

The CEX website should provide a crypto trading platform that supports multiple cryptocurrencies such as Bitcoin (BTC), Ethereum (ETH), Ethereum 2 (ETH2), BNB, XRP, and Dogecoin (DOGE). The CEX website should support fiat currencies including Malaysian Ringgit, US dollar (USD), Euro (EUR), Chinese Yuan (CNY) and Singapore dollar (SGD).

The CEX website should be able to handle spontaneous requests from users and complete each transaction within one minute simultaneously. The number of requests that can be handled at one time should not be lower than 10,000 requests. The CEX website should allow users to either deposit or withdraw their funds into or out from the website. With each withdrawal of funds, a 0.01 percent of the total amount of withdrawal will be charged for each transaction.

1.6 Proposed Approach/Solution

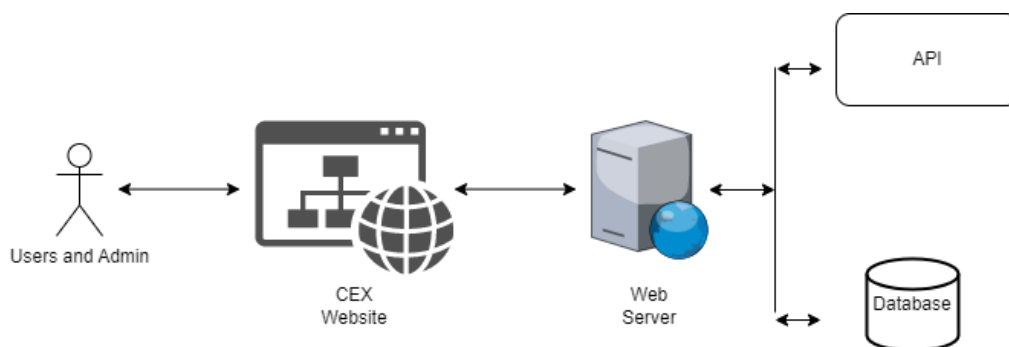


Figure 1.1: System Overview.

In Figure 1.1, a general overview of project solutions is illustrated. The stakeholders for this project are any people who would like to perform cryptocurrency trading on the website, this group of persons will be referred as traders. The other main stakeholder is the administrator of the website. For first time traders, they will need to sign up by providing information such as name, email, password. The administrator can add or remove cryptocurrencies on the website. The admin also can add or remove fiat currencies on the website. The traders can deposit funds on the website and buy cryptocurrencies. Besides, traders can withdraw their funds. The trader and admin can check their activities on the website. For example, traders can keep track of transactions made, total funds. The admin can view the volume of trading on the website, total cryptocurrencies sold and bought. The website can match the total amount of cryptocurrencies a trader wants to buy to the total amount of cryptocurrencies the database is available.

CHAPTER 2

LITERATURE REVIEW

2.1 About CEX Website

The existence of CEX websites is to provide a platform for investors or customers to be able to buy or sell digital assets with fiat currency or digital assets itself. The main product in these CEX websites is digital assets. Unlike traditional asset that can be buy and sell offline, and in real environment, digital assets can only exist in digital form, thus a new way of trading need to be developed to satisfy the need in the market. Therefore, the emergence of CEX websites fit in perfectly into the picture.

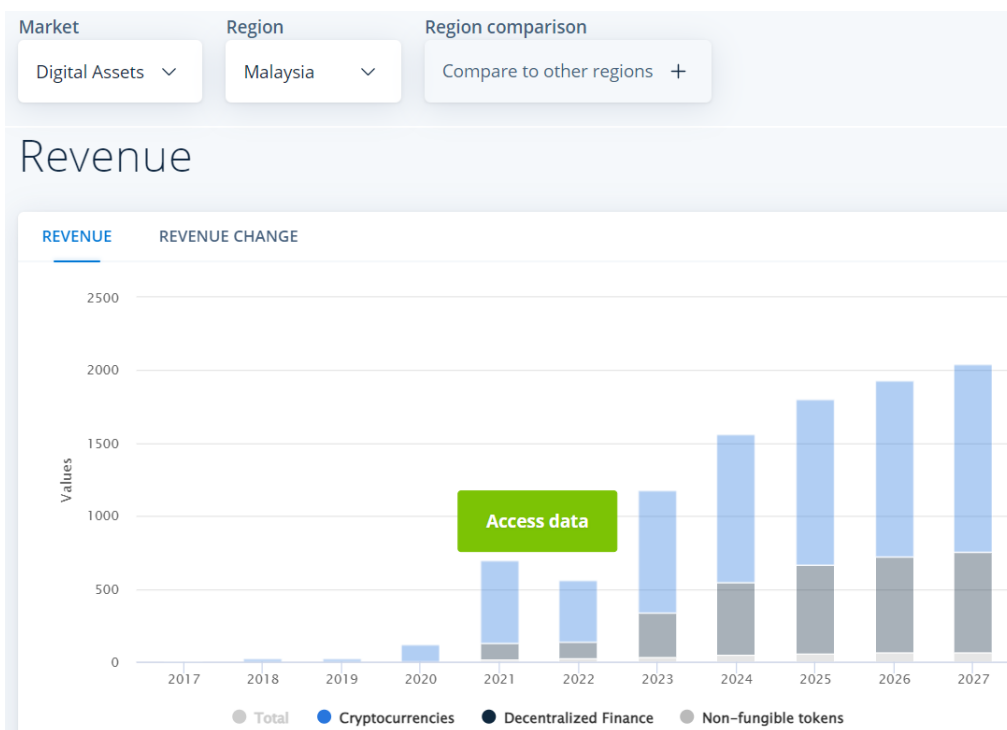
The other factor that prompts the creation and increase of CEX websites is the uprise in digital assets in terms of needs and revenues. This could be display by Figure 2.1 below, which indicates an increase of revenue of digital assets in each year from 2017. Although there was a setback in the year of 2022, but the market is estimated to bounce back this year and onwards (Statista, 2023a). Furthermore, the ratio of cryptocurrencies in the total digital assets is quite high, allocating more than half of the digital assets market.

The same scenario could be told in Malaysia, as revenue growth could be observed with the statistic shown in Figure 2.2 below. The increase in revenue in the digital assets market indicate the increase in need of robust, integrated, safe, reliable platform to trade digital assets especially cryptocurrencies in Malaysia.



Source: Statista, 2023a

Figure 2.1: Digital Assets Revenue Worldwide.



Source: Statista, 2023b

Figure 2.2: Digital Assets Revenue Worldwide in Malaysia.

2.2 Literature Review

The requirements of the CEX website are discovered by comparing the features of the existing CEX websites. The selected applications or websites to be compared are Kraken, Coinbase, and CEX.io. The upside of the websites is studied so that these features could be implemented in the proposed website. On the flipped side, the downside of existing websites should be avoided to be implemented in the proposed website.

Table 2.1: List of Existing CEX Websites.

	CEX Websites
1.	<p style="text-align: center;">Kraken</p> 
2.	<p style="text-align: center;">Coinbase</p> 
3.	<p style="text-align: center;">CEX.io</p> 

2.2.1 Kraken

Kraken is a cryptocurrency exchange website that gives users the privileges to buy and sell cryptocurrencies founded in 2011. Users can choose to trade cryptocurrency using the various types of orders such as limit and market order types. Users can also use advanced trading to access more order types such as stop loss, take profit stop loss limit, take profit limit, and settle position. Therefore, Kraken with its simple trading option is convenient for first time or amateur traders who just started venturing in the crypto exchange market. Besides, the advanced trading option also allows intermediate traders who have more experience and knowledge in crypto trading to fulfil their needs in trading with more options.

Figure 2.3: Simple Crypto Trading

Figure 2.4: Advanced Crypto Trading

A list of cryptocurrencies could be obtained in Kraken. In this list, information such as the digital assets' name, price, price changes, market cap are display for the traders to look at. The traders also can change the period of time of the information. For example, instead the price and price change of the digital assets in a period of one day, the traders could change it to view the price and price change in a period of one week, one month or one year. The difference in period of time could give different conclusion when analysing the trend of a certain crypto. One crypto may display a high increase in price for a period of one month, but in a one year, it may display huge downfall in price.

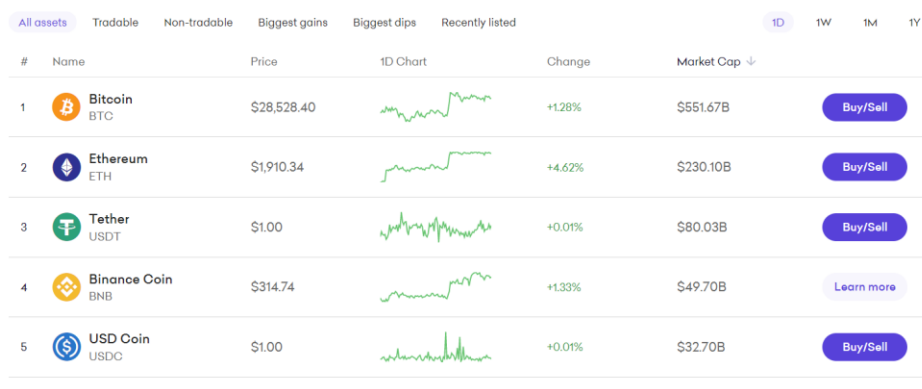


Figure 2.5: List of Cryptocurrencies.

After selecting a desired digital asset that a trader is interested in buying, the trader submits an order in Kraken. The trader will have to select the order type, start time and expire time or condition. After submitting the order, Kraken will prompt a confirmation message before proceeding to process the order.

Confirm your order

Buy 0.10000 BTC @ Limit 28,561.30 USD

ORDER DETAILS

Order type	Buy (Limit)
Limit price	28,561.30 USD
Leverage	-
Starts	Now
Expires	Good until canceled
Fee currency	USD
Estimated fee	4.5698 USD
Estimated USD to spend	2,856.13 USD
BTC to receive	0.10000 BTC

[Cancel](#) [Submit Order](#)

Figure 2.6: Submit New Trade Order.

Traders can always check their account balance anytime with a few clicks of the buttons. In the account balance page, traders are given access to either deposit or withdraw funds. The funds can be in the form of digital assets such as cryptocurrencies, or in the form of fiat currencies like US dollar.

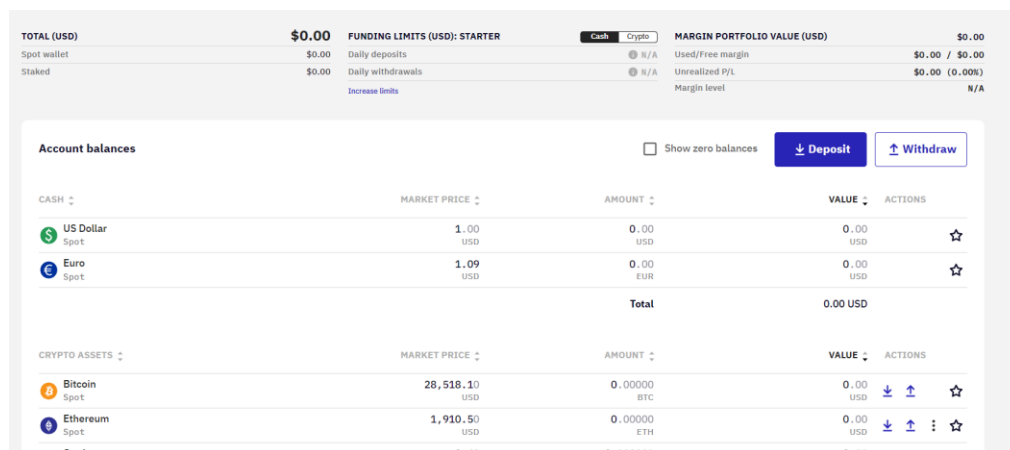


Figure 2.7: Account Balance Page.

Users can choose the desired cryptocurrency for deposit or withdrawal. Among the option of cryptocurrencies available in Kraken are Bitcoin, Ethereum, Tether USD, USD Coin, Dogecoin and Solana. There is no way to undo or cancel a withdrawal once it has been sent and displayed as "Success" in the Kraken account.

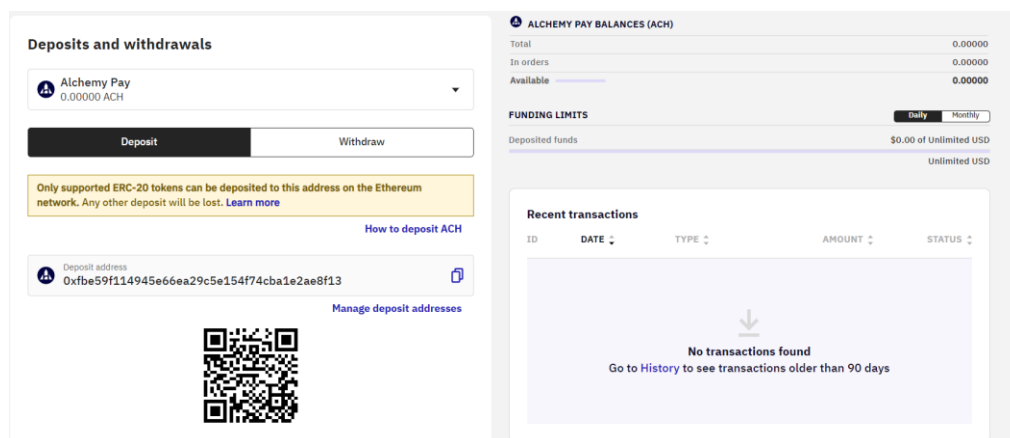


Figure 2.8: Deposit or Withdrawal Page.

Traders could monitor their trading activities via history of orders and traders. Records of completed or active orders and transaction can be assessed by the users in Kraken. This allows traders to keep track of their trading activities, such as how much is invested on a certain crypto so that adjustment could be accordingly. Next, various filter options are provided by Kraken to help traders to pinpoint the statistics that are critical and crucial for them for effective analysis. Some of the filters are to choose whether the orders or trades are completed or ongoing, to choose the start and end date or time of the orders or trades.

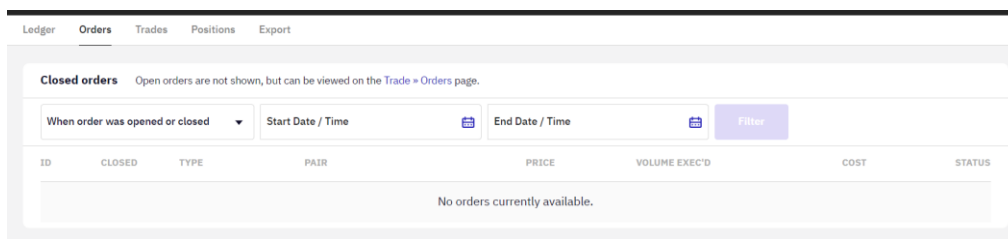


Figure 2.9: History of Orders.

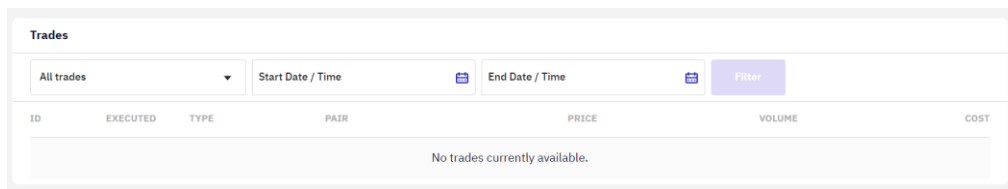


Figure 2.10: History of Trades.

In Kraken, there is a staking coin function that help users to earn rewards. Staking is an excellent technique to increase the value of holdings in the Kraken account. Once users staked their assets, users can collect staking rewards on top of their holdings and, in appropriate assets, compound those future benefits to grow them even more. To start staking coins, users will have to purchase or fund their Kraken account with one of the staking assets listed. Choose an asset to stake from the qualifying assets in users' spot wallet. Depending on the staked asset, users will receive weekly or bi-weekly rewards.

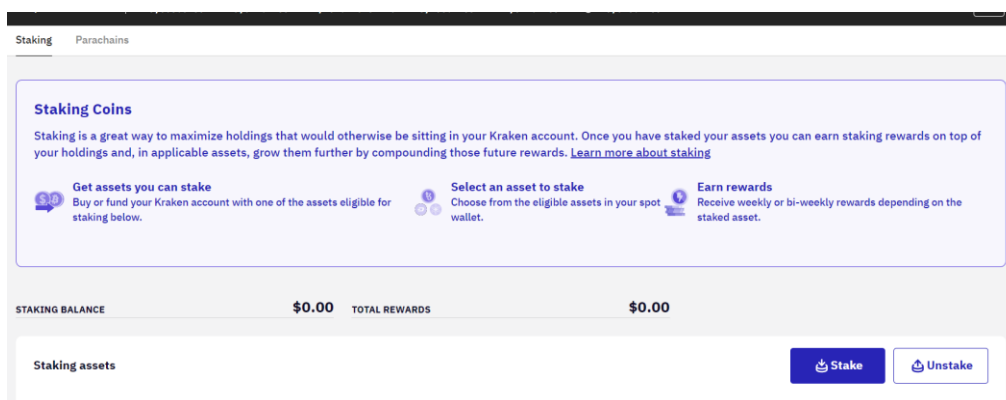


Figure 2.11: Staking Coins.

