16:332:567 - Software Engineering I

STOCK MARKET INVESTMENT FANTASY LEAGUE

REPORT 1

Group 6

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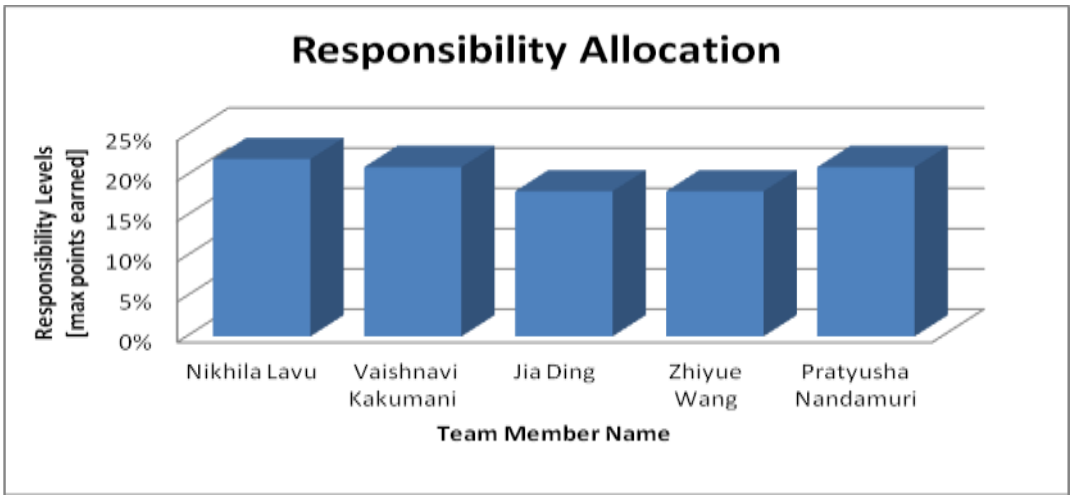
URL of the Project's Website:
http://**www.tradefun.rutgers.edu**

1. INDIVIDUAL CONTRIBUTIONS BREAKDOWN

The effort breakdown for all team members is shown in the following responsibility matrix and responsibility allocation chart.

Responsibility Levels	Team Member Name				
	Nikhila Lavu	Vaishnavi Kakumani	Jia Ding	Zhiyue Wang	Pratyusha Nandamuri
Project management	100%				
Cover Page and Individual Contributions Breakdown			100%		
Table of Contents					100%
Customer Statement of Requirements	100%				
Glossary of Terms				100%	
Functional Requirements Specification					100%
Nonfunctional Requirements			100%		
Domain Analysis		100%			
User Interface Design	100%				
Plan of Work		100%			
References				100%	



2. TABLE OF CONTENTS

3. CUSTOMER STATEMENT OF REQUIREMENTS

To whom it may concern,

I write on the behalf of my trading partners who require a platform where they can either learn at first hand the techniques required to invest in a stock market or hone their existing skills of trading. In the past years we trained the traders by letting them trade in the actual market itself by giving them small amounts of money and watching closely the techniques that they use to make the investments. In the present situation of market debacles, this idea seemed to be a very expensive taking into account the number of traders that our company is hiring right now. Another reason that is hindering the actual investments is the current nature of the market. In the time when the trading gurus are experiencing losses, it is not a safe idea to let loose the traders who are novice at the art of investing. Yet another reason for the want of this type of platform is that we need a place where even the most experienced traders can try and practice the new techniques that they may have before they use them in the actual markets.

What I have in my mind right now is a virtual stock market web application which will allow the investors to buy and sell the stocks virtually without entering the actual market itself. This idea of virtual stock market as you may know is not a new technique. There are a lot of web-sites that offer this kind of service to both amateur traders and trading gurus. This will be used not only to train the new traders but will also be a testing platform for advanced traders where they can practice new strategies, improve their decision making skills along with watching market from outside it. What the existing stock market games lack is a bit of sophistication that actual markets have and the too much of advertising which is taking away the sense of importance of the game. What I propose right now will be called TradeFun! For future references and will give the traders a chance to trade virtually here in the company itself.

Our aim is to make TradeFun! an interactive website based system which will simulate the real world stock market. It make the game very convenient to the returning users, we will be required to have a quick and easy registration process wherein the user will be able to choose his personalized username and password. From the time of registration, we will have to address

the user as a trader to continue the game spirit. Each trader will be given certain amount of virtual money at the time of the registration completion and the trader is free to use this money to make transactions. An upper cap can be placed to the amount of stocks that he/she can buy in certain amount of time. TradeFun! should keep track of all the transactions that the trader does and have them ready for any future references. It should also update the trader portfolios timely to ensure transparency of the system. Moreover, our site should conduct real-time, internal updates to regularly determine both the value of a trader's portfolio and the value of each stock in the virtual market. This can be achieved by subscribing to the real time date from trusted and updated vendors like Yahoo! Finance.

To personalize the game according to the traders choice, TradeFun! should have the ability to track his past trades and post comments on them. For this purpose, we are required to setup a module that is something like a trade diary where the system updates the trades and the trader will have a chance to put his/her personal comments and additional plans. For the purpose of teaching game to the beginners, there will be a quick links tab in the home page which will be redirecting to external websites with relevant information to the game.

Finally, to encourage the top scoring traders the website will award ranks to the traders depending on the amount of money that they are able to earn through balanced or strategic trading. Trader with first rank will be awarded more money by the website to keep up the spirit and his name will be displayed as the "TOP PLAYER OF WEEK/MONTH" in all the traders' home pages.

At the end of this narrative, a few comments that I would like to add are that TradeFun! should not only be a platform for the traders to buy and sell stocks as it may appear but it should also teach the traders the pitfalls of the current stock markets. By playing the game, they should be able to improve their strategic decision making, smart trading skills along with learning the basics of trading. After conducting a series of interviews with the investors and taking note of their individual requirements and what they would like to see in a web-based stock market

fantasy league application, a majority of responses advised eight important requirements. I have attached these requirements below.

I wish you and your team all the very best for the development of the TradeFun! and would like to answer any questions that you may have in the future.

Sincerely,

Stanley Jobs

Trading League LLC

List of Requirements:

REQ 1: TradeFun! Website

Traders are requesting for a virtual stock market website where they can trade stocks and practice their existing and new strategies. Website should be able to provide stock information and give a chance to invest in the stock market.

REQ 2: Tutorials

TradeFun! should be able to guide the new trader with the information that he/she might need when they first start trading. It should be able to redirect to external links for information like basics of trading, strategies etc.

REQ 3: Graphical User Interface (GUI)

User interface is what stands between trader and back end. So a decent look is expected with not too much of pictures and advertisements. The task to be accomplished should be done with a few number of mouse clicks.

REQ 4: Reliability

Regular maintenance is required to keep the website up to date. Website should be able to withstand decent amount of traffic during peak trading hours.

REQ 5: Trader Portfolios

Each investor must be able to register for the application. Once registered, a profile should be created. An investor portfolio must also be maintained, including previous and current stock transactions and amounts of money earned and lost

REQ 6: Monitoring activities

Administrator should be there to resolve any issues that traders might have and perform updates maintenances.

REQ 7: Automatic trading based on the thresholds

Users should have the option of setting threshold amounts. If price of the stock drops or rises beyond this threshold, then, the application should either buy or sell according to the set options of the user.

REQ 8: Updating stock prices

Continuous update of the stock prices should be provided for decent reliability. Most important thing is that the prices should be accurate. Too much of lag between the real time data and the system data is not appreciated.

REQ 9: Ranking and Rewards

Ranking should be given to the traders based on the performance and the best player of the month should be awarded periodically.

4. GLOSSARY OF TERMS

- **ASK PRICE:** The price that a security holder is willing to sell a security, at a given time.
- **ASSET TURNOVER:** The ratio of net sales divided by total assets.
- **ASSET/EQUITY RATIO:** The ratio of total assets divided by stockholders' equity.
- **AT-THE-MONEY:** An option that has a strike price, which is nearest to the underlying futures price.
- **BETA:** A statistically generated number used to measure volatility of a security in comparison to the market and determine the risk of the security compared to market risk, which is always 1.
- **BID PRICE:** The price that a buyer is willing to pay for a security.

- **BOND:** A certificate of indebtedness issued by a government entity or a corporation, which pays a fixed cash coupon at regular intervals. The coupon is paid on the face value of the bond, which is usually one thousand dollars.

- **BOOK VALUE:** The price at which the buyer purchased the asset for.

- **BUY-AND-HOLD STRATEGY:** A passive investment strategy where investor buys a security and holds on to it for a long term.

- **BUY-SELL AGREEMENT:** An agreement between shareholders or business partners where both parties agree to purchase or sale a stock in.

- **CALL OPTION:** An option that gives the right to a buyer to buy the underlying stock or futures contract at the strike price. It is a liability for the writer of the call option to sell the stock or future at the strike price on the option.

- **COMMISSION:** The fee a broker charges for administering a trade, also known as brokerage fees.

- **COMMON STOCK:** A security that represents ownership in the corporation.

- **CONTRACT**: A term that describes the unit of trading for a stock option, future option or future.

- **CONVERTIBLE BONDS:** Bond that can be converted into common stock usually at the maturity of the bond.

- **CONVERTIBLE PREFERRED STOCK:** Preferred stock that can be converted into common stock at a particular time frame.

- **COUPON:** The periodic interest payment made to a bondholder during the life of the bond. (Usually semi-annual)

- **COUPON RATE:** The rate of interest paid on a bond, expressed as a percentage of the bond's face value.

- **COVERED CALL WRITING STRATEGY:** A strategy that involves writing a call option on securities and own the underlying security. This strategy allows investors to make a gain of the option price.

- **CURRENCY RISK:** The risk an investor is exposed to when investing in international markets. Currency risk is mainly associated with the fluctuations in exchange rates of the various world currencies.

- **CURRENT RATIO:** The ratio of current assets divided by current liabilities.

- **DAY TRADING:** Establishing and liquidating the same position or positions within one trading day.

- **DELTA:** Also called the hedge ratio, it is the ratio of the change in price of an option to the change in price of the underlying stock.

- **DISCOUNT:** It is referring to the selling/buying price of a bond, a price below its par value. Related: Premium

- **DIVERSIFICATION:** Spreading investment risk among a number of different securities, properties, companies, industries or geographical locations. Diversification does not assure against market loss.

- **DIVIDENDS:** A distribution of the earnings or part of a company to its shareholders. Dividends are declared by the company based on profits and can change from time to time.

- **EARNINGS PER SHARE (EPS):** Total net profits divided by the number of outstanding common shares of in the market.

- **EXCESS RETURNS:** The returns in excess of those required by the shareholder based on the beta of the company.

- **EXPECTED RETURN:** The return expected on a based on the Beta (risky) of the company.

- **EXPIRATION DATE:** The last day upon which an option or futures contract can be exercised or traded.

- **FUTURES CONTRACT:** A standardized, transferable legal agreement to make or take delivery of a specified amount of a certain commodity, currency, or an asset at the end of specified time frame. The price is determined when the agreement is made. Future contracts are always marked to market.

- **IN-THE-MONEY:** When it is profitable to exercise the option. For example: Stock price is lower than the strike price specified in the put option contract.

- **IPO:** An Initial Public Offering, or IPO for short, represents the first opportunity for the public to purchase shares of a company.

- **LEVERAGED PORTFOLIO:** A portfolio that invests in the risky assets with borrowed funds.

- **LIMIT ORDER:** An order given to a broker by a customer where the order is not executed until the price reaches that price limit set by investor. Limits buy sets a price ceiling whereas limit sell sets a price floor for the investment price.

- **MARGIN** The amount of money supplied by an investor as a portion of the total funds needed to buy or sell a security, with the balance of required funds loaned to the investor by a broker, dealer, or other lender.

- **MARKET ORDER:** An order for immediate execution place with a broker to buy or sell.

- **MARKET RISK:** The general risk for investing in the any security. Every industry in the market is affected by this risk. Examples: depression, war, inflation etc.

- **MUTUAL FUNDS:** A mutual fund is a pooling of investor (shareholder) assets, which is professionally managed by an investment company for the benefit of the fund's shareholders. Each fund has specific investment objectives and associated risk. Mutual funds offer shareholders the advantage of diversification and professional management in exchange for a management fee.

- **OFFER PRICE:** The price that an investor is willing to pay for a security or future.

- **OPTIONS CONTRACT:** It is contract where an investor buys a call or put option for hundred stocks for the stock option contract. On the other hand, the size of the future contract depends on the future, which is usually same as the size of futures contract.

- **OUT-OF-THE-MONEY:** A put option with a strike price lower than the underlying futures price, or a call option with a strike price higher than the underlying futures price. Related: In-the-Money.

- **PAR VALUE:** The amount that the issuer agrees to pay at the date of maturity.

