University of Puerto Rico at Mayagüez
Department of Computer Science and Engineering
College of Engineering

Proposal for: Stocker

INSO 4117: Software Reliability Testing
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Team 11

1. Informative Part

1.1. Name, Place, Date:

1.1.1. Stocker, Mayagüez, 02/25/2022

1.2. Partners

1.2.1. Developers

Role:

A developer undergoes building the proposed app. Is responsible of programming all the functionality from back to front, so this includes designing, coding, and testing the product based on the requirements given.

1.2.1.1. Front-End Developer

Role:

A Front-End developer is specialized in the user-facing part of the application. The focus should be on creating the User Interface (UI) according to design, doing the correct API calls in order to display the correct information, and test the functionality so it provides a pleasing User Experience (UX).

1.2.1.2. Back-End Developer

Role:

A Back-End developer is in charge of designing the logic in the web services, cloud infrastructure, and Databases, to then build an API in order to have access to the data of the app without directly accessing the database.

1.2.1.3. Members

- Fabiola Robles
- Christian Robles
- Peter Santana
- Alberto Cruz
- Jorge Ortiz
- Hermes Colon

** Specialization of developers to be determined next phase with further discussion of implementation.*

1.2.2. Clients

Clients that would request services from the proposed app would be third-party institutions/companies with an interest in including more entries from the general public and part-time investors to the market(s) through their respective platforms and to register them as accounted units in their general analytics to understand more the direction the market could take based on the influx of investors. Such companies could be terminal base conglomerates like Bloomberg Inc.; penny stock focused platforms such as RobinHood, Fidelity, TradeStation, etc.; stockbrokers that seek to provide personalized services with their tools and analysis of the market and, finally, analytics companies who thrive on registering the interactions with the market(s) and attempt to provide forecasts of the tendencies displayed in it for a price.

1.2.3. Domain Experts

Domain experts would be able to provide critical feedback and contribute with ideas to the proposed app. These include third party hedge funds/financial institutions, Wall Street workers and financial technology workers. Their function, in the case of the proposed app, are the ones who are constantly utilizing the data and are keen on analyzing trends in the market as part of the success of their day-to-day jobs. Wallstreet workers specifically, know the market's data in real time, and will be able to tell if the proposed app is accurate and fast enough to serve a demanding demographic.

1.3. Current Situation

People are increasingly investing more in the stock market than ever before, and the numbers just keep going up. According to a study by Bank of America, more money flowed into stock-based funds over the first 5 months of 2021 than from 2008 through 2020 combined. Around 145 million Americans, or 56% of American adults own stocks. In this modern age as well, the ability to buy and sell stocks right from our phones has skyrocketed the number of users who "DayTrade" or casually invest in stocks. To name a few of the applications and companies that allow users to buy stocks we have Robinhood, Acorns, Stash, Webull, TD Ameritrade, and so on. Just in 2021 alone, The Dow Jones Industrial Average (DJIA) gained 18.7%, while the Nasdaq Composite gained 21.4%. Just in 2020, trading apps had a 10.9 billion dollars (about $34 per person in the US (United States)) revenue, and over 91.5+ million users, stock trading is as popular and profitable as ever.

Some reasons why the American population is putting more money in the stock market include inflation, the covid-19 epidemic, and social media influence. A big event that happened in 2021, mostly known as the "GameStop saga" and "The Wall Street bets event", made a giant impact on the usage of applications to invest in the stock market. A group of retail investors on an internet forum called Reddit raised the stock price of GameStop by 1,700 per cent, saving the company from a shorting by wall street investors, and encouraging a social movement for Americans to invest more and "take the money back to the working class."

Although investing in stocks is as popular and accessible as ever, this does not equate into investing being an easy or Mindlessly activity. Stocks require analysis and study of the market, and its ever-changing trends. Some tools that help with studying market trends and making good financial decisions include Seeking Alpha, Yahoo Finance, Trading View, CNN Money, Robinhood, and many more. With so many tools available out there, with different and varying trend expectations, limitations, and conflicting information, investing intelligently seems to be harder each day.