Kraken also provides a more advanced and sophisticated module for expert traders who know how to view analytics of the market to produce their own opinion and strategies when trading. This module is called Kraken Pro, which gives a totally different interface design for trading purposes. In this Pro version, the interface is filled with advanced tools and function for advanced and experienced traders to carry out trading activities. First of all, the time period for the price of crypto is increase in the market chart, traders can view price changes in a period of one minute, one hour, and four hours. Trading volume can be observed in the Pro interface.

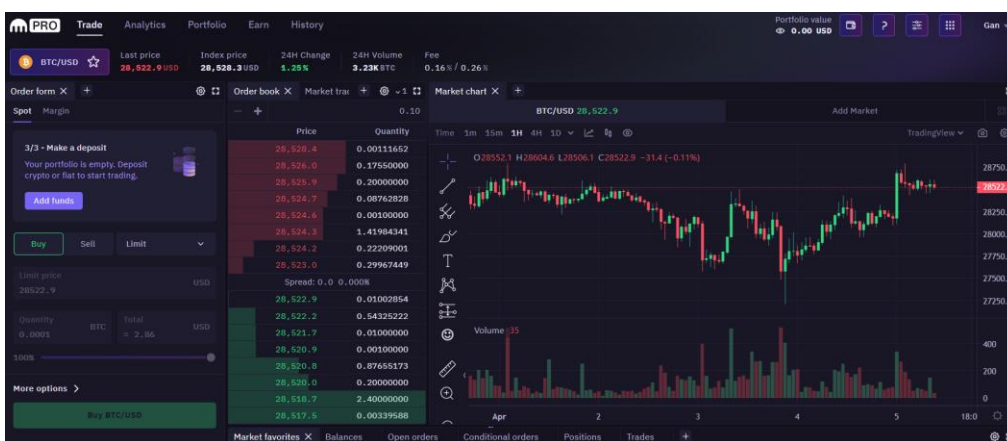


Figure 2.12: Kraken Pro Interface.

There is also a history of orders and trades in Kraken Pro version. Traders could also check on their trading activities in the Portfolio page.



Figure 2.13: History of Orders or Trades in Kraken Pro Version.

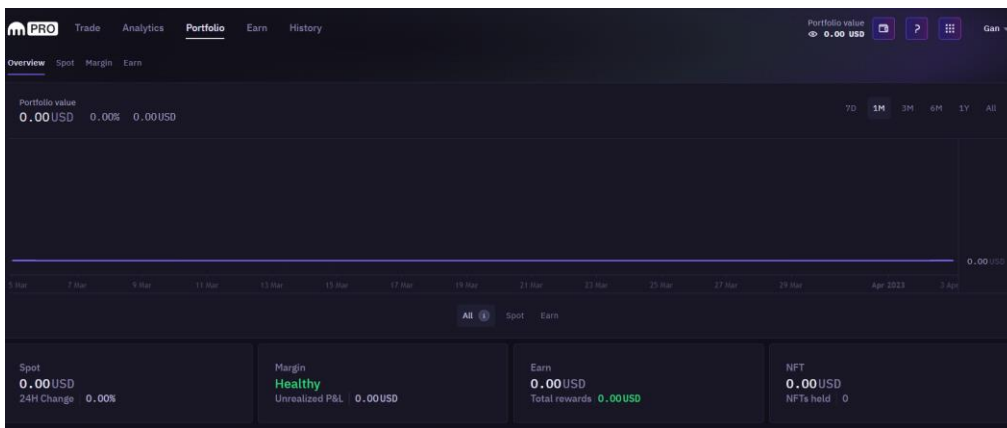


Figure 2.14: Portfolio in Kraken Pro Version.

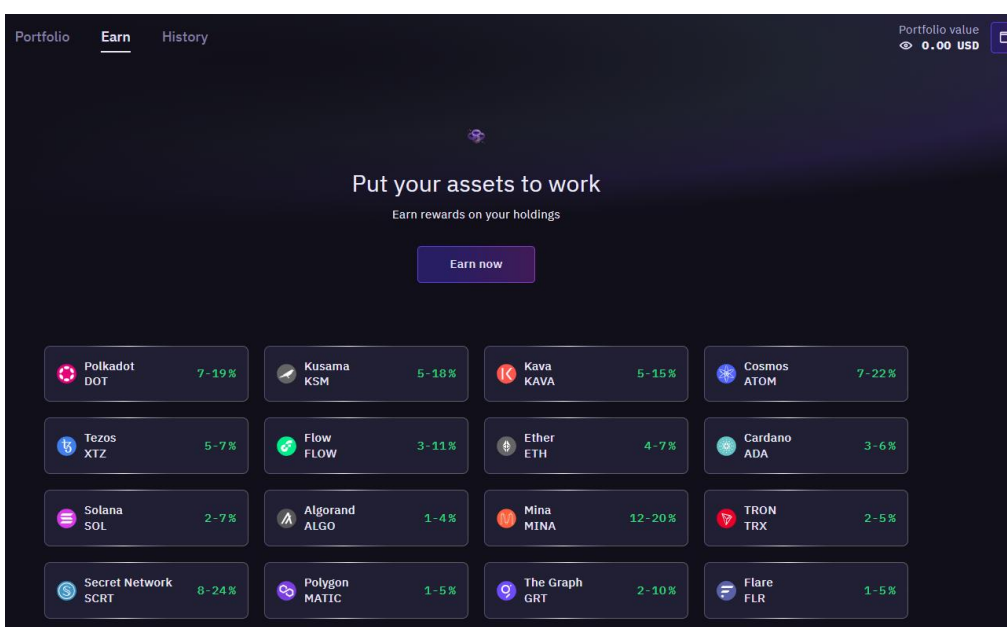


Figure 2.15: Staking in Kraken Pro Version.

2.2.2 Coinbase

Coinbase, a cryptocurrency exchange platform that started in 2012 is the second CEX website to be observe and research on. Founded by Brian Armstrong and Fred Ehrsam, Coinbase helps customers all across the world learn about and get started with cryptocurrency. Coinbase is trusted by around 110 million verified users and 245,000 ecosystem partners in over 100 countries to effortlessly and securely invest, spend, save, earn, and use cryptocurrency (Coinbase, n.d.).

Simple and Advanced trading mode is a feature in Coinbase which gives freedom and flexibility to users on how to trade cryptocurrencies based on their needs and preferences. In Simple view of trading module, traders can view the name, price, price change, and market cap of the cryptocurrencies listed. While in Advanced view of trading page, traders have access to more details and information about the cryptocurrencies. A more advanced and detailed price chart is shown when a traders choose a particular cryptocurrency in Advanced mode of trading.

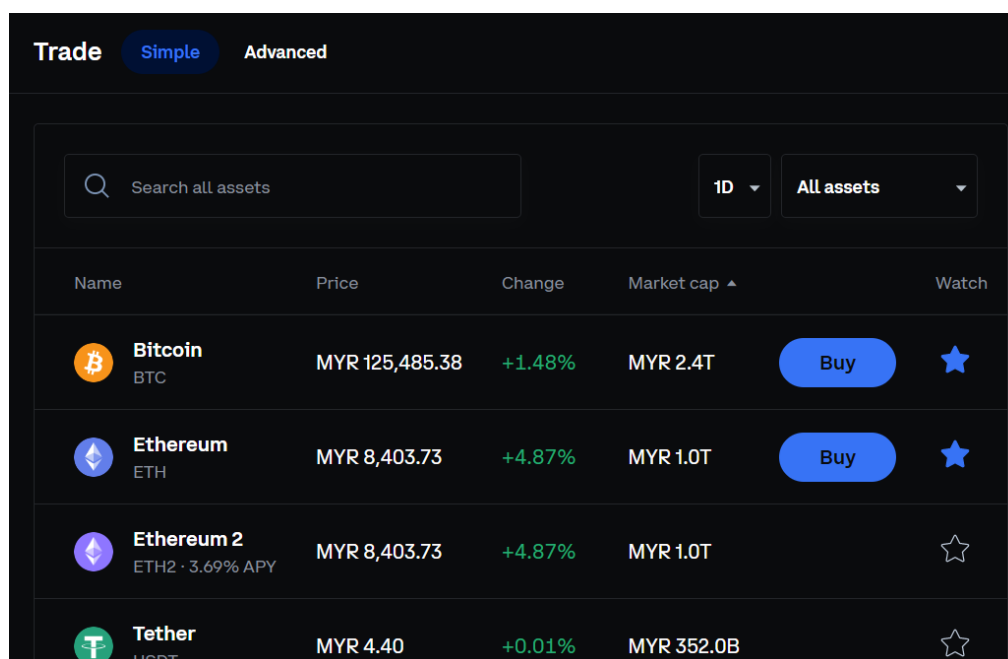


Figure 2.16: Coinbase Simple Trading.

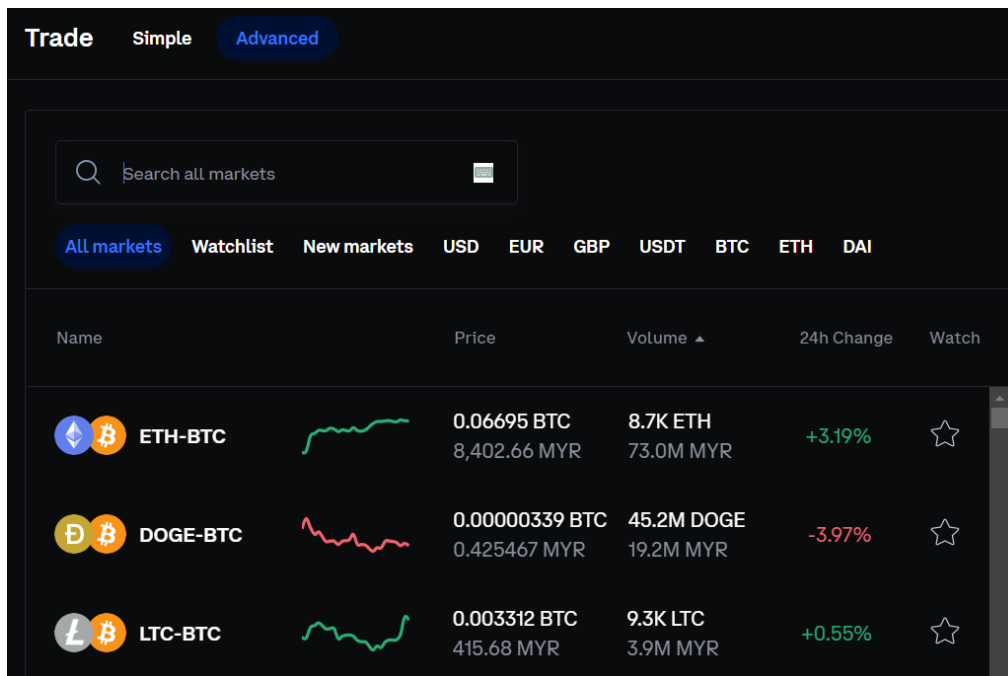


Figure 2.17: Coinbase Advanced Trading.



Figure 2.18: Coinbase Advanced Price Chart.

Continue from simple trading, when traders select a desired cryptocurrencies to be traded, traders will be redirected to a simple and clean interface containing information of the cryptocurrencies such as trend in price in multiple time range like one minute, one day, one month, one year and so on. Trading volume, trading activity, and circulating supply are also displayed to further assist traders in analysing certain cryptocurrency.



Figure 2.19: Information of Bitcoin in Coinbase.

Traders could check and monitor their portfolio balance in Coinbase. Traders could check digital assets that are acquired follow with its price and balance. The upside of Coinbase is that it will show the fiat currency in the users' own country. For example, when user from Malaysia browse Coinbase, the fiat currency used will become Ringgit Malaysia.

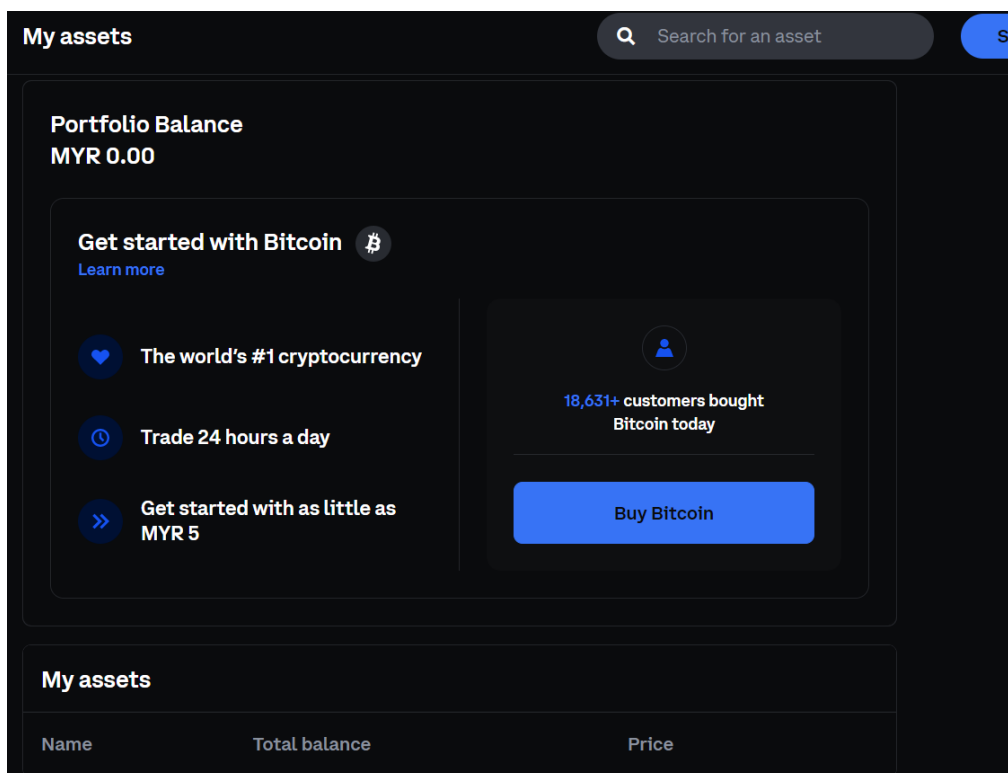


Figure 2.20: Portfolio Balance in Coinbase.

Coinbase also offers staking rewards for traders. Staking is the process of actively engaging in transaction validation on a proof-of-stake (PoS) blockchain. Anybody with a minimum necessary amount of a certain cryptocurrency can validate transactions and receive staking rewards on these blockchains.

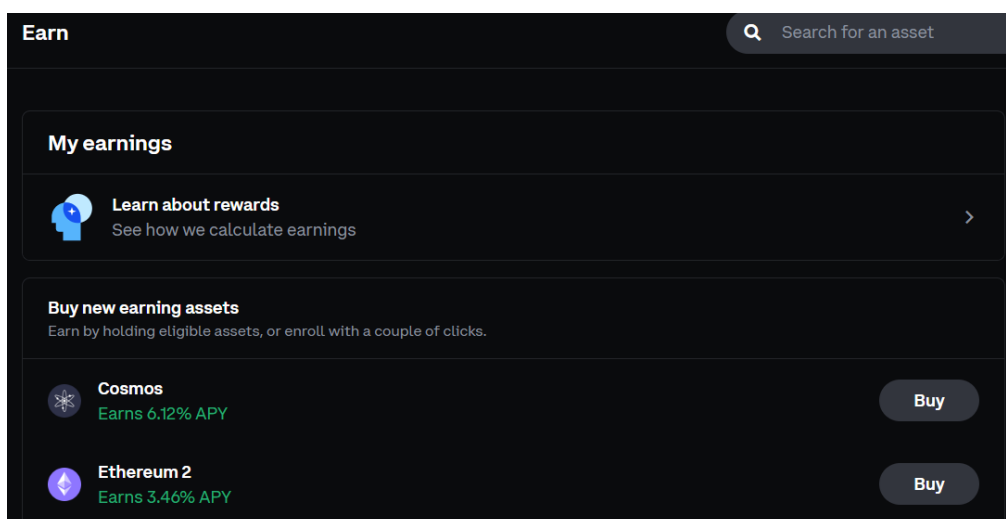


Figure 2.21: Earn Rewards in Coinbase.

Cryptocurrency	Minimum Balance Needed	Rewards Payout Rate	Protocol Unstaking Period	Additional Coinbase Unstaking Processing Time	Earns Rewards While Unstaking?
Cosmos (ATOM)	0.0001 ATOM	Every 7 days	21 days	Up to 48 hours	Yes
Ethereum (ETH)	No minimum balance	Every 3 days	Minimum 27 hours, longer in periods of high demand	Up to 48 hours	Yes
Tezos (XTZ)	0.0001 XTZ	Every 3 days	0 days	Up to 48 hours	Yes
Cardano (ADA)	\$1 worth of ADA	Every 5 days	0 days	Up to 48 hours	Yes
Solana (SOL)	\$1 worth of SOL	Every 3 days	3 days	Up to 48 hours	Yes

Figure 2.22: Cryptocurrencies Eligible for Staking in Coinbase.

Buying and selling cryptocurrencies is currently not supported in Malaysia. This is a rather unfortunate scenario for Malaysians who are interested in trading cryptocurrencies in Coinbase.