- **PREFERRED STOCK:** A class of stock that shares characteristics of both common stock and debt, the preferred stock holder gets first priority for the dividend and usually the dividend is fixed like the interest on the stocks based on par value.

- **PUTS:** An option giving the right to sell the underlying stock or futures contract at the strike price.

- **RETURN:** The change in the value of a portfolio over an evaluation period, including any distributions made from the portfolio during that period.

- **SELLING SHORT:** A trade in which the investor borrows a security and sells it to another investor in market. To close the short position an investor has to cover (purchase the same security from market) and return it to the person they borrowed it from.

- **STOP LOSS ORDER:** This is a similar order to the limit order where investor sells or covers the long or short position, respectively to stop incurring any loss on their position.

- **STRIKE PRICE:** The price at which an option can be exercise into the underlying futures contract or stock.

- **SYSTEMATIC RISK:** Also called undiversifiable risk or market risk, the minimum level of risk that can be obtained for a portfolio by means of diversification across a large number of randomly chosen assets. Related: Unsystematic risk

- **TICK:** Refers to change in price, either up or down.

- **TICKER SYMBOL:** A ticker symbol is a combination of letters that identifies a stock, bond, option or the future contract.

- **TREASURY BILL:** Treasury bills, often referred to as T-bills, are short-term securities (maturities of less than one year) offered and guaranteed by the federal government. They are issued at a discount and pay their full face value at maturity.

- **UNSYSTEMATIC RISK:** Also called the diversifiable risk, residual risk, or company-specific risk, the risk that is unique to a company such as a strike, the outcome of unfavorable litigation, or a natural catastrophe. Related: Systematic risk

- **YIELD RATIO:** The quotient of two bond yields.

- **YIELD TO MATURITY:** The interest rates that will make the present value of a bond's remaining cash flows (if held to maturity) equal to the price (plus accrued interest, if any).

- **ZERO-COUPON BOND:** A zero-coupon bond is a bond sold without interest-paying coupons. Instead of paying periodic interest, the bond is sold at a discount and pays its entire face amount upon maturity, which is usually a one year period or longer.

5. FUNCTIONAL REQUIRMENTS SPECIFICATION

a. STAKEHOLDERS

i. Internal Stakeholders

- **Owner**: A person who is legally allowed to own the web application. His interests are profits, expenditure, customer satisfaction and competitors.
- **Manager**: A person who overlooks the expenditure, resources, maintenance and development of the web application. His interests include customer satisfaction, expenditure, performance, employees, maintenance and development.
- **Website Administrator**: The person responsible for putting up the web application initially and then maintaining it and providing support when necessary. His interests are working conditions, job stability, salary and benefits.

ii. External Stakeholders

- **User or Customer**: The person who plays the game. His interests may include pleasure in online fantasy games, trying to get an idea of how trading and stock market works and trying out various investment strategies to see if they actually work.
- **Educator**: An educator is someone who may use the game to teach his students about trading and stocks. His interests are imparting knowledge to his students, simulating their interest.

b. ACTORS AND GOALS

- **User**: The person who uses the website to play the game.

  Type: Initiating

  Goal: Register an account, login, maintain his profile, buy and sell stocks.
- **Administrator**: The person who designs and maintains the website.

  Type: Initiating

Goal: Website maintenance and rank the players weekly depending on their monetary values.

- **Database**: A place where the various stocks being offered are stored as well as their current prices. Database also has the list of users currently enrolled apart from their profile information.

  Type: Participating

  Goal: None

- **Yahoo Finance**: The external source from which the stock quotes are picked up periodically.

  Type: Participating

  Goal: None

c. USE CASES

i. Casual Description

Use Case 1: Buy Stock

A user can choose to buy stocks whether from market or other users. Of course the transaction is failed if his portfolio doesn't have sufficient funds. Also, a commission fee is charged for each transaction which is 10$. Portfolio value is decreased after purchasing the shares of a stock.

Use Case 2: Sell Stock

Users are able to sell stocks to a market or other users. But he cannot sell shares if he doesn't have any shares of the company which he wants to sell in his portfolio. Similarly, a commission fee is charged for each transaction which is 10$. Portfolio value is increased after selling the shares.

Use Case 3: Manage Users

Once logged in, a user will be able to access his profile and make changes to it. He can even delete his profile if he doesn't need it anymore. Once a profile is deleted, the respective user information will be deleted from the database as well.

Use Case 4: Check History

This process with provide the user the ability to look at his past trade transactions. The My History tab will provide a complete list of all the transactions till date.

Use Case 5: Authentication

Once a user hits our URL, he will be prompted for his login details-username and password. This authentication is to make sure every user can access only his account and his trade.

Use Case 6: Registration

A new user can join the game at any time by registering his details with the system. The login page has a sign for registration in case he hasn't before.

Use Case 7: Rank Players

The Administrator is the initiator in this case as he is responsible for ranking the players weekly, depending on their net worth.

Use Case 8: Web Site Maintenance

The Administrator is responsible for creating as well as maintaining the webpage. He will be able to supervise and edit the game settings and also address any concerns a user might have.

ii. Fully Dressed Description

USECASE 1: BUY STOCK
Related Requirements: REQ Initiating Actor: User Actor's Goal: To buy shares of a stock Participating Actor: Database Pre-conditions: 1. The user has logged into his account. 2. The balance of is account has sufficient funds Post-conditions: 1. User successfully buys the new shares from market or other users. 2. Changes are reflected in the transaction place and the commission fee is added to the decreased funds. Flow of Events for Main Success Scenario: 1. → User enters the name and quantity of shares. 2. →Database looks up the price and other information of this stock. 3. ← System displays the whole information of this stock. 4. ← System calculates the total money including commission fee that user must pay. 5. ← System checks the balance of the user's account if he has enough money to pay for it. 6. ← System adds the purchased shares into user's account. Flow of Events for Extensions (Alternate Scenario 1): 3a. User fails to enter either the name or symbol 1. System displays the error information. 2. System prompts him to enter the complete name or symbol. Flow of Events for Extensions (Alternate Scenario 2): 3b. User enters invalid stock name or symbol 1. System informs the user about the invalid entry. 2. System prompts him to enter the correct name or symbol. Flow of Events for Extensions (Alternate Scenario 3): 3c. User doesn't have enough money in his portfolio 1. User enters the quantity of shares he wants to buy. 2. System informs the total cost including commission fee. 3. System shows an error warning that the balance of his portfolio is unaffordable for purchase.

USECASE 2: SELL STOCK

Related Requirements: REQ
Initiating Actor: User
Actor's Goal: To sell shares of a stock user owns
Participating Actor: Database
Pre-conditions: 1. The user has logged into his account.
2. The user has shares in his account.
Post-conditions: 1. User successfully sells the new shares to market.
2. Changes are reflected in the transaction place and the commission fee is added to the increased funds.
Flow of Events for Main Success Scenario:
1. → User enters the name and quantity of shares he owns and wants to sell.
2. ← Database verifies the valid name of this stock.
3. ← System displays the whole information of this stock.
4. ← System calculates the total income except commission fees that user must pay.
5. ← System checks the user's account if he has those shares which he wants to sell.
6. ← System removes the shares out of user's account and adds income to his balance.
Flow of Events for Extensions (Alternate Scenario 1):
3a. User fails to enter either the name or symbol
1. System displays the error information.
2. System prompts him to enter the complete name or symbol.
Flow of Events for Extensions (Alternate Scenario 2):
3b. User enters stock name or symbol that he doesn't own
1. System informs the user about the invalid entry.
2. System prompts him to enter the correct name or symbol.
Flow of Events for Extensions (Alternate Scenario 3):
3c. the quantity the user enters to sell is more than he owns
1. User enters the quantity of shares he wants to sell.
2. System shows an error warning that the quantity of shares in his portfolio is not enough to sell.
3. System informs the user to enter a correct number of shares.

USECASE 3: AUTHENTICATION

Related Requirements: REQ
Initiating Actor: User
Actor's Goal: To log into Tradefun.
Participating Actor: Database
Pre-conditions: 1. The database is non-empty
2. The user has an active account
Post-conditions: User successfully logs into his account.

Flow of Events for Main Success Scenario:
1. ← System prompts the user for his details: username and password
2. → User enters them.
3. ← System verifies them.
4. ← System informs the user they are valid and logs him in.

Flow of Events for Extensions (Alternate Scenario 1):
2a. User forgot his password.
1. System asks him a security question he has entered while registration.
2. Checks if the answer entered is correct.
3. Displays the password.

Flow of Events for Extensions (Alternate Scenario 2):
2a. User enters invalid password.
1. System informs the user about the invalid entry.
2. Prompts him to enter the correct information.

USECASE 4: REGISTRATION

Related Requirements: REQ
Initiating Actor: User
Actor's Goal: To create an account with Trade fun
Participating Actor: Database
Pre-conditions: The database is empty
Post-conditions: 1. User successfully creates an account.
2. He is given a portfolio to start the game.

Flow of Events for Main Success Scenario:
1. → User prompts the system to create an account.
2. ← System starts the registration process.
3. → User enters the required information and submits it.
4. ← System enters this information into the database.
5. ← System adds a new portfolio into the database.
6. ← System informs the user that his account has been created and he can now play the game.

Flow of Events for Extensions (Alternate Scenario 1):
3a. User already has an account.
1. System cancels the registration process.
2. System informs the user about his existing account.
3. Prompts him to enter the details of that account.

Flow of Events for Extensions (Alternate Scenario 2):
3a. User enters invalid information.
1. System informs the user about the invalid entries.
2. Prompts him to enter the correct information.

USECASE 5: MANAGE USERS

Related Requirements: REQ

Initiating Actor: User

Actor's Goal: To edit his profile. To delete it when necessary.

Participating Actor: Database

Pre-conditions: 1. The database is non-empty

2. The user has an active account

Post-conditions: User has successfully edited his profile.

Flow of Events for Main Success Scenario:

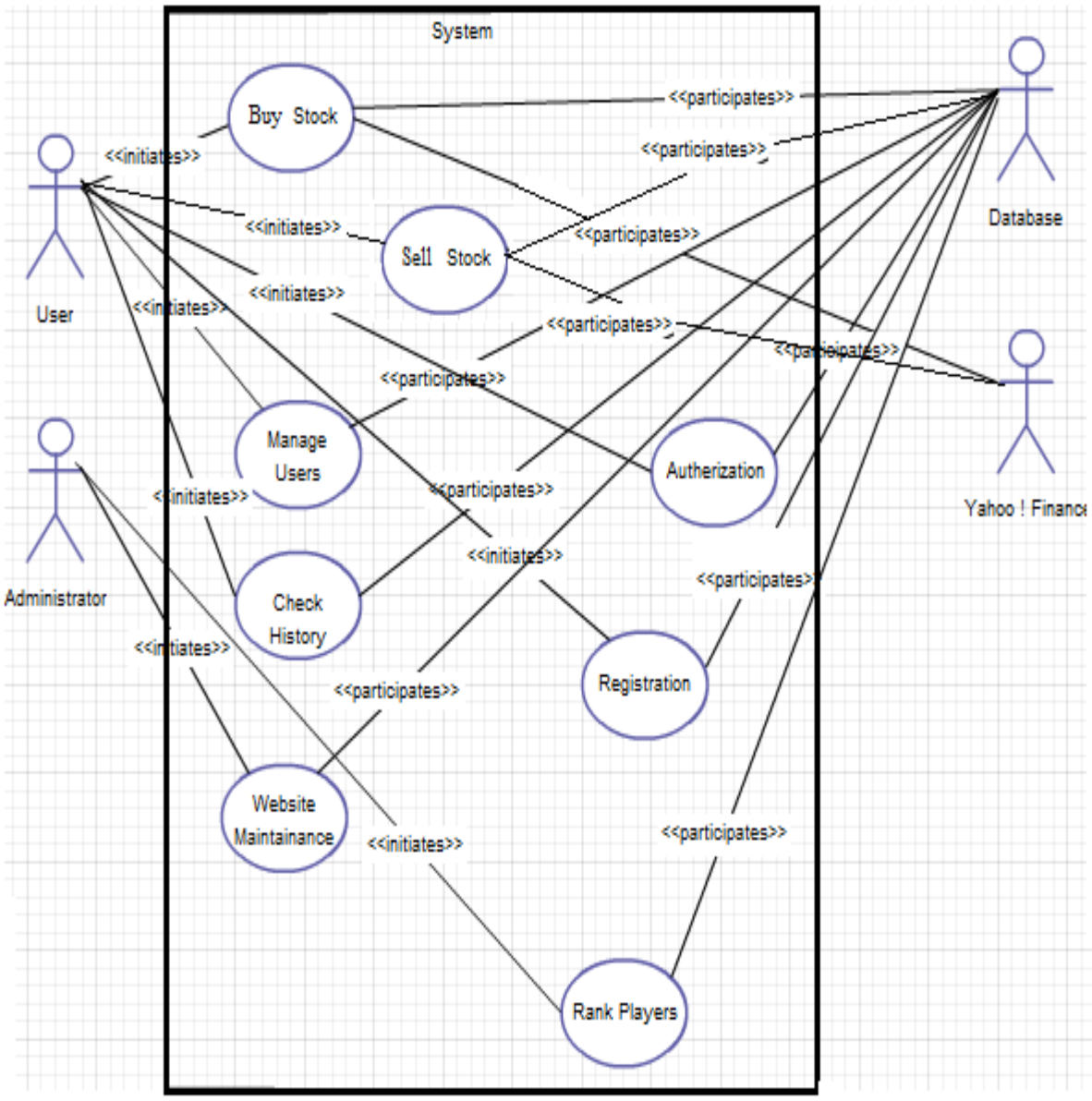
1. → User asks the system to edit his profile.
2. ← System displays his current profile.
3. → User makes required changes.
4. ← System updates the changes into the database.
5. ← System informs the user that the changes have been made.