1.4. Needs

When we look at the situation from a broader perspective, people entering the stock market are not exploiting its full benefits because of a lack of easily accessible information. Finding information and analyzing it to then invest, its time consuming. There is a perceived need for people to find a single place that counts with all the most-used statistics of the stock market from various sources in a simple and accessible matter. There is also a need involving any level of trader, but specially beginners in learning ways to analyze the data in order to make better decisions regarding investments.

1.5. Ideas

We propose the development of an online resource that eases and improve the investors decision-making process by providing a single tool with data on all or most stocks, educational resources, economic and stock news, charts and indicators, and a way to take notes. This will help investors when analyzing the available information, leading them to better overall decisions. The application will be freely accessible to the general public, although there is room for premium features later with some kind of membership or fee.

1.6. Scope

To improve the overall experience of people in the trading environment looking for information and statistics about their interests and next possible investments.

1.7. Span

To improve the overall experience of the general public interested in investment on their own by having an accessible platform where they can find all the necessary information in one place to make better decisions on investments or simply educate themselves to later enter the market. The platform will provide tools to organize, visualize, and take notes so there is no need to have multiple applications, which may be overwhelming and unproductive.

1.8. Synopsis

Investing is becoming a popular activity among the population during these past years. No matter if you are a professional trader or just want to make some extra money out of your savings, stocks require analysis and study of the market, including its ever-changing trends. What differences an average user with an investor in Wall Street is the access and amount of information they have at their hands before doing an investment. This situation stems from a variety of reasons: limited tools, availability of information, update time, or just lack of knowledge in investing. To help diminish the effects of these problems, and provide resources, information, and knowledge to the public, whether its experienced users or beginners, a platform tool is proposed to collect all available open-source stock market statistics tools into one. With this platform, users will have access to various sources of statistics about the stock market, different tips, predictions from experts, and current news related to businesses.

1.9. Domain Engineering

An important aspect of our domain is to encapsulate the entities that are participant of it and their relation, so that the requirements can be well developed. With a domain description we will describe the different entities, functions, events, action, etc. that are necessary so that our domain, the stock market and its information, exists. Also, a domain model would be developed with Alloy to understand the meaning of the domain description and better visualize it. Lastly, with the same purpose of exploring the domain deeper, several aspects that seem necessary during the project will be further analyzed on the descriptive part, such as domain actions, behaviors, functions, stakeholders, etc. The basis of our domain is the existence of a Stock Market compose of shares of different companies, which are bought and traded by investors. To perform these trades, investors should first search for data and analyze it.

1.10. Requirements Engineering

As the project evolves and the domain is better understood, the identification of requirements is possible. Some factors that we need to keep in mind in order to define good requirements are to make sure they cover what the user expects, make sure they are implementable, and make sure they can be verified and validated.

1.11. Software Architecture Design

With the domain knowledge acquired, and with knowledge crunching, a design is starting to be formulated along this document in a ubiquitous language so that every member of the team can understand. The use of diagrams will help to easily understand explanations of different aspects such as the relationship between domain entities and so. Also, the way services and the product flows from end-to-end will be broken down into implementation requirements and user stories, so that developers have a clear idea of the system to be.

1.12. Derived Goals

Motivate people that currently are not interested on investing to take a look and enter the market. Since they have a way to be informed in order to achieve better decisions regarding investments since the beginning, this will kill the fear of losing money because of misinformation.

1.13. Logbook

As a team we determined our plan of action. We established some milestones for our project:

- **Time Frame:** 10 weeks (about 2 and a half months) to submit on April 27, 2022.
- **Agile Methodology:** 2-week sprints and tasks are spread out among 5 total sprints:
    - Mock-up Design and Services Design
    - Design of Testing and Implementation
    - Implementation of Back-End and Front-End
    - Connecting Front-End and Back-end
    - Further testing and tuning
- **Deliverables:**
    - Stocker will be deployed via a web page
    - Provide design drawings before implementation
    - Progress reports every 2 weeks
    - Further updates addressing initial user feedback