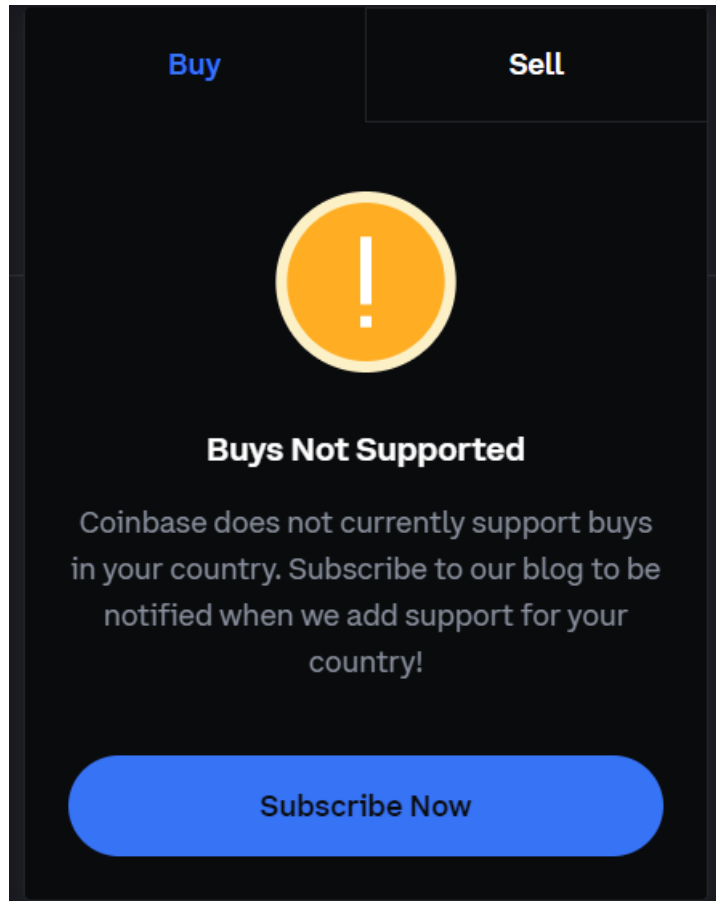


Figure 2.23: Coinbase Not Supported in Malaysia.

Furthermore, recurring buys are not supported as well in Malaysia. This is very frustrating for Malaysians that would like to explore and utilize the features and benefits of using Coinbase.

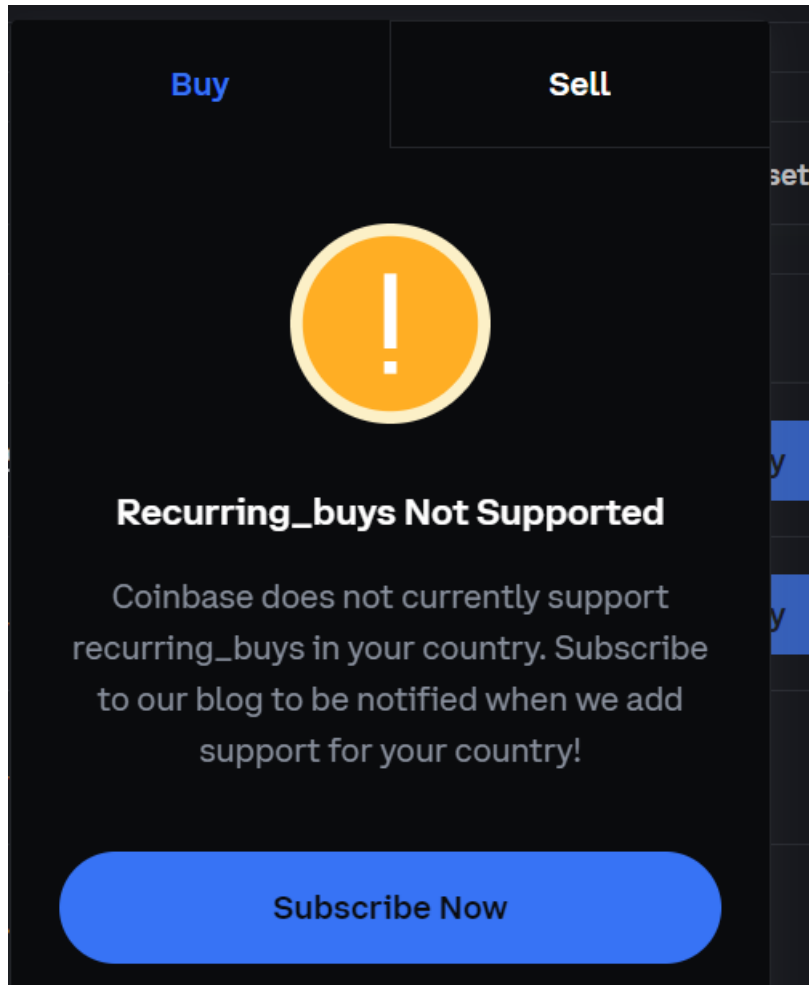


Figure 2.24: Recurring Buys Not Supported in Malaysia.

2.2.3 CEX.io

According to CEX.io (n.d.), CEX.io help individuals achieve their goals using cryptocurrencies and blockchain technology. CEX.io do this by providing a comprehensive set of safe options for purchasing, storing, trading, selling, sending, and earning digital assets. CEX.io began in 2013, when the overall market capitalization of the cryptocurrency business was less than \$1 billion. The CEX.io team has spent the last decade developing technologies that simplify the operational and technical aspects of cryptocurrency. With over 5 million registered users across 194 countries, CEX.io had accomplished 40.6 million purchases by users in 2021 alone.

Below figure is the dashboard of CEX.io website. In this dashboard, trading function is the main highlight of this webpage. Trading currencies are listed in this page such as trading between Bitcoin and USD, Ethereum and USD and so on. A price chart of selected trading currency pair is displayed for users to have an analytic view of the cryptocurrency before proceeding to trading activity.

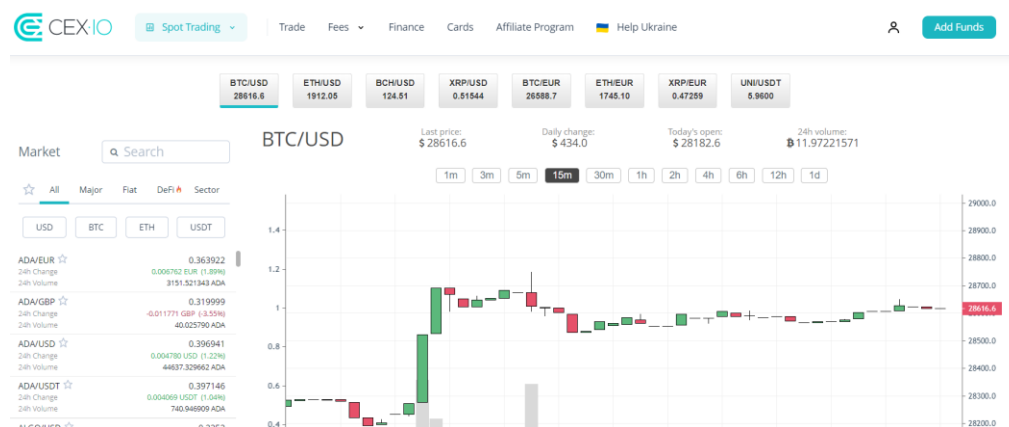


Figure 2.25: Dashboard of CEX.io.

Like other CEX websites, CEX.io provide various order options such as limit order and market order. A limit order is used to buy cryptocurrency below the market price or sell it above the market price at a specific price. This order type's execution is not assured until the desired price matches the opposing order from another user. The user may cancel the order at any moment before it is fully executed.

On the other hand, when placing a market order (instant order), you purchase or sell cryptocurrencies right away at the best price. For instance, placing a market order to purchase cryptocurrency on the BTC/USD marketplace entails deciding how much of the quoted currency (USD) to invest, for example buy me enough bitcoins for \$100 right now. Selecting the quantity of base currency (BTC) to sell when using a market order.

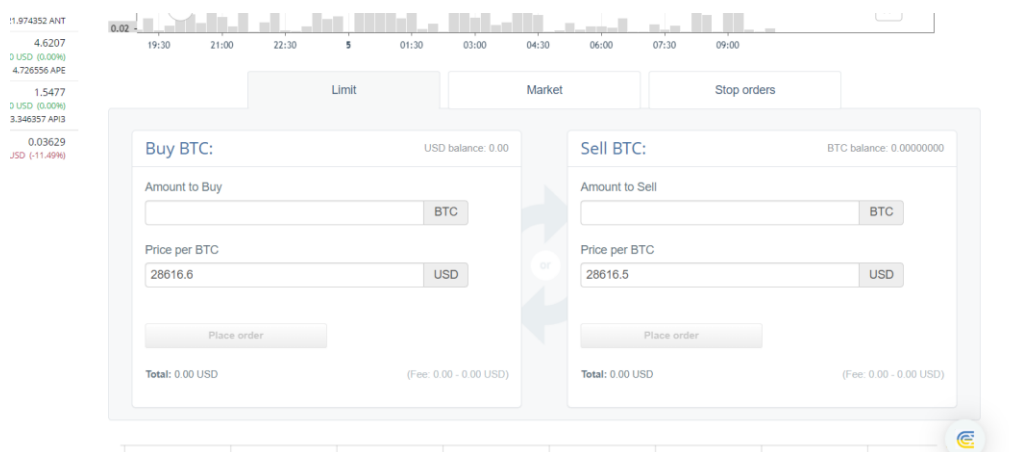


Figure 2.26: Limit Order in CEX.io.

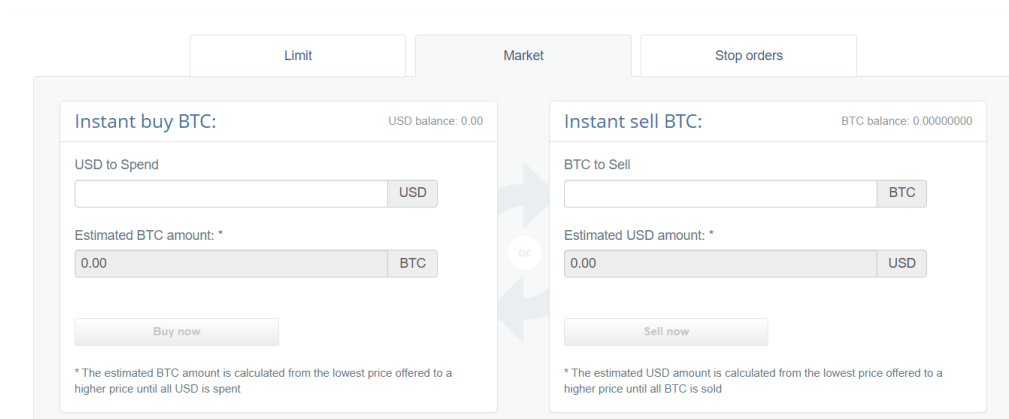


Figure 2.27: Market Order in CEX.io.

Limit and market orders are categorized into spot trading module in CEX.io. Beside spot trading, CEX.io also provides other trading modules such as Instant Buy module and Earn module.

In Instant Buy module, traders can instantly buy a wide selection of cryptocurrencies by paying fiat currencies. The fiat currencies available in CEX.io are USD, EUR, and GBP. Among of the cryptocurrencies available for instant buying are BTC, XRP, DOGE and many more.

Traders and users could also gain rewards in CEX.io by using their earn module. They are two options in this module, a user or trader could either transfer their cryptocurrencies to a saving account or transfer their cryptocurrencies to a staking account. In a saving account, it will give rewards up to 5% with a low risk. While in a staking account, it will give rewards up to 30% with medium risk. Traders could choose which type of account they will use based on their condition and judgement.

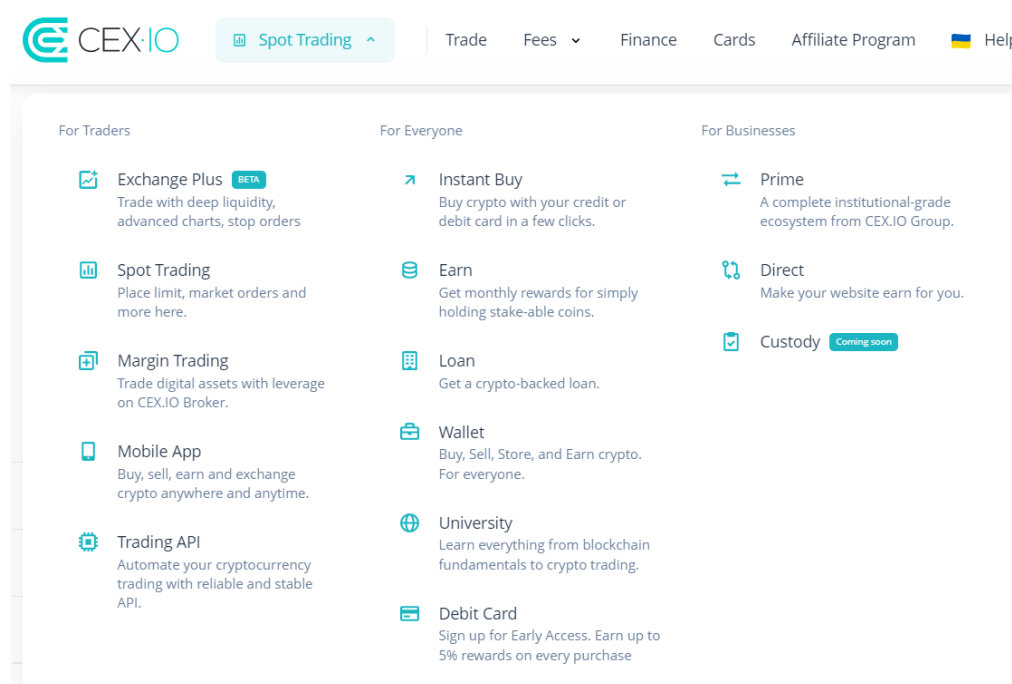


Figure 2.28: Modules in CEX.io.

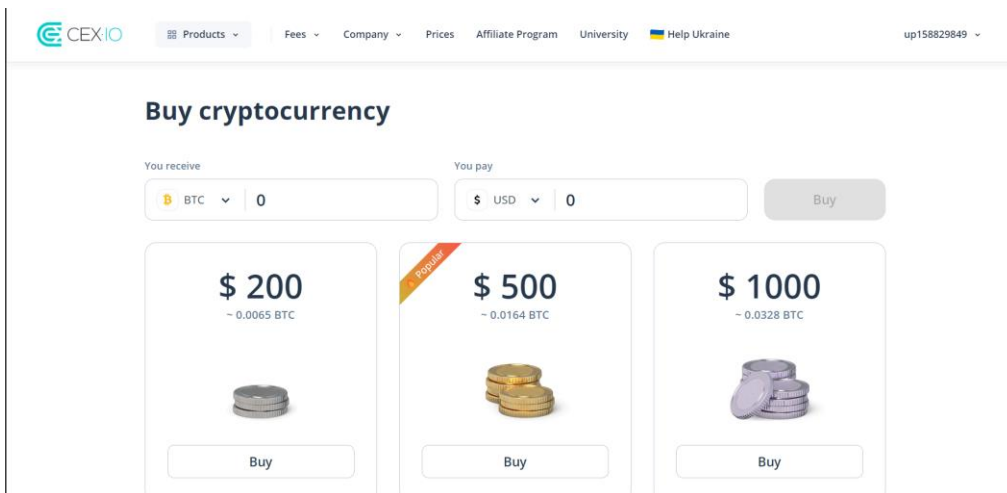


Figure 2.29: Instant Buy in CEX.io.

Buy cryptocurrency

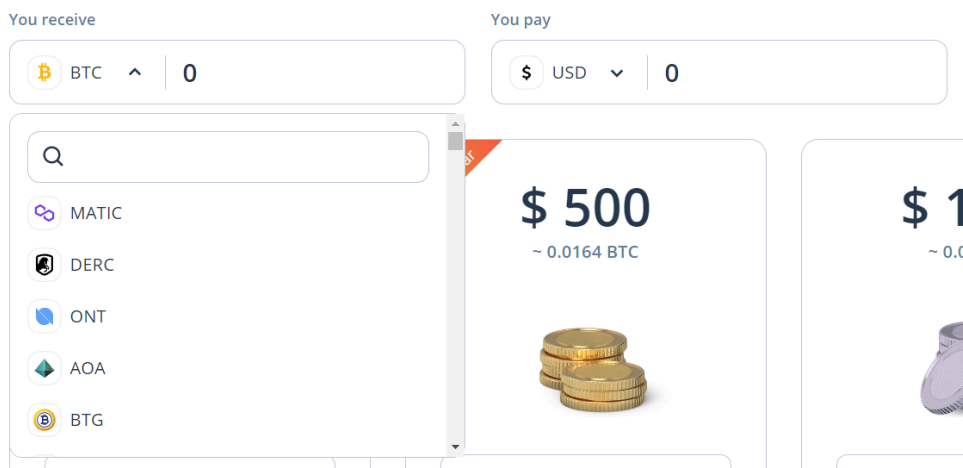


Figure 2.30: Wide crypto selection in Instant Buy module.