Flow of Events for Extensions (Alternate Scenario 1):

1a. User requests profile deletion.

1. System asks him for confirmation.
2. User confirms.
3. System deletes him and his portfolio from the database.
4. Informs the user about it.

iii. Use Case Diagram



iv. System Requirements - Use Case Traceability Matrix

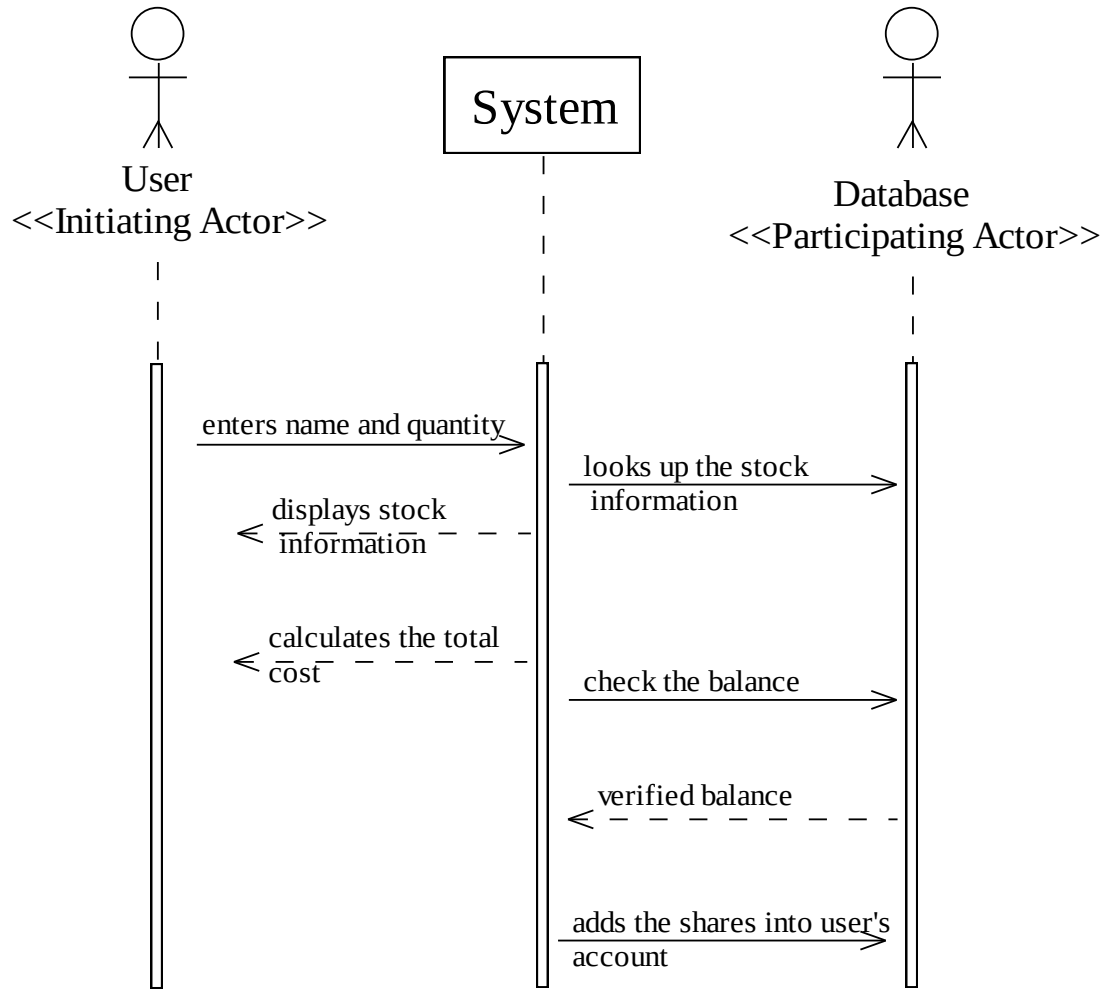
This is the traceability matrix for the requirements listed earlier:

Req.	Requirement Description	Related Use Cases	Implementation Status
1.	TradeFun! Website	ALL	Partial
2.	Tutorials	US- 7	Partial
3.	Graphical User Interface (GUI)	N/A	Incomplete
4.	Reliability	US- 7	Partial
5.	Trader Portfolios	US-2,3,4,5	Partial
6.	Monitoring activities	US- 7	Incomplete
7.	Automatic trading based on the thresholds	US- 1	Incomplete
8.	Updating Stock Prices	US- 1,7	Incomplete
9.	Ranking and Rewards	US- 6	Incomplete

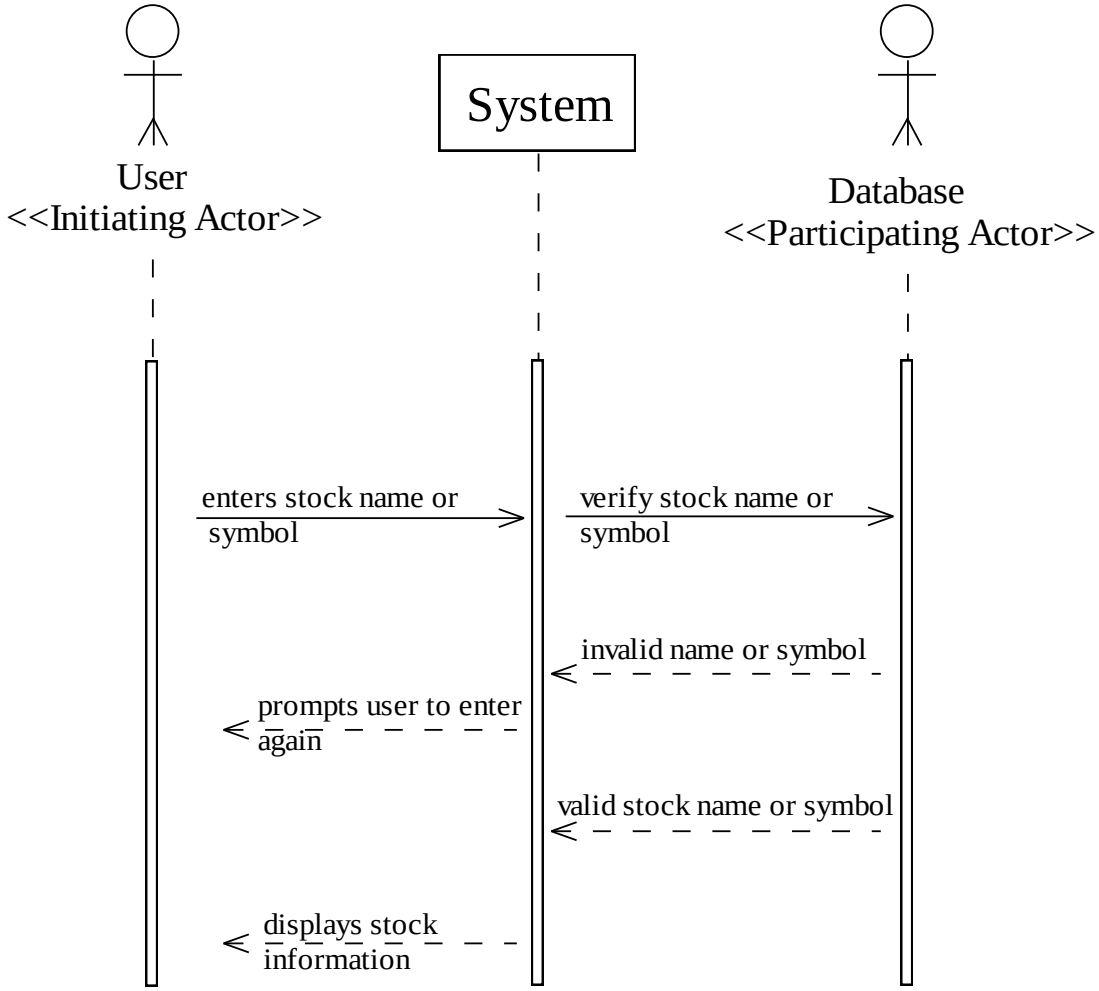
d. System Sequence Diagrams

UC-1 BUY STOCK

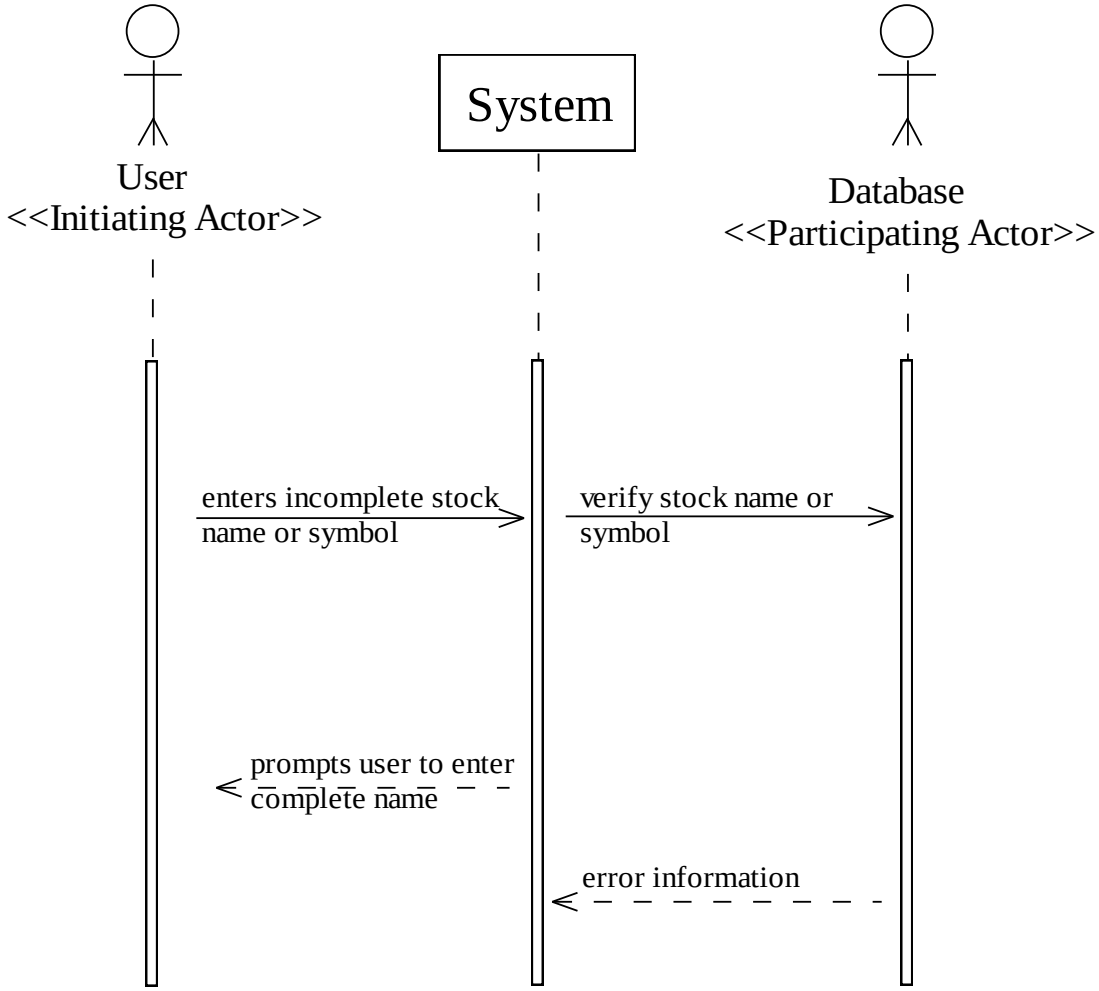
Main Success Scenario:



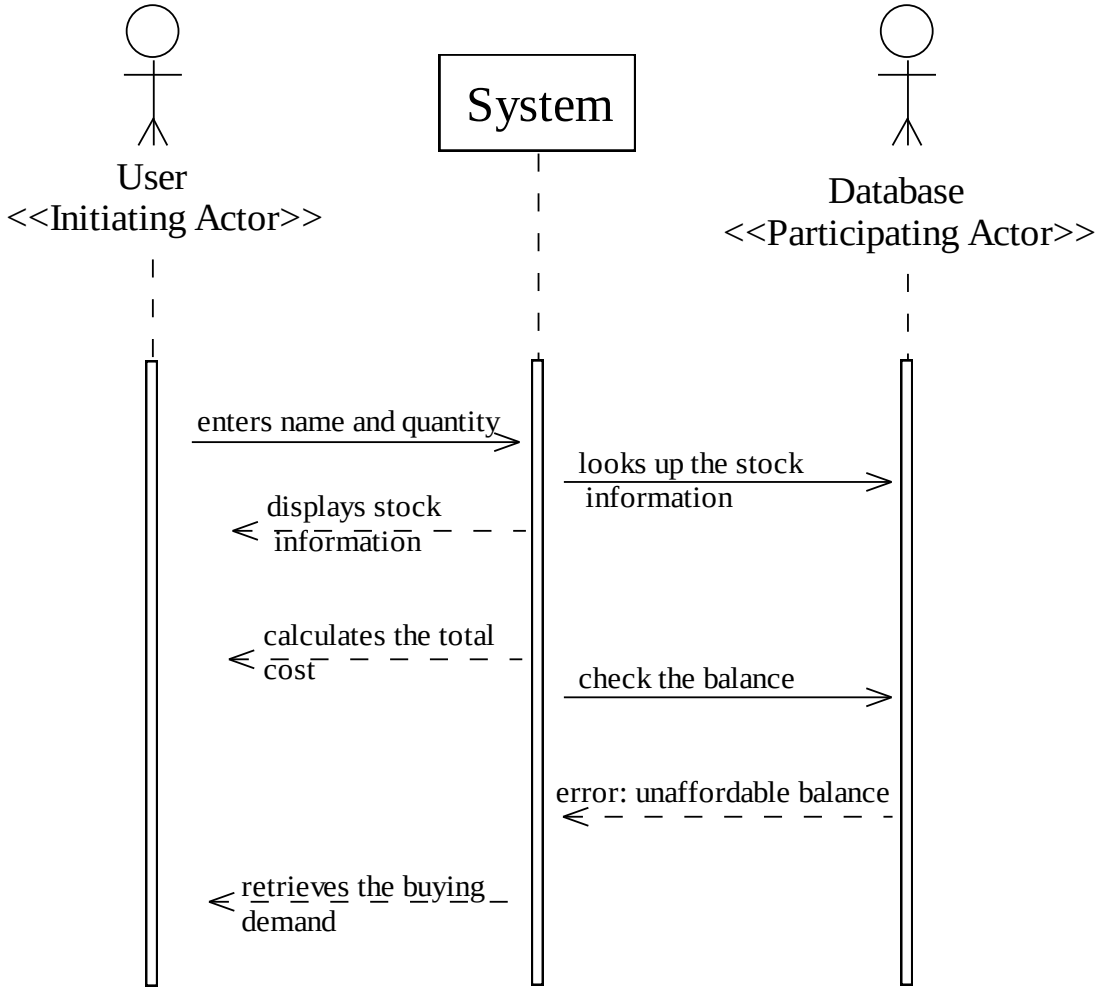
Alternate Scenario 1(invalid stock name):



Alternate Scenario 2(incomplete stock name):

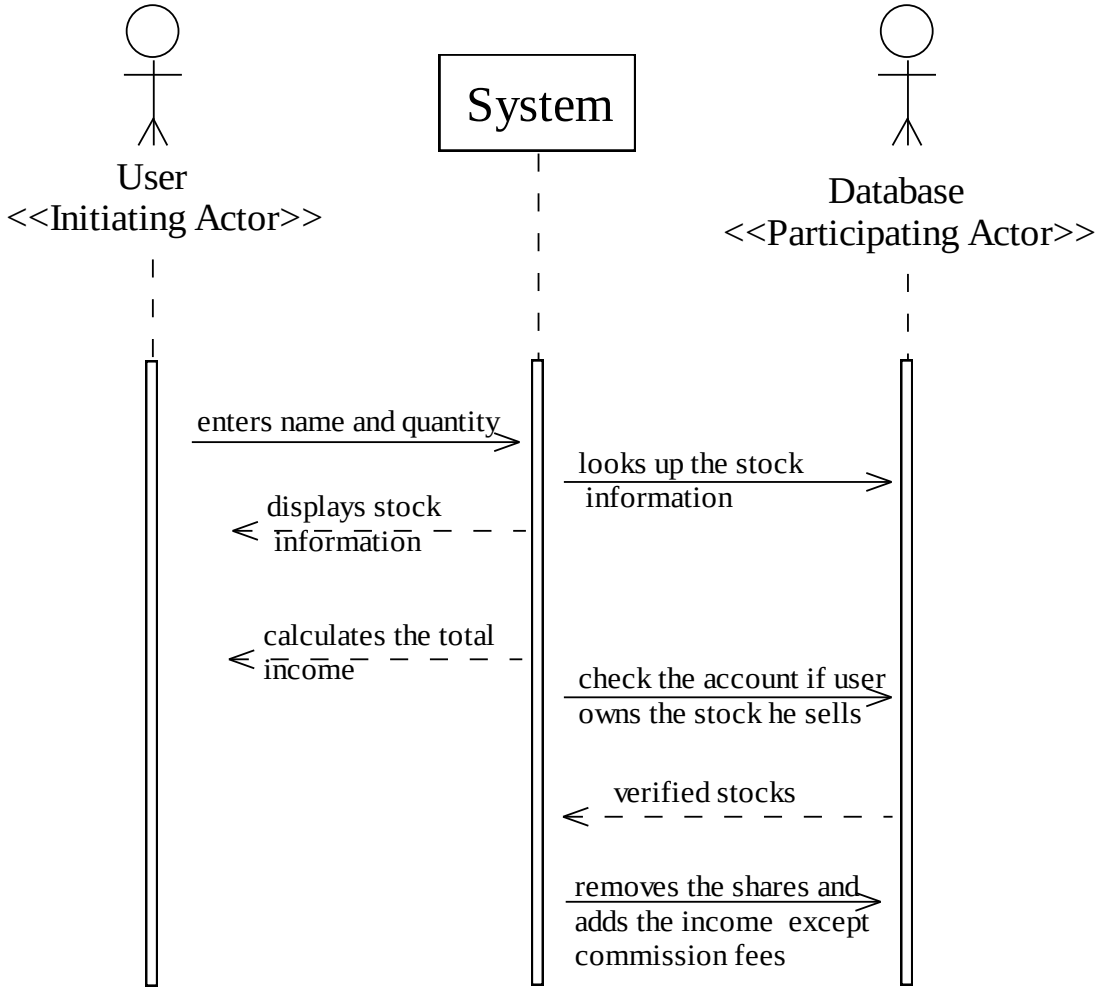


Alternate Scenario 3(Unaffordable account):

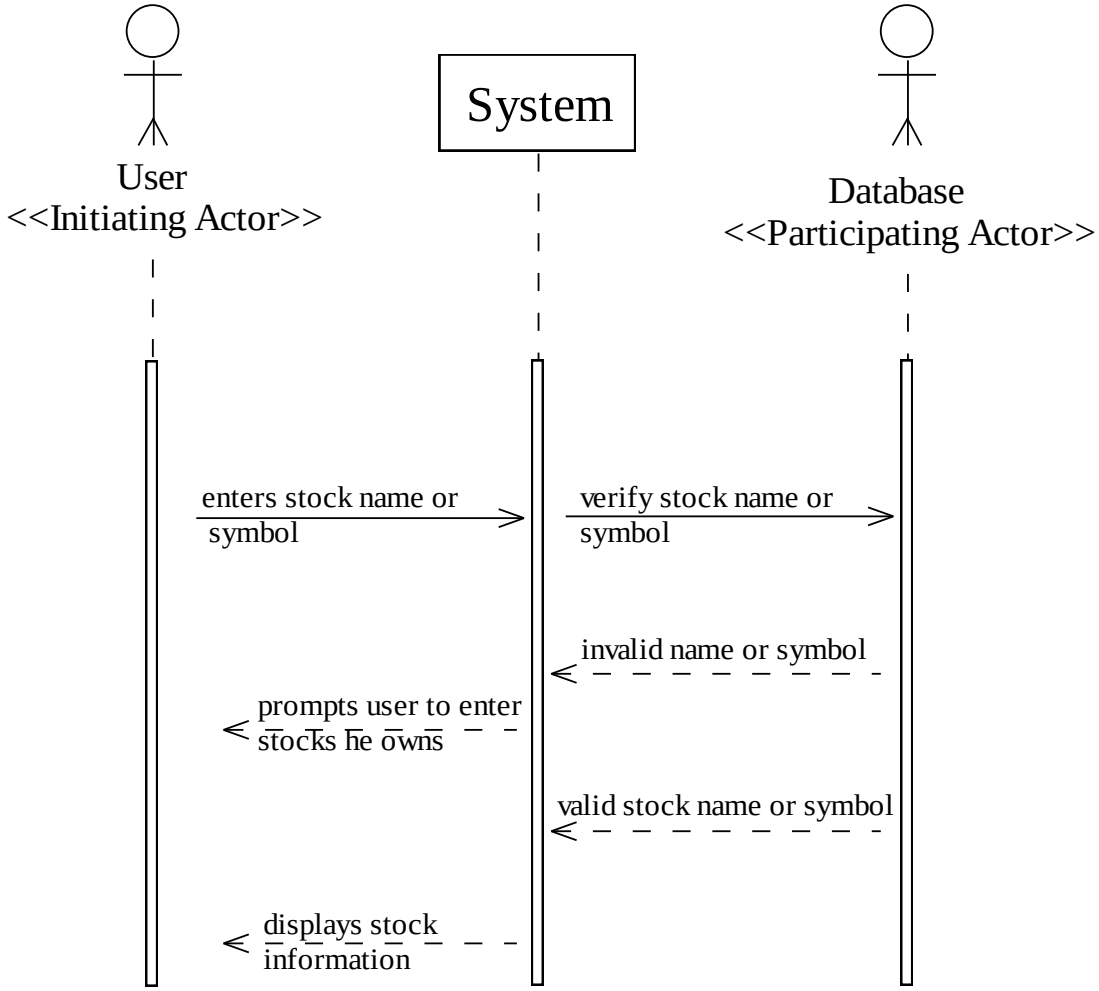


UC-2: SELL STOCK:

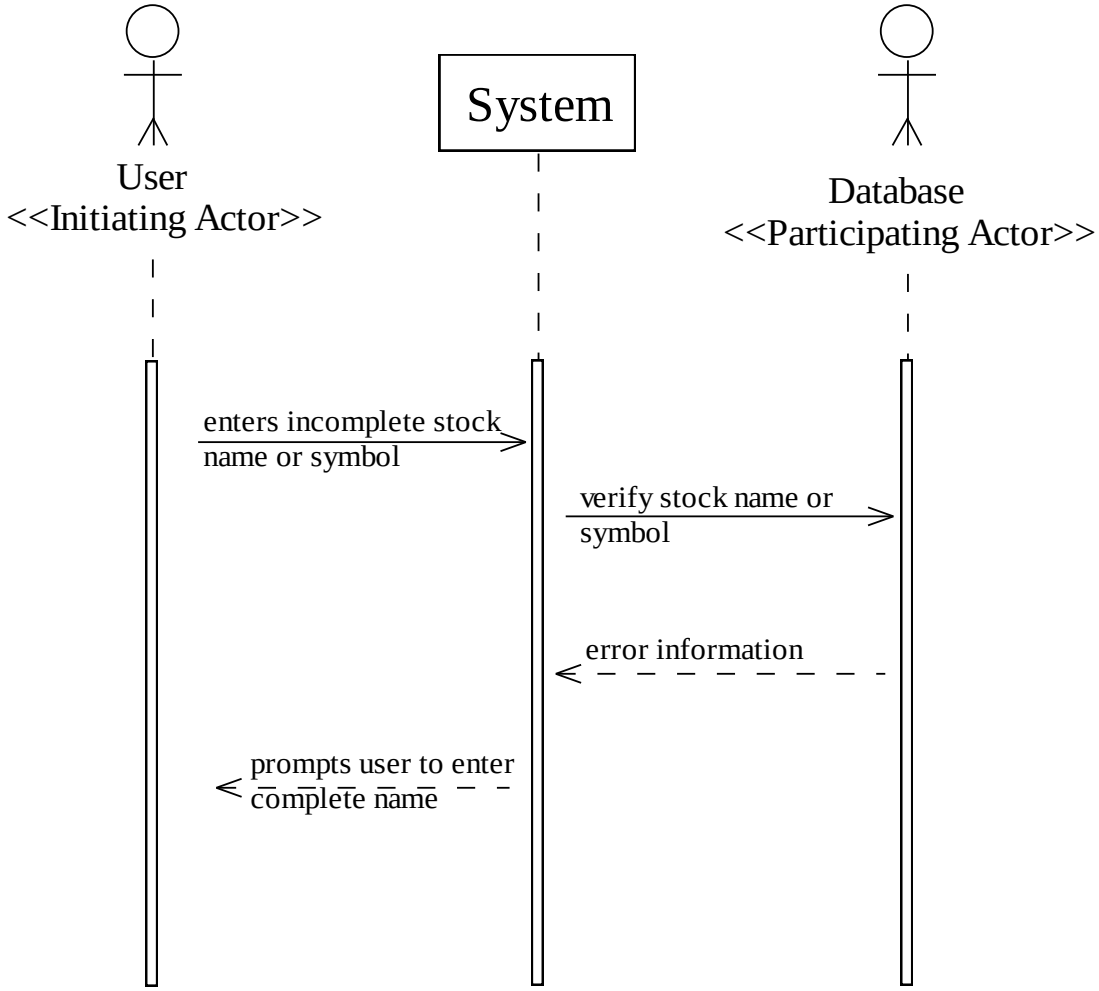
Main Success Scenario:



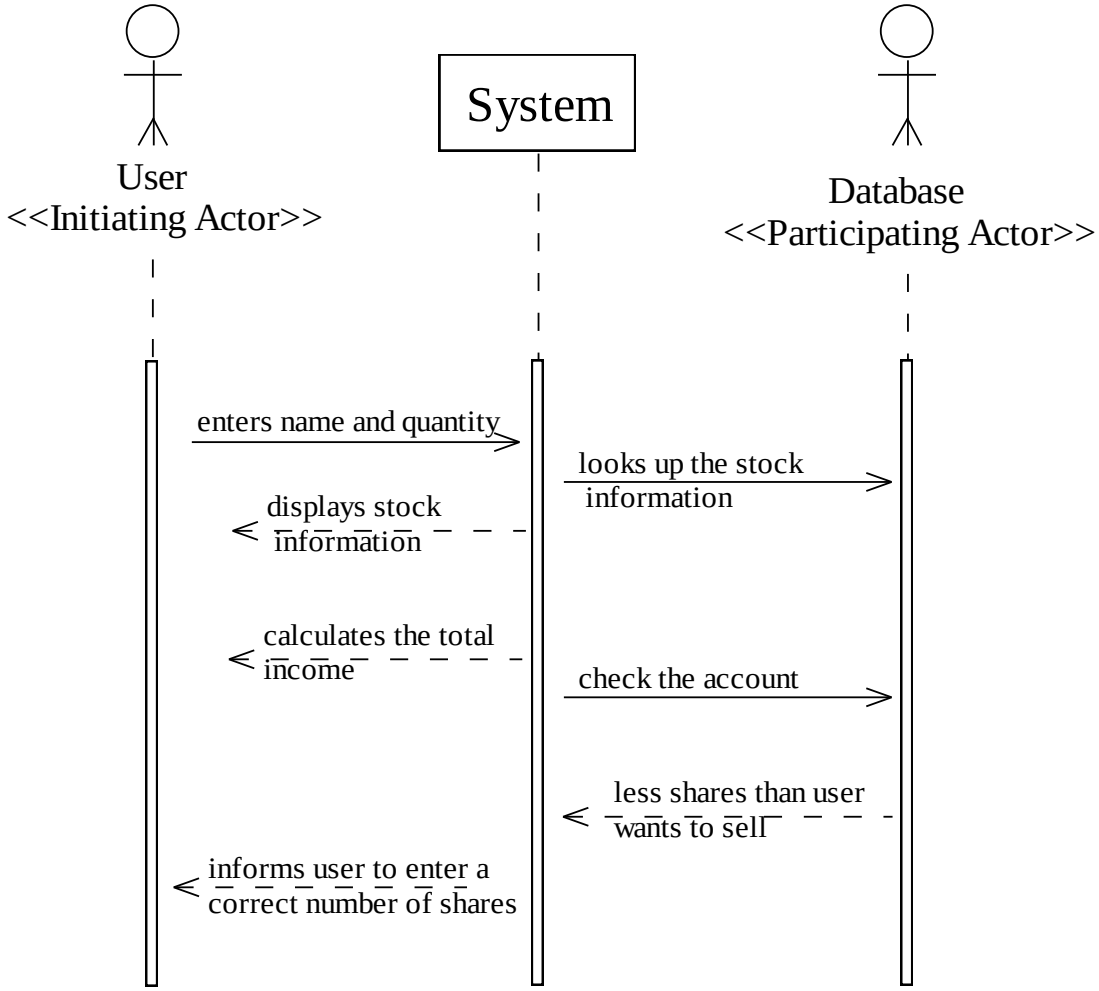
Alternate Scenario 1(invalid stock name):



Alternate Scenario 2(incomplete stock name):

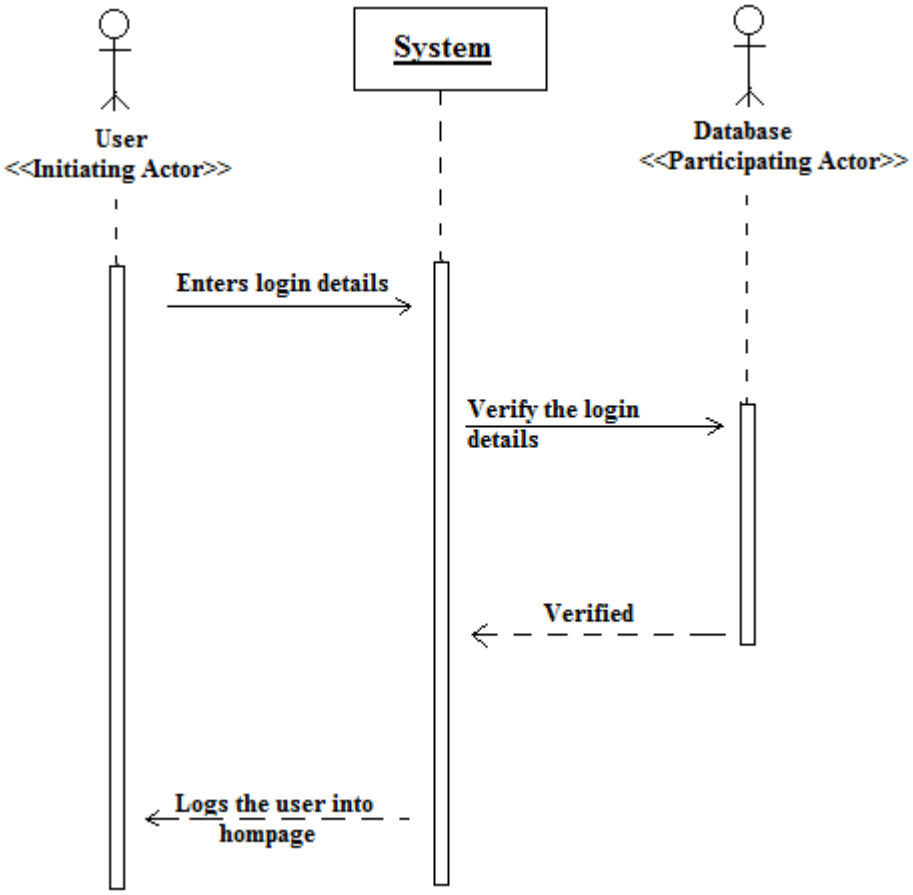


Alternate Scenario 3(Insufficient shares):