2. Descriptive Part

2.1. Domain

2.1.1. Rough Sketch Domain Description

- The stock market broadly refers to the collection of exchanges and other venues where the buying, selling, and issuance of shares of publicly held companies and other financial instruments take place. Such financial activities are conducted through institutionalized formal exchanges.
- The stock exchange shoulders the responsibility of ensuring price transparency, liquidity, price discovery, and fair dealings in such trading activities. As almost all major stock markets across the globe now operate electronically, the exchange maintains trading systems that efficiently manage the buy and sell orders from various market participants. The stock exchange often creates and maintains various market-level and sector-specific indicators, like the S&P 500 index or the Nasdaq 100 index, which provide a measure to track the movement of the overall market. The stock exchanges also maintain all company news, announcements, and financial reporting. A stock exchange also supports various other corporate-level, transaction-related activities. An exchange also earns from selling market data generated on its platform—such as real-time data, historical data, summary data, and reference data—which is vital for equity research and other uses.
- The most common market data includes stock prices, options prices, time series, volume, futures, sectors, charts, trending and popular stocks, financials, economic indicators, sentiment, etc.
- The investors are composed of long-term investors, short-term traders, stockbrokers, portfolio managers, investment bankers, market makers, high-frequency trading (HFT) programs, stock exchanges, etc.
- Some of these participants may look up market data, indicators, and related data on their own, to inform themselves before buying or selling a financial instrument. Many websites, apps, and APIs have been developed to gather all this information which is considered vital to mitigating risk. Gathering all this data from multiple sources can be a hassle for many market participants. We want to mitigate these issues by reducing the time and effort required to gather all this information and have it all in one convenient, user-friendly space.

2.1.2. Domain Terminology

- **Stock** - is a security that represents the ownership of a fraction of a corporation.
- **Stock Market** - broadly refers to the collection of exchanges and other venues where the buying, selling, and issuance of shares of publicly held companies take place.
- **Stock Exchange** - the stock exchange shoulders the responsibility of ensuring price transparency, liquidity, price discovery, and fair dealings in such trading activities.
- **Market data** - refers to the live streaming of trade-related data. It encompasses a range of information such as price, bid/ask quotes, and market volume.
- **Investment**– the act of allocating resources, usually money, with the expectation of generating an income or profit.

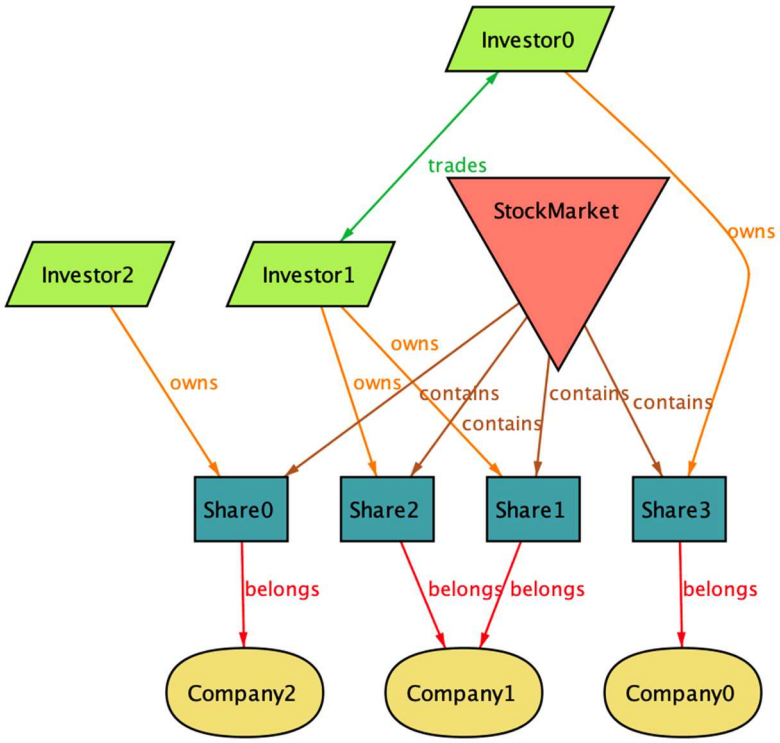
- **Investor/Participant**– Person who invests in the stock market, owns shares or any financial instrument traded through the stock market
- **Equity research** - Equity research is the study of a business and its environment in order to make a buy or sell decision about investing in its shares.
- **Technical indicators** - In the world of investing, indicators typically refer to technical chart patterns deriving from the price, volume, or open interest of a given security. Common technical indicators include moving averages, moving average convergence divergence (MACD), relative strength index (RSI), and on-balance-volume (OBV).
- **Economic indicators** - In economics, indicators usually refer to pieces of economic data used to measure the overall health of the economy and predict its direction. They include the Consumer Price Index (CPI), Gross Domestic Product (GDP), and unemployment figures.
- **Liquidity** - is a market's feature whereby an individual or firm can quickly purchase or sell an asset without causing a drastic change in the asset's price.
- **Share -** represent equity ownership in a corporation or financial asset, owned by investors who exchange capital in return for these units.
- **Trade** - a basic economic concept involving the buying and selling of goods and services, with compensation paid by a buyer to a seller, or the exchange of goods or services between parties.