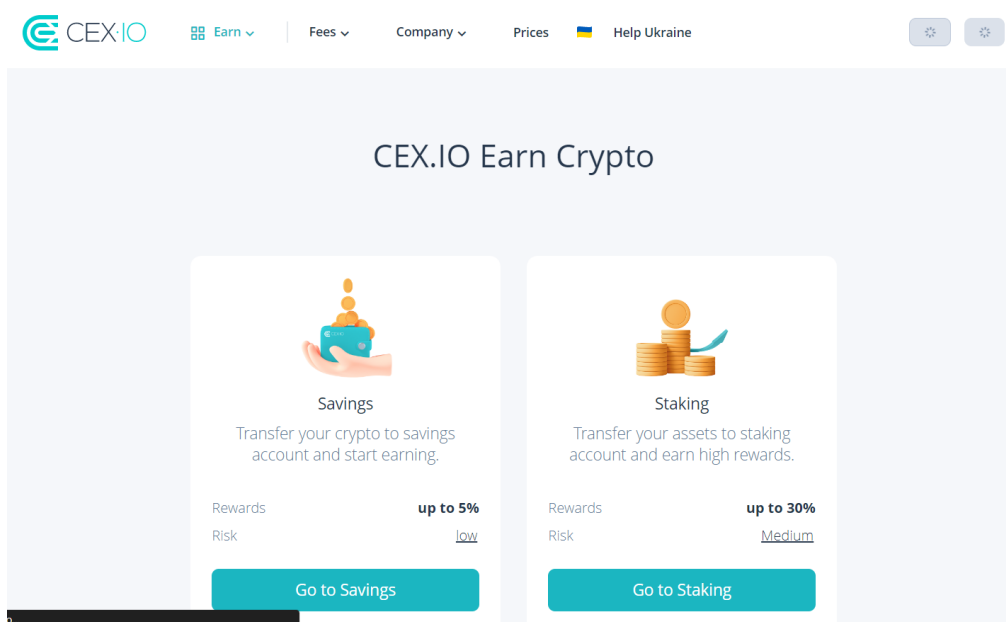


Figure 2.31: Earn module in CEX.io.

There is also a more advanced module in CEX.io to be used for trading activities. This module is called Exchange Plus. For advanced and professional traders, a more detailed price chart is much needed to further analyse and evaluated a certain cryptocurrency before any trading activities to occur. Many functions could be implemented to give deeper insight on the performance of a certain cryptocurrencies-pair. For example, a function that displays a graph representation of the price trend.

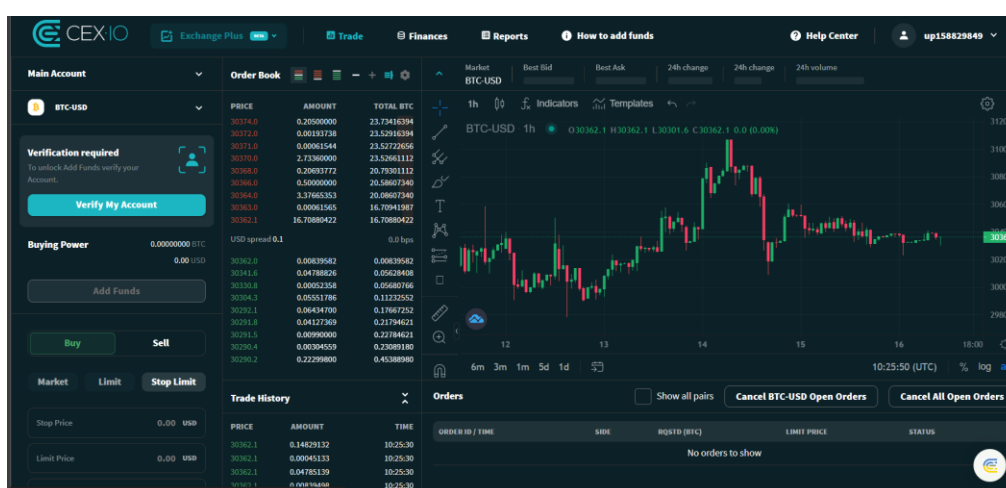


Figure 2.32: Exchange Plus in CEX.io.

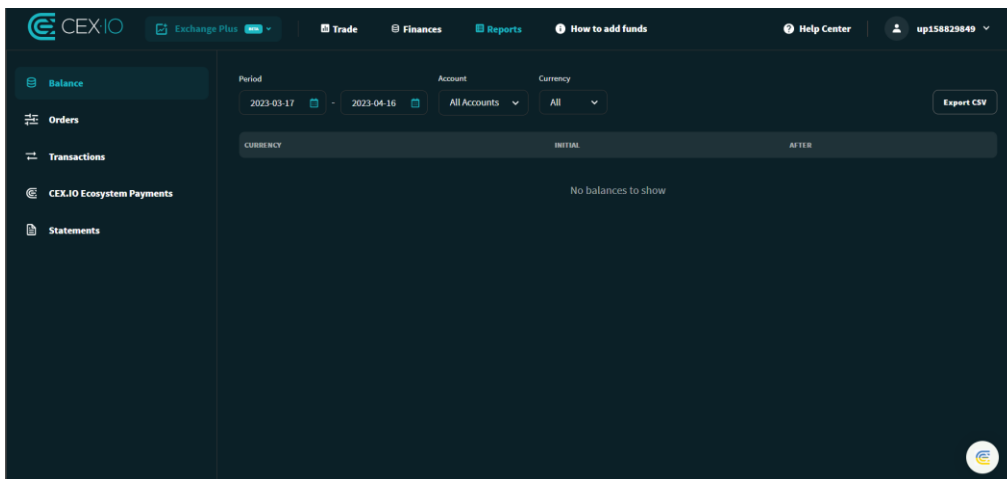


Figure 2.33: Exchange Plus Report in CEX.io.

2.3 Comparison of CEX Websites

In this section, we will be comparing the three CEX websites mentioned in the above sections, which are Kraken, Coinbase, and CEX.io. we will be comparing these websites based on the availability of the website in Malaysia region, the trading options offered by the websites, earning rewards methods, availability of RM in the websites, and presence of instant buy option in websites.

Table 2.2: Comparison of CEX Websites.

Websites	Kraken	Coinbase	CEX.io
Availability in Malaysia	Available	Not Available	Available
Trading Options	Simple, Advanced, Pro	Simple and Advanced	Simple and Plus
Earn Rewards	Staking	Staking	Staking and Saving
Availability of RM	Not Available	Available	Not Available
Instant Buy Option	Present	Present	Present

2.4 Summary

In this chapter, CEX websites are being researched and analysed thoroughly. CEX websites serve as platforms for buying and selling digital assets with fiat currency or digital assets themselves. The emergence of CEX websites was necessary to accommodate the trading of digital assets, which can only exist in digital form. The increasing demand and revenue of digital assets have led to the rise of CEX websites. The revenue of digital assets has steadily increased each year since 2017, with cryptocurrencies comprising more than half of the digital assets market. Although there was a setback in 2022, the market is expected to recover in 2023 and beyond.

The features of three existing CEX websites were also explored in this chapter. The three websites are Kraken, Coinbase, and CEX.io. From the analysis and comparison above, it could be concluded that a CEX website that could operate in Malaysia and provide RM as options in fiat currency is the ideal solution to provide crypto trading platform in Malaysia market. Besides, CEX website with instant buy or sell module is deemed ideal way of trading cryptocurrencies as it will not take much time.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

In this chapter, the methodology and work plan to help guide the development of the project and ensure it hit the project goals and objective is described thoroughly.

A total of 26 weeks was needed to complete this project. The project is separated into two phases, which is the proposal report phase and the implementation and final report phase. In the first phase, it took 13 weeks starting from February 2023 to April 2023 to complete. Next, another 13 weeks is needed to complete the project implementation and documentation, starting from June 2023 until September 2023.

In this project, iterative methodology will be implemented. This technique is well-known in software development and can be also call iterative and incremental methodology. In this methodology, the development of the project is broken down to a few smaller project or phases. In each iteration, general phases are carried out such as planning, requirements, analysis and designing, implementing, testing and evaluating. After each phase in an iteration are completed, evaluations are carried out to examine whether the specifications are fulfilled or not, if not, another round of iteration is carried out. The repetition will be stop if all specifications are fulfilled.

3.2 Software Development Methodology

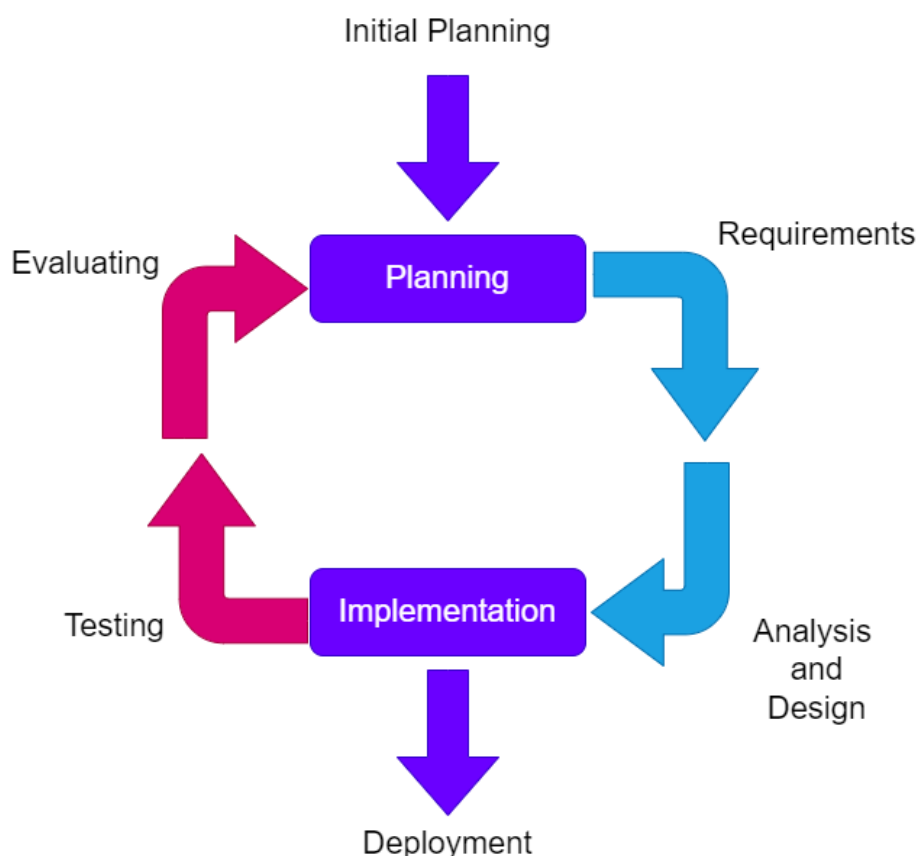


Figure 3.1: Iterative Methodology Phases.

Iterative methodology will be used in this project. In this methodology, the development of the project is broken down to a few smaller phases. The general phases are planning, requirements, analysis and designing, implementing, testing and evaluating. The phases are repeated until a website that satisfies the requirements and specifications is developed. Iteration of the phases is carried out so that a good quality CEX website will be developed in the end of this project.

In planning phase, a preliminary report is produced to give a guideline on what the project is going to cover and how to carry on the project. The deliverables in the preliminary report are project objectives, project scope, problem statement, proposed solution or approach. With this, a better understanding of the issue that I want to address in the project and possible

solutions are elaborated. In this planning phase, a clear direction on the topic chosen for the project is determined. This will reduce the confusions and doubts in the project. The main deliverable in this phase is the project work plan. In the work plan, project milestones are set to help keep the project on track. In addition, a work breakdown structure and Gantt chart are also included in the project plan.

Next, requirements phase is carried out. In this phase, literature review concerning CEX websites is carried out by comparing existing CEX websites. The three websites for comparison are Kraken, Coinbase, and CEX.io. Features and Modules of the three websites are fully explore and pros and cons of each website are examined. Beside comparing existing websites, data is collected to help in modelling the requirements of the proposed CEX website. Data may be collected from existing CEX websites, related articles, news, blog, and other media contents. After collecting all these data and information, functional requirements and non-functional requirements could be developed according to the research done. Besides, software, programming languages and tools are also reviewed to choose the most appropriate in developing the project. For this project, Laravel framework is chosen to develop the website, with the help of Wampserver and Mailtrap to host the website and perform email testing. MySQL is chosen to be the database of the website. APIs such as CoinGecko API and ExchangeRate-API are used to help retrieve live data.

Thirdly, analysis and designing phase of the iteration is conducted. In this phase, the requirements develop in the previous phase is analysed and the corresponding design is produced. Designing models or method used in this phase are use case diagram and entity relational diagram. Use case diagram descriptions can help give an overall view on the functionality and features of the website to be develop. While use case descriptions give a more detail description on the features and functions. Actors will be clarified for each function and the relationship between the functions are also well describe. The workflow of each function is also documented. Moving on, with the well establish core functions, a prototype is built to aid in visualizing the interface and design of the website and also the behaviour of functions will look like.

Furthermore, implementation phase is the next phase in the iteration. In this phase, Laravel framework and APIs will be implemented when developing the website. In Laravel framework, a combination of PHP scripts, JavaScript, Bootstrap, HTML scripts will be used in the development process. APIs such as CoinGecko API and ExchangeRate-API will be used too. CoinGecko API is used to retrieve live market prices of cryptocurrencies in different fiat currencies, while ExchangeRate-API is used to retrieve live exchange rates of fiat currencies. Wampserver is used to create web application for the project by acting as a web server with a built-in database which is MySQL and is compatible with PHP scripts. Besides, Mailtrap is also incorporated in the development process. Mailtrap is an email platform that aids in testing, sending and control email infrastructure effortlessly.

Also in the implementation phases, the major functions and modules of the website is developed. The core functions are viewing list of cryptocurrencies with their market price, buy and sell cryptocurrencies, deposit and withdraw fundings. Other than that, ability to view transactions history, user profile and access contact form is essential to be developed. After developing the core functions, the user interface and design of the website is taken into consideration. A simple and clean interface is optimal for users to interact with and will further attract users.

Moving on the next phase; testing phase, after the functionality of the website is developed, software testing is carried out to ensure no errors will be left undetected on the website. This is to ensure robustness, reliability, efficiency, and correctness of the website. Type of test such as unit testing, functional testing, performance testing, usability testing and user acceptance testing. To perform testing swiftly and efficiently, test plan and test cases need to be written before testing is executed. After testing phase is completed, evaluation of the final product after the previous five phase of iteration is carry out to measure the quality the website developed and determining the level of accurateness of the work done compared to desired requirements. If the final product does not meet the expectation, another iteration of the five phases should be performed to develop an improved product. The cycle keeps repeating until an optimal and high-quality product is developed, which also meets the specifications of the project.

3.3 Work Plan

3.3.1 Gantt Chart

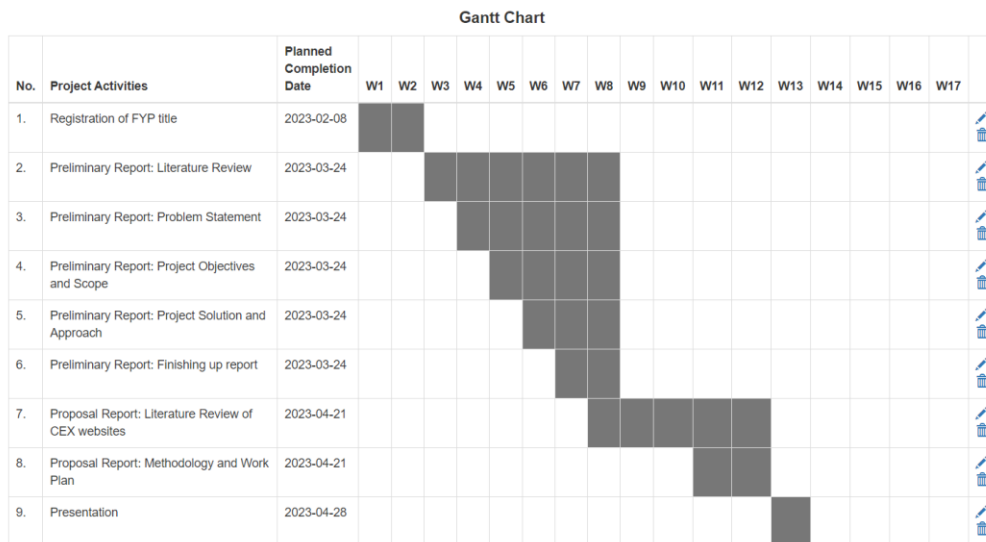


Figure 3.2: Gantt Chart for FYP1.

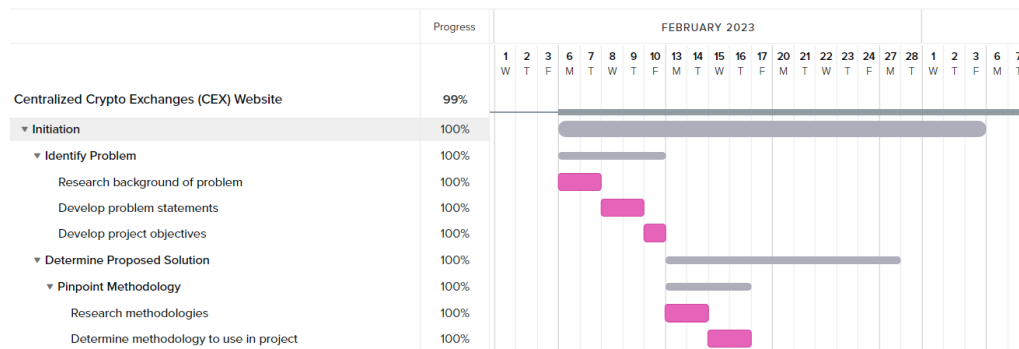


Figure 3.3: Initiation 1.

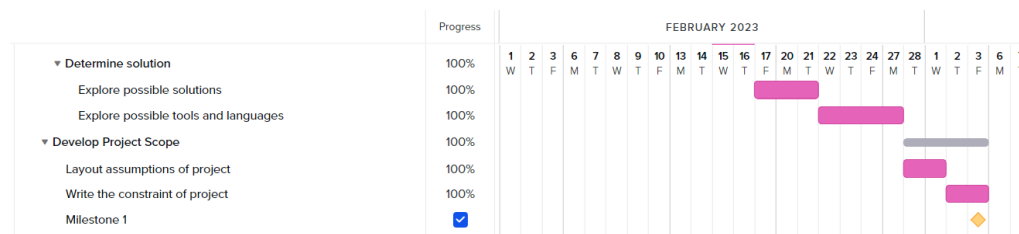


Figure 3.4: Initiation 2.