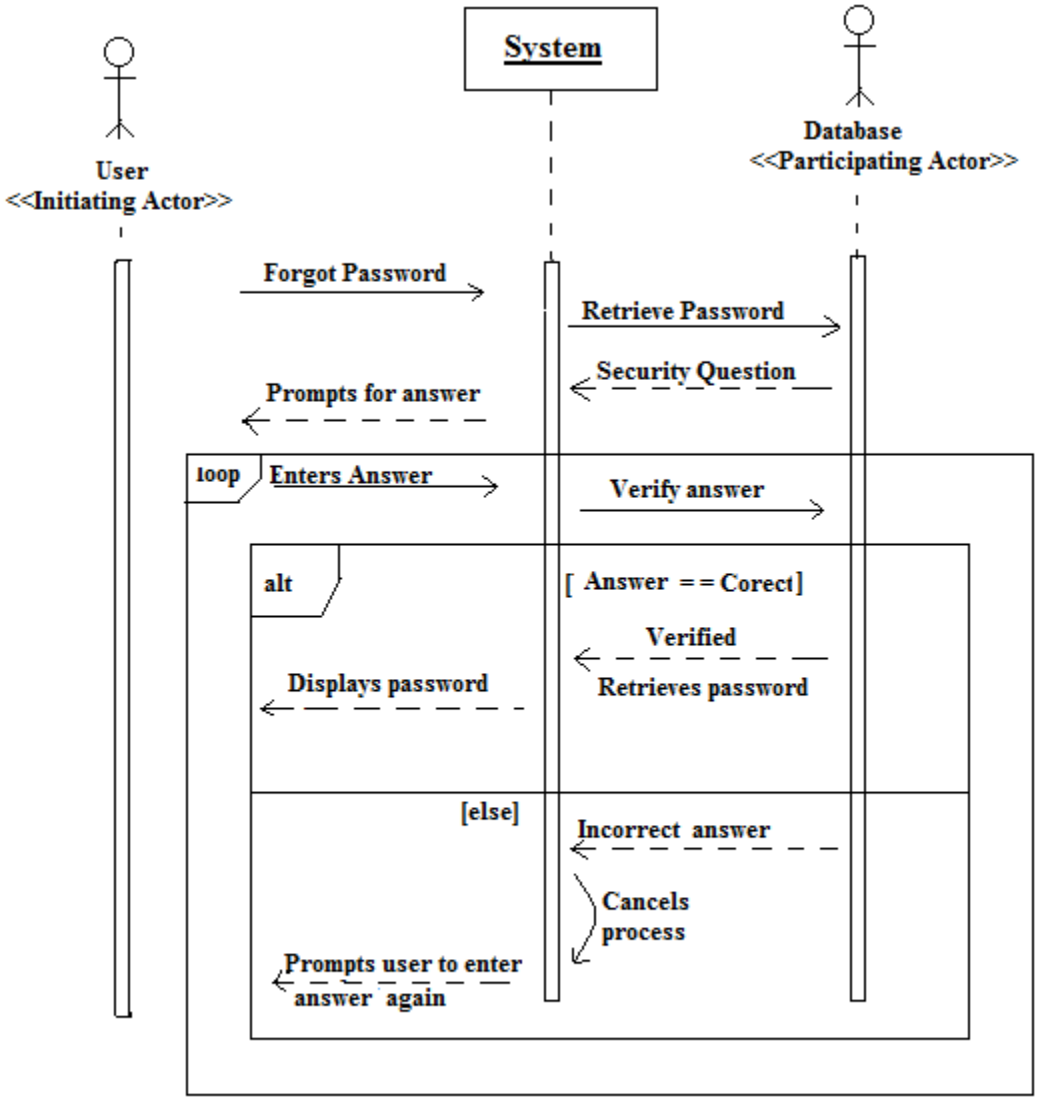


UC-3: AUTHENTICATION

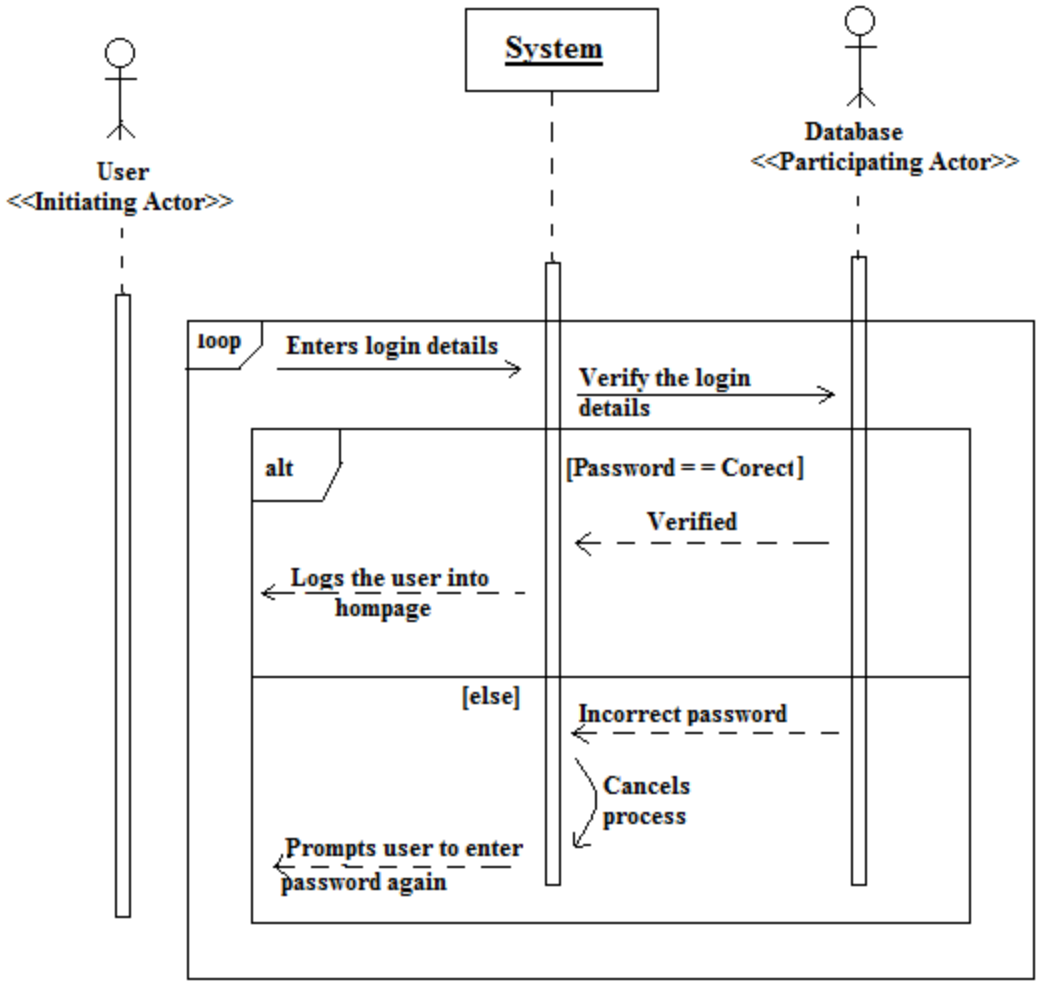
Main Success Scenario:



Alternate Scenario I (Forgot Password):

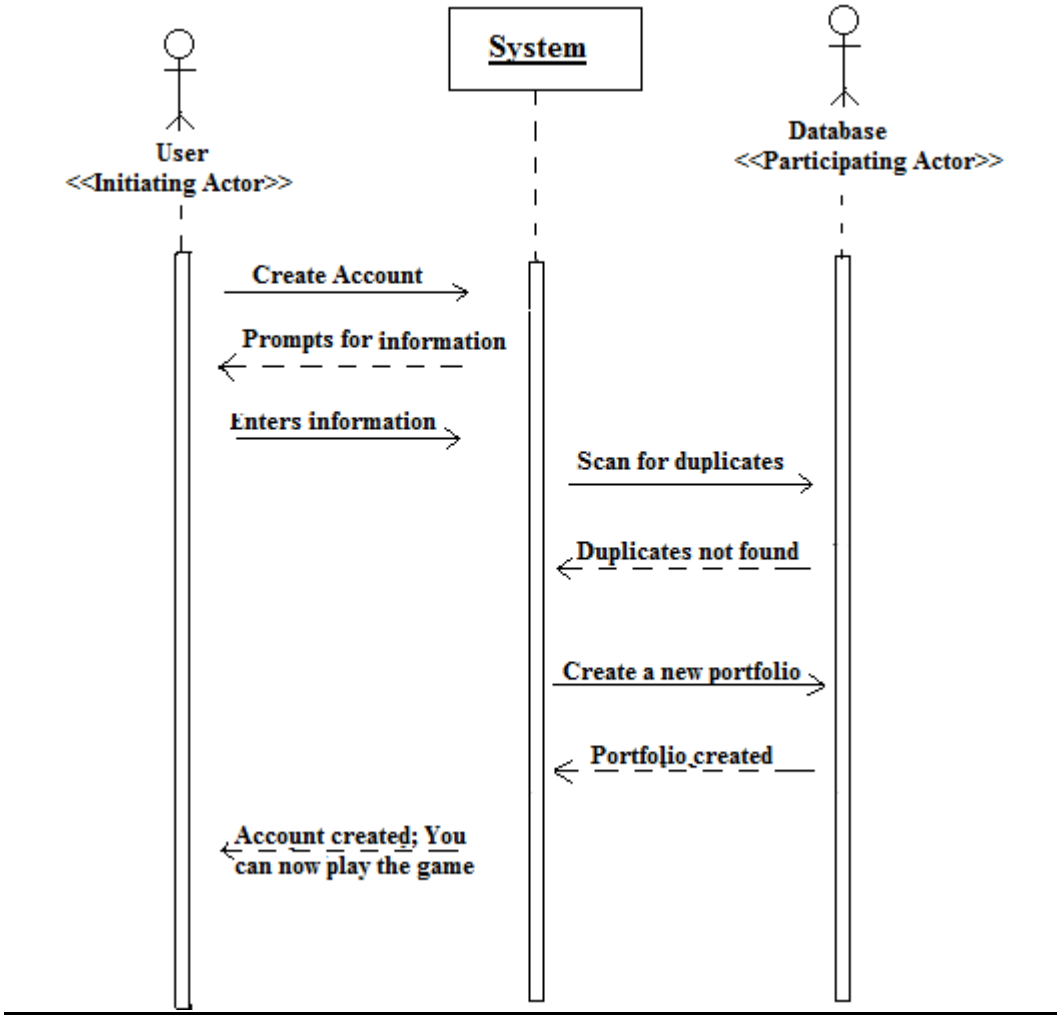


Alternate Scenario 2 (Invalid Password):

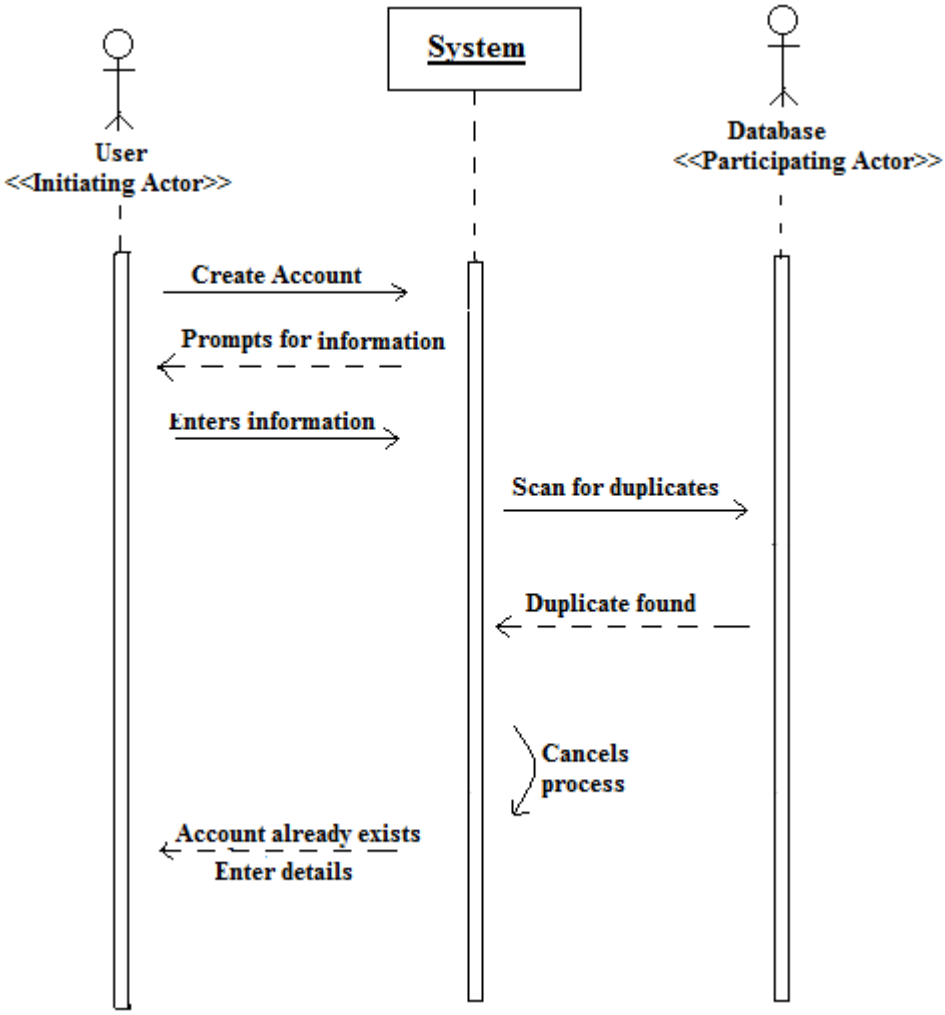


UC 4: REGISTRATION

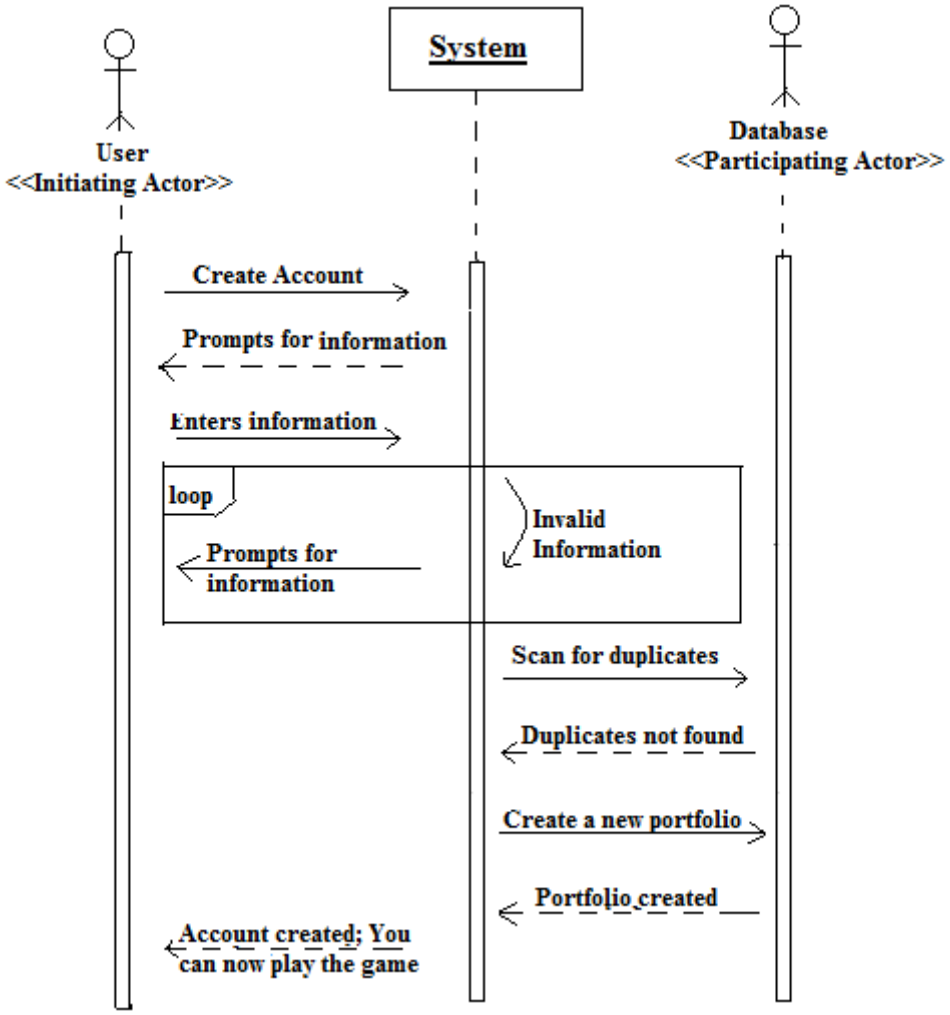
Main Success Scenario:



Alternate Scenario I (User already has an account):