2.1.3. Domain Narrative

The Stock Market is a collection of different entities and factors that together build an environment, usually called exchange, where investors are the main participants. On a big picture the Companies are part of the market, and these have different shares that can be bought by investors and at the same time investors can trade these shares inside the market and exchange with other participants. Stock Market participants benefit from all the data they can get their hands on to make better investment decisions. This data is often sourced from different platforms, while the user may be busy with other activities that consume their attention, time, and energy. Data about options is usually obtained from other sources that are not the same ones that offer regular stock prices and charts. Economic data and news are usually sourced from other places too.

2.1.4. Domain Model

In the following model is shown the relationships between some of the main concepts that compose our domain. Explained in words, there is a stock market (StockMarket) where shares (Share0-4) are available for investors (Investor0-2) to acquire or sell. Investors can own multiple shares, but a share can't be owned by multiple investors. They can trade between each other if every investor owns at least one share. Shares can belong to different companies (Company0-2), and companies are composed of multiple shares. In general, this model demonstrates the basics elements of our domain, and how they interact with one another.



2.1.5. Domain Events

- Stock data source(s) retrieved
- Data source selected
- Stock data displayed
- Investment decision made
- Trend data is retrieved
- Trend data source(s) are selected
- Trend data is filtered
- Predictions by sources are retrieved
- Relevant news for trends and stocks are retrieved
- News are filtered by sources

2.1.6. Domain Actions

- Search for stock – getStock
- Choose stock data source – selectSource
- Filter data source – filterData
- Analyze stock data – analyzeData

2.1.7. Domain Behaviors

- User searches for information about a stock:
    - Action: Search for stock
    - Event: Stock data source(s) retrieved
    - Action: Choose stock data source
    - Event: Data source selected
    - Action: Filter data source
    - Event: Stock data displayed
    - Action: Analyze stock data
    - Event: Investment decision made
- User searches for significant trends in the market:
    - Action: User searches for trends (substantial changes)
    - Action: User filters the sources for the data
    - Action: User filters the sources for the predictions
    - Event: Results are shown successfully, and trends are shown to the user
    - Action: User reads and goes through the trends shown.
    - Event: User decides to invest in that trend or sell their existing stock (if any)

2.1.8. Function Signatures

- *getStock: Name x SourceList -> SourceList*
  Searching for sources related to a stock name, in a list, produces a sub-list.
- *selectSource: ID x SourceList -> Source*
  Choosing a source from a list, results in a unique source.
- *filterData: Keyword x Source -> Data*
  Filtering a source produces a set of data related to the keyword provided.
- *analyzeData: Criterion x Data -> Evaluation*
  Analyzing data based on a criterion produces an evaluation.

2.2. Requirements

2.2.1. Requirements Rough Sketch as User Stories

As an investor, I hope that when I need to search for a stock I can easily go into the "Stocker" application and look for it, filter which sources are providing me with the information and be able to observe and analyze them while they're on the display clearly organized. The app is expected to be user-friendly and above all it will be stable so that I can search statistics without interruptions in an accurate and fast way.