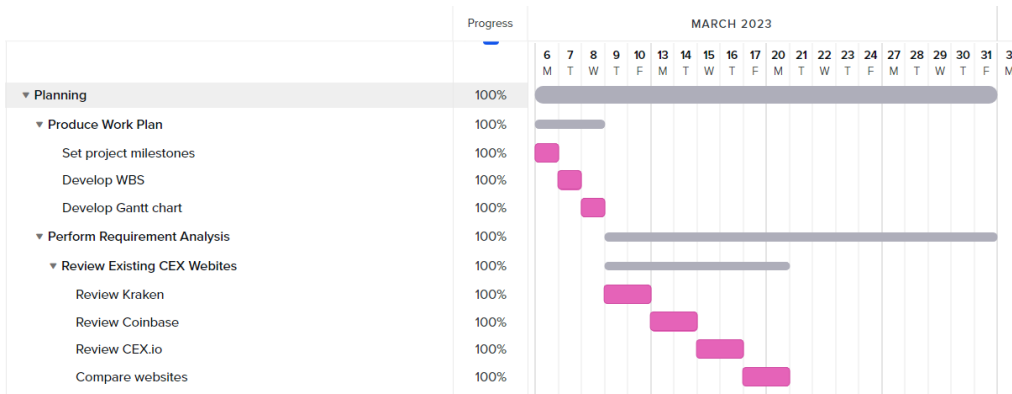


Figure 3.5: Planning 1.

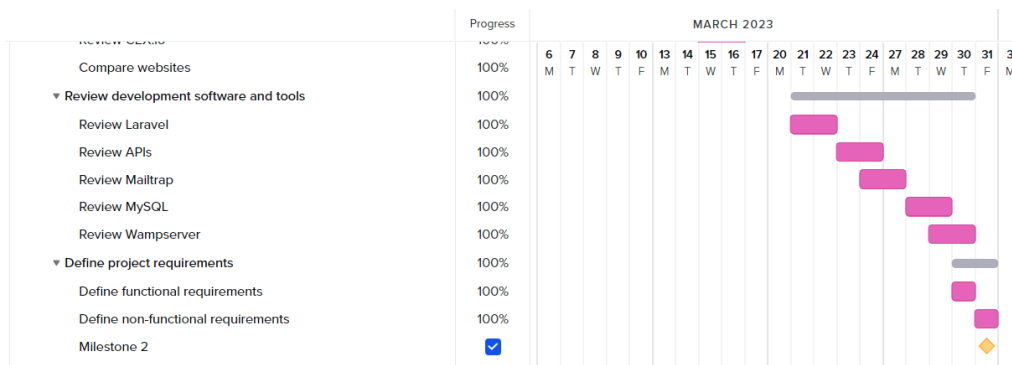


Figure 3.6: Planning 2.

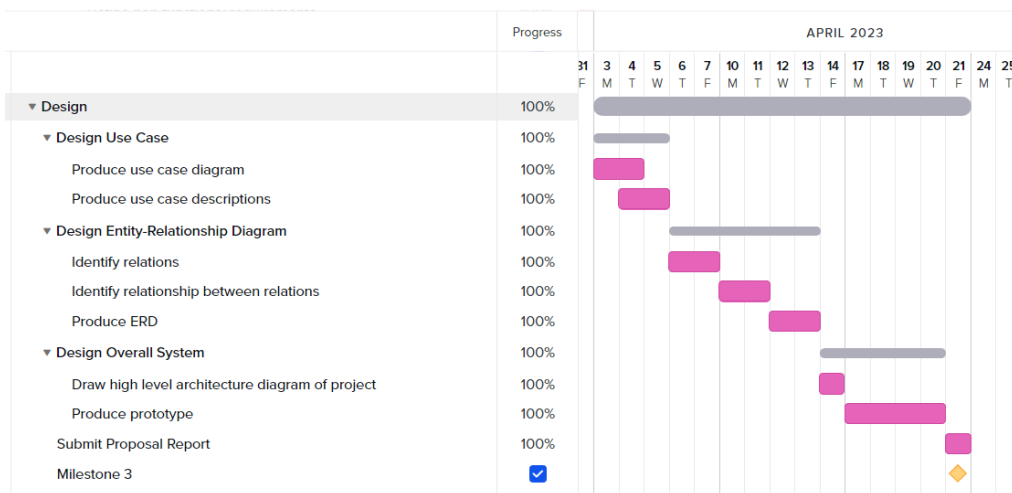


Figure 3.7: Design.

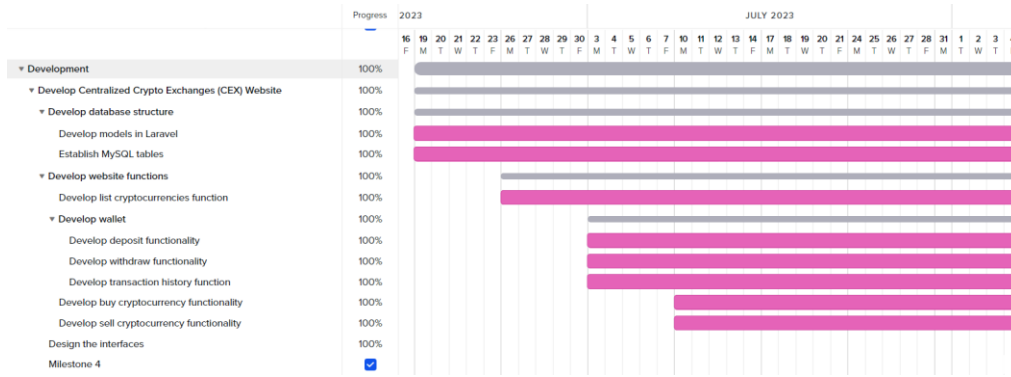


Figure 3.8: Development 1.

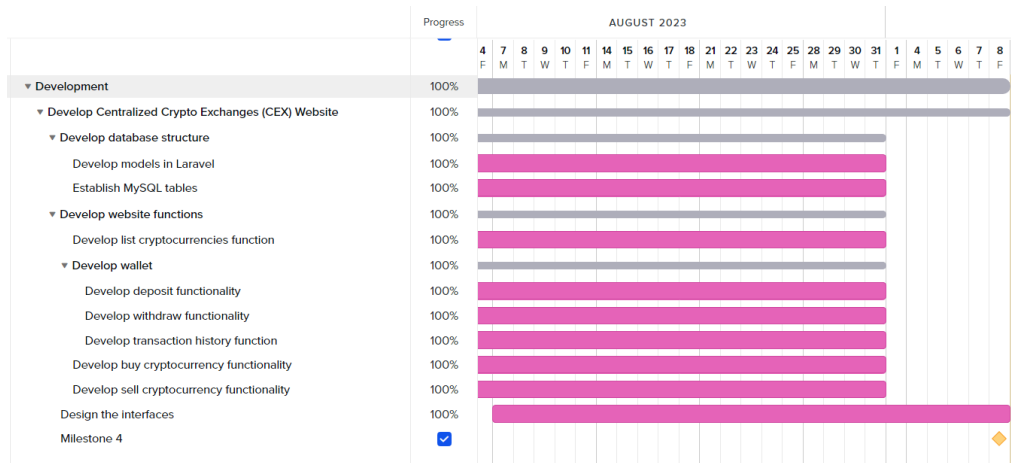


Figure 3.9: Development 2.

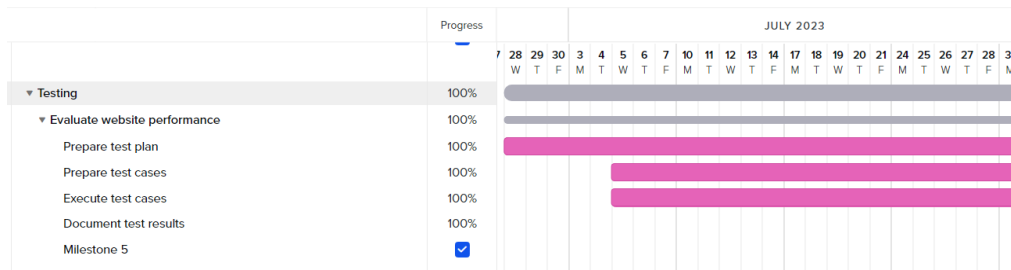


Figure 3.10: Testing 1.

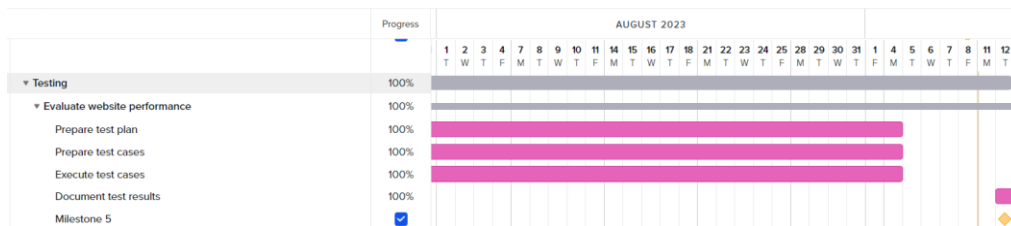


Figure 3.11: Testing 2.

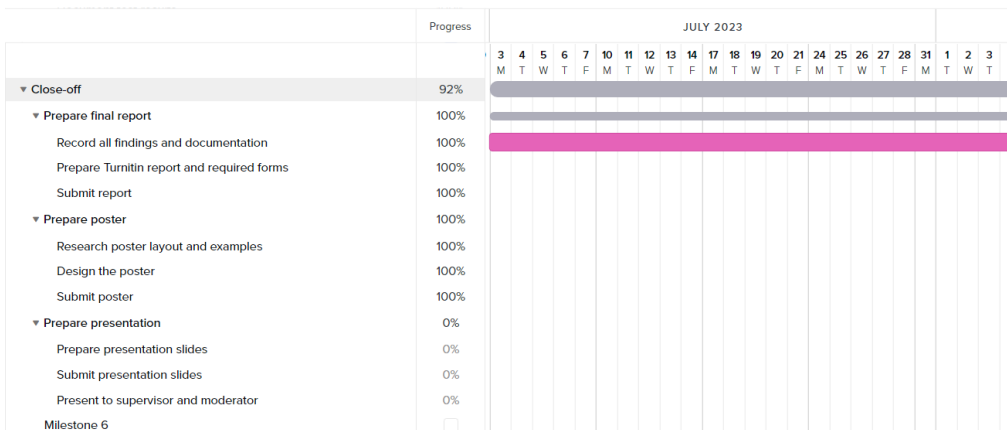


Figure 3.12: Close-off 1.

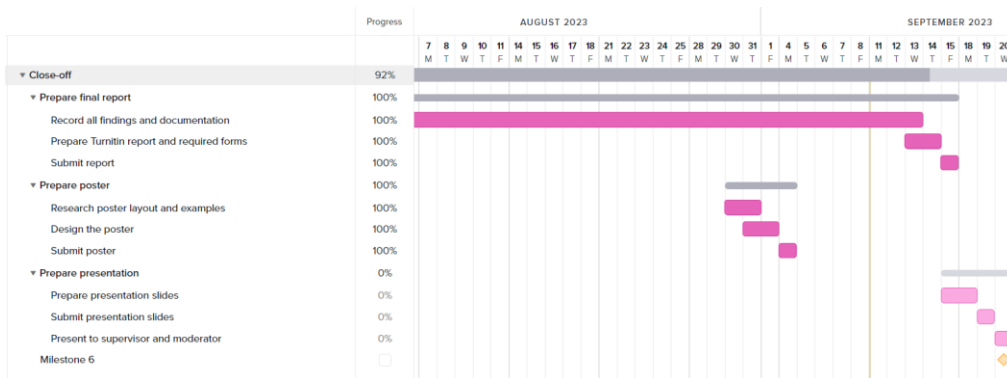


Figure 3.13: Close-off 2.

3.3.2 Project Plan

Table 3.1: Project Plan for Project 1.

Week	Key Milestone	Start Date	End Date	Status
1-2	Registration of FYP title	30/01/2023	08/02/2023	Completed
3-8	Preliminary Report: Literature Review	13/02/2023	24/03/2023	Completed
4-8	Preliminary Report: Problem Statement	20/02/2023	24/03/2023	Completed
5-8	Preliminary Report: Project Objectives and Scope	27/02/2023	24/03/2023	Completed
6-8	Preliminary Report: Project Solution and Approach	06/03/2023	24/03/2023	Completed
7-8	Preliminary Report: Finishing up report	13/03/2023	24/03/2023	Completed
8-12	Proposal Report: Literature Review of CEX websites	20/03/2023	21/04/2032	Completed
11-12	Proposal Report: Methodology and Work Plan	17/04/2023	21/04/2023	Completed
13	Presentation	24/04/2023	28/04/2023	Incomplete

3.3.3 Work Breakdown Structure (WBS)

1.1. Initiation

1.1.1. Identify Problem

1.1.1.1. Research background of problem

1.1.1.2. Develop problem statements

1.1.1.3. Develop project objectives

1.1.2. Determine Proposed Solution

1.1.2.1. Pinpoint Methodology

1.1.2.1.1. Research methodologies

1.1.2.1.2. Determine methodology to use in project

1.1.2.2. Determine solution

1.1.2.2.1. Explore possible solutions

1.1.2.2.2. Explore possible tools and languages

1.1.3. Develop Project Scope

1.1.3.1. Layout assumptions of project

1.1.3.2. Write the constraint of project

1.2. Planning

- 1.2.1. Produce Work Plan
 - 1.2.1.1. Set project milestones
 - 1.2.1.2. Develop Work Breakdown Structure (WBS)
 - 1.2.1.3. Develop Gantt chart
- 1.2.2. Perform Requirement Analysis
 - 1.2.2.1. Review Existing CEX Websites
 - 1.2.2.1.1. Review Kraken
 - 1.2.2.1.2. Review Coinbase
 - 1.2.2.1.3. Review CEX.io
 - 1.2.2.1.4. Compare Websites
 - 1.2.2.2. Review development software and tools
 - 1.2.2.2.1. Review Laravel
 - 1.2.2.2.2. Review APIs
 - 1.2.2.2.3. Review Mailtrap
 - 1.2.2.2.4. Review MySQL
 - 1.2.2.2.5. Review Wampserver
 - 1.2.2.3. Define project requirements
 - 1.2.2.3.1. Define functional requirements
 - 1.2.2.3.2. Define functional non-functional requirements

1.3. Design

- 1.3.1. Design Use Case
 - 1.3.1.1. Produce use case diagram
 - 1.3.1.2. Produce use case descriptions
- 1.3.2. Design Entity-Relationship Diagram
 - 1.3.2.1. Identify relations
 - 1.3.2.2. Identify relationship between relations
 - 1.3.2.3. Produce ERD
- 1.3.3. Design Overall System
 - 1.3.3.1. Draw high level architecture diagram of project
 - 1.3.3.2. Produce prototype
- 1.3.4. Submit Proposal Report

1.4. Development

- 1.4.1. Develop Centralized Crypto Exchanges (CEX) Website
 - 1.4.1.1. Develop database structure
 - 1.4.1.1.1. Develop models in Laravel
 - 1.4.1.1.2. Establish MySQL tables
 - 1.4.1.2. Develop website functions
 - 1.4.1.2.1. Develop list cryptocurrencies function
 - 1.4.1.2.2. Develop wallet
 - 1.4.1.2.2.1. Develop deposit functionality
 - 1.4.1.2.2.2. Develop withdraw functionality
 - 1.4.1.2.2.3. Develop transaction history function
 - 1.4.1.2.3. Develop buy cryptocurrency functionality
 - 1.4.1.2.4. Develop sell cryptocurrency functionality
 - 1.4.1.3. Design the interfaces

1.5. Testing

- 1.5.1. Evaluate website performance
 - 1.5.1.1. Prepare test plan
 - 1.5.1.2. Prepare test cases
 - 1.5.1.3. Execute test cases
 - 1.5.1.4. Document test results

1.6. Close-off

- 1.6.1. Prepare final report
 - 1.6.1.1. Record all findings and documentation
 - 1.6.1.2. Prepare Turnitin report and required forms
 - 1.6.1.3. Submit report
- 1.6.2. Prepare poster
 - 1.6.2.1. Research poster layout and examples
 - 1.6.2.2. Design the poster
 - 1.6.2.3. Submit poster
- 1.6.3. Prepare presentation
 - 1.6.3.1. Prepare presentation slides
 - 1.6.3.2. Submit presentation slides
 - 1.6.3.3. Present to supervisor and moderator

3.4 Development Tools



Figure 3.14: Laravel.

Laravel is a free and open-source PHP web framework that aids in web application development. Laravel uses a Model-View-Controller (MVC) architectural pattern. Laravel separates the business model from the user interface and modularized the codes, making codes reusable. Besides, Laravel uses Composer as a dependency manager to help download and manage packages when developing a project.

GitHub, the remote repository aspect of Git. GitHub will be used in the development of the project to help manage versions control and storing of source codes. In normal practices, when finished coding in our local machine, all these codes will be pushed to the remote repository which is located at GitHub. Git command-line interface is used to interact with GitHub. A repository could be created with a few clicks of buttons. In GitHub, I can easily record each change in form of pull request and identify effective code quickly.