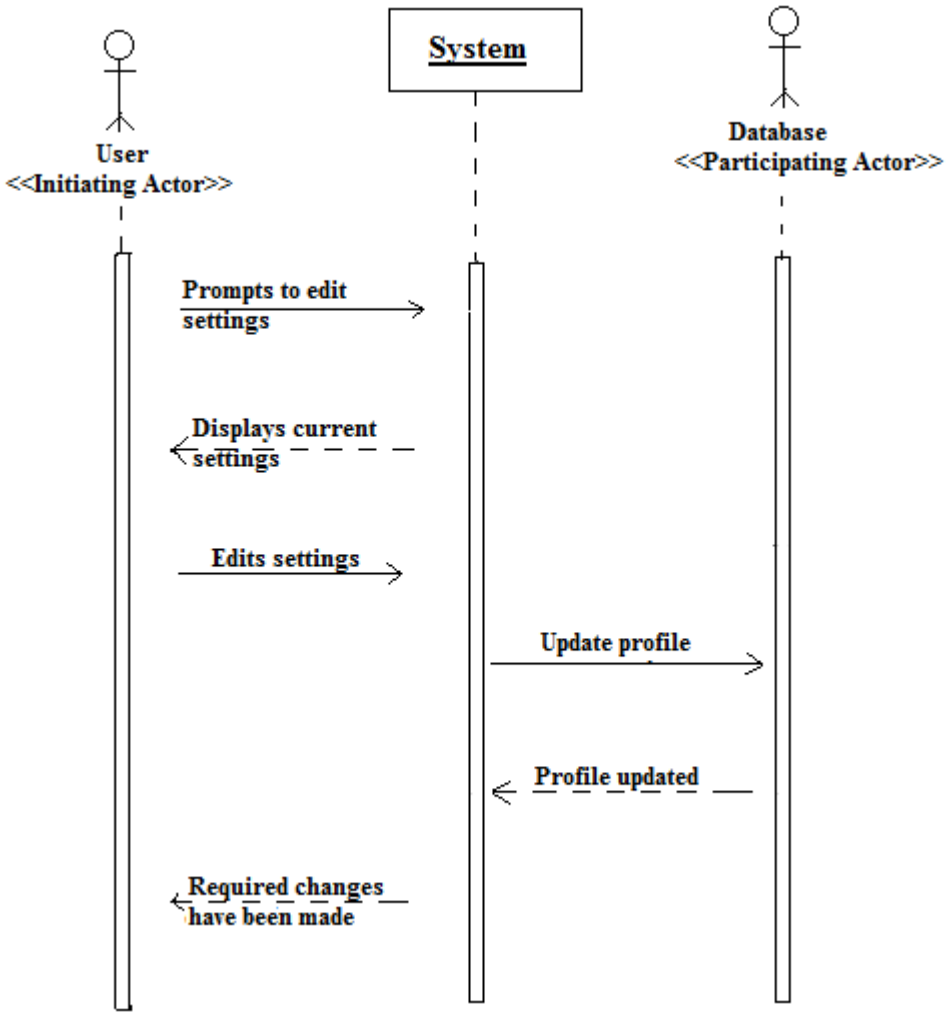


Alternate Scenario 2 (Invalid Information):

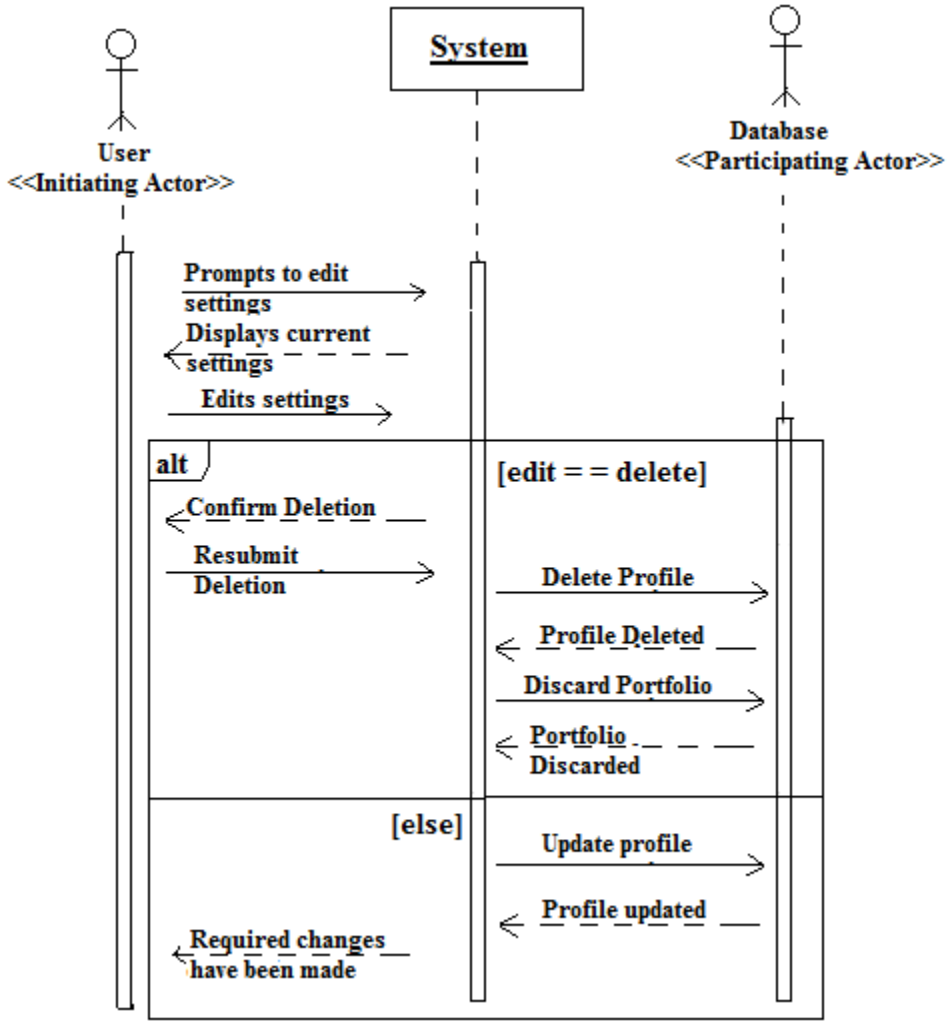


UC 5: MANAGE USERS

Main Success Scenario:



Alternate Scenario I (Delete Profile):



6. NONFUNCTIONAL REQUIREMENTS (FURPS+)

- **Functionality**

Homepage will show all the options and links which is easy to operate. The program will be able to provide a set of instructions on how to play the game and some useful quick links related to stock trading. We will also have the most comprehensive stock information which is the same as those in the real world. Also, Username and password are required when an existing user wants to check his profile or portfolio which he already created. A first-time user who wants to try the game should register for the website first and confirm the email sent by our website. Since the portfolios are stored in a data base, they are totally private that there is no way for other players to change information. Other services are also provided to protect access to certain resources or information. Additionally, we have “my trade diary” area which is a place for users to write something down about their stock trading, their thoughts on those trades and their predication for the markets.

- **Usability**

The program will take consideration of characteristics such as human factors, aesthetics and consistency in the user interface. All the operations are listed on the homepage which is easy to navigate for most visitors. Also, the website must be attractive and pleasing to catch the eyes. Most important, there will be a set of instructions on how to play the game and some useful quick links related to stock information.

- **Reliability**

If failure occurs between the program and connected website such as Yahoo! Finance or users’ transactions cannot go through, our program should be able to recover from these failures. We backup all the information includes users’ personal information in a database and updates accordingly so that we can call the data immediately. This also used to make sure the accuracy of system calculations.

- **Performance**

When searching the website, clicking buttons to jump to another links or doing stock tradings, we hope that the website is as efficient as possible, which is concerned with characteristics such as throughput, response time, recovery time, start-up time, and shutdown time.

- **Supportability**

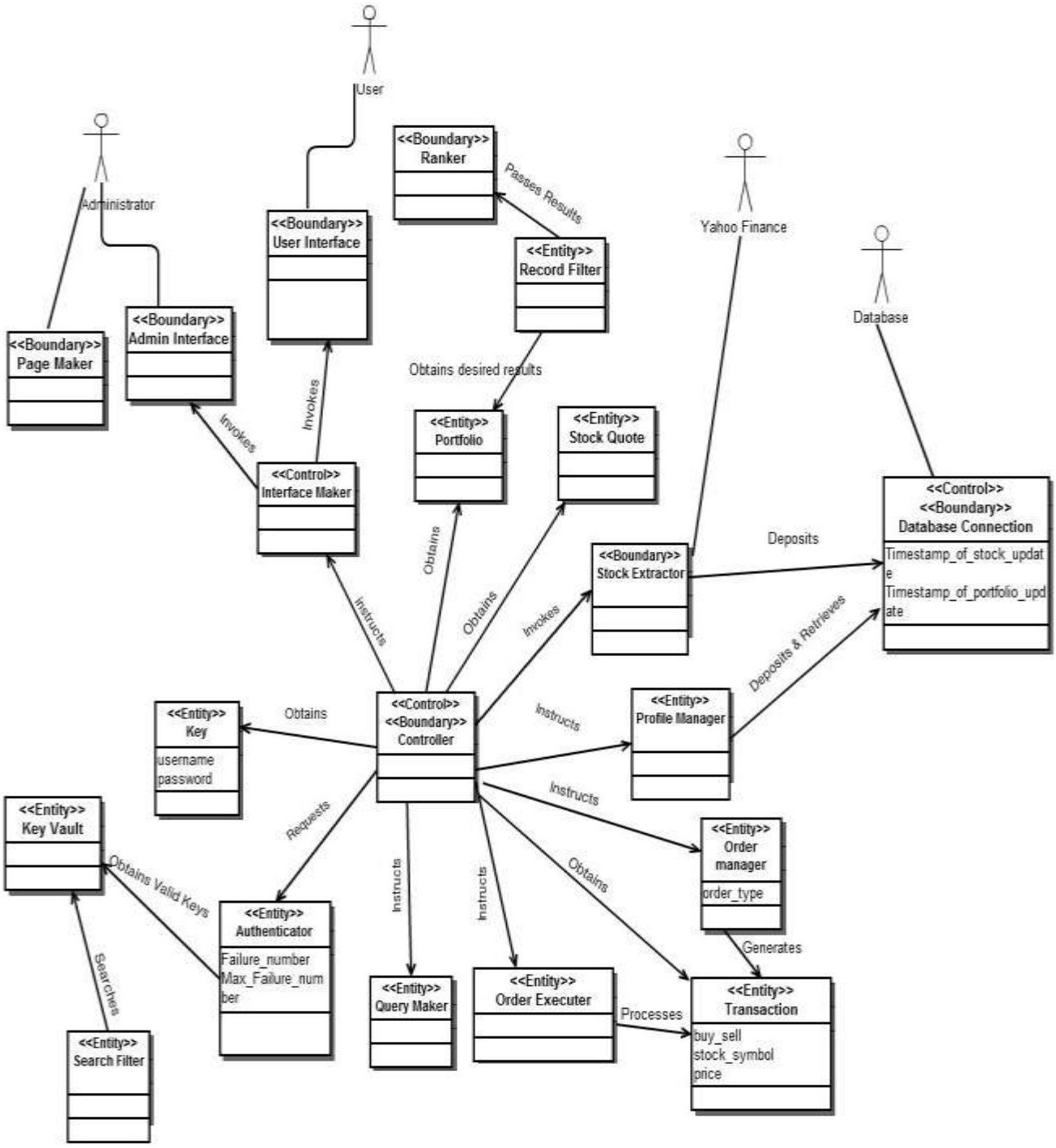
To setup a web server, we must consider that the website can be extended and improved in the future. With the data information updates every day, changes must be made to adapt to the new requirements. Also, it is easier for administrators if the changes are not hard to implement and maintain.

- **+ (Others)**

The website should have a strict system to protect users' information and portfolios from being tampered by some invaders. The coding and construction of the system should meet the basic required standard and take consideration of its implementation.