As an administrator, I hope data received from the trusted sources that have been selected to provide information about stocks, trends and relevant news are imported

carefully into our platform so that they are both complete and accurate. The application should be easy to use, and administrators should be able to fix any problem when searching for information.

2.2.2. Domain Requirements

1. The ability to provide the statistics of stocks and trends to investors:

The domain model must present the statistics of the different stocks provided by the sources selected. In addition to the stocks, it must present information about trends in different markets. It must present predictions in the market while showing which person or persons from that specific source or sources did the prediction and their validation for it. It must also provide the data in a way that facilitates analysis and review of the statistics provided.

2.2.3. Interface Requirements

2.2.3.1. Shared Data Initialization

For the creation of the system, we must first compile all information from different sources of information on predetermined topics of interest by investors. The acquired data would be used for the initial system, and as time goes on and more educational resources, economic and stock news, charts, and indicators come out, then the data would be continuously connected and updated.

2.2.3.2. Shared Data Refreshment

After an event, important data, or any information that the administrator believes is beneficial to users, the information must be collected immediately and used to update the information shown on the platform. The updates should be done automatically whenever it is possible or by the administrators in the case that it is a new data source that needs to be connected to the application, so it is available to all users.

2.2.3.3. Man-Machine Dialogue

The system shall be implemented as a web application, where the machine must show the information by presenting a graphical user interface on a screen and the users will communicate back by using a keyboard, mouse, and/or touch screen.

2.2.3.4. Updated Information

The system-to-be must provide automatic updates and information to reflect some new information or edit published information and the system-to-be must not allow to change more than once because it could compromise the reliability of the application. In case of an error on entering the date or if the clients notify that some information is incorrect then the information should be sought on other reliable pages, if it is false, it will be removed immediately, and the user and people of the same interest will be notified.

2.2.4. Machine Requirements

2.2.4.1. Performance

For the initial implementation of Stocker, we are counting on a control group of small investors, maybe including students and a sector of the population who are starting to invest. With the creation of this platform, the number of users interested in being part of it will increase. As we expect large consultations in the future, it is necessary to have enough CPU, network, memory, or disk I/O to avoid overloads. The formula **Number of CPU cores / Average time for a page request (in seconds) = Max number of Page Requests per second and Number of max requests per second * 60 * Click frequency of users in seconds = Maximum Number of Simultaneous Users**, with this we will know which is the maximum amount if there are several views simultaneously. The software size will be estimated using existing systems of the same kind and using the **COCOMO model.** The Constructive Cost Model (COCOMO) is a procedural software cost estimation model developed by Barry W. Boehm that works on historical data and provides more accurate details. All machine requirements are still under development and may change along the way.

2.2.4.2. Dependability

The system must allow all people who are interested in a platform that collects information from several tools to have a clearer idea when investing. The system must be compatible with most popular browsers such as: Google Chrome, Apple Safari, Firefox and Microsoft Edge. Each of these browsers has system requirements that must be met according to the device, guaranteeing exclusive and secure access for clients. As an example, Google Chrome minimum system requirements for a computer you'll need:

- Windows
  - Windows 7, Windows 8, Windows 8.1, Windows 10 or later
  - An Intel Pentium 4 processor or later that's SSE2 capable
- Mac
  - OS X Mavericks 10.9 or later
- Linux
  - 64-bit Ubuntu 14.04+, Debian 8+, openSUSE 13.3+, or Fedora Linux 24+
  - An Intel Pentium 4 processor or later that's SSE2 capable.

For more information, go to the official pages of the browsers and check if your device meets the minimum requirements. The software will be dependable even in an environment with failures and errors. The app must have at most two failures per month. Time between failure requiring more than 5 hours downtime must be at least 360 days (about 12 months).