APIs are also used to retrieve live data about the cryptocurrencies. The price and price chart of the cryptocurrencies could be obtained through the APIs. CoinGecko API is used to retrieve live market price of cryptocurrencies in this project. The market prices are retrieved in different fiat currencies such as MYR, USD, EUR and GBP. ExchangeRate-API is implemented to retrieve live exchange rates of fiat currency.



Figure 3.15: Mailtrap.



Figure 3.16: MySQL.



Figure 3.17: Wampserver.

Wampserver is web server software stack that consists of Apache webserver, MySQL database and PHP software language. Wampserver is used to help hosting the website developed. Furthermore, Mailtrap is used to test emails sent by the website. Testing email is crucial before actually sending email to real user. In the development phase of the website, Mailtrap can receive testing emails. Each testing email can be preview in the Mailtrap inbox. In addition, HTML/CSS of email templates could be validated. Mailtrap can display how different popular email services will treat testing emails – on web, mobile, and desktop.

CHAPTER 4

PROJECT SPECIFICATIONS

4.1 Requirements Specification

4.1.1 Functional Requirements

1. The system shall allow the trader and administrator to login the website.
2. The system shall allow new trader to sign up on the website.
3. The system shall allow trader to deposit and withdraw funds.
4. The system shall allow trader to buy or sell cryptocurrencies based on the available crypto in the database and fund in trader's account.
5. The system shall allow trader to view their past transaction history.
6. The system shall allow administrator to view the total trading volume within the website.
7. The system shall allow administrator to modify the information of cryptocurrencies on the website, which is changing the quantity of the cryptocurrencies available.
8. The system shall allow trader to contact customer support through a form on the website.

4.1.2 Non-functional Requirements

1. Performance requirement
 - a. The system shall ensure the period of time for transaction on the website is less than one minute 90% of the time.
2. Usability requirement
 - a. The system shall provide simple interface for user so that user can master the website in not more than one hour.
3. Security requirement
 - a. The system shall use authentication and authorization to protect website from unauthorized access.
4. Availability requirement
 - a. The system shall be running and available for users in 24 hours.
5. Reliability requirement
 - a. The system shall not crash 90% of time in a week period and if crash, recover under 10 minutes.
6. Portability requirement
 - a. The system shall operate in both Window and MacOS operating system.

4.2 Modelling

4.2.1 Use Case Diagram

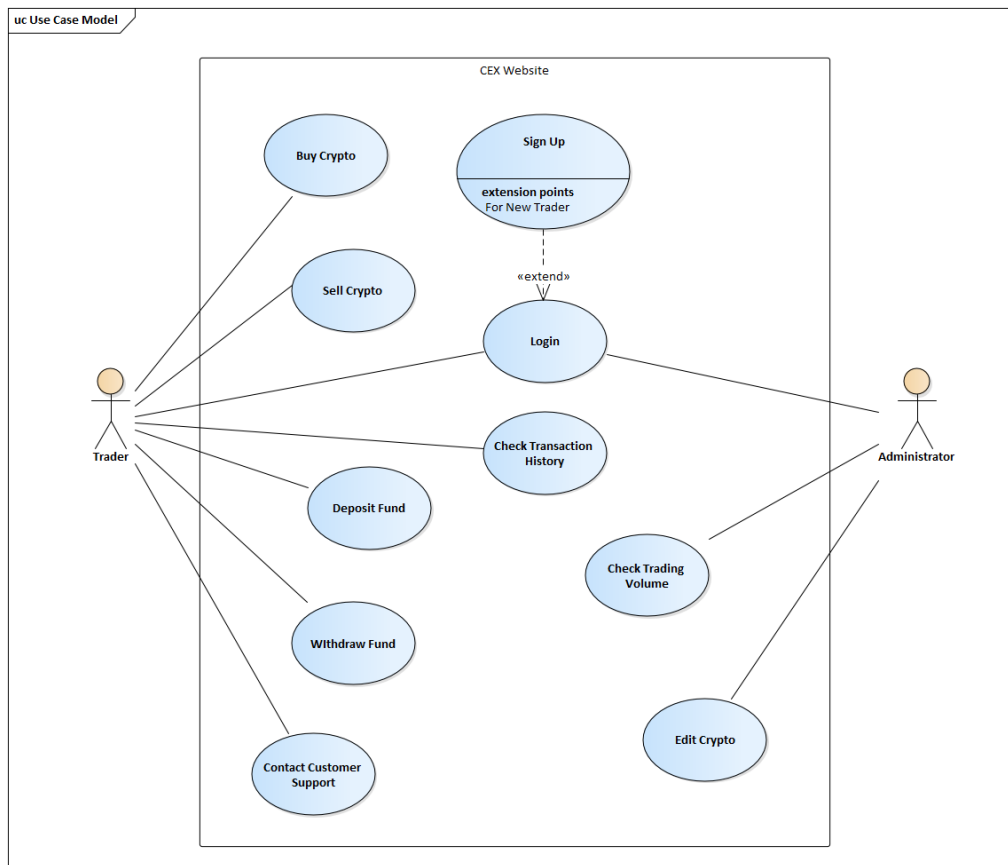


Figure 4.1: Use Case Diagram.

4.2.2 Use Case Description

Table 4.1: Use Case Description 1.

Use Case Name: Login	ID:	Importance Level:
Primary Actor: 1. Trader 2. Administrator	Use Case Type: Detail and Essential	
Stakeholders and Interests: Trader and Administrator – will be able to login to the website and obtain access to the website functions.		
Brief Description: This use case describes how a trader, and an administrator can login to the website and obtain access to the application functions. Trader – can buy or sell crypto, deposit or withdraw funds, check transaction history and contact customer support. Administrator – can check trading volume and edit cryptocurrencies in database.		
Trigger: A trader or administrator wants to use the website.		
Relationships: Association : Trader, Administrator Include : Extend : Sign Up Generalization:		
Normal Flow of Events: 1. A user wants to login to the website. If user does not have an account, he/she needs to create a new account. (Continue to 1a) 2. The user needs to enter his/her username and password. 3. The website verifies the username and password key in by user. - If username and password is verified (Continue to Normal Flow 4). - If username and password is not verified (Continue to S1a). 4. The user can now access the website functions.		

Sub-flows:

1Sa. The user will need to enter his/her username and password again.

Alternate/Exceptional Flows:

1a:

1. The user is needed to key in his/her desired username and password.
2. The user is needed to enter his/her personal information.
3. The website will verify the user's information and save to database.

Table 4.2: Use Case Description 2.

Use Case Name: Buy Crypto	ID: 2	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can buy cryptocurrencies from the website.		
Brief Description: This use case describes how a trader can buy cryptocurrencies from the website.		
Trigger: A trader wants to buy cryptocurrencies from the website.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: <ol style="list-style-type: none"> 1. The trader login to the website. 2. The trader selects a desired cryptocurrency in the provided list. 3. The trader enters desired number of cryptocurrencies to buy. 4. The website check whether the trader has sufficient fund to buy the selected number of cryptocurrencies. <ul style="list-style-type: none"> - If the fund is sufficient (Continue to Normal Flow 5). - If the fund is insufficient (Continue to S1a). 5. The website will transfer the desired number of cryptocurrencies from database into the trader's account. 		
Sub-flows: S1a. The trader will need to enter sufficient number of cryptocurrencies.		
Alternate/Exceptional Flows:		

Table 4.3: Use Case Description 3.

Use Case Name: Sell Crypto	ID: 3	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can sell cryptocurrencies to the website.		
Brief Description: This use case describes how a trader can sell self-owned cryptocurrencies to the website.		
Trigger: A trader wants to sell cryptocurrencies to the website.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: <ol style="list-style-type: none"> 1. The trader login to the website. 2. The trader selects a desired cryptocurrency in the provided list. 3. The trader enters desired number of cryptocurrencies to sell. 4. The website check whether the trader has sufficient assets to sell the selected number of cryptocurrencies. <ul style="list-style-type: none"> - If the assets are sufficient (Continue to Normal Flow 5). - If the assets are insufficient (Continue to S1a). 5. The website will transfer the desired number of cryptocurrencies from the trader's account into the database. 		
Sub-flows: S1a. The trader will need to enter sufficient number of cryptocurrencies.		
Alternate/Exceptional Flows:		

Table 4.4: Use Case Description 4.

Use Case Name: Deposit Fund	ID: 4	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can deposit a certain amount of funding into the website.		
Brief Description: This use case describes how a trader can deposit a certain amount of funding in the form of fiat currency into the website.		
Trigger: A trader wants to deposit funding into the website.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: 1. The trader login to the website. 2. The trader enters the amount of fiat currency desired to deposit. 3. The website record down the amount of fiat currency entered and save into database. 4. The trader's account balance will be displayed.		
Sub-flows:		
Alternate/Exceptional Flows:		

Table 4.5: Use Case Description 5.

Use Case Name: Withdraw Fund	ID: 5	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can withdraw a certain amount of funding from the website.		
Brief Description: This use case describes how a trader can withdraw a certain amount of funding in the form of fiat currency from the website.		
Trigger: A trader wants to withdraw funding from the website.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: <ol style="list-style-type: none"> 1. The trader login to the website. 2. The trader enters the amount of fiat currency desired to withdraw. 3. The website verifies whether the trader’s balance is sufficient for withdrawal. <ul style="list-style-type: none"> - If balance is sufficient (Continue to Normal Flow 5). - If balance is insufficient (Continues to S1a). 4. The website deducts the amount of fiat currency entered and save into database. 5. The trader’s account balance will be displayed. 		
Sub-flows: S1a. The trader will need to enter appropriate amount of funding to withdraw based on account balance.		
Alternate/Exceptional Flows:		

Table 4.6: Use Case Description 6.

Use Case Name: Check Transition History	ID: 6	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can view past recording of transaction made.		
Brief Description: This use case describes how a trader can view the past recording of buying and selling transactions made on the website.		
Trigger: A trader wants to view past recording of transaction made on the website.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: 1. The trader login to the website. 2. The trader selects 'History' in the navigation bar of the website. 3. The website will retrieve all recordings of past buying, selling, deposit and withdrawal transaction made by the trader from the database. 4. The website will display a list of past buying transaction made with details such as name of crypto, amount bought, the total funding spent. 5. The website will display a list of past selling transaction made with details such as name of crypto, amount sold, the total funding earn.		
Sub-flows:		
Alternate/Exceptional Flows:		

Table 4.7: Use Case Description 7.

Use Case Name: Contact Customer Support	ID: 7	Importance Level:
Primary Actor: 1. Trader	Use Case Type: Detail and Essential	
Stakeholders and Interests: Traders – can send message to customer support on the website.		
Brief Description: This use case describes how a trader can contact customer support on the website.		
Trigger: A trader wants to contact customer support.		
Relationships: Association : Trader Include : Extend : Generalization:		
Normal Flow of Events: 1. The trader login to the website. 2. The trader selects 'Contact Customer Support'. 3. The trader fills in the basic information such as name, phone number, email and messages in the form prompted by the website. 4. The website will send the form to the administrator email.		
Sub-flows:		
Alternate/Exceptional Flows:		

Table 4.8: Use Case Description 8.

Use Case Name: Check Trading Volume	ID: 8	Importance Level:
Primary Actor: 1. Administrator	Use Case Type: Detail and Essential	
Stakeholders and Interests: Administrator – can check the total trading volume of cryptocurrencies on the website.		
Brief Description: This use case describes how an administrator can check the total trading volume of cryptocurrencies on the website.		
Trigger: An administrator wants to check total trading volume of cryptocurrencies on the website.		
Relationships: Association : Administrator Include : Extend : Generalization:		
Normal Flow of Events: 1. The administrator login to the website. 2. The administrator checks on the total trading volume of cryptocurrencies on the website. 3. The website will retrieve data about total trading volume from the database. 4. The website will display the total trading volume for each cryptocurrency on the website. 5. The total number of cryptocurrencies sold and brought will be displayed.		
Sub-flows:		
Alternate/Exceptional Flows:		

Table 4.9: Use Case Description 9.

Use Case Name: Edit Crypto	ID: 9	Importance Level:
Primary Actor: 1. Administrator	Use Case Type: Detail and Essential	
Stakeholders and Interests: Administrators – can edit the information of cryptocurrencies present on the website.		
Brief Description: This use case describes how an administrator can modify the information of cryptocurrencies such as amount available on the website.		
Trigger: An administrator wants to edit the information of cryptocurrency on the website.		
Relationships: Association : Administrator Include : Extend : Generalization:		
Normal Flow of Events: <ol style="list-style-type: none"> 1. The administrator login to the website. 2. The administrator edits the selected cryptocurrency. 3. The website retrieve data from database and display current information of selected cryptocurrency. 4. The administrator enters new information about the displayed cryptocurrency such as the amount of available crypto on the website. 5. The website saves the edited information into the database. 6. The website displays the modified information of cryptocurrencies. 		
Sub-flows:		
Alternate/Exceptional Flows:		

4.2.3 Entity Relational Diagram (ERD)

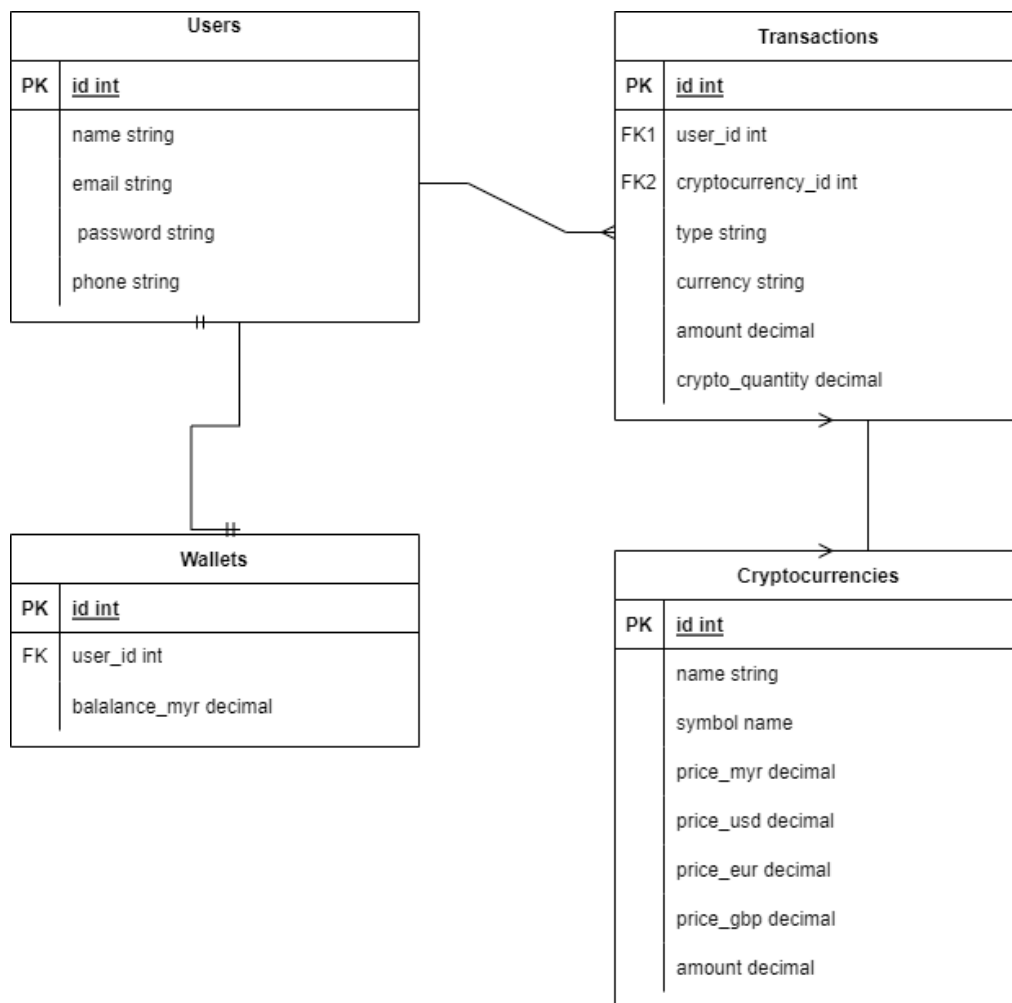


Figure 4.2: ERD.

CHAPTER 5

SYSTEM DESIGN

5.1 Centralized Crypto Exchanges (CEX) Website Prototype

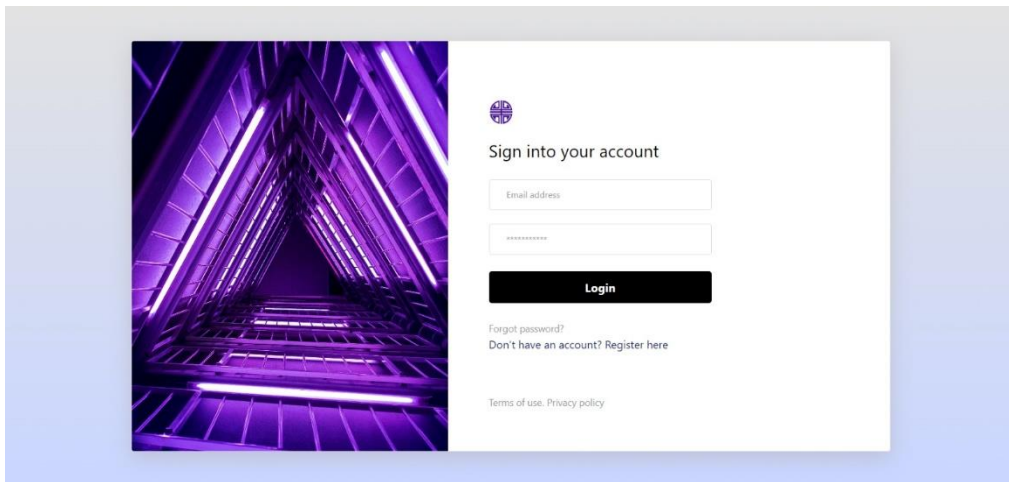


Figure 5.1: Sign in page.