7. DOMAIN ANALYSIS

a. Domain model



(i) Concept Definitions:

Responsibility type: 'D'-Doing, 'K'-Knowing

Serial Number	Concept Name	Type	Boundary	Responsibility
1.	Controller	D	No	Coordinates the functions of different concepts in the domain.
2.	Interface Maker	D	No	Displays the right user interface.
3.	User Interface	D	Yes	Interface for the user.
4.	Admin Interface	D	Yes	Interface for the administrator
5.	Authenticator	D	No	It identifies the user who has a valid key
6.	Key	K	No	The username and password obtained from the user which is to be validated.
7.	Key Vault	K	No	It stores valid keys (Username, password) for both users and administrators.
20.	Stock Quote	K	No	Contains the stock information like symbol,price.
9.	Stock Extractor	D	Yes	Extracts stock quotes from yahoo finance.
10.	Search Filter	D	No	Passes the search parameters.
11.	Record Filter	D	No	Filters records retrieved according to the search criteria.
12.	Query Maker	D	No	Prepares the query according to the search parameters provided.
13.	Portfolio	K	No	It is stored in the database and contains the portfolios of users.
14.	Database connection	D	Yes	Stores data and retrieves data from the database.
15.	Ranker	D	Yes	Ranks the players according

				to their monetary values.
16.	Page Maker	D	Yes	Prepares a html document for webpage display.
17.	Order Manager	D	No	Generates the transaction.
18.	Profile Manager	D	No	Used to edit profiles of users and administrators.
19.	Transaction	K	No	Transaction of user which is to be processed.
20.	Order Executer	D	No	Processes the transaction

(ii) Association Definitions:

Concept	**Relation (:⟶)**	**Concept**
Controller	Instructs	Interface Maker
Controller	Instructs	Order Manager
Controller	Obtains	Portfolio
Controller	Instructs	Query maker
Controller	Instructs	Profile Manager
Interface Maker	Invokes	User Interface
Interface Maker	Invokes	Admin Interface
Controller	Obtains	Key
Controller	Requests	Authenticator
Authenticator	Passes the key	Search filter
Search filter	Searches	Key vault
Authenticator	Obtains valid keys	Key vault
Controller	Obtains	Stock quote
Controller	Instructs	Order Executer
Order Manager	Generates	Transaction
Query Maker	Invokes	Record filter
Record filter	Obtains desired search results	Portfolio
Record filter	Passes the results	Ranker
Profile Manager	Passes keys	Key vault
Profile Manager	Passes data	Database connection
Order Executer	Processes	Transaction
Controller	Obtains	Transaction

(iii) Attribute Definitions:

Concept	Attributes
Controller	
Interface Maker	
User Interface	
Admin Interface	
Authenticator	1. Failure_number: Number of failed login attempts. 2. Max_failure_number: Maximum number of failed login attempts allowed.
Key	1. Username: login id 2.Password: Authentication key
Key Vault	
Order Executer	
Stock Extractor	
Search Filter	
Record Filter	
Query Maker	
Portfolio	
Database connection	1.Timestamp_of_stock_update: Represents time when stock database was updated 2.Timestamp_of_portfolio_update: Represents time when the users portfolios were updated
Ranker	
Page Maker	
Order Manager	1. order_type: specifies the type of order to be placed “market order” or “limit order”.
Profile Manager	
Transaction	1. Buy_sell: indicates whether it is a buy or sell stock transaction 2. Stock_symbol: indicates the symbol of the stock 3. Price: specifies the stock price.
Stock Quote	

b. System Operation Contracts

Operation: Use case 1- Buy Stock
Pre- Conditions: • User is logged into the system. • User should have sufficient funds to buy the stock.
Post-Conditions: • User's portfolio is updated according to the processed transactions 1. The monetary value is decreased based on the price of the stock bought. 2. Commission fee is charged. 3. The number of shares is increased based on the number of shares bought.

Operation: Use case 2- Sell Stock
Pre- Conditions: • User is logged into the system. • User should have sufficient amount of shares to sell a stock.
Post-Conditions: • User's portfolio is updated according to the processed transactions 1. The monetary value is increase based on the price of the stock sold. 2. Commission fee is charged. 3. The number of shares is decreased based on the number of shares sold.

Operation: Use case 3-Manage Users
Pre-Conditions: • User is logged into the system
Post-Conditions: • The user profile is updated in the database. • If a user chooses to delete his account then his profile is completely deleted from the database.

Operation: Use Case 4-Check History
Pre-conditions: • User is logged into the system.
Post-conditions: • Transaction history is viewed by the user.

Operation: Use Case 5-Authentication

Pre-conditions: • The user has valid key information and has entered the key. • The system is in proper function
Post-conditions: • Key is valid and the user is authenticated. • Key is invalid and the user is prompted to enter the key again.

Operation: Use Case 6-Registration
Pre-Conditions: • The system is in proper function. • The user enters his information in the text fields provided.
Post-Conditions: • A new profile for the user is created in the database.

Operation: Use Case 7- Rank Players
Pre-Conditions: • Administrator is logged into the system.
Post-Conditions: • The administrator obtains monetary values of users and ranks accordingly. • The ranks are displayed on the dashboard.

Operation: Use Case 8-Website maintenance
Pre-Conditions: • The administrator is logged into the system.
Post-Conditions: • The changes made are reflected in the system.

8. User Interface Design

The main goal of our User Interface is to make it simple and easy to work with. This will have to be achieved by creating relatively simple web pages which do not require much of web knowledge. This can also be achieved by minimizing the number of clicks or key strokes that are required to perform a particular task.

a. Preliminary Design

Navigational Paths:

Welcome page -> Register as new user -> Home -> Logout

Welcome page -> Log In -> Home -> Trading Floor -> Buy Stock -> Logout

Welcome page -> Log In -> Home ->Trading Floor -> Sell Stock -> Logout

Welcome page -> Log In -> Home -> My Profile ->Account Management-> Logout

Welcome page -> Log In -> Home ->My Profile -> Trading Diary -> Logout

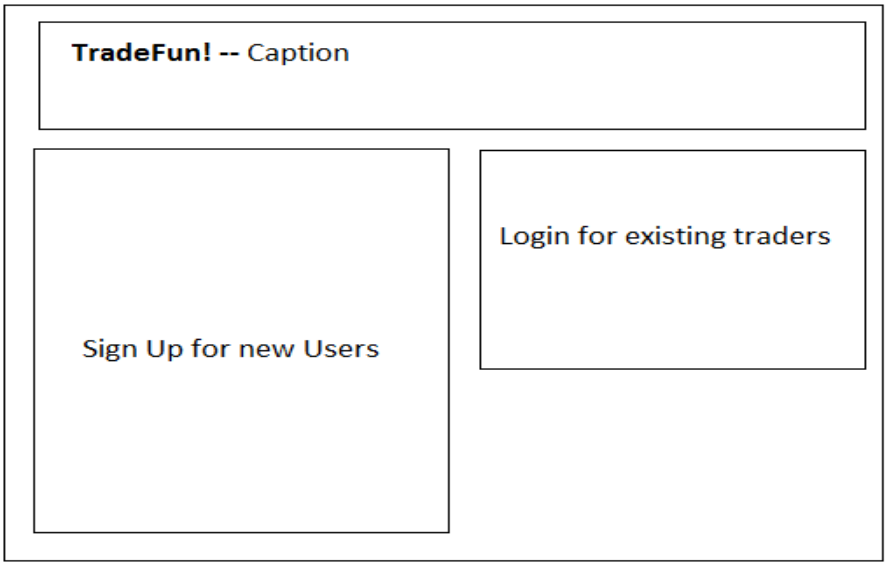
Welcome page -> Log In -> Home -> My Game Portfolio -> Logout

Welcome page -> Log In -> Home -> My Rankings -> Logout

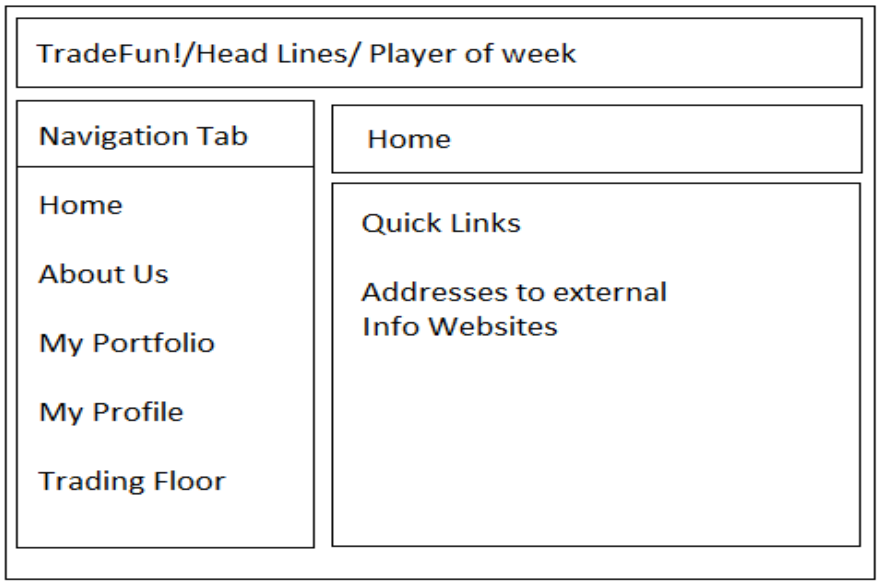
Welcome page -> Log In -> Home -> Quick links-> External Websites -> Logout

Screen Mockups:

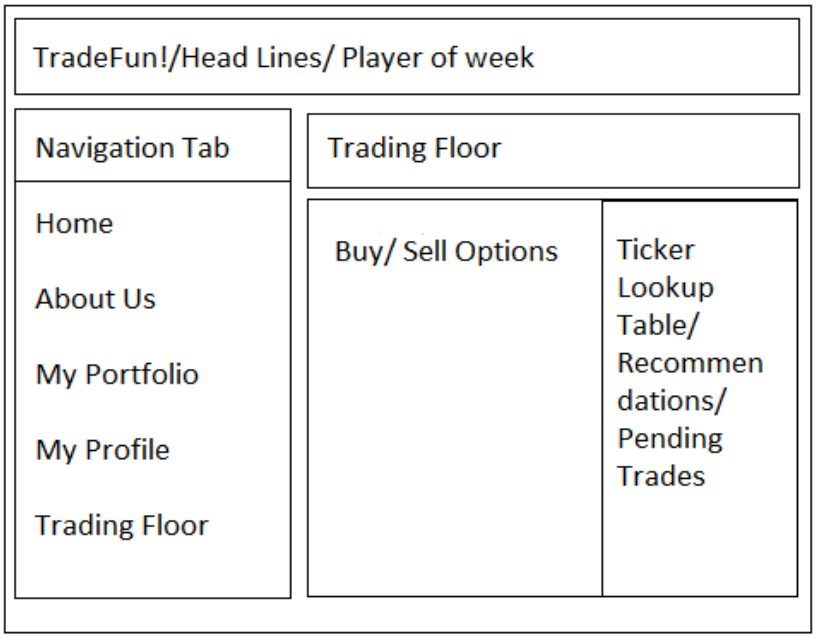
Welcome Page:



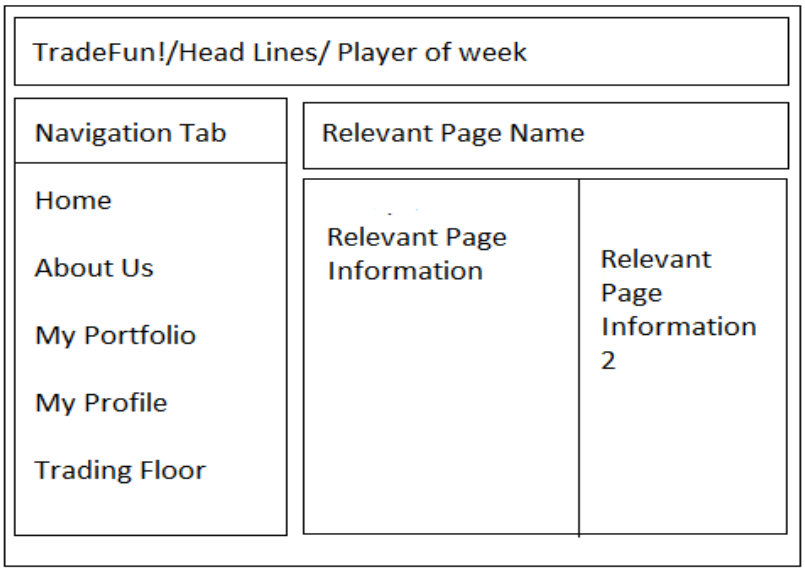
Home Page:



Trading Page:



General Page Format:



b. User Effort Estimations

The main of our User Interface Design is to minimize the user effort in regards to the number of mouse clicks that are required to complete a particular job. For this reason, in the estimation of User Effort we are not considering the data entry key strokes as they are variable depending on the size of username/password etc. The rough estimate of user effort is given below and please remembers that this may change during the implementation due to additional features.

Method for Goal: New User sign up - Requires at least 3 clicks

1. Click on the first input field on the sign up page
2. Enter required information
3. Press "TAB" to go to next field
4. Repeat steps 2 and 3 until form is complete
5. Submit form by clicking "Sign Up" button
6. Return with goal accomplished

Method for Goal: Log In/ authenticate – Requires 3 clicks

1. Click mouse on the username field (context)
2. Enter username
3. Click mouse on the password field
4. Enter password
5. Click "Log In" button
6. Return with goal accomplished

Method of Goal: Account Log out – Requires 1 click

1. Click mouse on the logout link in the account page
2. Return with goal accomplished

Method for Goal: Buy stocks and sell stocks - Requires at least 4 clicks

1. Accomplished goal: Log In/Authenticate
2. Click on "Trading Floor"
3. Click on “symbol” text field
4. Enter stock name/ticker symbol
5. Press "TAB" to move to next field
6. Repeat 4 and 5for all required fields and place the order(this is a rough estimate)

9. PLAN OF WORK

10. REFERENCES

- http://en.wikipedia.org/wiki/Stock_market
- http://en.wikipedia.org/wiki/Equity_(finance)
- http://www.investopedia.com/university/stocks/default.asp#axzz1XWQPiPfX
- http://www.investopedia.com/#axzz1XWQ25K7D
- https://www.wallstreetsurvivor.com/Public/Members/Login.aspx?ReturnUrl=%2fPrivate%2fTrading%2fTrade.aspx
- http://www.updown.com/trade-stock