2.2.4.3. Maintenance

The application must be made to adapt to all types of computers and to be easy to expand in the future to other services, delivering the same functionalities and behaviors of the already made services. The corrective maintenance shall be done remotely: from a developer site or via secure Internet connections. The app shall be designed in such a way as to clearly be able to monitor the user and compute for any instance of any query command. If an unwanted error occurs or an attempt to breach security, the developer will be notified immediately.

2.2.4.4. Platform

Stocker: Elsewhere prescribe software for the application is to satisfy the following platform requirements: shall be developed by "Team 11", shall execute on every computer with an internet access that complies with the dependability of the systems, shall be the maintenance of the code made the developers and any hardware topic such as the server would be maintained by the company that owns the server, and shall be demonstrated on anyone who enters the webpage.

2.3. Implementation

The application to be developed will consist of several components that will provide a friendly and welcoming experience to the end users. These components will seamlessly work together to ensure that the throughout the entire interaction of a user with the platform the main objective of supplying the data and information of interest is accomplished while also providing effective and easy-to-use filtering and personalization tools to enhance the platform utility and versatility. The components that will achieve these goals are the following:

- **Simple UI**: a clean, aesthetically pleasing, and readable interface so the user does not feel bloated with information and helps the user read the data in a more relaxed state of mind. Intuitive design and structure with clearly defined areas that can be easily identified upon its first inspection.
    - **Navigation**: ability to move swiftly between the pages that display the data. The pages will allow custom arrangements that ease swapping in an out of certain "views" that the user will store to enhance their experience for each session
- **Common data**: data of interest from the market, the core element of the platform. Stock/option prices, stock/option volume, charts, sectors, technical indicators, economic indicators, news, and financials.
    - **Correct data**: data must be representative of what really is happening or happened in the market, therefore it will be constantly updated and tracked to provide a consistent stream of reliable data for the end user to explore
- **Sort and filter**: mechanism that allows the user to establish search parameters that narrow their choices from the market to items that are closer to their individual interests, all of them prioritized accordingly based on the user's presets and search history.

3. Analytic Part

3.1 Concept Analysis of Rough Sketches

- The difference between stocks and shares concepts is usually overlooked, and they are commonly referred as the same thing. In the domain of this project, it is desired to establish explicitly the difference between them. Both represent, in slightly different ways, equity ownership in a company or corporation. Stocks is a more generic concept; it refers to the ownership in equity of different companies that can be classified together for some characteristic. On the other hand, shares are units of equity ownership of a specific company.
- Long-term investor, short-term trader, stockbroker, market maker, single investor, institutional investor, portfolio manager, and investment banker concepts, will be abstracted into one single general concept: Investors**.**
- Market data concept will comprehend the following fewer generic concepts: stock prices, options prices, time series, volume, futures, sectors, charts, trending and popular stocks, financials, economic indicators, sentiment, etc.

3.2 Validation

Our proposed system ensures that the current situation will be eased and that the current needs will be satisfied. The terminology, events, actions, and behaviors satisfy the domain, meaning we can describe different possible scenarios with these terms. For example, an investor A, which is participant of the Stock Market, owns X quantity of shares of company Y. The investor A looks for information about company Z and since the liquidity of the market is high, they decide to acquire shares of this Z company. An investor B is interested on getting a share of company Y and since investor A is no longer interested on holding their shares of this company then they perform a trade of these shares. More scenarios will be generated and validated with stakeholders in order to see if there is any conflict and fix them.

3.3 Verification

Our stakeholders are in need of a tool that makes accessible all the information required to make good investments. This information includes prices, percentages, statistics, charts, etc. To make sure that we are building the system correctly, we will perform tests on several aspects of our project, including domain, requirements, and implementation.

3.3.1 Test Plan

We can apply several test strategies to our projects, we selected the following:

- Analytic strategy
  - Analyze requirements and create tests based on this, to later compare the results with the basis.
- Model-based strategy
  - Use of this strategy to test specific scenarios.
  - It can be done in terms of domain to test the completeness of it (like on the validation).
  - It can also be done on the product, especially the UI/UX based on the user stories.
- Reactive strategy

- Based on defects/bugs found along the implementation, we will proceed to build tests in order to ensure they do not happen again.

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