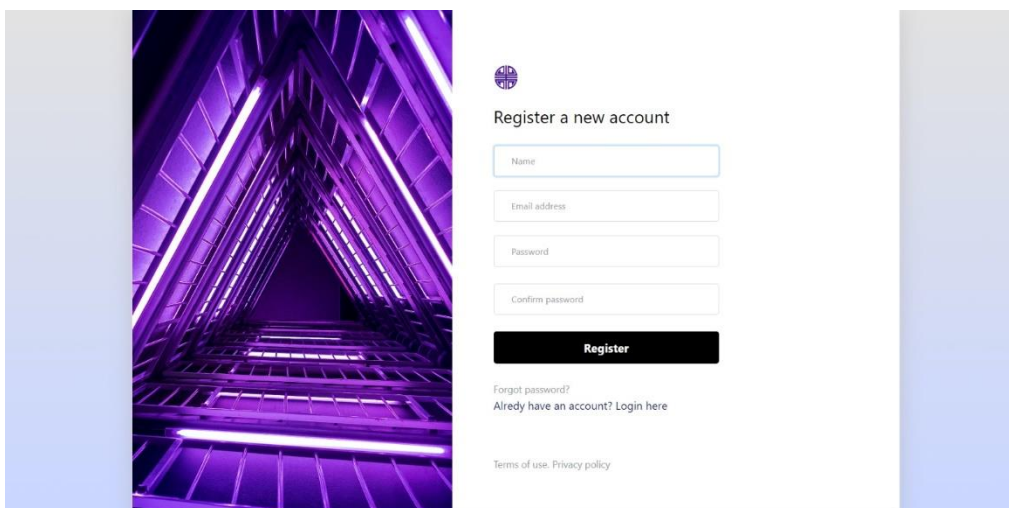


Figure 5.2: Register page.

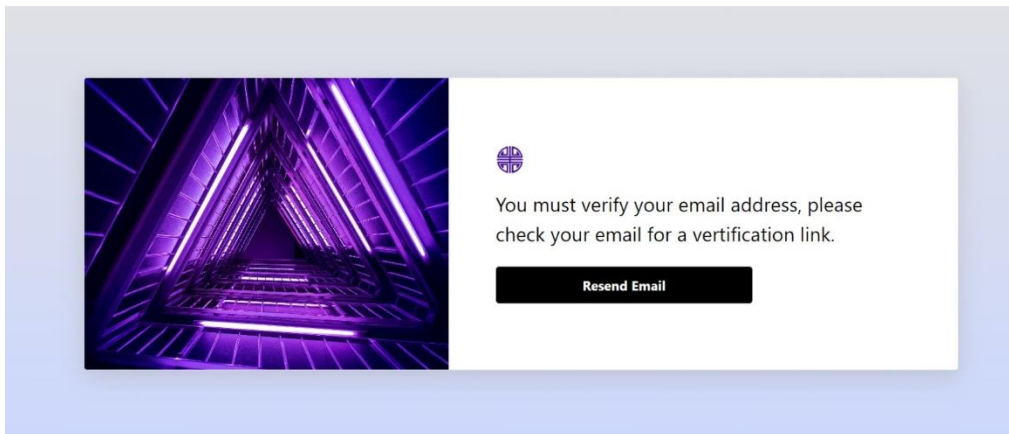


Figure 5.3: Verify email page.

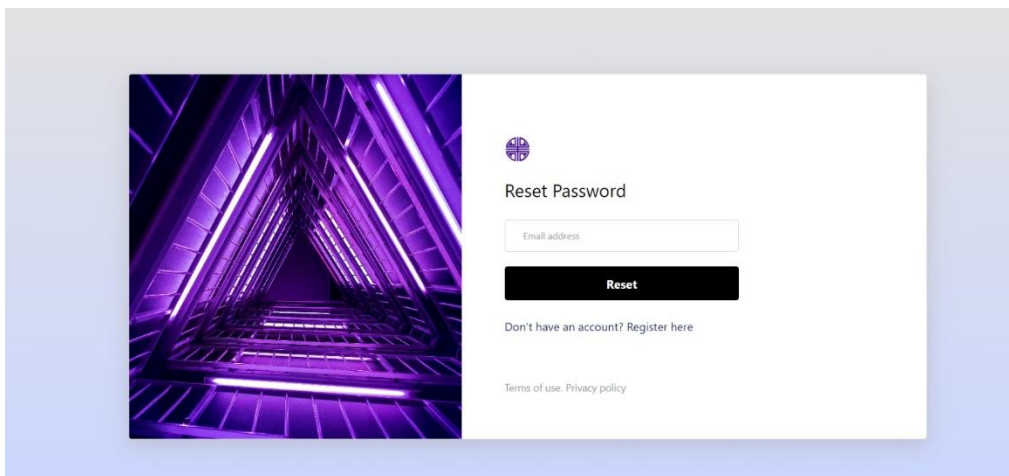


Figure 5.4: Reset password page.

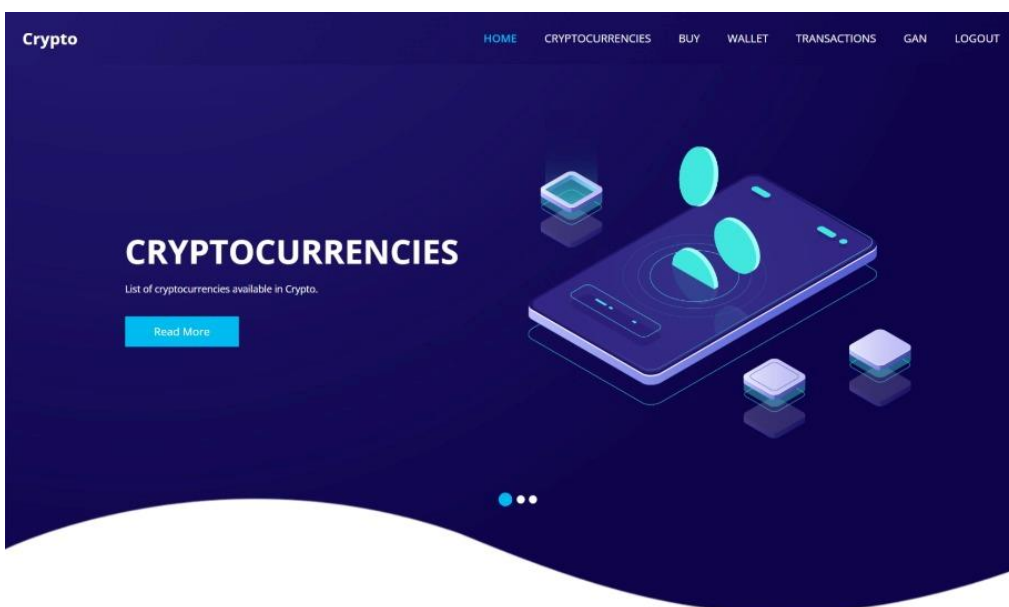


Figure 5.5: Homepage.

Our Services

Services provided are surrounding on one concept, which is to give the utmost experience for customers to buy and sell cryptocurrencies.



CURRENCY WALLET

A Wallet for customers to deposit and withdraw their funds. Also help keep track their fundings and cryptocurrencies holding.

[Read More](#)



INSTANT TRADING

Instead of creating trading orders and pairing with other orders, customer can directly buy and sell cryptocurrencies instantly.

[Read More](#)




CUSTOMER SUPPORT

Provide communications medium for customers to commute their experience, opinions, and problems when using Crypto.

[Read More](#)

Figure 5.6: Homepage (Cont'd 1).

About Us



We Are Crypto

Crypto is a web application that was developed to provide Malaysian traders or customer to have the liability to buy and sell cryptocurrencies in their familiar fiat currency which is Malaysia Ringgit (MYR).

Deposit, Withdraw, Buy and Sell function were designed to be as simple as possible for a more user-friendly experience.

Address

📍 Location

☎ Call +01 1234567890

✉ crypto@mail.com

📱 [f](#) [t](#) [in](#) [@](#)

Info

Crypto, a Centralized Cryptocurrency Exchange (CEX) Website that offers effortless and simple way to buy and sell cryptocurrencies of choice. By using familiar currency such as MYR, USD, EUR and GBP.

Links

[Home](#)

[Cryptocurrencies](#)

[Buy](#)

[Wallet](#)

[Transactions](#)

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Figure 5.7: Homepage (Cont'd 2).

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TRANSACTIONS](#) [GAN](#) [LOGOUT](#)

Cryptocurrency Prices

Select Fiat Currency:

Name	Symbol	Price	Amount Available	
Bitcoin	BITCOIN	120,074.00 MYR	999.75000	<input type="button" value="Buy"/>
Dogecoin	DOGECOIN	0.29 MYR	995.00000	<input type="button" value="Buy"/>
Ethereum	ETHEREUM	7,609.76 MYR	999.75000	<input type="button" value="Buy"/>
Ripple	RIPPLE	2.33 MYR	995.00000	<input type="button" value="Buy"/>
Tether	TETHER	4.68 MYR	995.00000	<input type="button" value="Buy"/>

Figure 5.8: Cryptocurrencies page.

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TRANSACTIONS](#) [GAN](#) [LOGOUT](#)

Buy Cryptocurrency

Your balance in MYR: 0.00

Your Cryptocurrency Holdings:

bitcoin (BITCOIN): 0
dogecoin (DOGECOIN): 0
ethereum (ETHEREUM): 0
ripple (RIPPLE): 0
tether (TETHER): 0

Select Cryptocurrency:

Quantity:

Market Price in MYR: 120085.00

Market Price in USD: 25667.00

Market Price in EUR: 23993.00

Market Price in GBP: 20605.00

Total Price in MYR: 120085.00

Figure 5.9: Buy crypto page.

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TRANSACTIONS](#) [GAN](#) [LOGOUT](#)

Sell Cryptocurrency

Your balance in MYR: 0.00

Your Cryptocurrency Holdings:

bitcoin (BITCOIN): 0
dogecoin (DOGECOIN): 0
ethereum (ETHEREUM): 0
ripple (RIPPLE): 0
tether (TETHER): 0

Select Cryptocurrency:

Quantity:

Market Price in MYR: 0.29

Market Price in USD: 0.06

Market Price in EUR: 0.06

Market Price in GBP: 0.05

Total Price in MYR: 0.29

Figure 5.10: Sell crypto page.

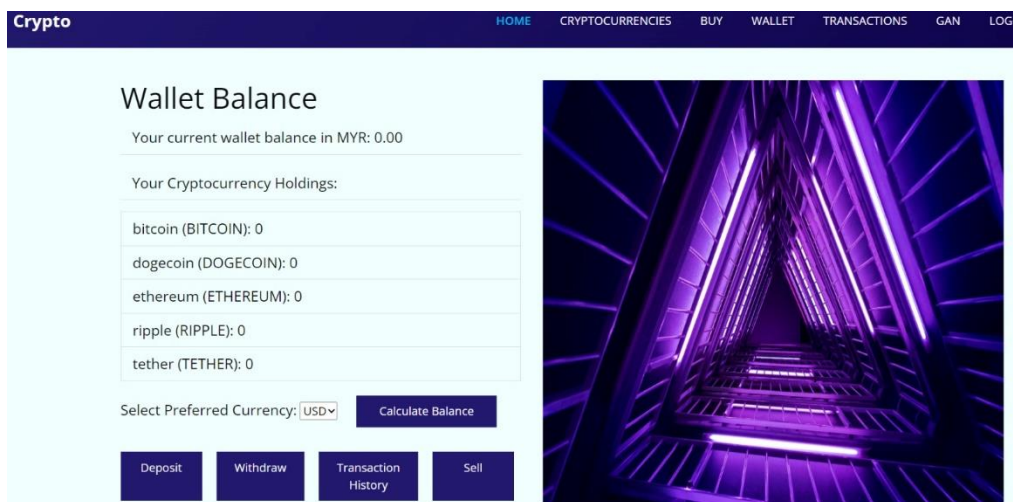


Figure 5.11: Wallet page.

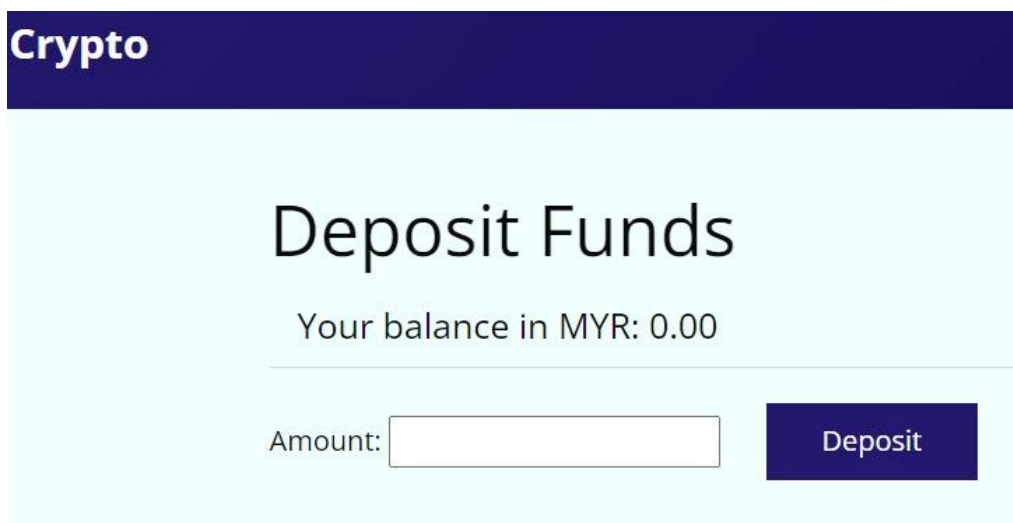


Figure 5.12: Deposit page.

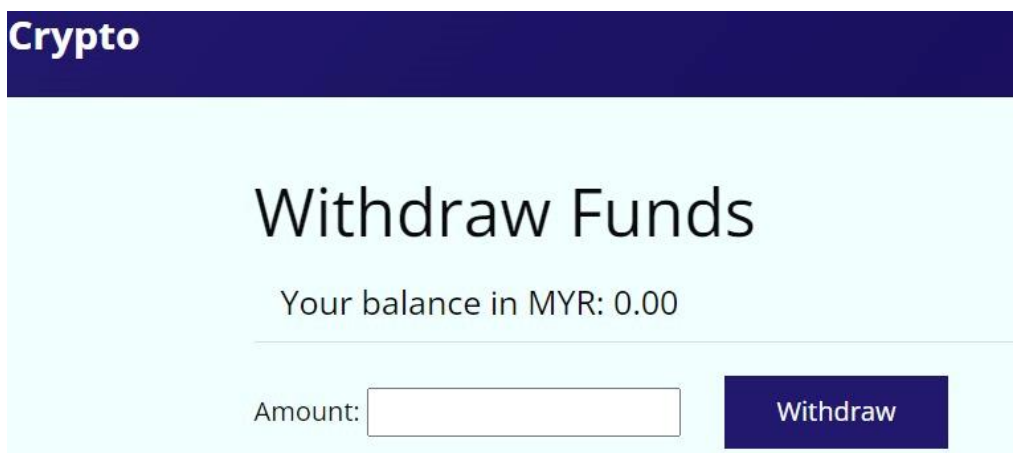


Figure 5.13: Withdraw page.

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TRANSACTIONS](#) [GAN](#) [LOGOUT](#)

Deposit Transaction History

Type	Amount	Currency	Date & Time
deposit	+10000.00	MYR	2023-09-07 14:35:56

Withdraw Transaction History

Type	Amount	Currency	Date & Time
withdrawal	-500.00	MYR	2023-09-07 14:36:01

Buy Transaction History

Type	Amount	Crypto Quantity	Crypto Name	Symbol	Cypto ID	Date & Time
buy_crypto	46.80 MYR	+10.00000	tether	TETHER	5	2023-09-07 14:36:14
Total	46.8 MYR	10				

Sell Transaction History

Type	Amount	Crypto Quantity	Crypto Name	Symbol	Cypto ID	Date & Time
sell_crypto	23.40 MYR	-5.00000	tether	TETHER	5	2023-09-07 14:36:21
Total	23.4 MYR	5				

Figure 5.14: Transaction history page.

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TRANSACTIONS](#) [ADMIN](#) [LOGOUT](#)

Edit Cryptocurrency

Cryptocurrency Holdings in Website:

bitcoin(BITCOIN): 999.75000
dogecoin(DOGECOIN): 995.00000
ethereum(ETHEREUM): 999.75000
ripple(RIPPLE): 995.00000
tether(TETHER): 990.00000

Select Cryptocurrency:

The quantity entered will be the new quantity of Cryptocurrency:


Quantity:

[Edit](#)

Figure 5.15: Edit crypto page.

Crypto [HOME](#) [CRYPTOCURRENCIES](#) [BUY](#) [WALLET](#) [TR](#)

User Profile



gan
user

Email:
gan@gmail.com

Phone Number:

[Edit Phone Number](#)

Contact Us

Feel free to leave us message when stepped upon any problem.

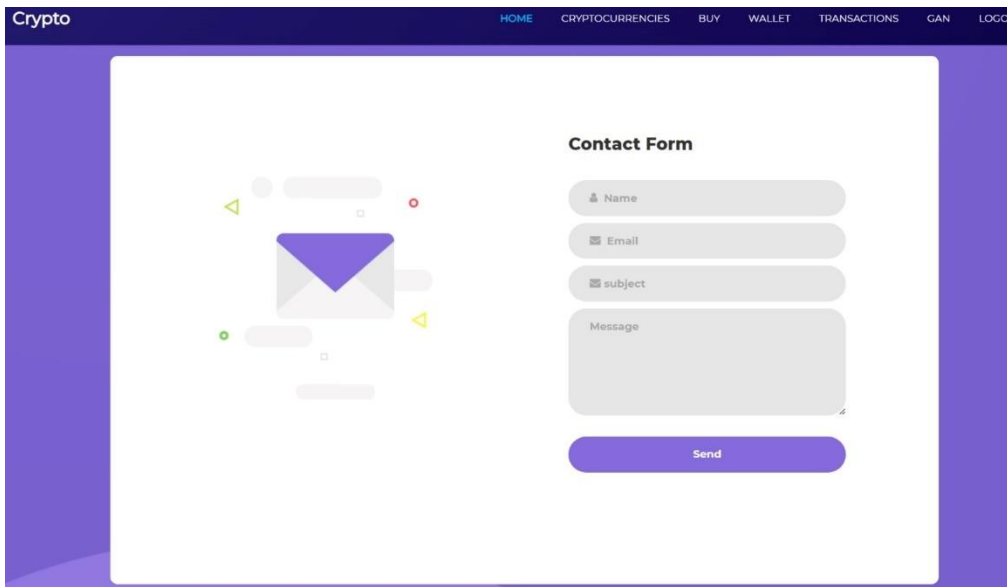
[Click Here](#)

Figure 5.16: Profile page.



The screenshot shows the 'Crypto' website header in a dark blue bar. Below it, a light blue section contains the heading 'Edit Phone Number'. Underneath the heading is the text 'Your Current Phone Number:'. A horizontal line separates this from a form area. The form includes the label 'Phone Number:' followed by a white text input field and a dark blue 'Edit' button.

Figure 5.17: Edit Phone Number page.



The screenshot shows the 'Crypto' website header with navigation links: HOME, CRYPTOCURRENCIES, BUY, WALLET, TRANSACTIONS, GAN, and LOGOUT. The main content area has a purple background and features a 'Contact Form' on the right. The form includes fields for Name, Email, and subject, a larger text area for the Message, and a purple 'Send' button. On the left side of the form area, there is a decorative graphic of a purple envelope with floating icons.

Figure 5.18: Contact form page.

CHAPTER 6

SYSTEM TESTING

6.1 Introduction

In this chapter, system testing, or software testing is put into attention. Software testing is a critical stage in any software development process. Software testing is also important in the iteration methodology as testing is one of the phases in the iteration. With this, it is clear that software testing plays an important role in project development. This due to the benefits of software testing. Firstly, software testing could help developers to detect potential or hidden defects that will not normally pop up if not tested specifically. Common bugs or errors that one could accidentally made and not aware of could also detected after software testing process. It is crucial to exercise software testing practices as soon as possible, since it requires less resources and time to find and fix defects early on in the development stage. Moreover, software testing can ensure that the finished product will not have major bugs and flaws when used by end user. There is various type of testing that could be done. In this project five types of testing will be conducted which is unit, functional, performance and usability. To better execute the software testing process, appropriate planning should be done first. Test plan and test cases are great documents that gives a layout and guidance on how the testing process should be performed.

6.2 Unit Testing

6.2.1 Unit Testing 1: Get live crypto price

Test Objective: To ensure accurate live crypto price could be retrieved.

Table 6.1: Unit Testing 1.

ID	Test Case Description	Test Steps
1	Live crypto price of bitcoin, dogecoin, ethereum, tether, ripple can be retrieved in MYR, USD, EUR, GBP via API.	Input name of cryptocurrencies and fiat currency along with the API link.

Test Data	Expected Result	Actual Results	Pass/Fail
'ids' =>'bitcoin, dogecoin, ethereum, tether, ripple' \$fiatCurrencies = ['myr', 'usd', 'eur', 'gbp'];	The live market price of cryptocurrencies will be retrieved in different fiat currency and store into database, 'cryptocurrencies' table.	As Excepted	Pass

Table 6.2: Unit Testing 1 (Cont'd).

ID	Test Case Description	Test Steps
2	Live crypto price of cryptocurrencies cannot be retrieved in MYR, USD, EUR, GBP when the crypto is not specified.	Input fiat currency along with the API link.

Test Data	Expected Result	Actual Results	Pass/Fail
\$fiatCurrencies = ['myr', 'usd', 'eur', 'gbp'];	The live market price of cryptocurrencies will not be retrieved in different fiat currency.	As Excepted	Pass

6.2.2 Unit Testing 2: Get live currency exchange rate

Test Objective: To ensure accurate live currency exchange rate is retrieved.

Table 6.3: Unit Testing 2.

ID	Test Case Description	Test Steps
1	Live currency exchange rate of MYR, USD, EUR and GBP can be retrieved via API.	Use the proper API link to retrieve data.

Test Data	Expected Result	Actual Results	Pass/Fail
'https://api.exchangerate-api.com/v4/latest/MYR'	The live currency exchange rate of MYR to USD, EUR and GBP is retrieved.	As Expected	Pass

Table 6.4: Unit Testing 2 (Cont'd).

ID	Test Case Description	Test Steps
2	Live currency exchange rate of MYR, USD, EUR and GBP cannot be retrieved via improper API implementation.	Use the improper API link to retrieve data.

Test Data	Expected Result	Actual Results	Pass/Fail
'https://api.exchangerate-api.com/v4/'	The live currency exchange rate of MYR to USD, EUR and GBP is not retrieved.	As Expected	Pass

6.2.3 Unit Testing 3: Deposit funding

Test Objective: To ensure deposit function could execute correctly.

Table 6.5: Unit Testing 3 (i).

ID	Test Case Description	Test Steps
1	Fundings can be added to wallet of user when user enter proper amount of fundings.	Enter the amount (1000) to deposit.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = 1000	RM 1000 is added to user's wallet successfully.	As Excepted	Pass

Table 6.6: Unit Testing 3 (ii).

ID	Test Case Description	Test Steps
2	Fundings cannot be added to wallet of user when user enter improper amount of fundings.	Enter the amount (-1) to deposit.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = -1	Fundings cannot be added to user's wallet	As Excepted	Pass

Table 6.7: Unit Testing 3 (iii).

ID	Test Case Description	Test Steps
3	Fundings cannot be added to wallet of user when user enter non-numeric value for the amount of fundings.	Enter the amount (abc) to deposit.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = 'abc'	Fundings cannot be added to user's wallet	As Excepted	Pass

6.2.4 Unit Testing 4: Withdraw funding

Test Objective: To ensure withdraw function could execute correctly.

Table 6.8: Unit Testing 4 (i).

ID	Test Case Description	Test Steps
1	Fundings can be withdraw from wallet of user when user enter proper amount of fundings.	Enter the amount (1000) to withdraw assuming that balance of wallet is RM 2000.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = 1000	RM 1000 is withdrawn from user's wallet successfully.	As Excepted	Pass

Table 6.9: Unit Testing 4 (ii).

ID	Test Case Description	Test Steps
2	Fundings cannot be withdraw from wallet of user when user enter improper amount of fundings.	Enter the amount (1000) to withdraw assuming that balance of wallet is RM 500.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = 1000	RM 1000 cannot be withdrawn from user's wallet due to insufficient balance.	As Excepted	Pass

Table 6.10: Unit Testing 4 (iii).

ID	Test Case Description	Test Steps
3	Fundings cannot be withdraw from wallet of user when user enter non-numeric value for amount of fundings.	Enter the amount (abc) to withdraw assuming that balance of wallet is RM 1000.

Test Data	Expected Result	Actual Results	Pass/Fail
amount = 'abc'	Fundings cannot be withdrawn from user's wallet.	As Excepted	Pass

6.3 Functional Testing

6.3.1 Functional Testing 1: Sign in website

Test Objective: To ensure user can sign in website successfully with proper credentials.

Table 6.11: Functional Testing 1 (i).

ID	Test Case Description	Test Steps
1	User can sign in the website using correct email and password that match with credentials in database.	Enter valid email and password to sign in website.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = 'user123456'	User can successfully sign in the website.	As Excepted	Pass

Table 6.12: Functional Testing 1 (ii).

ID	Test Case Description	Test Steps
2	User cannot sign in the website using correct email that match with credentials in database but invalid password.	Enter valid email but invalid password to sign in website.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = 'invalid987654'	User cannot sign in the website.	As Excepted	Pass

Table 6.13: Functional Testing 1 (iii).

ID	Test Case Description	Test Steps
3	User cannot sign in the website using correct password that match with credentials in database but invalid email.	Enter valid password but invalid email to sign in website.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'invalid@email.com' password = 'user123456'	User cannot sign in the website.	As Excepted	Pass

Table 6.14: Functional Testing 1 (iv).

ID	Test Case Description	Test Steps
4	User cannot sign in the website using correct email that match with credentials in database but not entering password.	Enter valid email but did not enter password to sign in website.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = NULL	User cannot sign in the website.	As Excepted	Pass

6.3.2 Functional Testing 2: Register account

Test Objective: To ensure user can register a new account properly.

Table 6.15: Functional Testing 2 (i).

ID	Test Case Description	Test Steps
1	User can register new account for the website using proper format of email and password.	Enter valid email and password and confirm password to register new account.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = 'user123456' password-confirm = 'user123456'	User can register new account successfully.	As Excepted	Pass

Table 6.16: Functional Testing 2 (ii).

ID	Test Case Description	Test Steps
2	User cannot register new account for the website using proper format of email but improper format for password.	Enter valid email and invalid password that is less than 8 characters to register new account.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = 'invalid' password-confirm = 'invalid'	User cannot register new account.	As Excepted	Pass

Table 6.17: Functional Testing 2 (iii).

ID	Test Case Description	Test Steps
3	User cannot register new account for the website using proper format of email but incorrect confirm password.	Enter valid email and valid password but different confirm password to register new account.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'user@email.com' password = 'user123456' password-confirm = 'notsame987654'	User cannot register new account.	As Excepted	Pass

Table 6.18: Functional Testing 2 (iv).

ID	Test Case Description	Test Steps
4	User cannot register new account for the website using proper format of email and valid password but email that is already used by other users.	Enter email that was registered by other users previously and valid password to register new account.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'admin@email.com' password = 'user123456' password-confirm = 'user123456'	User cannot register new account.	As Excepted	Pass

Table 6.19: Functional Testing 2 (v).

ID	Test Case Description	Test Steps
5	User cannot register new account for the website using improper format of email and valid password.	Enter email but not in proper email format which is 'xxx@mail.com' and proper password to register new account.

Test Data	Expected Result	Actual Results	Pass/Fail
email = 'useremail' password = 'user123456' password-confirm = 'user123456'	User cannot register new account.	As Excepted	Pass

6.3.3 Functional Testing 3: Buy cryptocurrency

Test Objective: To ensure use can buy cryptocurrency successfully.

Table 6.20: Functional Testing 3 (i).

ID	Test Case Description	Test Steps
1	User can buy crypto of choice by entering proper quantity of crypto with sufficient balance.	Assuming crypto available in website is 1000, balance of user is RM 500 and price per crypto is RM 10; user enter 50 for quantity of crypto to buy from website.

Test Data	Expected Result	Actual Results	Pass/Fail
quantity = 50	User can buy 50 crypto since total price is RM 500 and available balance is RM 500.	As Excepted	Pass

Table 6.21: Functional Testing 3 (ii).

ID	Test Case Description	Test Steps
2	User cannot buy crypto of choice by entering proper quantity of crypto with insufficient balance.	Assuming crypto available in website is 1000, balance of user is RM 450 and price per crypto is RM 10; user enter 50 for quantity of crypto to buy from website.

Test Data	Expected Result	Actual Results	Pass/Fail
quantity = 50	User cannot buy 50 crypto since total price is RM 500, but available balance is RM 450.	As Excepted	Pass

Table 6.22: Functional Testing 3 (iii).

ID	Test Case Description	Test Steps
3	User cannot buy crypto of choice by entering improper quantity of crypto.	Assuming crypto available in website is 1000; user enter 2000 for quantity of crypto to buy from website.

Test Data	Expected Result	Actual Results	Pass/Fail
quantity = 2000	User cannot buy 2000 crypto since total available crypto is 1000.	As Excepted	Pass

6.3.4 Functional Testing 4: Sell Cryptocurrency

Test Objective: To ensure user can sell cryptocurrency properly.

Table 6.23: Functional Testing 4 (i).

ID	Test Case Description	Test Steps
1	User can sell crypto of choice by entering proper quantity of crypto with sufficient available crypto in wallet.	Assuming crypto available in user's wallet is 50; user enter 50 for quantity of crypto to sell to website.

Test Data	Expected Result	Actual Results	Pass/Fail
quantity = 50	User can sell 50 crypto since total available crypto in user's wallet is 50.	As Excepted	Pass

Table 6.24: Functional Testing 4 (ii).

ID	Test Case Description	Test Steps
2	User can sell crypto of choice by entering proper quantity of crypto with insufficient available crypto in wallet.	Assuming crypto available in user's wallet is 50; user enter 100s for quantity of crypto to sell to website.

Test Data	Expected Result	Actual Results	Pass/Fail
quantity = 100	User cannot sell 100 crypto since total available crypto in user's wallet is 50.	As Excepted	Pass

6.4 Performance Testing

Table 6.25: Performance Testing (i).

ID	Test Case Description	Test Steps
1	Verify execute time for website to retrieve live crypto price and display them.	Users click on 'Cryptocurrencies' button

Test Data	Expected Result	Actual Results	Pass/Fail
-	Execute time does not exceed 1.5 sec.	As Excepted	Pass

Table 6.26: Performance Testing (ii).

ID	Test Case Description	Test Steps
2	Verify execute time for user to buy crypto.	Users click on 'Buy' button

Test Data	Expected Result	Actual Results	Pass/Fail
-	Execute time does not exceed 1.0 sec.	As Excepted	Pass

Table 6.27: Performance Testing (iii).

ID	Test Case Description	Test Steps
3	Verify execute time for user to sell crypto.	Users click on 'Sell' button

Test Data	Expected Result	Actual Results	Pass/Fail
-	Execute time does not exceed 1.0 sec.	As Excepted	Pass

Table 6.28: Performance Testing (iv).

ID	Test Case Description	Test Steps
4	Verify execute time for website to display transaction history.	Users click on 'Transaction' button

Test Data	Expected Result	Actual Results	Pass/Fail
-	Execute time does not exceed 1.0 sec.	As Excepted	Pass

6.5 Usability Testing

Table 6.29: Usability Testing.

ID	Test Case Description	Pass/Fail
1	User is able to sign in website	Pass
2	User is able to register new account	Pass
3	User is able to reset password	Pass
4	User is able to view crypto list	Pass
5	User is able to buy crypto	Pass
6	User is able to sell crypto	Pass
7	User is able to view wallet	Pass
8	User is able to view transaction history	Pass
9	User is able deposit fundings	Pass
10	User is able to withdraw fundings	Pass
11	User is able to view profile	Pass
12	User is able to edit phone number	Pass
13	User is able to view contact form	Pass
14	Admin is able to edit crypto	Pass
15	Admin is able to view trading volume	Pass

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

In conclusion, a CEX website that provides option for Malaysian to buy and sell cryptocurrencies in MYR is developed in this project. Although there is an emergence of crypto exchange in the market, including Malaysia, the low availability of CEX websites in the country and the lack of accessibility of Malaysian Ringgit in existing CEX websites still is the main problem and hurdle for Malaysian to freely exchange cryptocurrencies. Besides, CEX website may suffer high traffic in transaction volume due to the order creating and order matching mechanism for trading cryptocurrencies. CEX website may crash and cost users time and money.

To counter this, an innovative CEX website is developed that allow Malaysian to buy and sell cryptocurrencies. Furthermore, MYR is added into the website as the main fiat currency for transaction purpose. Besides, complex order matching is not implemented in the CEX website developed in this project, where else instant buying and selling of cryptocurrency is applied. Users can directly buy cryptocurrencies from the website if the available cryptocurrency is sufficient. Users can also sell cryptocurrencies to the website immediately, knowing that the users owned cryptocurrencies on the website. Transactions are made instantly, without the hassle of order matching.

Iteration methodology is chosen as the methodology for this project. Iteration of every phase is evaluated and repeated until the website is fully developed. 26 weeks overall are allocated to complete the project, with the first 13 weeks covering the period from February to April 2023, and another 13 weeks dealing with the project's implementation and documentation from June to September 2023.

7.2 Recommendations for Future Work

Although a CEX website with improved functionality had been developed in this project, but future works can be done to further improve the website. Firstly, exploration of other software developments tools and programming languages can be taken into consideration. In this project Laravel is the main web application framework used to develop the CEX website. Other frameworks or programming languages can be used to build the website, such as Django, React, Asp.net, Ruby on Rails and more.

Next, MySQL is used for the development of this project. MySQL is relation-based database, while there is NoSQL databases that can be used too. Other databases can be used for future work such as MongoDB, Apache Cassandra, Neo4j and more. By exploring other options for database implementation, transaction speed of website may be increased and the ability to handle multiple requests simultaneously may be improved. Besides, the cryptocurrencies variety in this project is limited, thus for future work, it is advisable to increase the type of cryptocurrency available on the website for user to buy and sell.

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